Rural/Urban and Racial Disparities in Infectious Mortality in the United States, 1922-1944

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ABSTRACT:
At the beginning of the twentieth century, U.S. cities had greater mortality than its rural areas; by midcentury, this had reversed. The details of when, where, and for whom the urban mortality penalty reversed is not well known, largely because data to address those questions are limited. Here, we prevent new national and regional estimates of infectious mortality, divided by race, for urban and rural areas from 1922-1944. We show that, already in 1922, rural mortality exceeds or equals urban mortality. For whites, median urban and rural mortality are strikingly similar, in the country as a whole and in each region, across this entire period. For nonwhites, regional patterns differ: nonwhites evince a rural mortality penalty in the Midwest and West but an urban penalty in the South. These results speak to ongoing debates about the public health contribution to the mortality decline.

At the beginning of the twentieth century, living in cities posed a greater risk of mortality than living in rural areas in the United States (Higgs 1973; Condran and Crimmins 1980; Haines 2001; Cain and Hong 2009). As one paper title summarized the situation heading in to the twentieth century: "Survival in 19th Century Cities: The Larger the City, the Smaller Your Chances" (Cain and Hong 2009). By midcentury, this had reversed (Haines 2001): the development of modern public health infrastructure meant that, for the first time in the historical development of cities, cities became safer places to live than rural areas. This reversal of the urban mortality penalty was driven by a reversal in where infectious diseases, in particular, were concentrated.

Although this stylized history is well known, the details of when, where, and for whom the urban mortality penalty reversed is not well known, largely because data to address those questions are limited. Here, we prevent new national and regional estimates of infectious mortality, divided by race, for urban and rural areas from 1922-1944. These estimates are based on newly available data on deaths to detailed causes of death in each state, collected by the Department of Commerce at the time in the annual *Vital Statistics*.

Data

The primary data source for this research is annual counts of deaths to specific causes collected in the *Vital Statistics*. From 1922 to 1944, these annual data collected cause-specific mortality for individual states, divided by the sizes of the cities and areas the deaths occurred in. The series began with 34 states in 1921; by 1930, it contained 46 states until the series end in 1944.[1]

[1] Except 1941, in which only 21 states were included.

Deaths were collected separately by race (white and non-white) in most states. We digitized this series and constructed counts of total deaths to infectious causes.[2]

The geographic units collected varied over the course of the series, but in all years, the data distinguish, on the one hand, rural areas and cities smaller than 10,000 residents, and on the other hand, cities of more than 10,000. Accordingly, the results here use that dividing line to distinguish rural from urban areas. Later years in the series (i.e., the 1930s and 1940s) allow finer-grained distinctions between rural areas and cities of any size, and smaller and larger cities, which we will use in further analyses before the PAA meetings.

To estimate infectious death rates from these death counts, we use complete-count Census data from IPUMS to construct denominators for each state divided into urban and rural areas defined using the same criteria, and similarly divided into white and non-white categories. We use the 1920-1940 Censuses and interpolate and extrapolate the log populations to the intercensal years.

Preliminary Results

Figure 1 shows median infectious death rates (reported as deaths to infectious causes per 100,000 members of the population) for the United States as a whole, divided into rural (solid) vs. urban (dashed) and white (red) vs. non-white (blue) populations. Already in 1922, rural mortality exceeds or equals urban mortality for both whites and non-whites. For non-whites, median rural mortality is consistently higher than median urban mortality; for whites, median urban and rural mortality are strikingly similar: they are indistinguishable across the 1930s.

Figure 2 shows the same populations separately by region on a common axis scale, and Figure 3 shows the same plots as Figure 2 with separate y-axes so that the patterns in individual regions are easier to distinguish. The fact that median white urban and white rural mortality are essentially indistinguishable is true for every region.

However, for nonwhites, the pattern is different. Nonwhites in the Northeast look like whites in their urban/rural similarity, albeit at a far higher level of mortality. In the Midwest and West, nonwhites faced substantially higher risk of infectious death in rural areas compared to urban areas (e.g., in 1940 in the Midwest, the median infectious death rate was 382 per 100,000 in urban areas and 542 per 100,000 in rural areas). But in the South, this pattern was reversed: through the mid-1930s, non-whites faced higher infectious mortality in urban areas.

