Brown
BioMed
DIVISION OF BIOLOGY AND MEDICINE

CENTER FOR STATISTICAL SCIENCES SEMINAR

Multivariate Lattice Models for Areal Data with Application to Multiple Disease Mapping

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Tuesday, January 25, 2005 ~ 4:00-5:00 pm

Refreshments at 3:45 pm

Hemisphere Building, 167 Angell St., 1st FL Conference Room 106

The last decade has seen an explosion of interest in disease mapping, with increasing availability of Geographic Information System (GIS) technology and spatial databases. For example, the databases from the National Center for Health Statistics (NCHS) or from the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute, publicly available to anyone with a web browser, provide an enormous supply of georeferenced data. Conditionally autoregressive (CAR) models (Besag et al., 1991) have been widely used for single disease mapping with such data. But when we simultaneously map multiple diseases, a multivariate areal model may be needed to permit modeling of dependence between diseases while maintaining spatial dependence across regions. Existing methods for multivariate areal data (see, e.g. Kim et al., 2001; Carlin and Banerjee, 2003; Gelfand and Vonatsou, 2003) typically suffer from unnecessary restrictions on the covariance structure. In this talk, we propose a class of Bayesian hierarchical models for multivariate areal data that avoids these restrictions, permitting flexible modeling of correlations both between diseases and across areal units. Our framework encompasses a rich class of multivariate conditionally autoregressive (MCAR) models that are computationally feasible via modern Markov chain Monte Carlo (MCMC) methods. We illustrate the strengths of our approach over existing models using simulation studies, and also offer a real-data application to disease mapping which involves annual lung, larynx, and esophagus cancer death rates in Minnesota counties between 1990 and 2000.

NOTE: This work is joint with Bradley P. Carlin and Sudipto Banerjee of the Division of Biostatistics, University of Minnesota.