The New American Ghost Town:
Foreclosure, Abandonment, and the Prospects for City Planning

Justin Hollander, Colin Polsky, Dan Zinder, and Dan Runfola

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Abstract

Housing vacancy has been recognized as a significant factor that accelerates neighborhood decline. More recently, researchers and policymakers have reframed this problem as an opportunity for adaptive redevelopment. This study is the first stage of a research effort to identify vacancy hot spots, analyze why these areas have declined, and tailor policy recommendations to planners and policymakers for encouraging neighborhood revitalization. It utilized GIS technologies to analyze housing occupancy data provided by the United States Postal Service to show how housing occupancy patterns changed during the recent foreclosure crisis. It also utilized Global Moran's I and Local Indicators of Spatial Autocorrelation (LISA) spatial analysis techniques to identify clusters of declining zip codes. It found that formerly expanding regions in the South, West, and northern Midwest were most heavily impacted. Suburban areas recorded a higher net increase in declining zip codes during the foreclosure period than other areas.

About the Authors

Justin B. Hollander: Justin is an Assistant Professor in the Department of Urban and Environmental Policy and Planning at Tufts University and a Research Scientist at the George Perkins Marsh Institute at Clark University. Dr. Hollander is the author of the forthcoming Sunburnt Cities: The Great Recession, Depopulation, and Urban Planning in the American Sunbelt (London/New York: Routledge).

Tufts University
97 Talbot Avenue
Medford, Massachusetts 02155 USA
tel: (617) 627-3394
fax: (617) 627-3377
email: justin.hollander@tufts.edu
http://www.tufts.edu/~jholla03

Colin Polsky: Colin is an Associate Professor of Geography at Clark University and directs the National Science Foundation funded Human-Environment Regional Observatory (HERO) program.

Graduate School of Geography
Clark University
950 Main Street
Worcester, MA 01610 USA
tel. +1-508-421-3828
email: cpolsky@clarku.edu

Dan Zinder: Dan is a recent graduate of the Urban and Environmental Planning program at Tufts University. His research interests include land use policy, declining cities, GIS, and sustainability.

6 Walter Terrace
Somerville, MA 02145
Phone: 617.997.3625
Email: dan.zinder@gmail.com

Dan Runfola: Dan is a PhD student at Clark University in Worcester, MA. His research interests include Remote Sensing, GIS, Land Change Science and Vulnerability.

950 Main Street
Worcester, MA 01610
Phone: 678.525.2685
Email: drunfola@clarku.edu
web: http://www.danrunfola.com

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Introduction

Over the last several years, growing public attention has centered on the fall-out from the sub-prime lending debacle – an unprecedented event that has resulted in massive foreclosures and widespread housing vacancy in what had been the perennially growing Sunbelt (Goodman 2007; Leland 2007). From Atlanta, to Fort Meyers, to Phoenix, massive new housing developments sit largely unoccupied while older housing sits abandoned due to foreclosure. Cities in the Sunbelt now face depopulation and housing vacancy akin to that observed in former industrial Rustbelt cities. This leads to two critical questions: Can sunbelt cities manage the rapid land use changes that this unstable (and unpredictable) economic situation has created, while still maintaining at least the status quo for remaining residents? How can neighborhood change in depopulating cities provide new opportunities for cities to become sustainable?

In this paper, we report on an empirical study we conducted to begin to answer those questions. We received household residential delivery data from the U.S. Postal Service for every zip code in for the USA for February 2000 (roughly the beginning of the real estate boom), February 2006 (roughly the peak of the real estate market) and February 2009. In our preliminary analysis, we have found hundreds of zip codes, which have experienced a net loss in housing units (a surrogate for both population decline and land use change).

We are completing this project in three stages: first, (reported in this document) the compilation and first-cut analysis of the Postal Service data using basic multivariate statistical techniques as well as an exploratory spatial analysis. The results of this first stage are a series of maps suggesting the scale and scope of the vacant and abandoned property problem and some early hypotheses concerning key correlates. The second stage of the research will involve the analysis, both spatially and non-spatially, of the patterns and trends of housing vacancy throughout the U.S. We anticipate this second stage will result in robust results that will be of a publishable quality and will translate directly to policy recommendations. The third stage of the research will advance the statistical analysis through the application of more advanced spatial statistical analysis coupled with fieldwork in 25 neighborhoods in 30 cities to validate the findings from the second stage.