These figures also show how great the racial disparities in mortality were in urban and rural areas alike. For example, in the Midwest in 1930, median infectious mortality for rural whites was only 177 per 100,000, while for rural non-whites it was 616 per 100,000.

[2] Specifically, we included as infectious causes: Tuberculosis, Typhoid, Malaria, Smallpox, Measles, Scarlet fever, Whooping cough, Diphtheria, Influenza, Bronchitis, Pneumonia, Erysipelas, Meningitis, Diarrhea, Appendicitis, Puerperal septicemia, Diptheria, Syphilis, Polio, Acute rheumatic fever, and Dysentery.

Next steps for proposed poster

For the poster we propose to present at PAA, we will use more specific population size categories in the years when they are available. For example, in 1939-1944, we can more specifically distinguish categories at both ends: distinguishing truly rural areas from small cities (2,500-10,000 residents) and distinguishing medium-sized from large cities (10,000-25,000, 25,000-100,000, and 100,000+). These more precise gradations of population will help to show whether the similarity of urban and rural whites held across units of all sizes, and whether the urban mortality penalty for Southern non-whites and rural mortality penalty for Midwestern and Western non-whites was limited to particular city or town sizes. More generally, it will allow us to address whether "The Larger the City, the Smaller Your Chances" persisted into this time period in any region.

We will also use the IPUMS complete-count Censuses to indirectly age-standardize the infectious mortality estimates (using a standard age schedule of infectious mortality we have previously constructed [Feigenbaum et al. n.d.] from other data in the *Vital Statistics*). This may be particularly important in interpreting the non-white estimates, as the Great Migration meant that many low-risk, prime-aged nonwhites moved from rural southern to urban midwestern and northeastern areas (often living in southern urban areas along the way). Thus, the urban and rural patterns for nonwhites may partially reflect these age compositional effects.

Conclusion

As Condran and Crimmins (1980, p. 202) argued in classic early work on U.S. mortality, the "differentiation of space by rural and urban characteristics is essential to understanding the decline in mortality." The surprising similarity of urban and rural mortality for whites in this period—especially when contrasted with the stark divisions in each type of area by race—suggest new puzzles and possibilities about what drove the mortality decline. Some major public health improvements—in sewage treatments, for example—in urban areas were implemented before 1922, but many were constructed during this period (Anderson et al. 2018). Yet urban and rural infectious mortality were nearly identical for whites, in the country as a whole and in each individual region, across the entire 1922-1944 period. Only for Southern non-whites did the urban mortality penalty persist into this period.

Recent analyses of urban mortality (Anderson et al. 2018, responding to Cutler and Miller 2005) have reopened long-running debates about the roles of public health interventions and generalized improvements in standard of living in the infectious mortality decline. Considering rural areas alongside urban areas can give new leverage in addressing those questions because infrastructural improvements generally came later to rural regions. These results shown here suggest the need to develop new accounts of how infectious mortality fell that match its uniformity in this period across geographic areas—and its dissimilarity for non-whites compared to whites.

References

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Haines, Michael R. 2001. “The Urban Mortality Transition in the United States, 1800-1940." Annales de Demographie Historique 101:33-64.

Higgs, Robert. 1973. “Mortality in Rural America, 1870-1920: Estimates and Conjectures." Explorations in Economic History 10:177-193.

