The demographic burden of population loss in US cities, 2000–2010

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Abstract

Although the effects of urban shrinkage on quality of life and the built environment have received a great deal of attention, the characteristics of those experiencing these impacts have been much less studied. This is ironic, as urban shrinkage or depopulation is by nature a demographic phenomenon: city sizes evolve precisely because people move in and out, are born, and die. Moreover, the demographic processes that contribute to shrinking cities—out-migration and death—are selective and so they also govern who remains behind in cities as they shrink. It is this latter group that is the focus of this research. The analysis contributes to the literature on shrinking cities through its novel consideration of community-level exposure to depopulation. In particular, it investigates who is impacted by loss; the extent to which population loss is experienced disproportionately across urban space and demographic subgroups; and whether decline occurring at multiple spatial scales magnifies exposure for some groups more than others. Findings show that, at both city and census tract levels, demographic characteristics of growth and loss areas are different and, at all levels, some groups are more likely than others to be living in a loss-impacted area.

Keywords Population loss · Inequality · Race/ethnicity · Aging · Age structure · Shrinking cities · Urban demographic change

JEL Classification J11 · J15 · R23

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1 Introduction

As a subject of research, shrinking cities have garnered attention from across the social sciences. Planners have been the largest contributors to this literature, but geographers and economists have weighed in, as well. Within geography, a recent spate of publications has helped to push the subject into further prominence (Bellman et al. 2018; Franklin and van Leeuwen 2018; Franklin et al. 2018; Richardson and Nam 2014; Reis et al. 2016; Weaver and Bagchi-Sen 2014; Weaver et al. 2016). Given the long-standing nature of urban decline in the USA, Germany, and elsewhere, it is natural that most attention should focus on the economic or fiscal causes of decline, the locations it occurs, its myriad impacts, and the most suitable responses. Population geography and demography, however, have been largely absent from this discussion. This is interesting and, especially, ironic, as shrinking cities and urban decline are fundamentally about people: not only people out-migrating, suburbanizing, dying, or aging, but also how many people are living in affected areas and what sorts of demographic characteristics they possess.

Such demographic insights are valuable from a practical perspective. Effective policy responses surely require knowledge about the recipients or beneficiaries of said policies. Demographic insights are also useful from a theoretical perspective. Identifying shrinking cities and comprehending the myriad causes and impacts—whether housing vacancy, provision of services, or quality of life assessment—requires understanding and baseline knowledge about the underlying demographic processes at work. This paper explores just one aspect of the demographic element of urban decline: who and how many are affected by recent population loss in US cities. This basic question, to which we do not as yet have answers, offers important foundational knowledge about the demographic characteristics of shrinking cities.

2 Motivation and conceptual context: the demographic burden of decline

Population loss in the USA, whether urban or rural, takes place within a larger context of growth. Between 2000 and 2010, the nation's population grew by almost 10%. This strong growth rate belies the heterogeneous change occurring within the country, however. At a sub-national scale, many areas of the country face recent or ongoing population loss, with no immediate prospect of a demographic turnaround. During this same time period, 35% of US counties, both urban and rural and in all regions of the country, experienced depopulation. Where cities are concerned, 18% of those with a population 100,000 or more in 2010 lost population during the same period.

Tallies of numbers of areas and magnitudes of loss (e.g., Detroit losing 25% of its population between 2000 and 2010) represent the usual way of identifying and

categorizing urban decline. This approach, though straightforward, risks neglecting the demography of loss, in particular those left in an area after or while loss is taking place. At the county level, for example, stating that 35% of counties experienced loss provide useful information about the areal extent of decline, but is of indeterminant value where population is concerned. Of equal or greater importance is knowing how many people live in such impacted areas and whether they are old, young, or poor, for example. Put another way, the number of areas losing population is a different metric than numbers and characteristics of people living in areas losing population.

In addition, concentrating on summary statistics for cities or metropolitan regions, while shedding light on the widespread nature of the phenomenon, ignores the potentially heterogeneous change occurring within the city that is producing loss at the larger urban scales. This approach also misses out on the role of scale in measurement of change: choice of unit is related to the amount of change recorded (for example, Detroit city versus metropolitan area), and the impacts of shrinkage vary by spatial scale. That is, neighborhoods losing population face challenges associated with increased housing vacancies and decreased values, closing schools, and loss of other public and commercial services. At the city level, loss of population impacts tax revenue and ability to provide services. Up another level, at the metropolitan scale, loss of population may reflect a region-wide lack of opportunity. Those living in areas in which all three are occurring may be especially vulnerable, feeling the cumulative impacts of decline at each level: neighborhood, city, and region. This is the burden of decline, and it operates at multiple spatial scales.

When the country as a whole continues to grow, it is tempting to treat population loss at any spatial scale as a temporary phenomenon that will right itself through some combination of demographic or economic mechanisms. Although this is likely true in many situations, in the short-term impacts are felt and adjustments are necessary—and some population will bear the brunt of these effects, whatever they may be. Thus, there is value in studying inhabitants along with areas: *Who* and *how many* are affected by population loss and whether this is different from the characteristics of those living in non-shrinking locations. Given the spatial nature of population change, considerations of scale and the potential for living in double or triple jeopardy areas of decline are also worth pursuing. In particular, some demographic groups are hypothesized to be more likely than others to be embedded within multiple spatial layers of population loss (i.e., census tract, city, *and* metropolitan area)—the burden of decline may be especially heavy for these individuals. To begin to provide some baseline information about those living in loss-impacted places, this paper assesses not only the macro-level demographic characteristics of US cities losing population, compared to those that are growing, but also the characteristics of those living in the sub-areas that are the source of city-level decline.

