Spatial Patterns of Mortality and Associated Risks
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BACKGROUND

• Spatial patterns of mortality have been observed in the United States1
• Objective is to identify spatial patterns of associations between mortality and compositional and contextual risk factors, such as work, personal relationships, and household status2
• Employment is positively correlated with health and mortality3, 4, while unemployment is negatively correlated with mortality and an indicator of socioeconomic status5
• Women typically have an mortality advantage over men due to longer life expectancy7, 8
• However, divorced women, an indicator of personal relationships, and families with a female head, an indicator of household status, may have access to fewer household resources thus increasing the risk of mortality6, 9
• Examining the relationships between female-headed households, women’s labor force participation and mortality is important given that women have just surpassed men in the labor force10

DATA AND METHODS

• County-level five-year rate of age-adjusted all-cause mortality data for 2001-2005 were calculated from the Compressed Mortality File (CMF) produced by the Centers for Disease Control’s National Center for Health Statistics,
• Independent variables—percent women employed full time, percent families with female head, unemployment rate, percent females divorced, and percent blue collar workers—were acquired from the 2009 County Database developed by the Northeast Mississippi Area Health Education Center
• Bivariate correlations were examined to determine stronger relationships between mortality and independent variables
• Descriptive statistics—mean and standard deviation—were used to identify counties with average, high, or low mortality as well as identify counties with average, high, or low values of ecological measures of independent variables
• County-level values within one standard deviation of the mean were classified as average, values more than one standard deviation greater than the mean were classified as high, and values more than one standard deviation lower than the mean were classified as low
• Counties where both mortality and the independent variable were not categorized as average were then classified as high-high, high-low, low-high, or low-low in order to assess spatial patterns
• High-high is defined as high mortality and a high value of the covariate, high-low is defined as high mortality and a low value of the covariate, low-high is defined as low mortality and a high value of the covariate, and low-low is defined as low mortality and a low value of the covariate
• Geographic information systems (GIS) were used to assess spatial patterns of mortality in relation to ecological measures

RESULTS

• Map 1 illustrates the distribution of age-adjusted all-cause mortality in the contiguous U.S.
• Clusters of high mortality (dark gray) are shown in the Southern region, particularly the Mississippi Delta, central Appalachia, in Alabama and Georgia, and the border of the Carolinas, plus clusters in Nevada and Oklahoma most likely reflecting the presence of Native American reservations
• Clusters of low mortality (maroon) are shown in the northern Great Plains, across the Mountain and Western states, South Carolina, California’s Pacific Coast, and the New York City area
• Maps 2-5 illustrate the distribution of age-adjusted all-cause mortality in relation to each of the independent variables: the percentage of females employed full time, unemployment, the percentage of families with a female head of household, and the percentage of divorced females, respectively
• Map 2 shows several clusters of high mortality and a high percentage of females employed full time (dark gray) are shown across the Southern states, particularly in Georgia, along the Tennessee/Kentucky border, the eastern border of the Carolinas, and in central/Mississippi
• Clusters of low mortality and a low percentage of females employed full time (maroon) are located mainly in Minnesota and Idaho
• Map 3 illustrates the distribution of age-adjusted all-cause mortality and  percentage of families with Female Head of Household
• Map 4 shows the most prominent cluster of high mortality and high unemployment rates are located in the Mississippi Delta region, with a few smaller clusters in western Tennessee, northeastern South Carolina and eastern Kentucky
• Low mortality and low unemployment rates are mainly clustered in the northern Great Plains states of North Dakota, South Dakota, and Nebraska, although a cluster appears in the Washington, D.C. area
• Map 5 shows clusters of high mortality and a high percentage of families with a female head in the South, almost forming a line from the border of the Carolinas to the Mississippi Delta area
• Clusters of low mortality and a low percentage of families with a female head are shown in central Idaho and the Dakotas
• Map 6 shows the distribution of age-adjusted all-cause mortality in relation to the percent of divorced females
• Few clusters of high mortality and a high percentage of divorced females are shown, although there is a small cluster in Oklahoma as well as counties in the South that stood out
• Low mortality and a low percentage of divorced females are shown in the Great Plains region, but also along the Texas-Mexico border
• There are no clusters of either high-low (light gray) or low-high (pink) relationships between mortality and the measures identified in Maps 2-5, although there are a few counties that do reflect this relationship

CONCLUSIONS

• Age-adjusted mortality rates continue to be high in the South and lower in the Upper Great Plains
• These county-level rates are highly correlated with the percent of females who are employed full-time (0.52) and percent female-headed household (0.26) and more moderately correlated with unemployment rates (0.45) and the percent of women who are divorced (0.26)
• Higher rates of women in the workplace and higher rates of female headed households are associated with mortality rates

LIMITATIONS

• Ecological analyses are limited by their level of geography, so sub-county variations are not taken into account

DIRECTIONS FOR FUTURE RESEARCH

• Future analyses can correlate gender-specific and age-adjusted county-level mortality rates to these measures of household employment and family structure
• Multivariate weighted least squares regression analyses should be employed to ascertain causal relationships
• Spatial regression models can also be fitted to determine the spatial nature of these relationships
• Cause-specific mortality rates can also be assessed to determine whether socio-economic and occupational contexts are more relevant to specific causes of death

REFERENCES


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