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We propose a population-adjusted conditional autoregressive (CAR) model to describe the structured spatial clustering. When borrowing information from the neighboring areas to estimate the mortality rates, the conventional CAR model share the information regardless of the population size. We conjecture that the amount of information borrowed should be weighed based on the neighbor's population sizes. Mortality rate of a certain area may be more affected by the neighboring densely-populated area(s) rather than by the less-populated area(s).

Posterior estimates are obtained via Markov chain Monte Carlo methods. For estimating female breast cancer mortality rates, we use the loglinear mixed model which includes the age effects, regional effects, and nonlinear temporal trends. Numerical results from the female breast cancer in the state of California during 2001-2006 show that the small areas near densely-populated areas have more shrinkage effects toward the overall means. (Received September 14, 2009)