As noted above, it is an unavoidable fact that change statistics are dependent on the geographic unit employed, such that measures of impacted population will shift with spatial scale. This paper focuses on larger cities in the USA, including their wider metropolitan context as well as their component census tracts. Why cities as the preferred spatial scale of analysis? They are tricky to work with, with frequently changing boundaries and geographies that do not align with commonly used census tracts or

metropolitan areas. Weighed against their disadvantages, cities have at least two benefits. First, if one aim of the paper is to provide the demographic complement to existing research, it makes sense to choose units that align with that body of work—much of which has been on cities and how to describe and manage for their decline (e.g., Beauregard 2009; Hollander 2011; or Short and Mussman 2014). Second, while ascertaining the disproportionate burden of decline at a variety of spatial scales may be interesting from an intellectual perspective, it is most useful from a policy perspective when the unit has administrative powers and responsibilities and therefore has some capacity to take action based on results. US cities meet this requirement.

The explicit focus of this paper on the demography of decline is not intended to suggest that the areal aspects are unimportant. The areal aspect of decline undeniably impacts effective service delivery and infrastructure provision. Areal effects may be compounded, though, if those living in shrinking areas come from marginalized or vulnerable populations. As an extensive corpus of research on neighborhood effects has shown, the contexts in which individuals live can have measurable impacts on outcomes, over and above the contribution that individual characteristics make to a particular outcome (Wilson 1987). The “on-the-ground” experience of population loss—vacancies, closures, decreases in public service provision—may then carry impacts that overlay, exacerbate, and intersect with existing levels of disadvantage. So it is important to ask whether age, racial and ethnic composition, and poverty levels at the city and tract scales differ depending on whether a city or census tract is growing or shrinking. For that reason, the demographic profile of those living in shrinking cities and tracts is addressed here. The characteristics of those individuals living in areas affected by decline at multiple spatial scales (for our purposes, declining tract, city, and metropolitan area) are also explicitly considered. To answer these questions, data for 2010 census tracts are integrated with 2000–2010 tract-level change data and data for cities. From that, a spatial hierarchy of exposure to decline is constructed for individuals in census tracts—where loss is captured at the tract, city, and metropolitan area levels. Paired with the demographic and socioeconomic characteristics listed above, the analysis shows who bears the burden of decline across multiple levels of geography.

The remainder of the paper is organized as follows. The next sections address the previous research on shrinking cities, demographic change, and neighborhood context and show how, taken together, this research provides a framework for evaluating the demographic context of urban population loss in the USA. Subsequently, the data employed in the analysis are summarized and the analytical strategy is discussed. The section thereafter explains how the burden of decline is estimated and provides the analytical results and an in-depth example for Chicago, Illinois. Conclusions and thoughts on future avenues of research are offered in the final section.

3 Background

Although shrinking cities or urban population loss may be fundamentally a demographic phenomenon, this has not been the main lens through which it has been studied. Rather, the backbone of the shrinking cities literature comes from the field

of planning and has been complemented by contributions from economics, geography, and, very occasionally, demography. In planning and related fields, the main topics of interest are identifying and classifying locations of loss (Beauregard 2009 or Short and Mussman 2014)—that is, generating descriptive typologies of shrinking places based on place, economic base, or history of loss. Identifying possible impacts and responses (Cooper 2011; Rieniets 2009; Savitch 2011) and envisioning and evaluating future outcomes for currently shrinking cities, particularly under the rubric of “right-sizing” or “smart decline,” have also been key threads in the literature (Großmann et al. 2013; Hollander 2011; Hollander and Németh 2011; Schilling and Logan 2008). These are often case studies that evaluate how, for example, city master plans can be used as a tool to meet the challenges of decline head on, through innovative policy and planning. On the policy side, as Mallach (2017) notes, US-based shrinking city policy has been distinctly bottom-up, with individual cities identifying challenges and crafting responses tailor-made for their situation. In economics, contributions have emphasized the impacts of new housing construction costs and housing durability (Glaeser and Gyourko 2005), as well as the role of residential choice and household formation (Boustan and Shertzer 2013). From a more theoretical perspective, within the field of geography, Weaver and Holtkamp (2015) offer an assessment of theories of urban decline, while Weaver and Bagchi-Sen (2014) evaluate sources of neighborhood population change. In each case, the impact and value of this research would be enhanced by a better understanding of the numbers and characteristics of individuals who live in these locations and are exposed to the impacts of depopulation and any attendant policy responses.

Internationally, population loss at the city, regional, and national levels has attracted a good deal of attention. Coleman and Rowthorn (2011) and Reher (2007), for example, address population loss at the national scale, highlighting the roles of demographic momentum and aging, as well as the various impacts of a shrinking population at the country scale. Hummel and Lux (2007) provide an example from Germany of the interplay between infrastructure provision and population loss that country. More recently, Carbonaro et al. (2018) make the important connection between public finance and population loss in European Union countries, emphasizing the heavy demands often placed on depopulating areas, which much continue to provide services with less funding to do so. Aside from population aging and the role of household formation, however, which is at the forefront of most population loss discussions in Europe and Japan, the demography of decline is not often central to international research on loss, either.