FIGURES

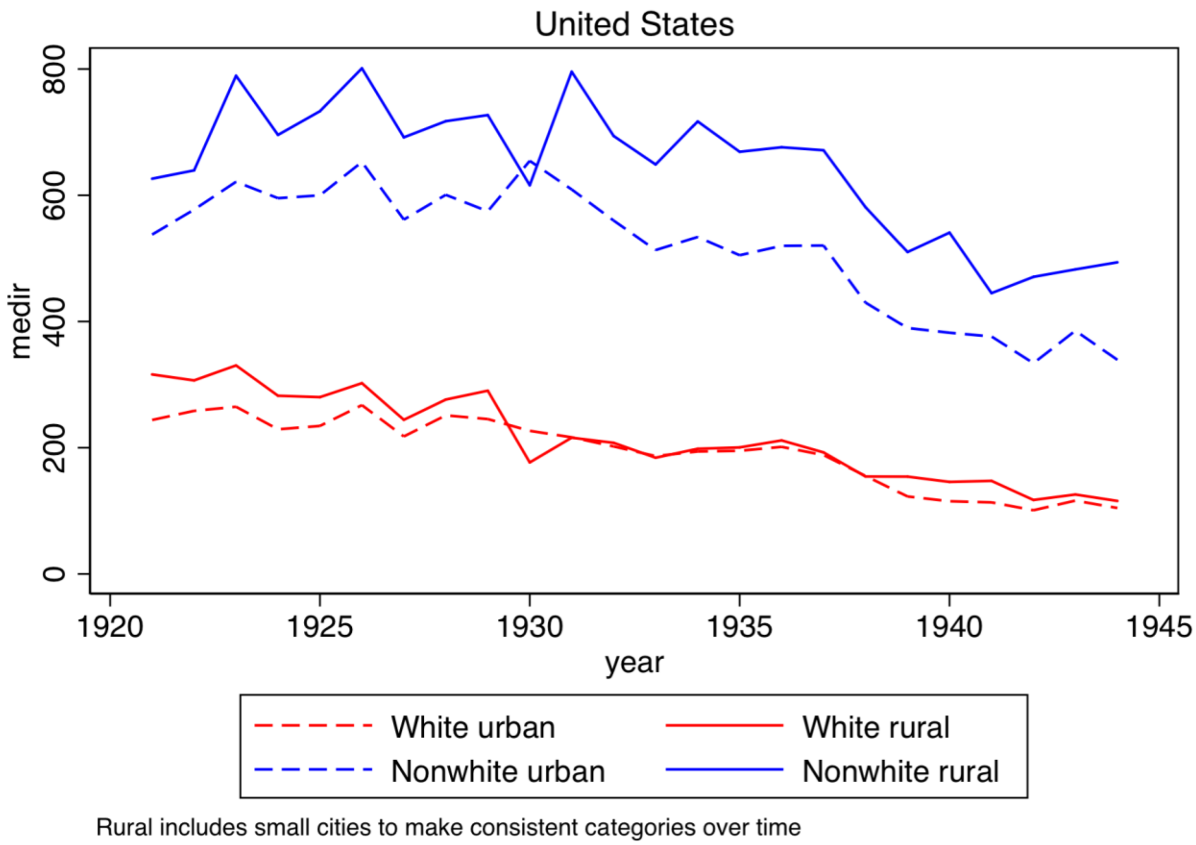


Figure 1. Median infectious deaths per 100,000 population by race and rural/urban status.

