Reviewer's report

Title: Pneumonia and poverty: a prospective population-based study among children in Brazil

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Reviewer: Daniel Feikin

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Abstract.
• Last sentence of results says high income household associated with pneumonia which seems contrary to main geospatial association with poorer census tracts.
• Conclusion. Should change phrasing from “should be kept at high vaccination coverage” to should be targeted for high vaccination coverage as you have not stated in abstract that they already have high coverage.

Background
• First paragraph. Too much detail on pneumococcus. That is not the focus of the paper. should lead with association of pneumonia as a syndrome and poverty as a risk factor. You only introduce this idea in 2nd paragraph in sentence starting “Several studies have investigated…..” Bring this up into first paragraph.
• Second paragraph. Too much on development of CXR guidelines by WHO. That is not the focus of the paper.

Methods
• Major. First paragraph. Please clarify the discrepancy between 70% persons use public health system but 80% pneumonia seen in private hospitals. Do you really think you capture all children with pneumonia in the catchment population in the facilities under surveillance – you state on page 6 “The investigation was conducted at 100% of health services that provide urgent pediatric care in Goiania…” . You must convince reader that wealthier children with pneumonia were not being treated in facilities outside your surveillance area or that were not part of your surveillance system.
• Major. Page 6. The enrollment criteria are not clear. Was it clinician’s judgment? How was suspicion of pneumonia or invasive disease defined? Symptoms, signs, subjective clinical impression?
• Page 6. Not important that blood cultures were done before CXR but more so before antibiotics given. What was timing of culture with antibiotic administration?
• Major. Page 6. In paragraph describing LEAP surveillance, the locations of health facilities involved need to be described. A map would be useful. Did you control for distance to facility in the analysis?
• Major. Page 7. The primary and secondary outcomes imply some children with consolidated CXR pneumonia were not admitted. This seems unusual to treat these children as outpatients since they likely have bacterial pneumonia, yet almost half were treated as outpatients. Describe how decision to admit or not was made? What were criteria used? Was it strictly clinical? Or were there other factors involved, like whether the family could afford and manage outpatient treatment. Is outpatient pneumonia treatment a common practice?

• Page 8. Please explain what is meant by “earning more than 20 minimum wages monthly”

• Page 8. Why was 15 years of schooling chosen? What does this mean in Brazilian educational system?

• Page 8. Give the range of possible SES scores using the system described? Not sure how many “points” can get for each of the two variables.

• Page 9. Not clear why of the 7 SES variables you looked at you chose only those 2 variables to create the score. Explain choice.

• Page 9. Data analysis. State unit of analysis. Was it district?

• Page 9. Not sure what distribution was positively skewed? Skewed by age? By location?

• Major. Page 10. Please describe how the clusters defined by geospatial software overlapped with district? It is not clear how you used the defined clusters to then come up with a RR by district. I would assume the clusters defined by the program are not same as districts as defined geopolitically.


• Page 12. It seems strange that PCV was distributed also with SES tracts since only available in private market? Explain in discussion.

• Page 12. It is more conventional to give 95% CI around RR, rather than p value.

• Page 12. I think you mean second cluster rather than secondary cluster. Correct?

• Page 12. Please clarify the meaning of the following sentence “In this way the relative risk for the spatial scan statistics was conservative but strong enough to show the high risk area in northwest region.” The analysis of suspected pneumonia is not clearly described in methods? Is this analysis based on clinical diagnosis rather than CXR?

Discussion

• 1st paragraph. Not clear where the 80% higher comes from. If that is the bottom line finding it is not clear in the results.

• Major. 2nd paragraph. “Living conditions and hygiene, rather than access to services, likely played an important role in higher risk of pneumonia in low
income areas of Goiania.” This study does not support this statement. It is unclear if poor families seek care later than wealthy families when ARI has progressed to pneumonia without early antibiotic treatment. Besides hospitals what other health care facilities might children be taken to to receive treatment and would pre-hospital treatment be less common for the poor? Are antibiotics available at pharmacies without prescription? There could be health seeking component to this difference. Health seeking is more than just distance to facility. The discussion of explanations for higher incidence in the poor needs to be expanded to include not just difference in health care seeking and access to antibiotics, but other factors such as increased exposure to pathogens in crowded living conditions (e.g. increase viral transmission, increased risk of bacterial pneumonia), differences in underlying illnesses that predispose to pneumonia (e.g. malnutrition), and differences in vaccination.

- Major. 2nd paragraph. Page 13. Is it possible that illegal settlers don’t seek care early because of their illegal residence status? Would they not qualify for public care because they officially are not residents of the area?

- Page 14 top. I don’t follow the math. If only half of pneumonias are outpatient, shouldn’t the incidence have doubled in the current study from the previous one on hospitalized patients – it was 4.3 times higher. Please explain.

- Page 15. “One limitation of this study is the possibility of ecological fallacy since area-based socioeconomic data may not represent the individual-level socioeconomic status.” This is not an example of ecological fallacy, although it could still be a limitation. The ecologic fallacy would be that the association between poor areas and pneumonia is true, but confounded by another factor that actually is leading to pneumonia increase, such as different elevation or rainfall.

- Major. Page 16. Should discuss how PCV should even the differential between incidence in poor and wealthy in Brazil. Cite studies from US that showed IPD rates between white and black children became more similar after PCV introduction. You mention that the study highlights areas that should be priority areas for vaccination. But isn’t vaccination a national program, without targeted areas. Would not suggest a targeted approach if universal vaccination. Rather could stress that extra efforts should be made to get poor children in for vaccination. Are there differences in vaccination for other EPI vaccines by economic status of districts?

- Discussion should mention that the case definition is more for bacterial than viral pneumonia. how might that affect results?

- Major. Discuss potential bias and its direction of one area NW Goiania accounting for disproportional amount of missed CXRs, since this is same area with highest incidence.

- Major. Might the referral for admission be confounded by socioeconomic status. Among those not referred for admission, were they of higher SES? Might clinicians have felt that these were more reliable and educated families who could better manage pneumonia treatment at home? Is this a bias?
Level of interest: An article of importance in its field

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

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