Where North American population geographers and demographers have tangentially touched on the subject of depopulation is with research on urban population growth/decline and residential segregation (e.g., Bellman et al. 2018; Watson et al. 2006). Watson et al. document the ways in which the long-standing structures of shrinking or stagnant cities inhibit residential integration, compared to newer, rapidly growing cities which population and build concurrently. In addition, extensive bodies of research exist in the areas of population distribution and spatial inequality in the USA. In both cases, the focus is not on depopulation per se, but rather on the ways in which social, economic, and demographic change at one particular scale—the nation or metropolitan area, for example—plays out in a heterogeneous fashion

at the county or neighborhood scale, such that, even in a context of overall growth, some areas and individuals will experience loss (Johnson and Purdy 1980; Johnson and Beale 1994; Fuguitt and Beale 1996; Johnson et al. 2005). Related research has documented, too, the ways in which this population redistribution is connected to compositional change (especially race and ethnicity) that is observed in many areas (Johnson and Lichter 2008, 2010; Franklin 2014). Connected to this, the changing patterns in population concentration that Long and Nucci (1997) investigated have more recently been shown to be connected not only to regional migration patterns but also a heterogeneous geography of births and deaths (Rogerson and Plane 2013).

It is this literature that forms the foundation of the approach embraced in this paper: population ebbs and flows will occur at multiple spatial scales, as will the spatial distribution of various subpopulations. The country may grow as a whole, but this does not exclude the possibility of depopulation in many types of areas. Rather than focus on the mechanisms driving the change—whether growth or loss—this analysis looks at who remains in place to experience the impacts of loss. The uneven distribution of different subgroups at various spatial scales in the USA (and selectivity in migration, fertility, and mortality) suggests that some groups will be more affected by population decline than others. The purpose of the analysis that follows is to examine who it is who carries this burden of decline in shrinking US cities.

4 Data

The present analysis is facilitated by a special US Census Bureau tabulation (U.S. Census Bureau 2012) that re-tabulated Census 2000 population and housing counts using 2010 tract boundaries, making exact comparison across units possible at a relatively fine spatial scale. Population change, whether loss or growth, has an inherently spatial component: Change is always measured for an area. In the USA, this means that accurate and consistent measures of change over time can be difficult to come by. Even at the county level, boundary changes can and do occur over time. Census tracts, which often serve as proxies for neighborhoods in social science research, are plagued by enormous decadal changes, as boundaries are drawn and redrawn to accommodate precisely the topic addressed here: population change. Similarly, in the USA and elsewhere, data for small geographic areas are collected only at designated time points—in this case, every decade. This places inherent limits on our ability to assess time trends in population change (or any other similar topic), as slow-moving changes require multiple data points and fast-moving changes may be completely masked. In fact, a shortcoming of the 2000 to 2010 period is the occurrence of the Great Recession near the middle of the period. Because of data collection constraints, we are unable to separate temporary decline due to the recession from other, longer-term decline processes. On the other hand, similar shortcomings would arise for any study period and a very strong advantage of employing census data is the availability of reliable data for very small geographic areas such as census tracts.

Table 1 Data characteristics

Geographic unit	Number of units	Number of tracts	2010 Population
All tracts	72,604	n/a	308,745,538
City (100,000+ in 2010)	278	20,587 ^a	84,266,993
100 k+ City CBSAs	148	49,201	213,259,859
All CBSAs	942	67,069	289,261,315
Metropolitan areas	366	59,673	258,317,763
Micropolitan areas	576	7396	30,943,552
Non-CBSA territory	n/a	5535	19,484,223

^aReflects number of tracts with centroids inside a 100 k city. 2010 population of these tracts is 81,630,086

For this analysis, the tract-level change data described above are integrated with demographic characteristics—age, household poverty, and race and ethnicity—for 2010. While age and poverty are relatively straightforward, race and ethnicity reflect two separate categories in the US census, both of which are based on self-identification. Respondents may select one race alone or opt to select multiple race categories. They also respond to an ethnicity question that captures Hispanic background. This paper follows the typical approach: all who respond to the ethnicity question as Hispanic are classified under that category, regardless of race. White and Black categories contain those who responded non-Hispanic and either White or Black alone. Age and race/ethnicity data come from the 2010 decennial census; poverty status and income inequality data come from the 2009–2013 American Community Survey (ACS) estimates. This combination of data is designed to identify who is left in areas that have lost population, since these are the individuals who are exposed to the impacts of population loss at each level of geography.

Tract data are paired with place-level data, which include total counts for 2000 and 2010 (for identifying loss/growth cities) as well as the demographic variables used for tracts above. Data sources are the same as above, and all variables, for both tracts and cities, were accessed via the Minnesota Population Center's NHGIS Web site (Manson et al. 2017). All cities with at least 100,000 in population in 2010 are selected as sample cities. Those cities that did not exist in 2000 or which may have combined with the surrounding county were excluded, resulting in 278 cities (Table 1).¹ These cities are located throughout the USA, and in many cases, there are several cities located close by and within the same metropolitan area (Fig. 1).

