

The Geography of Population Loss in the U.S.: New Insights From a Typology of Decline

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Abstract: This paper uses demographic data for the United States at multiple spatial scales and complements it with historical change data at the county level to construct a multilevel spatial database that allows the development of a county-level typology of population change. This typology incorporates not only recent population change within the area, but also past change and changes occurring in surrounding locations, allowing for a more nuanced—and potentially accurate—assessment of the nature and character of population loss in the United States. A descriptive analysis of typology categories is conducted and fundamental questions are answered, such as: where is decline occurring, how much territory does it encompass, what types of places are experiencing what sorts of decline, and how does the geography of decline differ from that of growth? In addition, the analysis produces a deeper knowledge of the areal extent of population decline in the U.S. and answers questions such as: Where are the counties most affected by decline (i.e. those that are surrounded by other declining areas that have been experiencing ongoing population loss for several decades) and how spatially clustered are they? The final portion of the paper assesses internal patterns of decline within different types of declining counties. Questions answered here include: How common is neighborhood, or tract-level, decline across different types of counties? Are some kinds of shrinking counties losing population across the board or are they simply redistributing people to other neighborhoods or areas within the county? All together, the paper provides measurements and visualizations of the geography of different types of decline and identifies locations that might be considered particularly vulnerable based on their history of population loss and/or the larger spatial context of population change within which they are situated.

Introduction

Although population growth at the national level continues unabated, many areas of the United States face recent or ongoing population decline, with no immediate prospect of a demographic turnaround. Between 2000 and 2010, 35 percent of U.S. counties, both urban and rural and in all regions of the country, experienced population loss. During the same period, 18 percent of large cities (population 100,000 or more in 2010) experienced population decline. And these figures are not mere short-term aberrations: over 30 percent of counties had fewer inhabitants in 2010 than in 1950. The impacts of population decline are myriad: an aging of the population, shrinking tax base, loss of sense of community, difficulty attracting outside investment, and mismatch between service needs and available infrastructure (see e.g. Hummel and Lux, 2007; Reher, 2007; Beauregard, 2009; Coleman and Rowthorn, 2011; Weichmann and Pallagst, 2012). Building on prior research that focuses mainly on non-metropolitan areas or older central cities, this paper will provide an authoritative evaluation of the phenomenon of population decline across the nation, at multiple spatial scales. The paper is novel in its focus on demographic characteristics and change, generating new knowledge about who is affected by population loss and how decline is connected to demographic change processes, such as residential segregation or age structure.

Population shifts have important spatial and temporal dimensions. Decline (and growth, naturally) is uneven across space, and it occurs sometimes in specific pockets and sometimes covering broad regions. It is also uneven over time, appearing as a long term continuing loss in some areas and as a first-time event in others. Finally, population loss is the result of myriad demographic and economic processes—suburbanization, globalization, shrinking family size, to name a few—working at a range of spatial scales,

from neighborhood, to city, to region and nation. And given the uneven spatial distribution of different populations—racial, ethnic, or age groups, for example—**some sub-populations are likely to be more exposed than others to the impacts of population decline**. The word itself, “decline,” can have economic, cultural, or demographic connotations, among others. For the purpose of this paper and the following proposal, “decline” alone will be taken to refer to population loss, or depopulation. And although the paper could seek to uncover the causes of decline listed above, it adopts a different strategy, focusing on the geography of loss and how this geography is related to demographic characteristics and change.

Space and time are hypothesized to be important dimensions of population decline. Recent population change, 2000–2010, is studied in relation to a composite measure that combines the area’s change in this decade, plus change in surrounding locations and the prior history of change. This approach provides a bird’s eye view of the dynamics of depopulation across the U.S. but also clear measures of those experiencing the impacts of population loss at various spatial scales. It also provides a more nuanced alternative to typical population change statistics that simply report percent change over a given time period. Implicit in this approach is a belief that there are different types of decline, that impacts of decline may vary depending on the “sort” of decline, and that the key dimensions to evaluating different sorts of change are history and spatial context—recent loss following decades of sustained growth has different demographic impacts (and real-world impacts) than recent loss that is a continuation of past decline trends.

