A Class of Tests for Spatial Clustering of Health Events Based on Case-Control Point Data

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A class of tests with quadratic forms for detecting spatial clustering of health events based on case-control point data is proposed. It includes Cuzick and Edwards' test statistic(1990). Although they used the property of asymptotic normality of the test statistic, we show that such an approximation is generally poor for moderately large sample sizes. Instead, we suggest a central chi-square distribution as a better approximation to the asymptotic distribution of the test statistic. Furthermore, not only to estimate the optimal value of the unknown parameter on the scale of cluster but also to adjust for multiple testing due to repeating the procedure by changing the parameter value, we propose the *minimum of the profile p-value of the test statistic for the parameter* as an integrated test statistic. We also provide a statistic to estimate the areas or cases which have large contributions to significant clustering. The proposed methods are illustrated with a data set of the locations of cases of childhood leukemia and lymphoma and a data set of early medieval grave site locations consisting of affected and non-affected grave sites.