Reviewer’s report

Title: Mathematical models used to inform study design or surveillance systems in infectious diseases: a systematic review

Version: 0 Date: 31 Aug 2017

Reviewer: Michael Caruana

Reviewer's report:

In this systematic review, the authors seek to quantify the use of mathematical models of infectious diseases in the design of clinical trials and observational/surveillance studies. Although these models are extensively used to explain and predict infectious disease outcomes in epidemiology and ecology, the authors found that their use in study the design stage is limited. Indeed, only 28 publications were identified in this review, and of these, only one was used in the design of a 'real' study while all the others were used in the design of theoretical studies. In the majority of these publications, the models were used in the calculation of sample size and statistical power.

Comments:

1) The authors include most of the relevant items in the PRISMA checklist.

2) Was there any specific reason for not including the Embase database in the search?

3) When summarizing the characteristics of the models (Tables 2-3, eTable S1-S4) could the authors include an indication about whether there was enough information in the publication to replicate the model and hence replicate the outcomes (sample size, power etc.) used in the study design?

4) An important aspect that has not been mentioned in the review is whether a model used for designing a study was a well-established model (i.e. previously published and well-validated especially if it includes calibrated parameters) or else whether it was built specifically for the purposes of the study design. I believe that this is an important distinction because it helps to assess the credibility/validity of the modelled outcomes used in the design.

5) In the discussion, lines 200 - 208, the authors discuss some of the possible reasons why mathematical models are not widely used in study design. The reasons mentioned are valid, but I would also take into account the fact that well-validated models take significant time, expertise and effort to build and maintain. Including someone with mathematical modelling expertise in the relevant disease in the study design/management team from the very early
stages, could make models and model outcomes more accessible to others involved in the design phase.

6) These is a typo on line 168: "divers" -> "diverse"

**Are the methods appropriate and well described?**
If not, please specify what is required in your comments to the authors.

Yes

**Does the work include the necessary controls?**
If not, please specify which controls are required in your comments to the authors.

Unable to assess

**Are the conclusions drawn adequately supported by the data shown?**
If not, please explain in your comments to the authors.

Yes

**Are you able to assess any statistics in the manuscript or would you recommend an additional statistical review?**
If an additional statistical review is recommended, please specify what aspects require further assessment in your comments to the editors.

I am able to assess the statistics

**Quality of written English**
Please indicate the quality of language in the manuscript:

Acceptable

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