Reich, Brian J.; Hodges, James S.; Carlin, Bradley P.
Spatial analyses of periodontal data using conditionally autoregressive priors having two classes of neighbor relations. (English) Zbl 1284.62669

Summary: Attachment loss, the extent of a tooth's root (in millimeters) that is no longer attached to surrounding bone by periodontal ligament, is often used to measure the current state of a patient's periodontal disease and monitor disease progression. Attachment loss data can be analyzed using a conditionally autoregressive (CAR) prior distribution that smooths fitted values toward neighboring values. However, it may be desirable to have more than one class of neighbor relation in the spatial structure, so the different classes of neighbor relations can induce different degrees of smoothing. For example, we may wish to allow smoothing of neighbor pairs bridging the gap between teeth to differ from smoothing of pairs that do not bridge such gaps. Adequately modeling the spatial structure may improve the monitoring of periodontal disease progression. This article develops a two-neighbor-relation CAR model to handle this situation and presents associated theory to help explain the sometimes unusual posterior distributions of the parameters controlling the different types of smoothing. The posterior of these smoothing parameters often has long upper tails, and its shape can change dramatically depending on the spatial structure. Like previous authors, we show that the prior distribution on these parameters has little effect on the posterior of the fixed effects but has a marked influence on the posterior of both the random effects and the smoothing parameters. Our analysis of attachment loss data also suggests that the spatial structure itself varies between individuals.

MSC:

62P10   Applications of statistics to biology and medical sciences; meta analysis

Cited in **13** Documents

Full Text: DOI Link