As noted in the introductory section of the paper, city boundaries do not necessarily follow census geography boundaries, especially tract and county. In addition,

¹ Miami Gardens, Florida, and Centennial City, Colorado, were excluded as they incorporated after 2000 and thus only exist in the 2010 data. Geography changes to Honolulu, Hawaii, in 2010 and to Louisville, Kentucky, which merged with its surrounding county in 2003, also preclude their inclusion in the final dataset.

Fig. 1 Population change in US cities (population 100,000 or more in 2010), 2000–2010

boundaries change frequently and external city boundaries may include other municipalities and unincorporated areas located within the city. The solution adopted here is to consider a census tract a component of a sample city if its geometric centroid falls within the city's 2010 boundary.² Figure 2 provides an example of the non-alignment of city and census tract boundaries, along with population change and tract centroids for Columbus, Ohio. The figure clearly indicates the difficulty of assessing local change within cities. Using a GIS, tract centroids (72,604 located in the USA after dropping those lacking population in both 2000 and 2010) are joined to 2010 place boundaries for cities 100,000 or more in population in 2010. This process results in 20,587 census tracts within the 278 cities. Cities are in turn placed within their larger core-based statistical area (CBSA) for the purposes of situating tracts and cities within larger areas that may also have experienced population loss between 2000 and 2010. CBSAs are the technical name for US metropolitan and micropolitan areas, reflecting the underlying way in which they are designated. Metropolitan areas are centered around urban cores of at least 50,000 inhabitants, drawing in surrounding counties based on commuting flow connections. Micropolitan

² An alternative solution would be the interpolation of population values according to the share of a census tract's area falling inside a given city. This method is also fallible, assuming uniform population distribution within census tracts and would not necessarily generate substantially improved estimates.

Fig. 2 Municipal boundaries of Columbus, Ohio, and census tract locations and centroids

areas are designated in a similar fashion, except based on smaller urban cores of at least 10,000, but less than 50,000.

5 Analysis

The demographic burden of population decline is evaluated in two stages and then followed by an in-depth consideration of one city, Chicago—the only city in the top 10 in the USA to lose population between 2000 and 2010. First, the number of individuals in 2010 living in each city is calculated and a basic demographic profile of each type of area—growing or shrinking—is constructed, including measures that capture age structure, racial/ethnic population composition, and income. Second, the issue of community-level burden is introduced, with the aim of capturing who is living in the shrinking neighborhoods driving the population loss observed at the city

Table 2 Geography of population loss, 2000–2010

Geographic unit	Units with loss count (%)	Population loss	Tracts with loss count (%) ^a
All tracts	30,269 (41.7)	8,166,465	15,825 (21.8)
City (100,000+ in 2010)	49 (17.63)	1,066,549	6,203 (30.1)
100 k+ City CBSAs	10 (6.8)	511,158	10,753 (21.9)
All CBSAs	207 (22.0)	924,707	14,210 (21.2)
Metropolitan areas	42 (11.5)	664,521	12,758 (21.4)
Micropolitan areas	165 (28.7)	260,186	1452 (19.6)

^aConstituent tracts that lost at least 5% of population, 2000–2010

level. Of key interest is the extent to which, in shrinking cities, the local or neighborhood burden of loss is disproportionately allocated across subgroups (in particular race and ethnicity, but also poverty status and the young and elderly). As a point of comparison, demographic characteristics for shrinking cities and their neighborhoods are juxtaposed against those for growing cities and their local areas.

By way of contextual background, Table 2 provides an overview of the geography of population loss for tracts, sample cities, sample city CBSAs, and all CBSAs. The table shows that, regardless of level of geography, population loss affected some share of each type of unit, with micropolitan statistical areas impacted more than the larger metropolitan areas. Over 40% of all tracts in the USA had fewer inhabitants in 2010 than in 2000. Because some population loss at the tract level could simply reflect the natural and short-term neighborhood demographic change that takes place as households form, age, and evolve in structure (Hoover and Vernon 1959), the final column in Table 2 gives tract-level statistics for those tracts that lost at least 5% of population between 2000 and 2010. By that standard, about one fifth of US tracts lost population during this period. Over 18% of large cities (i.e., those with at least 100,000 in population in 2010) experienced a loss of population 2000 to 2010, with about 30% of sample city census tracts losing population. These tracts are located in both shrinking and growing cities. The middle column of Table 2 shows the numerical loss of population—the result of inhabitants leaving these areas for other locations or dying. At the tract level, the redistribution was over 8 million people, while for large cities it was about one million.

5.1 A demographic profile of growing and shrinking cities

In 2010, cities that had experienced population growth over the previous decade had a different demographic profile than those that had lost population. As discussed above, this is largely because different types of places attract (and lose) different types of individuals—growing cities attract younger migrants from elsewhere, both domestically and internationally, and those migrants are often at a life stage in which they start families, further increasing the younger population stocks. Cities losing population face a double jeopardy. Those who can leave, will—but these will often

Table 3 City and US demographic characteristics, 2010

Characteristic	Cities (100,000+ in 2010)			US total
	All	Loss	Growth	
Count	278	49	229	n/a
Population	84,266,993	14,123,066	70,143,927	308,745,538
Percent under 18	23.9	23.6	24.0	24.0
Percent 65 +	10.7	11.3	10.6	13.0
Median age ^a	33.8	34.4	33.6	37.2
Percent White (nH)	43.2	37.6	44.3	63.7
Percent Black (nH)	19.4	35.7	16.1	12.2
Percent Hispanic	26.7	19.0	28.3	16.3
Percent below poverty level (hh)	17.8	22.6	16.8	14.2
Income inequality (Gini coefficient) ^a	0.46	0.47	0.45	0.47

^aValues for median age and income inequality are means across areas in each group

be younger and less poor individuals. As areas empty out, a vicious circle can commence, where few in-migrants arrive and the remaining population ages and produces fewer children, reinforcing the depopulation process. Fewer inhabitants can mean fewer services, over time rendering cities and neighborhoods less attractive and less likely to attract in-movers.

