**Redevelopment of the Rapid Inquiry Facility software for assessment of environmental health risks**

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Background: The Rapid Inquiry Facility (RIF), an embedded application to a Geographical Information System (GIS), is a novel software that has been successfully used worldwide to support disease mappings and risk analysis studies in the field of spatial epidemiology. The RIF’s software is currently being updated with enhanced capabilities.

Objectives: To develop the RIF as free software that will provide rapid assessment of spatial relationships between a number of environmental exposures and health outcomes.

Methods and Results: Databases on spatial and population characteristics, environmental attributes and exposures, and health outcomes areinvestigated with the use of a three layers framework in which all data can be stored locally or remotely. A spatially enabled database, PostGIS, is directly linked to a Java middleware whose role is to check, validate and secure all communications between the graphical user interface, a JavaScript/HTML5 platform, and the databases.

The RIF is presented as a web application, which allows the visualization and analysis of geographically linked data. Users can open up a browser and carry out a study, visualize their current data in the form of interactive maps, charts and tables or use the RIF to run R statistical packages and infer custom disease mapping models on large datasets. Problems of extreme risk estimates based on small number of events are then addressed with Bayesian spatial smoothing techniques. Under the common case of spatial correlation, estimates based on low counts are enhanced by borrowing information from neighbours..

Discussion: Spatial epidemiological analysis using the RIF offers great opportunities to quickly localise potential environmental risks and address public health issues. The new design has enhanced computational performance to address problems ranging from inconsistent geography to data quality checks.

Keywords: Mapping, Database, Methods, Risk Assessment, Public Health Tracking