Overview of Stage 1 Analysis

Three steps were undertaken in the first stage of analysis:

1. The dataset was analyzed and outliers were removed;
2. Data showing changes in occupied housing by zip code was tabulated and mapped;

3. Patterns of spatial clustering were examined for the data using Global and Local Moran's statistics.

Data Source

The USPS regularly releases datasets that provide information on occupied housing units for each United States zip code. For this study, three of these datasets were analyzed: February 2000, February 2006, and February 2009. All zip codes in the Lower 48 states were included in the analysis for a total of 29,026 zips codes in 2000, 28,730 in 2009.

Methods

The key indicator employed was one derived from the USPS dataset: occupied housing units. The USPS data lists how many housing units received mail during a given month in each zip code. After a housing unit is emptied of occupants and with no one receiving mail at the location, it is considered vacant. After 90 days of vacancy, the USPS no longer lists the unit as active and for our purposes removes it from the occupied housing unit list.

Following a method developed in Hollander (2010), we noted a change in occupied housing units from one period to the next as indicative of a shift in housing density (this was possible to do because zip code boundaries remained constant in out study sample). An overall decline in housing density suggests a broad shift in land use in a given zip code and can mean widespread vacancy and abandonment. (Hollander 2010).

Two time intervals were selected for analysis: February 2000 to February 2006 and February 2006 to February 2009. The first period was chosen to correspond with the housing boom years in the first half of the decade and the second period corresponds with the slowing of the boom into the foreclosure crisis. Change for each time interval was calculated by subtracting the later time intervals total households from the earlier time intervals (e.g., Total households in Feb 2000 subtracted from total households in Feb 2006 from that same zip code).

Removal of Outliers

The first step of analysis consisted of an exploration of the dataset to determine if any systematic errors existed. This exploration led to a number of conditions under which zip codes were removed from the datasets:

1. The USPS generates a list every two weeks for zip codes that have undergone administrative changes including those whose boundaries change. These lists were compiled for the duration of the periods in the study. The reasons that communities petition for a change in zip code boundaries, such as aligning zip code boundaries with municipal boundaries, almost inherently corresponds with a change in how many housing units are counted. This makes any analysis of net

loss or gain within changing zip codes impossible to discern from this dataset. Because of this, any zip code that had a boundary change was omitted from the analysis in the period in which the change occurred.

2. Additional zip codes were omitted from the 2006-2009 period in instances where the housing total went from a positive number in 2006 to zero occupied housing units in 2009. While it is entirely possible that a zip code could lose its entire housing stock, it was noted that there were many egregious cases where a zip code containing many housing units in 2006 – thousands in some cases – would be reduced to 0 in 2009.

Data Tabulation and Mapping

In addition to comparing national indicators of household change between different periods, each dataset was additionally broken up into rural, suburban, and urban areas. These regions were defined using Census data with zip codes in Urbanized Areas boundaries corresponding with "urban", zip codes in Metropolitan Statistical Areas but outside of Urbanized Areas corresponding with "suburban', and the rest of the zip codes corresponding with "rural".
With these datasets three steps were undertaken:

1. Tables were created that compared the following factors for declining and gaining zip codes respectively:

    - The number of zip codes with a net decline or gain in housing occupancy
    - Total square mileage within those zip codes
    - Total net housing loss (or gain) for all declining (and gaining) zip codes
    - Percentage of the total housing units lost (or gained) in declining (or gaining) zip codes

    Tables with this information were also created for rural, suburban, and urban classes of zip codes.

2. For the 2006-2009 time interval the twenty zip codes that experienced the greatest decline in housing occupancy were identified and mapped.

3. Data was mapped to display losing and gaining zip codes for each time interval by defining zip codes which lost 30 or more zip codes zip codes as "losers", those that gained more 30 or more "gainers", and those that lost or gained between -29 and 29 as no change.

Global and Local Indicator's of Spatial Autocorrelation:[1]

Two measures of spatial autocorrelation, Global Moran's I and a Univariate Local Indicator of Spatial Association (LISA), were used to explore spatial clustering of USPS Housing Unit Occupancy Change. Global Moran's I was interpreted as a single numerical statistic on a scale of 0 to 1, with values approaching 1 exhibiting increasing spatial autocorrelation and values near zero exhibiting randomness (Heppen, 2003). The Univariate LISA test was used to determine where statistically significant clusters of similar values were located spatially. There were four possible results from a Univariate LISA test:

1. High-high clustering – high change[2] zip codes surrounded by high change zip codes
2. Low-Low clustering – low change zip codes surrounded by low change zip codes
3. Low-High clustering – low change zip codes surrounded by high change zip codes
4. High-Low clustering – high change zip codes surrounded by low change zip codes

The high-high and low-low results indicate local clustering, while the high-low and low-high results indicate outliers, or "islands" (Anselin, 1995).

