Reviewer's report

Title: GAMwithAR applied to temperature-mortality study

Version: 2 Date: 9 April 2012

Reviewer: Xiangming Fang

Reviewer's report:

This manuscript addresses an important issue of generalized additive models when the data are correlated. In particular, the authors proposed to model time series data with covariates using a generalized additive model which incorporates the autocorrelation structure (GAMwithAR). The authors showed by simulation studies that the proposed GAMwithAR model works better than the GAM without accounting for autocorrelation. However, there are a few things which need to be further addressed.

1. Major Compulsory Revisions

1) GAMs with correlated data have been investigated by many researchers, for example Simon Wood (2006). The “gamm” function in Wood’s R package “mgcv” can be used to fit GAMs with correlated data. Both spatial and temporal correlation structures (including AR(1) and ARMA) can be specified. It seems to me that the proposed GAMwithAR model is just a special case of GAMM (Generalized Additive Mixed Model). The authors need to justify the advantages of their model and fitting algorithm by comparing with the existing work on GAMMs.

2) In fitting a GAM, there is a smoothing parameter which controls the smoothness of the unknown function and needs to be estimated. The authors ignored the uncertainty due to the smoothing parameter in their algorithm, simulation studies, and real data analysis. Instead, they used fixed degrees of freedom for all smooth functions. In practice it will be hard to select appropriate degrees of freedom.

2. Minor Essential Revisions

1) Some subscripts are confusing. For example, X_{t-ji} should be X_{t-j,i} or X_{(t-j)i}.

2) Line 3 on Page 8, the second X_{it} in the equation should be X_{t-j,i}.

3) The notation of “mp=m+p” on page 9 is confusing.

4) I would like to know how the 1000 samples were generated in the simulation studies.

5) Line -5 (fifth from the bottom) on Page 14, coverage2 was not used in table 1, it is “GAM” Coverage” in table 1.
6) What are the Z values in table 6?

7) Grammar errors (some examples):
Line -2 on page 6, “have ” should be “has”;
Line -1 on page 12, “are” should be “was”;
Line -10 on page 16, “which” is redundant;

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

**Quality of written English:** Needs some language corrections before being published

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**
I declare that I have no competing interests.