Reviewer's report

Title: Investigating spillover of multidrug-resistant tuberculosis from a prison: a spatial and molecular epidemiological analysis

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Reviewer: Catherine Smith

Reviewer's report:

In this paper, the authors use a Bayesian hierarchical modelling approach to investigate a potential spillover effect of increased risk of multidrug-resistant tuberculosis around a prison in Lima, Peru. They quantify the magnitude of this effect and the distance over which it is detectable. They also examine other individual risk factors for MDR-TB, and use molecular strain typing data to assess plausibility of transmission. This paper builds on previous work in the same population which identified imprisonment as a risk factor for MDRTB in the area and suggested that the prison could "act as an amplifier of drug resistant Beijing strain in the community". The paper is very clearly written and the results have implications for control of MDRTB in this community. I have the following comments.

1. Control group. The control group in this analysis is patients who have tuberculosis that is not MDR, presumably as a proxy for the general distribution of the population. Does this therefore assume that the spillover risk from the prison is confined only to MDR patients and not to other types of TB? Or, if we assume that this spillover effect is being shown over and above any spillover effect from all types of TB, then the MDR effect is more striking. The limitations of using other TB patients as the denominator population should at least be raised in the discussion.

2. Table 1 - summary of patient characteristics. This table should include the numbers of patients in each group, rather than just the proportions. The numbers calculated form the proportions do not tally up with numbers quoted in the text - the results state that "among the 40 inmates with TB, 17.5% have MDR-TB compared to 10.2% of individuals in the general population." However, the table implies that there are 0.04*164=6.5 prisoners with
MDRTB and $0.02 \times 1423 = 28.5$ prisoners with non-MDRTB. $6.5 + 28.5 = 35$. This gives us a total of 35 prisoners, not 40?

3. Figures.
   a. The figures should have a scale in km, not just the lat/long values - this would help when interpreting the ~5km estimated spillover effect from the prison.
   b. In figure 1, the selected colours (red/ grey/ blue) are (at least for me) quite difficult to look at. The legend should explain what the black lines represent (city block?).
   c. Figures 2 and S4 are the same but one for patients with previous TB treatment and one for patients without previous TB treatment. The results say that these figures highlight the large difference in risk between patients with and without history of TB treatment. However, I found the differences between these two figures hard to interpret because the colour scales are different.

4. Results - molecular analysis section. If I have understood this correctly, this section compares:
   a. Number of MDR-TB patients residing within the spillover region who share a strain type with an MDR-TB patient in the prison as a proportion of number of TB patients living in the spillover region = $9/467$
   b. Number of MDR-TB patients residing outside the spillover region who share a strain type with an MDR-TB patient in the prison/ number of TB patients living outside the spillover region = $7/1080$

I think that a more natural comparison would be to restrict the denominator to MDR-TB patients as well - i.e. to compare the proportion inside and outside spillover areas of MDR-TB patients who had prison links. The current analysis looks at two factors - MDR and prison links - whereas restricting to MDR patients would enable investigation of prison links specifically.

Minor comments
1. Background, first sentence - this should be referenced.
2. Average socioeconomic status of city block. I think that this has been included in the model as an individual-level effect. Could the authors discuss if they considered it as a group (city block) level effect.
3. Table 1 - are population density and distance to prison the mean values?
4. How many of the MDR-TB patients shared residences?

**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?**
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