The focus here, though, is on the outcome of these growth/loss processes: those who live in these cities after or as the loss/growth occurs. The number of inhabitants potentially affected is large. In 2010, over 14 million people were living in cities that had lost population during the previous decade (Table 3). That means 14 million individuals who experience the effects of living in a shrinking city—smaller tax bases and constrained public services or lower attractivity to possible employers or in-migrants, to name just a few potential impacts.

The main difference between growing and shrinking cities is in terms of race and ethnicity. On the whole, there is not much difference in terms of age structure between growing and shrinking cities; loss cities have a slightly higher percentage of the population 65 and older, but these cities are still younger than the USA as a whole. Racial/ethnic differences, in contrast, are quite noticeable. While cities in general tend to be less White and more Black and Hispanic than the country as a whole³—reflecting the higher levels of diversity to be expected in dynamic urban areas—loss cities are substantially more Black (and less White and Hispanic) than growth cities. This difference is the outcome of other, larger demographic processes, including suburbanization and international migration, but also regional race/ethnicity characteristics and migration behavior. In most parts of the USA, for example, Hispanic migration is a relatively recent phenomenon. It is therefore not

³ For ease of discussion, henceforth the terms White and Black will be taken to refer to the non-Hispanic population.

Table 4 Demographic profile in 2010 for cities by type of change, 2000–2010

Characteristic (2010)	Tracts in loss cities		Tracts in growth cities	
	Loss	No loss	Loss	No loss
Count	2463	1896	3740	12,488
Population	6,922,563	6,988,140	12,753,486	54,965,897
Percent under 18	24.9	22.4	23.3	24.1
Percent 65 +	11.1	11.4	11.5	10.5
Median age ^a	34.7	34.8	35.3	34.8
Percent White (nH)	28.8	46.2	39.0	45.2
Percent Black (nH)	49.4	22.1	22.9	14.7
Percent Hispanic	15.8	22.5	29.0	28.4
Percent below poverty level (hh)	26.9	18.6	21.2	16.1
Income inequality (Gini coefficient) ^a	0.45	0.44	0.43	0.42

^aValues for median age and income inequality are means across areas in each group. Tract loss indicates tracts lost at least 5% of population, 2000–2010. Tract values do not sum to published city populations as tracts are those with centroids inside cities

so surprising that, when choosing where to locate, Hispanics select growing areas over perceived moribund shrinking cities. Their relatively younger age and initially higher fertility rates may also contribute to the youth of these places.

Finally, in terms of income, the share of households in poverty is larger in cities than in the USA as a whole, but even higher in cities losing population. This is not surprising, as households more able to leave a suffering area can be expected to do so, resulting in a concentration of poorer households. Though the differences are small, income inequality, as measured by the Census Bureau's calculation of the Gini coefficient, appears to be higher in loss cities than in growing cities. This weakly suggests that, as city populations shrink, economic disparities may be magnified. That, or possibly loss occurs in places that had more existing income inequality than places that are thriving.

5.2 A demographic profile of loss

Within cities that lost population between 2000 and 2010, more than half of tracts lost more than 5% of their population in this interval (Table 4), affecting almost seven million people in 2010. Importantly, this indicates that, conversely, a sizable share of tracts continued to grow or remained stable even though the city as a whole was losing population. This points to a “tale of two neighborhoods” narrative within many of these cities, with some areas experiencing high competition for housing and services, while others languish. Comparing the tract-level demographic profiles of loss cities, clear income and race/ethnicity disparities emerge at this spatial scale, as well. Tracts losing population are much more Black and have a much larger share of households in poverty than those tracts that did not experience such population loss. On average, income inequality is on average similar across all types of areas, although this finding is quite possibly a relic of the choice of measurement statistic.

Fig. 3 Age structure in 2010 by type of area

The observed disparity between loss and no-loss tracts in shrinking cities is mirrored in growing cities, as well. Here, even in a larger context of growth, almost 13 million people lived in a tract that had lost population over the course of the previous decade. These tracts are less White and more Black than growing tracts in the growing areas. They are also poorer. Thus, it is that, even in growing cities, some places will lose population (and the services and amenities that go along with this population) and those left in these impacted areas will be poorer and less likely to be White.