Background Literature and Theoretical Context

The existing literature on population loss is splintered across a variety of social science disciplines and tends to be national or local/regional in scale and outlook. Nonetheless, existing research and logic provide some initial guidance. First, population loss is experienced in a variety of types of places in the United States and elsewhere, this loss has measurable impacts on those left behind, and expected impacts are likely to vary depending on spatial scale. Second, context and scale matter: not only does measurement of loss depend on choice of geographic unit and time frame, but impacts of that loss will be mediated by past experience as well as that of neighboring areas. Third, population change is inherently demographic in terms of both sources of that change and its impacts on population composition.

As a topic, population decline has been studied at the national, city, and rural scales. Decline at the national level can be tied to issues of national self-worth and in terms of impacts is most closely associated with aging of the population, economic activity and productivity, and national defense priorities (Coleman and Rowthorn, 2011). Moreover, its demographic sources are usually linked to low fertility, as opposed to emigration. Lutz, O’Neill, and Sherbov (2003) highlight the “negative momentum” of smaller numbers of reproductive-age individuals and below-replacement level fertility that can lock a nation into continued population loss over time. This observed negative momentum can hold for smaller areas, as well. On the local and regional side, research has focused on either rural or non-metropolitan counties (e.g., Johnson and Purdy, 1980 or Popper and Popper, 1987) or cities (e.g. Beauregard 2009; Gordon, 2009; Rieniets, 2009; or Short and Mussman, 2014); it is extremely rare for a study to encompass the geography of an entire country. Where shrinking cities are concerned, the planning literature is burgeoning (e.g. Hollander, 2011; Hollander and Németh, 2011; Martinez-Fernandez et al., 2012; or Reckien and Martinez-Fernandez, 2011), but with little explicit demographic analysis;

outmigration or changing population distribution are stated as facts and are not topics of investigation unto themselves. Rather, the shrinking cities literature addresses policy solutions, as well as underlying economic, institutional, and societal change that drive decline. Better understanding of the demographic nuances of decline would likely improve planning policy.

Although the literature is silent on the issue, this paper posits that not all population loss is created equal. When recent population loss follows successive decades of decline, the effects fall on an already-impacted population: previous attempts at population turnaround will have failed, suggesting the underlying causes of decline are entrenched. Age structures may be older, too, meaning that evolving infrastructure needs take place in a very unfavorable fiscal environment (assuming no outside government support) and the possibilities for a return to population growth are limited. In contrast, emerging, new decline—such as that resulting from the Great Recession and the housing foreclosure crisis—could be temporary but almost certainly takes place in a more robust demographic and economic context. Spatial context is important, as well. Pockets of decline, whether emerging or longstanding, surrounded by growth could indicate that the larger labor market is relatively healthy and that population loss is due to shifting housing or location preferences. Areas surrounded by other loss-suffering areas may face a more intractable challenge, one that demands a different sort of policy response. Although focused on rural economic development, Feser and Sweeney (2003), Feser and Isserman (2006), and Veneri and Ruiz (2013), have shown that interaction, or spillovers, matter for economic development, as does proximity to urban areas. The same is hypothesized to be true where population loss is concerned: declining areas that are more distant from other declining areas are different in nature from those located closer or surrounded by more decline.

