A new spatial agregation algorithm that improves performance of spatial cluster detection

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As more detailed spatial data becomes available, e.g. geocoded individual addresses rather than county wide counts, the computational burden in tests for spatial clustering increases; most have practical upper limits on the number of locations that can be used. Therefore, some spatial agregation is needed. Typically political boundaries or a regular square grid are used. Political boundaries are subjective and may not have a usefull resolution. The resolution of a square grid can easily be adjusted but when the density of the underlaying point process changes by orders of magnitude within the region of interest, the range of the population at risk in each grid cell is very large which affects the performance of the test. We suggest a new agregation of the locations, Epiunits, that gives a more homogeneous distribution of the population at risk in each cell by adjusting the size of the cells to the density of the underlaying point process. A simulation study using Episcan [1], an extension of SatScan [2], to detect a circular cluster covering the nearest 2% of the population around a random point shows that the use of epiunits both increases the sensitivity and specificity of the test versus using a square grid with about the same total number of cells. The point process used is geolocated addresses of mothers giving birth in Imperial and San Diego counties in California over a five year period. The background risk was set to 0.005 and the relative risk of the cluster was varyed from 2 to 10. The increased performance is seen throughout.

References

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