What drives these stark demographic differences between growth and loss neighborhoods within cities? How is it that, even in shrinking cities, some groups appear to be more impacted by the loss than others? One possibility is demographic: Perhaps shrinking tracts were populated in 2000 by inhabitants more likely to out-migrate or die over the course of the decade. Although this would need to be observed in 2000-era age structures, it would likely also be reflected in varying age structures across types of neighborhoods in 2010, as well. Figure 3 shows detailed age structure in 2010 for stable/no-loss tracts and loss tracts in growing and shrinking cities. Interestingly, in terms of age structure, all four types of city tracts are largely similar, suggesting that “urban” trumps population change in these US cities. That is, cities are especially attractive to those in their 20s and early 30s, who form households and even have children in the city. Once children reach school age, though, both parents and children are likely to leave the city. Older age cohorts are smaller, both because of increased mortality, but also likely retirement migration. This basic structure appears to hold across both shrinking and stable/no-loss tracts,

Fig. 4 Exposure to loss by select characteristics for cities (100 k+) losing population, 2000–2010

in both growing and shrinking cities. An implication of these similar age structures is that service provision (e.g., schools or shops) should be the same in stable and shrinking neighborhoods—that is, if age is the predominant driver of service provision. If, however, race and income drive service decisions, then differential provision is to be expected. Anecdotal evidence suggests that in the USA, the latter is the typical case.

There is an additional, complementary explanation for observed demographic differences that relies more heavily on the salience of race in American society. At the city scale, when push factors emerge that will push a city into decline—say through suburbanization or loss of employment—the first to leave will be those with resources: physical and human capital, but also information, connections, and employability. In the USA, these individuals have tended to be White. Their departure will, over time, result in a city that is less White (and, historically, more Black) overall. Within these cities, however, whiter neighborhoods may be somewhat insulated: middle class jobs in hospitals, universities, or the financial sector may remain, providing a foundation for continued stability in these parts of the city. Moreover, those migrating into the city for such jobs may be more likely to be White and to move into existing stable, White neighborhoods. Public and private services will be eroded in shrinking areas, but supported in stable areas—again, reinforcing the diverging paths of these different parts of the city.

Another perspective on the burden of decline is to consider the share of city populations that are exposed to the effects of population loss. In cities losing population, about half the 2010 population was in an affected tract (compared to about 19% of the population of growing cities living in loss tracts). Over two-thirds of the Black population across all shrinking cities lived in a tract that was also losing population in 2010 (Fig. 4). This compares to a little over a third of the White and Hispanic populations. This latter statistic is particularly interesting because tracts that

Table 5 Exposure to multiple layers of loss for city tracts

Layers of loss	Impacted population	Percent of impacted population that is				
		White, non-Hispanic	Black, non-Hispanic	Hispanic	Under 18	65 +
Tract Only	12,720,994	39.0	22.9	29.1	23.3	11.5
Tract and City	4,758,699	27.3	45.8	19.9	24.9	10.6
Tract, City, and CBSA	2,163,864	32.1	57.3	6.7	24.8	12.2

For tracts with centroids within large cities (population 100,000 and up in 2010) that lost at least 5% of population 2000–2010 and reported a population in 2010. Eleven tracts experienced loss, while the city grew and the larger CBSA lost population; there were 32,492 inhabitants of these tracts in 2010

lost population only tended to be about 16% Hispanic. Hispanic population in these cities may be smaller, but a sizable share is exposed to the effects of population loss at the tract level.

5.3 Exposure to multiple layers of loss

A premise of this analysis is that exposure to population loss at multiple spatial scales compounds the potential impacts of living in a declining area. Living in tracts that have recently lost population may lead to one set of local, on-the-ground impacts, but living in cities and CBSAs that have also lost population will carry another set of impacts that operates at the larger spatial scales. The question is who lives in these areas and whether, as within cities, those embedded in multiple layers of loss are different from those who are not. Table 5 shows that, where large cities are concerned, many more people live in tracts that have lost population but situated within a larger context of growth. For these 12.7 million people, the effects of living in a loss tract may not be negligible—schools may close, sense of community may erode, and housing impacts may be significant—but the larger labor market and the city's financial base may be more sound.

In 2010, almost five million people lived in cities and tracts losing population, but within larger CBSAs that continued to grow. Only about two million lived in a triple layer of population loss: tract and city and metropolitan area. These individuals, however, were 57.3% Black, over 12% age 65 and up, and only 6.7% Hispanic. This group is much more Black than the share of the population for the tract only or tract and city groups.

Tracts embedded within three layers of population loss are older, Blacker, and poorer than the other two types of loss exposure (Table 6). In contrast, tracts that experienced isolated loss (i.e., where cities and metropolitan areas grew) are more White and more Hispanic and less poor than areas more affected by population loss. The character of areas that lost at both the tract and city level is also special in some respects. They are more Black on average than losing tracts embedded in growth areas, but less Black than areas hit by the trifecta of tract, city, and CBSA loss. Loss tracts in loss cities also have a smaller percentage of the population 65 and over,

Table 6 Mean tract characteristics in 2010 by layers of loss experienced, 2000–2010

