Bayesian Hierarchical Models

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BAYESIAN DISEASE MAPPING
In this session, we will work through an example of hospital admissions for chronic obstructive pulmonary disease (COPD) for England between 2001–2010.

Using this example, we will see how to calculate smoothed SMRs and plot them on a map.
The data required for these examples can be found in the folder Data.

This contains the following files:

- shapefiles and information for England split by local authorities (‘englandlocalauthority.shp’, ‘englandlocalauthority.dbf’)
- observed numbers of hospital admissions by local authority (‘copdmortalityobserved.csv’)
- expected numbers of hospital admissions by local authority (‘copdmortalityobserved.csv’).
We need the following packages

- **spdep** - Package to create spatial objects (such as neighbourhood matrix)
- **rgdal** - Package to create spatial objects
- **rgdeos** - Package to create spatial objects
- **shapefiles** - Package to read and write shapefiles
- **CARBayes** - Package to fit spatial GLMMs.
- **R-INLA**
Now we will calculate raw and smoothed SMRs and plot them on a map.

We will examine hospital admissions of chronic obstructive pulmonary disease (COPD), a respiratory condition, in England (2001–2010).

We have observed and expected numbers of cases and want to calculate the SMR for each area.
Creating and Mapping Risks

Figure: (Left) Raw SMRs. (Right) Smoothed SMRs.