Spatial scale is also important. Population loss at the county or regional level has different impacts than loss at the neighborhood scale, where the immediate concerns may relate to housing vacancies and lack of services, rather than, say, lack of economic opportunity. Glaeser and Gyourko (2005), for example, find that urban housing costs play an important role in determining where population growth/decline will occur. This relationship may hold at a city level, but not at a neighborhood or even county level. Similarly, Boustan and Shertzer (2013) show the importance of residential preference and demographic factors for central city population loss but consider only cities and suburbs, and not larger regions. Also, of key interest for this work, population change at the county level is produced by change at the neighborhood level. Those living in declining neighborhoods within declining counties face decline at multiple spatial scales: it forms part of the daily, lived experience, but also affects individuals via municipal financial health and job markets. In contrast, those living in stable or growing areas of shrinking counties may be relatively insulated from the negative impacts of population loss, at least at the local level. This suggests another point: geographies, whether neighborhoods or counties, are interdependent. The internal spatial patterns of loss are thus also of interest.

Population change is a demographic phenomenon, both in terms of causes and effects. Decline can only happen through some combination of natural decrease and outmigration. Uncovering the intricacies of migration (out-migrants' destinations, but also characteristics of in- and out-migrants) can help explain how declining counties may differ from each other. Counties losing population due to natural decrease may be less susceptible to policy efforts to bring about a return to growth than those losing population mainly through out-migration to local destinations. And counties that lose inhabitants to neighboring

counties face different challenges than those losing migrants to further off destinations. Research on population distribution has established that trends vary over time and that geographical location matters (Fuguitt and Beale, 1996; Johnson and Beale, 1994; Johnson, Nucci, and Long, 2005; Johnson and Purdy, 1980), leading not only to population loss in some areas, but also changing population composition in terms of age and race/ethnicity (Franklin, 2014a; Johnson and Lichter, 2008, 2010). Moreover, the changing concentration of population across different spatial scales over time documented by Long and Nucci (1997) is the result not only of regional shifts in internal migration flows but also, of course, regional variations in births and deaths (Rogerson and Plane, 2013). In short, population change occurring in any one area is interdependent with demographic dynamics in other locations and at multiple spatial scales. In order to understand decline in any one location—or all—we must assess it within its larger demographic and spatial context.

Decline is related to demographic outcomes as well: some groups are more likely to live in declining areas than others, meaning that the burden of loss falls disproportionately on some more than others. The overall composition of places is also likely to change as decline occurs—mixing of groups may increase or existing segregation patterns may worsen. Watson et al. (2006), for example, show that income segregation decreases more quickly in fast-growing metropolitan areas and suggest findings may hold for racial segregation, as well. This means that population loss may have important implications for improvement of residential segregation over time, as residential patterns become sclerotized as population shrinks. Also, importantly, because of the hypothesized roles of space and time, the effects of loss may vary by type of decline. To take the previous example of residential segregation, change in the observed mixing of groups in an area likely varies depending on the history and spatial scale of population loss.

Conceptual Framework

In spite of the potential severity and unevenness of impacts and the widespread nature of the phenomenon, current knowledge on population decline is unable to answer such basic questions as how do spatial and temporal scale affect measurements of decline and how persistent is the trend across different location types? Or, who is most likely to be affected by population loss and how are their communities and regions changing as loss occurs? Although the proposed paper does not fit squarely into any one existing stream of research, together the bodies of literature referenced above do suggest foundational facts and conceptual relationships to build upon.

First, population change, and in particular decline, can be viewed as varying across sub-national space and as the result of interactions across a range of geographical units, scales, and configurations. Full understanding of either national- or sub-national-level change requires consideration of neighboring areas, as well as other aspects of spatial configuration (e.g. clustering or proximity to large cities). This paper considers change at the neighborhood (i.e. census tract), city, county, and metropolitan area levels. It also incorporates spatial and historical context into measures of change to classify counties and cities by type of decline.

Second, not all population decline is created demographically equal. Change is the result of varying contributions from migration, births, and deaths and, so, while the outcome (population loss) is the same for a range of places, the demographic impacts and appropriate policy responses may be different. Most

important here are the distinctions between natural decrease (surfeit of deaths over births) and out-migration, as well as characteristics of migrants and their destinations.

