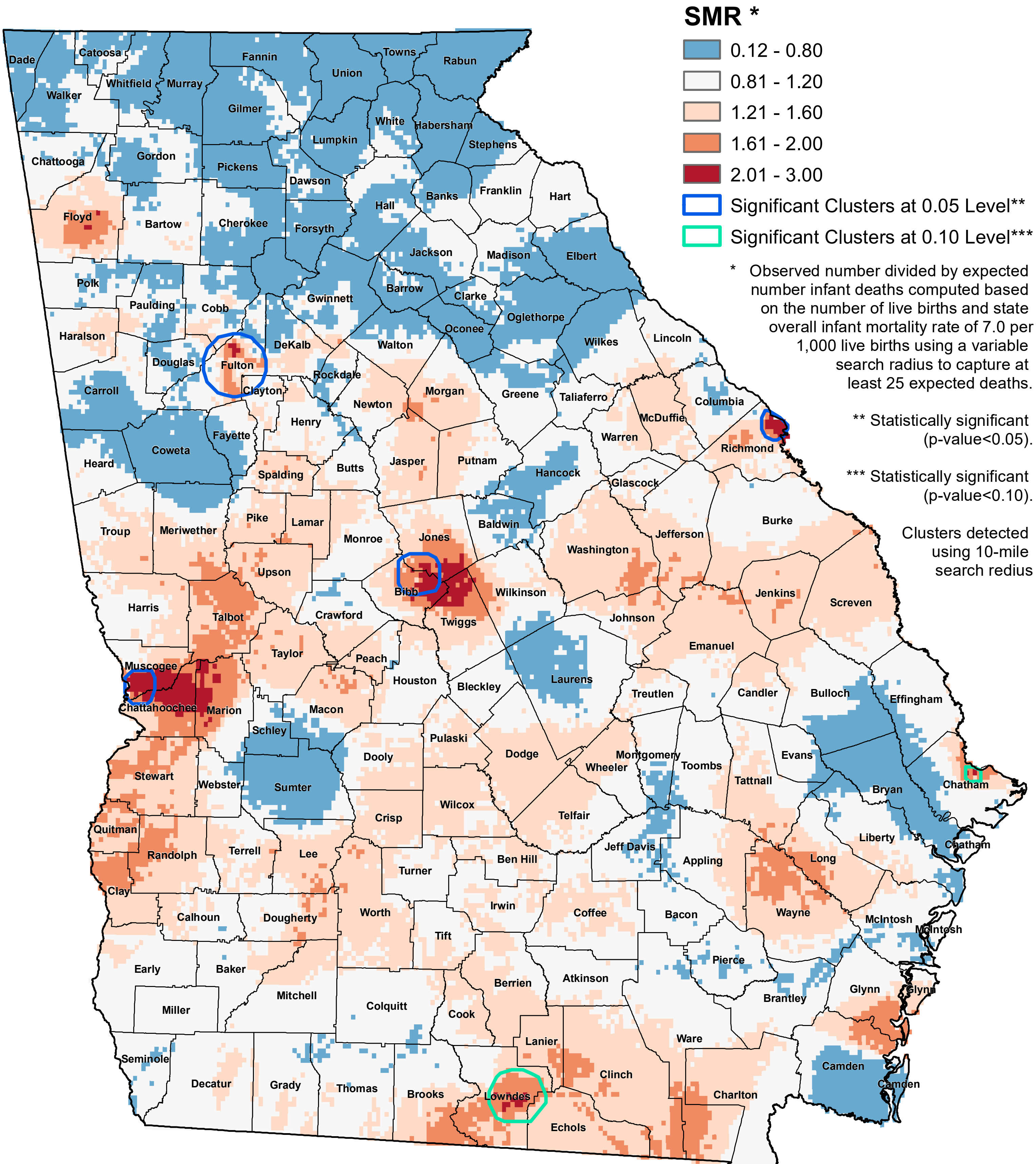
Smoothed Surface of Standard Infant Mortality Ratio (SMR), Georgia, 2006-2010 Birth Cohort



Georgia Department of Public Health
Office of Health Indicators for Planning (OHIP)

20 0 20
Miles

Created: October 2013
Manual Classification
Projection: Georgia Statewide
Lambert Conformal Conic

Infant Mortality Clustering Methodology

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In order to avoid using the administrative areas of varying sizes and shapes such as counties, zip codes or census tracts to aggregate data, a fishnet consisting of squares with 1×1 mile cell size was created to cover the entire area of the state of Georgia. Based on the geocoded locations of their mother's residence at delivery, all live births in the 2006-2010 birth cohort and births of infants in this cohort who died before their first year birthday were aggregated to the one-mile square to obtain the counts of births and deaths observed. The aggregated counts of births and the state overall infant mortality rate in the years 2006-2010 were used to calculate the expected counts of deaths under the null hypothesis that all births had the same probability of dying in their first year of life. The observed and expected numbers of deaths were then assigned to the centers of the squares, which were used in the creation of the smoothed surface of the standard mortality ratio (SMR) as well as the detection of clusters.

The smoothed surface was created using the Spatial Filtering method introduced by Ruston and Lolonis (1996). Centered on the center of each square, a circular area was constructed by expanding the circle from a point to a certain area at which at least 25 expected deaths were captured. The total number of observed deaths within the same area was calculated. The observed and the expected numbers of deaths were then used to calculate SMR by dividing the observed deaths by the expected deaths. The procedure was repeated for all squares. The SMRs were then used to create the smoothed surface.

The clusters were detected using the Spatial Scan Statistic developed by Kulldorff and Nagarwalla (1995). Centered on the center of each square, a set of circles were overlaid with varying radii from 0 to a upper limit defined by a radius of circle that captures maximum 10% of total births or a maximum of 10 miles. For each circle, the likelihood ratio associated with the ratio of the observed and expected numbers of deaths inside and outside the circle was calculated. The procedure was repeated for all squares. Then the circles were ranked based on their likelihood ratios. The circle with the maximum likelihood ratio was considered the most likely cluster. For this cluster, it is least likely that the observed number of deaths exceeded the expected number of deaths by chance alone under the null hypothesis that the infant mortality rates inside and outside of the circle were the same. A certain number of other circles were considered secondary clusters. The p-values were obtained for the most likely and the secondary clusters through the Monte Carlo hypothesis testing. The clusters that had p-values smaller than 0.05 were said to be statistically significant at the $\alpha = 0.05$ level. The clusters that had p-values smaller than 0.10 were said to be statistically significant at the $\alpha = 0.10$ level.

References

Kulldorff M, Nagarwalla N. Spatial disease clusters: Detection and inference. Statistics in Medicine, 1995; 14:799-810.

Rushton, G., and P. Lolonis. 1996. Exploratory spatial analysis of birth defect rates in an urban population. *Stat Med* 15 (7-9):717-26.