In this analysis, the GeoDA software package was used to run the Global Moran's I and Univariate LISA tests. A 1st order queen-based contiguity weighting was used for each test. Contiguity refers to the neighboring polygons that have influence on a single target polygon. For example, rook-based contiguity only considers the influence of neighboring polygons in the cardinal directions (north, south, east, and west), while queen-based contiguity considers the influence of neighboring polygons in all directions.

Findings

This analysis of the USPS occupied housing dataset revealed a number of trends that provide a spatial and statistical context for understanding the foreclosure crisis and numerous paths for further investigation.

We had initially anticipated finding significantly more zip codes that had a decline in occupied housing in the 2006-2009 period than the 2000-2006 period. Though the latter period did have 16.4% more declining zip codes than the former period this increase was not as high as expected given the expectation of a boom vs. bust comparison (see Tables 1 and 2). However, when the dataset was broken down by zip codes in urban, suburban, and rural areas much more distinctive trends were noticed. Suburban areas sustained

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[1] Many thanks go to Nick Giner (nginer@clarku.edu) for his contributions to this. Much of the methodological explanation is taken directly from his work examining the spatial distribution of lawns in Massachusetts.

[2] In this case "high change" refers to an increase in housing occupancy over 30 in a zip code. "Low change" refers to a decrease in housing occupancy over 30.

registered 42.8% more declining zip codes in the latter period, rural zip codes registered 14.8% more declining zip codes in the latter period whereas, and urban areas had 1.9% fewer declining zip codes (see Tables 1 and 2).

Table 1: Summary Statistics For Zip Codes With A Net Decline In Housing Occupancy; 2000-2006

	TOTAL US	URBAN	SUBURBAN	RURAL
Total Count of Zip Codes	29,026	7,143	13,801	8,082
Sqmi	3,428,778	145,233.9	1,448,650	1,835,333
Number of Zip Codes with Net Declining Housing Occupancy	5,656	2,124	1,634	1,924
Percentage Zips with Net Declining Housing Occupancy	0.19486	.297354	0.118397	0.23806

Definitions Used for This Study:
Urban is defined as all zip codes within Census defined Urbanized Areas.
Suburban is defined as all zip codes within Census defined Metropolitan Statistical Areas.
Rural is defined as all zip codes outside of Metropolitan Statistical Areas.

Table 2: Summary Statistics For Zip Codes With A Net Decline In Housing Occupancy; 2006-2009

	TOTAL US	URBAN	SUBURBAN	RURAL
Total Count of Zip Codes	28,670	6,949	13,340	8,474
Sqmi	3,400,981	139,770.9	1,390,027	1,884,710
Number of Zip Codes with Net Declining Housing Occupancy	6,586	2,084	2,333	2,189
Percentage Zips with Net Declining Housing Occupancy	0.229717	0.299899	0.174888	0.25832

Definitions Used for This Study:
Urban is defined as all zip codes within Census defined Urbanized Areas.
Suburban is defined as all zip codes within Census defined Metropolitan Statistical Areas.
Rural is defined as all zip codes outside of Metropolitan Statistical Areas.

The maps in Figures 1 and 2 depict occupied housing unit gain and loss during both periods. The 2006 to 2009 interval was not only marked by an increase in the total number of declining zip codes but a marked slowing of growth in many previously expanding areas (as indicated by the increase in "no change" zip codes marked in yellow

in many previously expanding regions). Decline also became more prevalent in new areas. The upper Midwestern states such as Michigan, Wisconsin, Northern Illinois, and Minnesota, Southwestern cities such as Phoenix, Las Vegas, Los Angeles, and the Bay Area, New Orleans, and the outskirts of Florida's coastal cities were hit particularly hard. In contrast, declines in the Great Plains, Mississippi River corridor, western Pennsylvania, and the Pacific Northwest were tempered in the latter period.

The results of the Global autocorrelation tests indicated spatial clustering existed in the dataset. Both measurements of household change exhibit statistically significant clustering, .1208 (sig @ .01) for the 2006 – 2009 interval and .1608 (sig @ .01) for the 2000 – 2006 interval. This prompted us to perform a Local Indicator of Spatial Autocorrelation (LISA) to determine where, spatially, clustering occurred. These results are seen in Figures 3 and 4, focusing only on areas of loss (that is, only examining zipcodes which had a loss in occupied housing units). Only results which are statistically significant at the .05 level are shown in these maps, with areas which are dark red showing zip codes which had high loss surrounded by other zip codes which also experienced high loss. This LISA analysis reinforces what is seen in the maps showing raw change in housing.