Tract characteristic	Layers of loss	Tract mean	Standard deviation
Percent White, non-Hispanic	Tract Only	39.1	30.5
	Tract and City	27.8	29.7
	Tract, City, and CBSA	29.0	31.8
Percent Black, non-Hispanic	Tract Only	25.6	31.1
	Tract and City	49.2	37.9
	Tract, City, and CBSA	61.1	36.2
Percent Hispanic	Tract Only	26.5	26.8
	Tract and City	16.5	24.8
	Tract, City, and CBSA	6.2	11.6
Percent under 18	Tract Only	22.8	7.7
	Tract and City	24.8	7.9
	Tract, City, and CBSA	24.4	6.9
Percent 65 +	Tract Only	11.7	7.4
	Tract and City	10.8	5.4
	Tract, City, and CBSA	12.3	5.4
Median age	Tract Only	35.5	7.2
	Tract and City	34.0	6.2
	Tract, City, and CBSA	36.1	6.1
Income inequality (Gini coefficient)	Tract Only	0.43	0.07
	Tract and City	0.45	0.07
	Tract, City, and CBSA	0.46	0.06
Percent households below poverty level	Tract Only	22.5	14.5
	Tract and City	27.8	14.0
	Tract, City, and CBSA	32.2	14.5

For tracts with centroids within large cities (population 100,000 and up in 2010) that lost at least 5% of population 2000–2010 and reported a population in 2010. Means are reported for values across each type of area

although the different across groups is not substantial. And they also straddle a middle ground in terms of the average share of the population that is Hispanic.

5.4 The case of Chicago, Illinois

Of the 49 large cities that lost population 2000 to 2010, the bulk are Midwestern Rust Belt cities—also referred to as shrinking or legacy cities—many of which have experienced ongoing population loss for several decades (Table 7). In many cases, population loss can be attributed to suburbanization, with continued overall growth experienced by the larger metropolitan area, but in other cases, the entire metropolitan region has also lost population over time. Each city has its own story, and in each the pattern of demographic impacts of loss—not

Table 7 Cities with most extensive population loss, 2000–2010

City	Population		Percent change	Demographic characteristics (%)						Loss impacts (prop.)	
	2000	2010		Under 18	65 +	White (nH)	Black (nH)	Hispanic	Poverty (hh)	Tracts	Population
New Orleans, LA	484,674	343,829	−29.1	21.3	10.9	30.5	59.6	5.2	25.5	0.81	0.76
Detroit, MI	951,270	713,777	−25.0	26.7	11.5	7.8	82.2	6.8	35.5	0.92	0.93
Flint, MI	124,943	102,434	−18.0	27.3	10.7	35.7	56.1	3.9	35.5	0.83	0.83
Cleveland, OH	478,403	396,815	−17.1	24.6	12.0	33.4	52.5	10.0	32.3	0.87	0.84
Dayton, OH	166,179	141,527	−14.8	22.9	11.8	50.5	42.6	3.0	30.5	0.82	0.78
Birmingham, AL	242,820	212,237	−12.6	21.5	12.4	21.1	73.2	3.6	27.4	0.80	0.76
Buffalo, NY	292,648	261,310	−10.7	23.6	11.4	45.8	37.4	10.5	28.4	0.67	0.66
Cincinnati, OH	331,285	296,943	−10.4	22.1	10.8	48.1	44.6	2.8	27.9	0.67	0.63
Pittsburgh, PA	334,563	305,704	−8.6	16.3	13.8	64.8	25.8	2.3	21.2	0.70	0.65
Toledo, OH	313,619	287,208	−8.4	24.0	12.1	61.4	26.7	7.4	25.6	0.71	0.71
St. Louis, MO	348,189	319,294	−8.3	21.2	11.0	42.2	49.0	3.5	24.9	0.69	0.68
Akron, OH	217,074	199,110	−8.3	22.9	12.6	61.2	31.2	2.1	25.2	0.64	0.52
Chicago, IL	2,896,016	2,695,598	−6.9	23.1	10.3	31.7	32.4	28.9	20.2	0.61	0.57
Hampton, VA	146,437	137,436	−6.1	22.8	12.3	41.0	48.7	4.5	12.7	0.22	0.17
South Bend, IN	107,789	101,168	−6.1	27.3	12.5	55.8	26.2	13.0	23.6	0.50	0.43

Loss impacts are the share of tracts that lost at least 5% of population and the share of the 2010 population living in one of those tracts

Table 8 Comparison of tracts in Chicago, 2010

Characteristic (2010)	Loss	No loss
Count	482	302
Population	1,506,024	1,144,393
Percent under 18	24.4	21.8
Percent 65 +	10.5	9.9
Median age ^a	33.1	33.9
Percent White (nH)	20.5	46.1
Percent Black (nH)	47.9	11.4
Percent Hispanic	26.2	33.5
Percent below poverty level (hh)	24.4	15.0
Income inequality (Gini coefficient) ^a	0.46	0.44

Tracts with geographic centroid located within the city of Chicago

^aValues for median age and income inequality are means across areas in each group

to mention the spatial concentration of loss within the city—will vary. The final columns of Table 7 provide a sense of the impact of loss, in terms of population and geography. In the unusual and extreme cases of New Orleans and Detroit, for example, almost all tracts lost population and most of the population were living in neighborhoods of loss in 2010. In Akron, Ohio, and South Bend, Indiana, on the other hand, almost half the population lived in tracts unaffected by loss, even though the cities as a whole were losing population. In South Bend, in fact, half the tracts in the city remained unscathed where population loss is concerned.

