Reviewer's report

Title: Shared component modelling as an alternative to assess geographical variations in medical practice: gender inequalities in hospital admissions for chronic diseases

Version: 3 Date: 4 October 2011

Reviewer: Tim Pearson

Reviewer's report:

This is a useful paper which demonstrates, and compares, a practical application of established modelling techniques (BYM, SCM) to a realistic public health question. The rationale for considering SCM as an alternative, or an additional option, to a BYM modelling strategy is well explained.

The data and methods that have been used are well explained and appear to be sound. I am, however, unable to give a detailed review of statistical methods. This aspect of the review should be conducted by an expert in spatial statistics.

Major Compulsory Revisions
None

Minor Essential Revisions
The authors do not appear to have stated whether they checked their results for sensitivity to priors and hyperprior specification. This ought to be clearly stated along with any different priors that were tested.

Discretionary Revisions

1. The authors references provide a comprehensive list of background reading for each of the statistical issues that are discussed. However, as this is a paper that will be of interest to public health analysts, as well as epidemiologists with specific interests in spatial statistics, it would helpful to give a brief lay explanation of the key statistical parameters that are used to interpret the results from the three modelling approaches that the paper presents. This would help to make the paper more accessible to a wider audience, including those with a limited statistical background who would stand to benefit from the authors research.

2. The author's discussion is well balanced and supported by the data. Study limitations are addressed. However, with regard to these aspects of the paper I have the following comments and recommendations:

I do not have the expertise to comment on the choice of priors and hyperpriors for the random effect terms that are fitted in the BYM and SCM models. However, I am aware that under certain circumstances, such as when modelling
sparse data, the BYM and SCM models can be very sensitive to prior and hyperprior specification, and that identifiability of random effects between the random effect terms in the model can be difficult. A lay discussion of these issues and whether the authors choice of hyperprior, for example tau~gamma(0.5,0.0005), was considered to be informative or vague, as well as justification for the choice of priors/hyperpriors, would be helpful to the reader.

One rational for promoting the SCM modelling approach is its ability to borrow strength between jointly modelled datasets. This would make SCM a sensible option to consider when modelling sparse data in which some component of variability/risk was thought to be shared. A brief non-technical discussion of prior and hyperprior choices, particularly in relation to the type of data being modelled, would be helpful and make the paper more accessible to public health analysts in general.

**Level of interest:** An article of importance in its field

**Quality of written English:** Acceptable

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interests