Though there were more zip codes losing units in the 2006-2009 period these zip codes were more dispersed and often in new territory, in comparison with the earlier period. The 2000-2006 period shows more low-low clusters (declining clusters), particularly in the Great Plains states and Mississippi River corridor, and western New York and Pennsylvania. Despite having more total declining zip codes less low-low clustering occurred in the 2006-2009 period. However, clustering did occur in new territory including the upper Midwestern states, south Florida, New Orleans, and the Southwest and California.

Figure 1: 2000-2006 Household Delivery Change Analysis Map

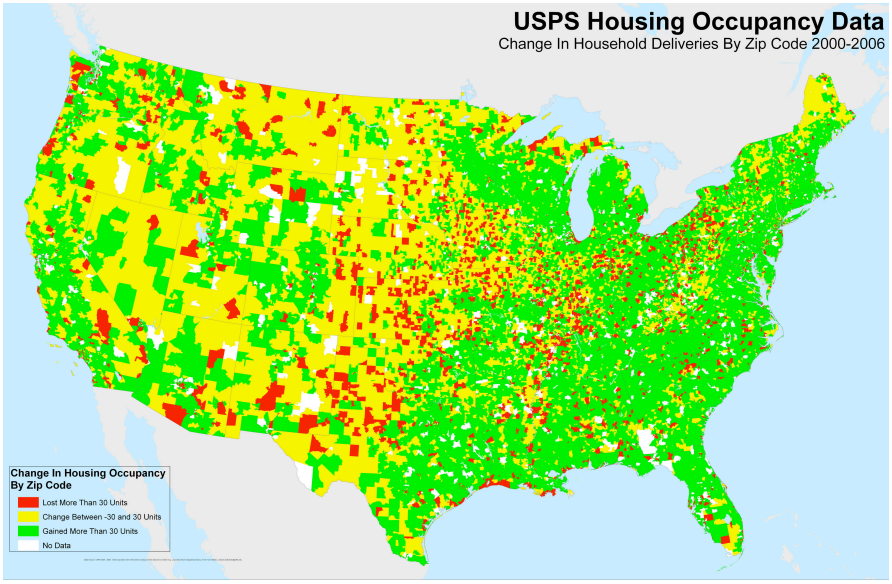


Figure 2: 2006-2009 Household Delivery Change Analysis Map

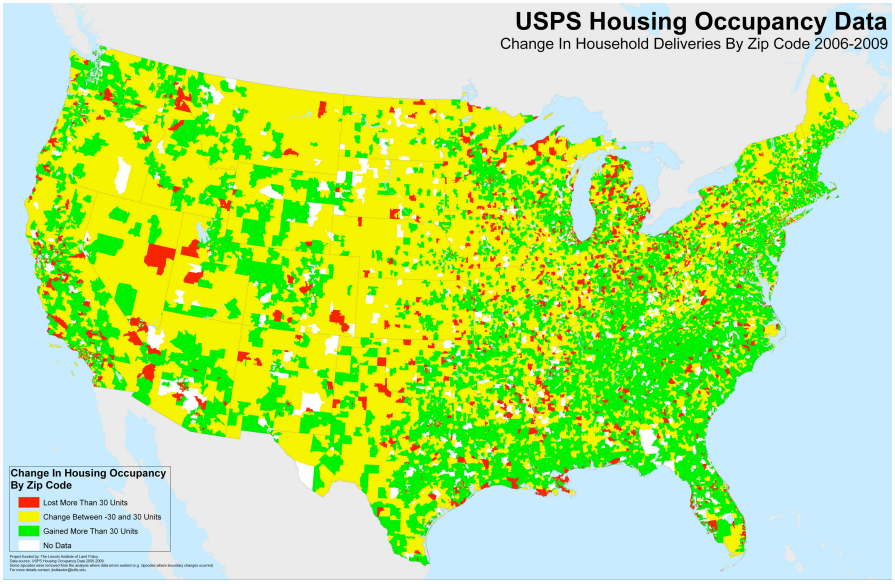