Chicago was the third largest city in the country in 2010 and the only city in the largest 10 to lose population (Philadelphia averted loss by gaining half a percent in population between 2000 and 2010). A closer look at the internal geography of population loss within the city, as well as the characteristics of those living in loss tracts, provides a detailed picture of the interaction between loss and the demographic characteristics of those living in loss areas. With a loss of almost 7%, Chicago's population was down to 2.7 million in 2010. Approximately one third each of the city's population is White, Black, and Hispanic and about 20% of households were in poverty (Table 7). The city is also fairly segregated by race, such that the likelihood of population loss affecting one group more than another is high.

Most census tracts in Chicago lost population during the study period and the number of people living in loss tracts outweighed those living in growth areas (Table 8). The contrast in characteristics of those living in loss/no-loss areas is striking. As in the city-level statistics, tracts losing population in Chicago were much less White and much more Black than those unaffected by loss. A larger share of households was in poverty in these areas, as well. In terms of the burden of decline, about 85% of Chicago's Black population lived in a declining tract in 2010 (Fig. 5). Only around a third of the White population lived in a similar environment. Similarly, about two-thirds of poor households lived in loss tracts, as did more than half of the 18 and under and 65 and up populations. By almost any definition of

Fig. 5 Exposure to loss for Chicago, by tract change and characteristic, 2000–2010

Fig. 6 Loss tracts (left) and the distribution of the Black, non-Hispanic population (right), Chicago, 2010

vulnerability, the bulk of this population lived in areas likely to be affected by the impacts of neighborhood-level population loss.

Maps of Chicago (Fig. 6) show the strong spatial concentration of population loss in Chicago on the south and west sides—areas that are also very Black. The city may have lost almost 7% of its population, but the loss and the burden thereof were far from evenly distributed across the city. In fact, entire areas of the city remained stable or continued to grow while loss was substantial enough in other neighborhoods to push

the entire city into overall population decline. The map on the right in Fig. 6 highlights the colocation of loss and predominantly Black census tracts. With a few exceptions, loss and share of Blacks are in the same places. These two maps provide evidence of diverging fortunes of two parts of the city: one, centered around educated, well-to-do, often White inhabitants, either from the city or in-migrants from elsewhere. These areas are experiencing robust population growth. In the other part of the city, cycles of disinvestment and out-migration continually push stability or repopulation out of reach; those who are able to move do so, and few choose to move in.

6 Conclusions

This paper offers a new demographic perspective on the subject of shrinking cities, shifting the emphasis toward a fuller recognition of the importance of both geography and demography in understanding *who* is affected by population loss. The analysis generates descriptive city-specific findings and also contributes new knowledge regarding the phenomenon of urban population decline: millions of urban inhabitants are directly affected by population loss within their census tracts, while millions more live in tracts that are embedded within larger urban contexts of depopulation. Those living in these areas and exposed to the burdens such depopulation entails tend to be Black.

This research emphasizes the connection between the changes “on the ground” that occur with depopulation (e.g., school closings, vacant properties, or fewer retail opportunities) and the characteristics of those who live in those areas—some groups are simply more *exposed* to the effects of population loss. Moreover, the paper hypothesizes that living in a growing neighborhood, albeit within a shrinking city or metropolitan area, is likely different than living in a neighborhood that is doubly or triply jeopardized by population loss. Certainly, the results show that different subgroups tend to be exposed to loss at multiple levels than to growing or stable areas.

This paper represents a first cut at investigating the issue of demographic exposure to decline. A number of promising angles remain to be pursued. Perhaps most importantly, population loss and the characteristics of those located in the area at the end of the period are connected—investigation into the underlying demographic processes that produce the results observed would be a fruitful avenue for future research. In addition, the analysis evaluates just one spatial aspect of the demography of decline: the spatial scale of the phenomenon. Also of interest, though, would be to consider spatial patterns of loss within cities, as proposed by Reis et al. (2016), and the potential impacts of the spatial clustering of loss. Moreover, although the demography of urban depopulation is very much at the center of this paper, and although underlying questions to do with age structure are addressed, the drivers of loss—the demographic components of change, whether fertility or migration—are not considered but would likely shed additional light on the processes that lead to depopulation in urban centers and neighborhoods.

The analysis also makes much of spatial context but because of data limitations—in particular the bugbear of changing census tract boundaries over time—necessarily ignores temporal context. Places that continue to lose population decade after decade are likely worse off than those who may lose population during only one period. The

identification of “burdened” groups is also narrowly defined in this analysis, mainly because of data limitations. Aside from poverty, age, and race/ethnicity—evaluated here—employment status, human capital levels, and nativity also stand out as important individual- and community-level demographic characteristics of potential interest. Shrinking neighborhoods with higher levels of human capital or employment could, for example, be more resilient in the face of loss than similar shrinking neighborhoods with higher unemployment or lower levels of human capital. Finally, the insights gained from a case study approach, here Chicago, suggest continued merit in evaluating cities within their individual context. New knowledge about the phenomenon of population loss is gained by including a demographic approach, but also by complementing larger-scale studies with city-level investigations.

In conclusion, the results provide a consistent picture of the burden of decline: No matter the spatial scale (where these cities are concerned) and whether the larger geographic context is one of population growth or loss, the burden of decline falls on the poor and on the Black population. Especially at the tract level and in cities losing population, these groups are especially exposed. And arguably, any eventual economic or demographic turnaround is unlikely to help these groups—housing vacancies, for example, might be made to decrease, but eventually rents might increase and gentrification encroach, making it even more difficult for households to remain in place.

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