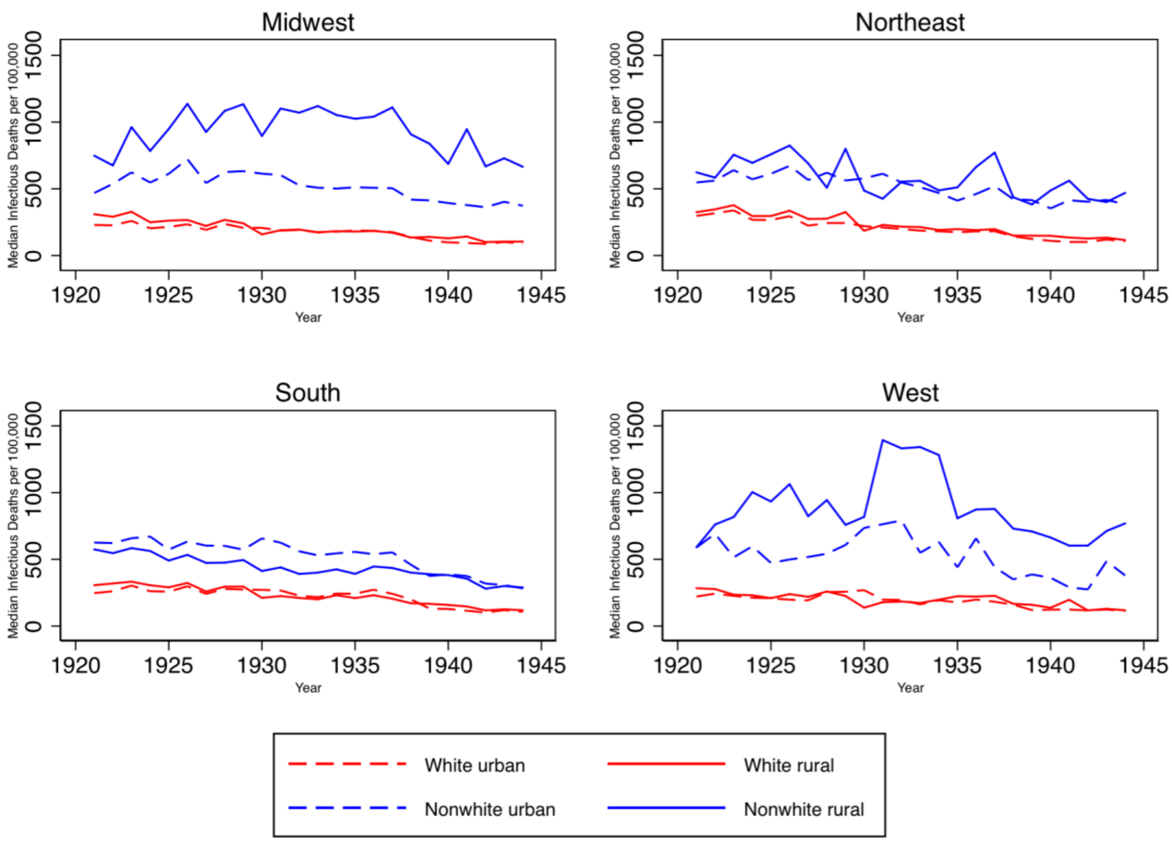
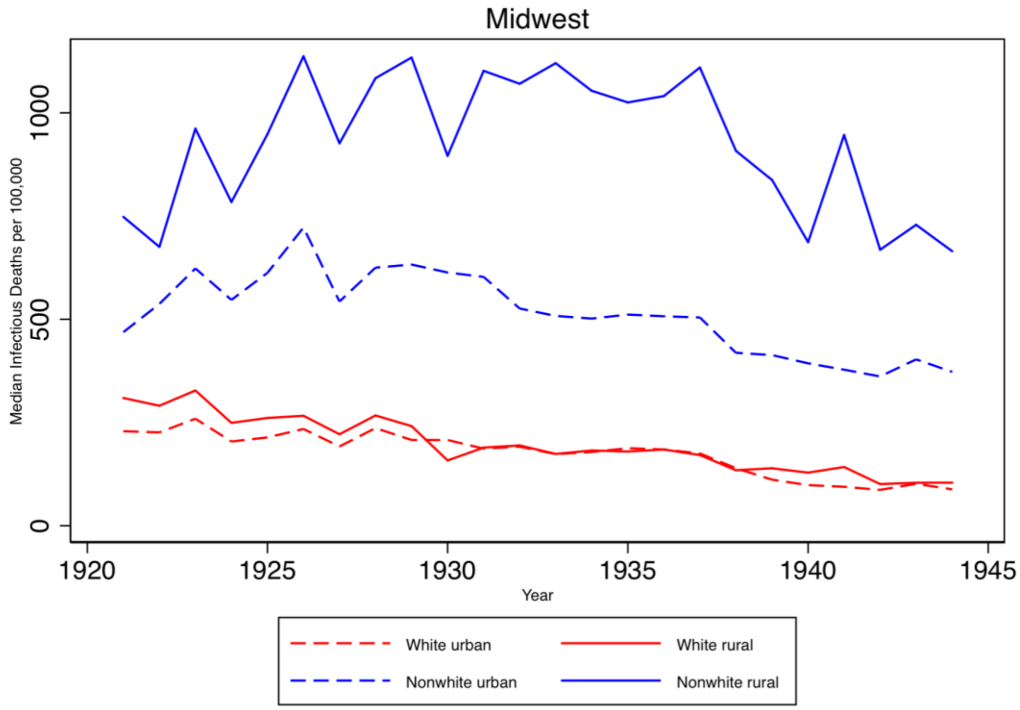
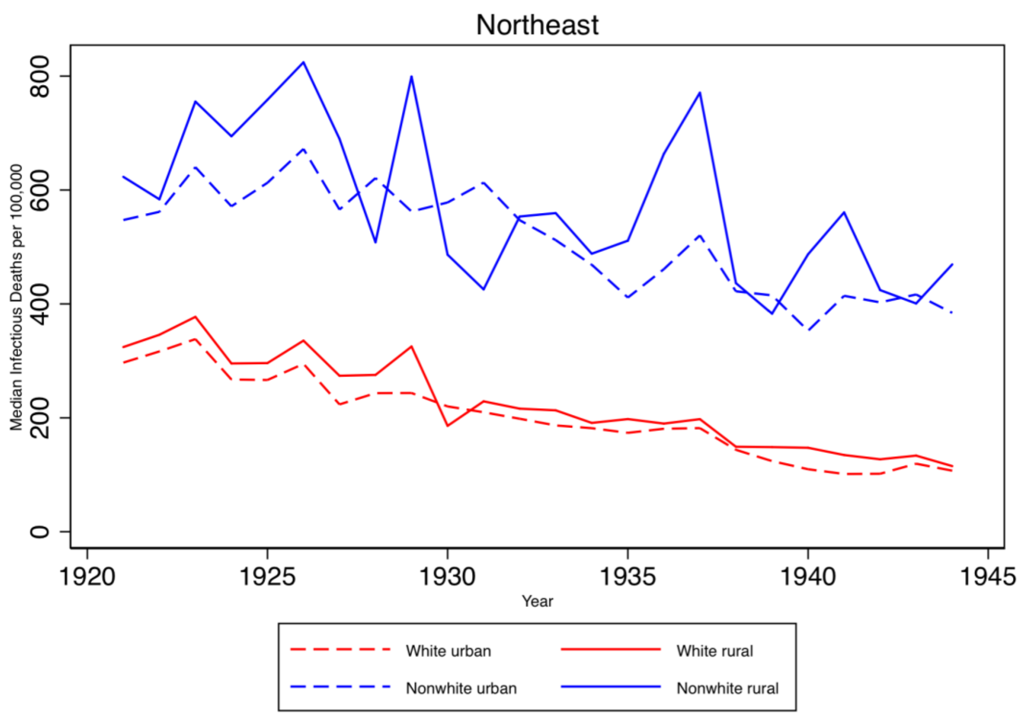
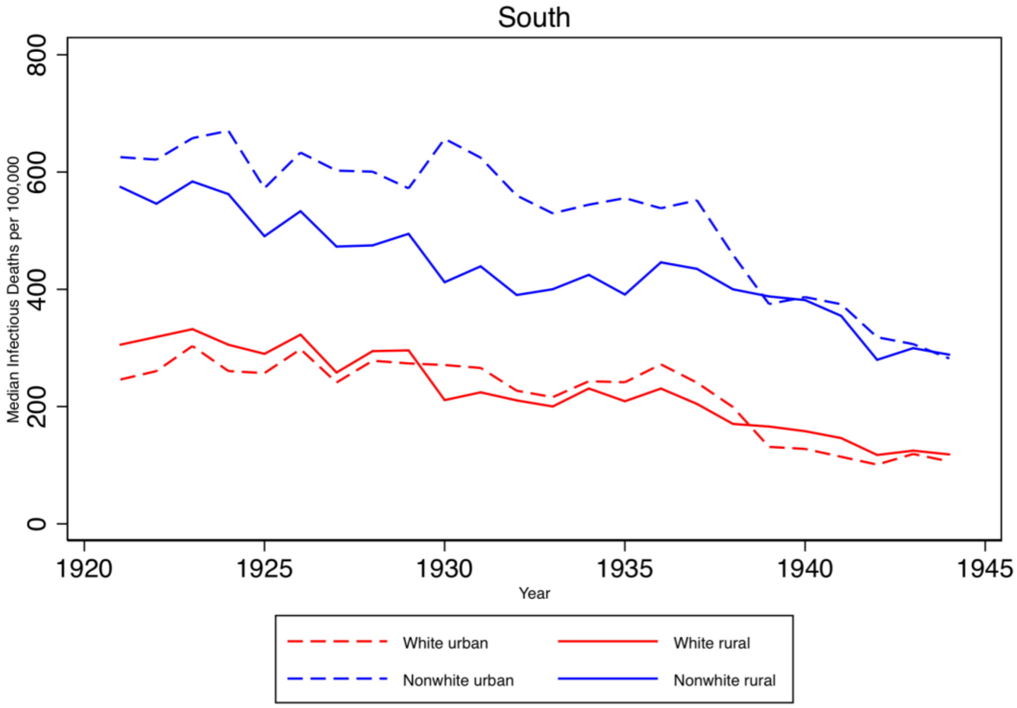
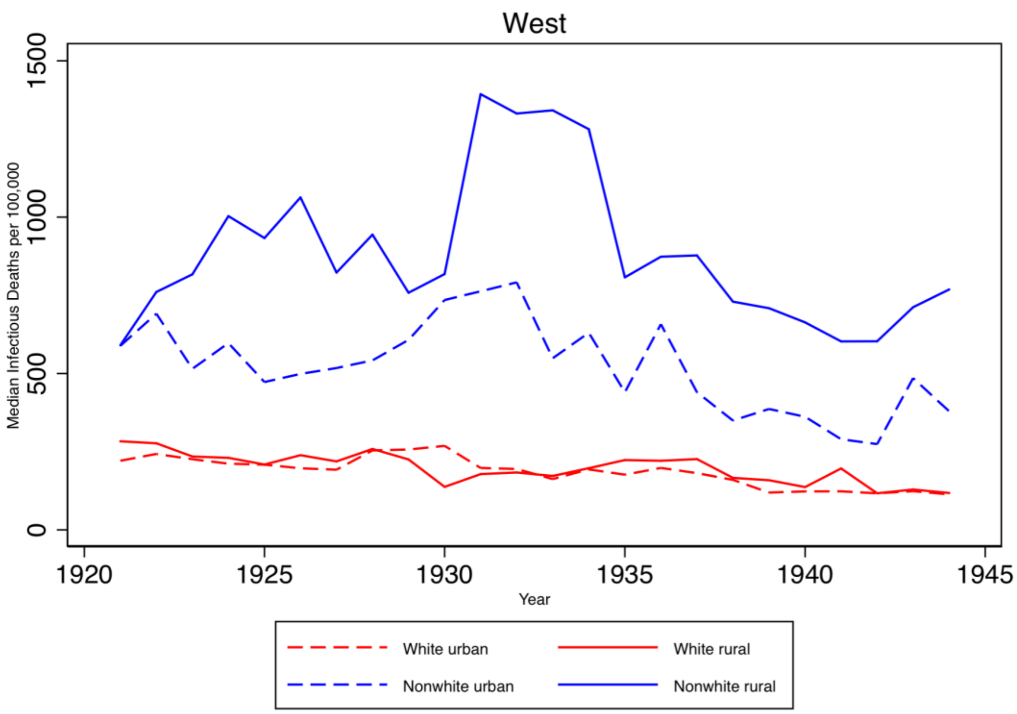


Figure 2. Median infectious deaths per 100,000 population by race and rural/urban status, for individual regions.


Midwest
Median Infectious Deaths per 100,000
0
500
1000
1920
1925
1930
1935
1940
1945
Year
White urban
White rural
Nonwhite urban
Nonwhite rural


Northeast
Median Infectious Deaths per 100,000
0
200
400
600
800
1920
1925
1930
1935
1940
1945
Year
White urban
White rural
Nonwhite urban
Nonwhite rural


South
Median Infectious Deaths per 100,000
0
200
400
600
800
1920
1925
1930
1935
1940
1945
Year
White urban
White rural
Nonwhite urban
Nonwhite rural


West
Median Infectious Deaths per 100,000
0
500
1000
1500
1920
1925
1930
1935
1940
1945
Year
White urban
White rural
Nonwhite urban
Nonwhite rural