Figure 3: 2000-2006 LISA Analysis Map

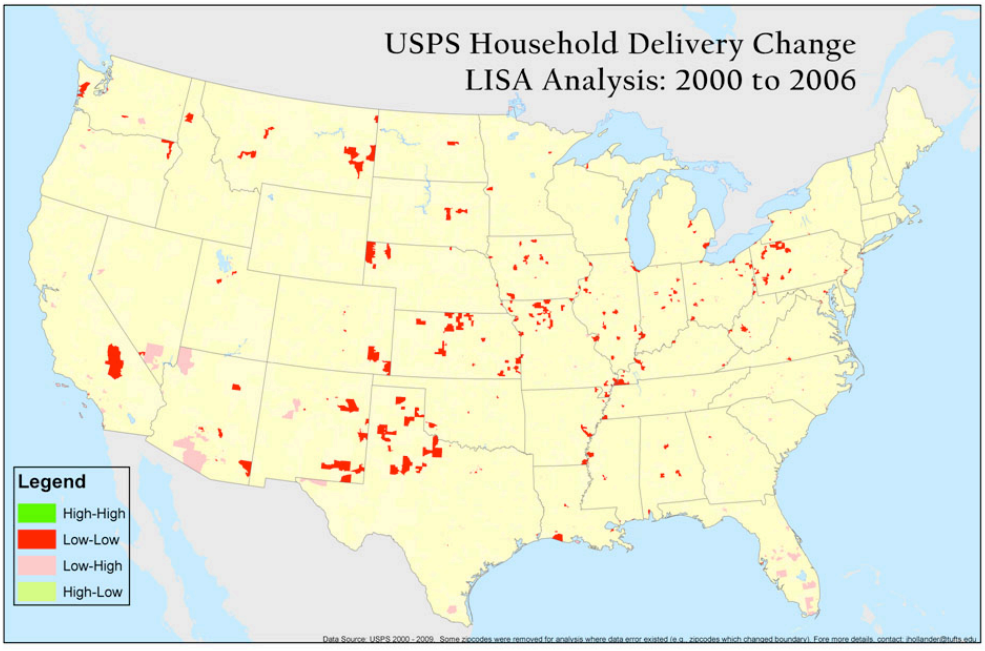
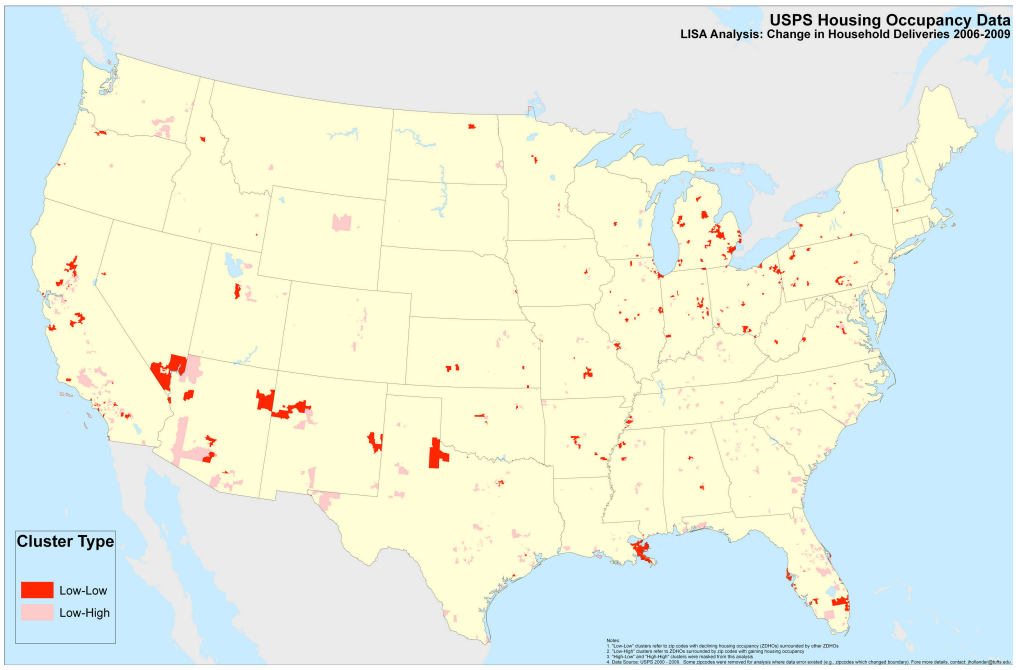


Figure 4: 2006-2009 LISA Analysis Map



Future Research

This research has already generated significant evidence that many areas that were previously not susceptible to decline, particularly suburban areas, have begun to experience some of the challenges of decline previously attributed to urban areas and central cities. In the second and third phases of this research, we propose to further study how changes in occupied housing density have been dispersed throughout major Census defined Urbanized Areas and to begin to employ advanced multivariate statistical techniques to understand the key attributes which cause places to decline and cause such decline to occur in a clustered fashion.