Third, ongoing population redistribution implies that, even in a national context of population growth, population decline can be persistent and widespread and is likely to be associated with particular subpopulations and changes in demographic composition in affected areas. In its conception, this paper relies partly on work done by Johnson and Purdy (1980), who looked at nonmetropolitan county population change post-1970, based on the past county history of change, and then linked recent change to geographic location and migration patterns. In addition, basic migration theory addressing both migrant and origin/destination selectivity suggests who might be affected—with those who are most able migrating out first, leaving behind the older and those possessing less human capital (Sjaastad, 1962; Lee, 1966; Plane and Heins, 2003; Plane, Henrie, and Perry, 2005)—but these conjectures have not been tested within the context of population decline. Similarly, although decline should have some predictable effects on compositional *change* (e.g. areas become older), how decline is related to the mixing of groups (i.e. residential segregation) and whether these effects vary across type, location, or spatial scale of declining areas is less clear. Certainly, measurement of segregation depends on unit and spatial scale (Lee et al., 2008), so that segregation, decline, and scale may be confidently assumed to be interdependent.

This paper conceptualizes the differential impacts of decline in terms of *exposure* and *burden* and sees decline as form of spatial inequality. Exposure can be thought of as the share of a particular subgroup (e.g. White, non-Hispanics or children) living in a declining area, and it operates at multiple spatial scales. So, for example, we could consider the share of the total Black, non-Hispanic population in the U.S. that lives in a city that is shrinking. More specifically, for a shrinking city, we could compare the shares of different demographic groups that are living in the shrinking neighborhoods that are driving the city-level decline. Minorities and the old are hypothesized to be more exposed to the impacts of decline. The burden of decline gets further at the idea of disparate impacts of decline: who is it who feels the impacts of housing vacancies, school closures, or lack of economic opportunity?

Fourth, and finally, focus on one, non-exhaustive unit of geography—the city—obscures the fact that change within the city is inter-related with changes occurring in neighboring areas and even larger regions. Because cities are the focus of much of the shrinking cities literature and because they are home to a large share of the U.S. population (27 percent of the U.S. population in 2010 lived in a city of 100,000 or more) they are included in the proposed analysis. However, because city-level change is related to change at other spatial scales, the paper addresses counties in equal measure (see Data section for further details).

Analytical Approach

Measures of population change for any location are problematic: both the choice of time period and spatial unit will affect results. The latter is referred to as the modifiable areal unit problem, or MAUP, and has been well documented in the field of geography (Openshaw and Taylor, 1979; Wong, 2004). Moreover, loss in a particular location may be balanced by growth in neighboring locations or may be paired with coinciding loss in the larger region. These difficulties suggest that a more useful indicator of population decline—one that might serve better to assist policymakers and researchers in identifying vulnerable locations and populations—would incorporate measures of both temporal and spatial scale. Together these elements differentiate between, for example, counties or cities in growing regions that are

experiencing only recent population loss and those for which decline has been persistent over time. A goal in developing the typology is to highlight how alternative measurements and conceptualizations of decline elicit different information.

