Spatial Clustering of Cause Specific Mortality

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Extended Abstract

Chronic diseases account for more than 70% of deaths and disproportionately affect women and minorities, accounting for one-third of their years of potential life lost before age 65 (Trust for America's Health, www.healthyamericans.org, 2003). Given the demonstrated geographic patterns of county-level mortality (Cossman et al. 2002, 2003, 2004; James et al. 2004), it is logical to expect the distribution of cause-specific death rates to also vary geographically. We propose to investigate these geographic patterns of cause-specific mortality. Ultimately, this research trajectory offers potential for identifying the fundamental roles that place (environmental conditions) versus people (demographic accumulation) play in the leading causes of death in the United States.

Our earlier research using this approach has generated evidence that clusters of high and low mortality-rate counties are spatially persistent over time (Cossman et al., 2002; 2003, 2004). Something about the internal resident population or social and economic structure of these places makes them unique. We argue that it is necessary to examine these places (inhabitants as well as the physical and social environment) in more detail. In this paper, we explore this specifically by extending our spatial analysis to cause-specific mortality rates.

Building on this line of research, we used mapping to visualize health outcomes as part of our research in Mississippi State University's Rural Health, Safety and Security Institute. We calculated county-level, age-adjusted, five-year averaged (1993-1997), all-cause mortality rates from the Compressed Mortality File (see Cossman et al. 2002, 2003, 2004 for a full description of the methodology). Using age-adjusted rates (rather than age-sex-race adjusted rates which mask important socioeconomic relationships), we found visual evidence of spatial clustering of relatively high and low mortality rates in several regions. We tested this clustering using the Local Moran's I spatial statistic and found statistically significant spatial clustering of counties in many of these regions. Next, we explored spatial clustering of mortality over time. We extended our investigation of five-year average mortality rates to a 30-year time period. To analyze persistence over time, we classified counties as having had high or low mortality rates in three or more of the six time-periods. The results demonstrate a spatially-anchored temporal persistence of high and low mortality counties in the U.S. (see Cossman et al., 2002, 2003, 2004).

At first glance it is difficult to explain the clusters on the basis of the characteristics of their internal population. We have examined ecological-level descriptive statistics for these clusters. The same wide variation even within healthy (or unhealthy) areas can be found in a host of demographic (e.g., age, sex and race) and socioeconomic (e.g., education, occupation, income, poverty, access to health insurance, and social networks) characteristics of these counties. The levels of mortality cannot be adequately explained by a cursory review of ecological-level descriptive statistics.

Our preliminary findings suggest that an explicitly spatial approach to mortality is necessary—non-spatial approaches are not revealing pertinent aspects to the mortality equation, nor do they take into account spatial autocorrelation. For example, when researchers categorize populations using residential population size (i.e., rural-versus-urban), rural residents are found to have lower mortality rates (McLaughlin et al. 2001; Miller et al. 1987) and higher life expectancies than urban residents (Geronimus et al. 2001; House et al. 2000); however we have shown that this interpretation may arise mainly due to a choice of the metric (Cossman et al., under review; James et al., under review). Therefore, it is critical to examine mortality differentials spatially. We extend this research by examining changes in these spatial patterns across different causes of death. Once cause-specific death rates are tested for spatial clustering, we test the absolute income hypothesis by looking at individual income, controlling for household size, female-headed households, health insurance and other factors.

<u>References</u>

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