For Stage Two, we propose to conduct a multivariate, explanatory spatial statistical framework. This product will result in robust results that will translate directly to policy recommendations. For Stage Three, we will probe the spatial statistical analysis with in-depth field work in 25 neighborhoods in 15 cities and towns to validate the spatial statistical findings. The complete project will require three years.

For Stage Two, we ask: What are the geographic distributions of zip codes that have lost/gained households receiving mail, for the periods 2000-2006 and 2006-2010, and do these distributions exhibit statistically significant patterns? The analytical steps are as follows:

Stage 1 located some statistically significant clusters of zip codes experiencing home abandonment in recent years, the next question to answer is: What social processes and

factors explain this clustering? We will answer this question using a sequential quantitative-qualitative mixed methods approach. It is important to note that housing abandonment (i.e. a drop in occupied housing unit density) is one manifestation of neighborhood change and it is only part of a larger story of metropolitan growth and decline. We focus here on those neighborhoods in decline, but will be attuned to the growing neighborhoods, as well.

1. Quantitative study of the geographic clustering of home abandonment

    i. In this stage, we will revisit the extant literature on home abandonment, in combination with insights produced by the spatial statistical analysis described above, to enumerate the social processes and factors thought to produce home abandonment.
    ii. Next, we will search existing databases with national coverage (e.g., American Housing Survey variables on abandoned housing and decennial census variables on vacant housing units) to identify datasets with socio-economic measures that reflect the processes and factors enumerated in the list above.
    iii. Finally, we will use the available data to specify a multivariate spatial econometric model, with a measure of home abandonment as the dependent variable. A spatial econometric framework will allow us to test for the presence of spatial patterning among (a) omitted variables (via heteroscedasticity) and/or (b) the specified variables (i.e., parameter estimates) (Aneslin 1988; Anselin and Bera 1998; Polsky 2004). Where appropriate, a multi-level (i.e., geographically nested random coefficient/parameter) model will be used (cf. Polsky and Easterling 2001; Bryk and Raudenbush 1992) to test for the importance of geographical nesting of neighborhoods (zip codes).

For Stage Three of the research, we will conduct field research to validate the findings from Stages 1 and 2. This third stage will also allow us to further probe the causal relationships between economic decline and abandonment patterns, further testing the hypothesis developed during Stages 1 and 2 and probing for variation of conditions within neighborhood. In approaching this stage, we will adopt a research design utilized by Dr. Hollander in several published studies which involves a triangulation of multiple qualitative sources in a rigorous and systematic methodology. The analytical steps are as follows:

1. Based on the results of the earlier work, we will identify between two and three neighborhoods located within between 5-10 cities and towns to examine more closely – being sure to include both growing and declining places. In selecting neighborhoods, we will find those for which the resident defined neighborhoods boundaries are roughly coterminous with that of zip code boundaries. Here we build on the findings of urban geographers who have challenged the static or top-

down nature of defining neighborhood boundaries and instead attempt to incorporate the meanings that residents bring to these territories and the political contests that shape them (Martin 2003; Cope 2008). While this is far from common, previous research by the Dr. Hollander successfully employed this strategy in a recently completed research project.

2. Background research for each city will be conducted, including extensive literature reviews and examinations of published and unpublished city and NGO reports on land use, development, and housing issues in each city and neighborhood.
3. Contacts will be made with key city officials in each of the sample cities and through a snowball sampling methodology key community and neighborhood leaders will be identified in each location. At least two local officials and at least two non-governmental community leaders knowledgeable about each neighborhood will be included in the study. Previous research has shown that interviewing local officials alone provides biased results and that this type of inquiry also demands the voices of community development professionals working outside of local government (Hollander 2009).
4. Through in-person and telephone interviews, we will examine the spatial pattern of shrinkage in each neighborhood to assess both how each place changes and to gain insight into why they experienced decline. Content analysis of interview data using NVIVO qualitative analysis software.
5. Direct observation of each neighborhood through fieldwork will involve capturing information about abandoned buildings, vacant lots, new construction, and overall neighborhood aesthetic quality to assess variation in conditions among neighborhoods.
6. The field observations of physical conditions in each neighborhood will then be compared with findings from the quantitative data analysis for the purposes of validation.

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