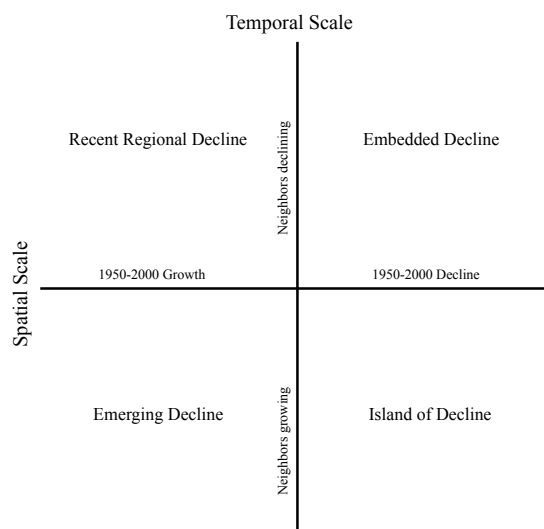
Previous typologies have focused mainly on only one type of geographic area (cities or rural counties) or have been based on historical or geographic context, but not both (Beauregard, 2009; Feser and Isserman, 2006; Johnson and Purdy, 1980; Short and Mussman, 2014). Johnson and Purdy (1980), for example, investigate the past history of population change and consider proximity to metropolitan areas, but their sample comprises only nonmetropolitan counties. There appears to be no previous research looking at decline at multiple spatial scales. The paper will quantify and characterize the areal extent of population decline in the United States by developing a typology of declining and growing counties and cities, incorporating recent rates of population change, as well as measures of depopulation in previous decades and in surrounding counties. The typology will be constructed for counties, and in parallel for cities, and will be based on three elements: population change 2000–2010, population change 1950–2000, and population change in neighboring areas, 2000–2010 and earlier. Taken together, these elements yield four categories for counties that lost population, 2000–2010, and four for those that gained population during the period. Most work evaluating the typology will focus on the four decline categories (Figure 1).

Geographical typologies abound. They can be constructed manually, using clustering methods such as k means, or employing data reduction techniques such as factor analysis (Mulligan and Vias, 2006; Smith, 1977; Vias, Mulligan, and Molin, 2002). This paper will compare results using each method: once the data are assembled, typology construction and comparison is straightforward if time-consuming. Alternative operationalization of spatial and temporal context will also be considered. Geographic Information Systems (GIS) will be employed to capture population change in neighbors, both average change and share of neighbors experiencing loss. Distance-based, contiguity-based, and commuting-link operationalization of “neighboring areas” will be explored, as will definition of neighborhood change (i.e. recent change alone or combined with historical measures of change). Use of first and second order contiguity will allow places to be identified that are embedded in local or regional areas of decline.

The typology will be used to answer the following questions: where is decline occurring, how much territory does it encompass, what types of places are experiencing what sorts of decline, and how does the geography of decline differ from that of growth? How do typology-based findings differ from basic population change statistics and what does this indicate for our understanding of the geography of decline?

Alongside the typology development, the analysis will produce a deeper knowledge of the areal extent of population decline in the U.S. and will answer questions such as: Where are the counties most affected by decline (for example, those that are

Figure 1. Local Decline



surrounded by other declining areas that have been experiencing ongoing population loss for several decades) and how spatially clustered are they? Are some shrinking cities or metropolitan areas losing population across the board or are they simply redistributing people to other neighborhoods or areas within the larger region? Thus, this part of the paper will produce measurements and visualizations of the geography of different types of decline and will identify locations that might be considered particularly vulnerable based on their history of population loss and/or the larger spatial context of population change within which they are situated.

Following this first stage and using the categories developed above, the internal variations in population change across decline categories will be studied for counties and cities, using Moran's I, a standard measure of spatial dependence across sets of spatial units, and other usual measures of variation. The geographic characteristics of different decline types will also be investigated, to determine which types of decline fall into central cities, outlying areas, micropolitan areas, and non-metropolitan areas. Proximity to growing places will also be evaluated for each county/city and type of county/city.

Exploratory analysis looking at county-level change between 2000 and 2010 and the share of neighboring counties experiencing decline suggests there is value in incorporating spatial relationships into measurement of decline (Figure 2). In the top map, the lighter color indicates declining counties surrounded by other declining counties. The darker colors indicate declining counties embedded in two levels of decline (neighboring counties lost population, as did *their* neighbors). The figure on the bottom panel shows declining population, but in this case counties are surrounded by one (light blue) or two (dark blue) spatial layers of *growing* counties. In a typical choropleth map showing county-level population change, declining counties in the top and bottom panels would fall into similar categories, when in fact their spatial context is quite different.

Figure 2. Spatial Context of County-Level Population Change, 2000–2010

