Author's response to reviews

Title: Advancing the application of systems thinking in health: Understanding the Growing Complexity Governing Immunization Services in Kerala, India

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Author's response to reviews: see over
Reviewer's report
Title: Advancing the application of systems thinking in health: Understanding the Growing Complexity Governing Immunization Services in Kerala, India
Version: 1 Date: 11 March 2014

Reviewer: Anjali Chikersal

Reviewer's report:
The authors have explored an important topic. It is also very pertinent that this is in a state where most health and health service indicators perform much better than the national average. The methods used are appropriate and described well.

Major compulsory revisions–
1. The authors have used data only from the last two rounds of the District Level Health Survey to show the rise in immunization in Alappuzha district and the fall in Kozhikode district. They must also include district data from DLHS 1 in the time trend analysis. It is important to explore if there was any fall in immunization coverage in the districts between the first two rounds since there is a clear decrease in the state coverage during this time. Because if such a reduction is evident between the earlier rounds as well then the reasons for the later decrease cannot explain this fall. Questions may then arise - What were the reasons for this decrease? The statement made by the authors under Introduction, para 3 “The sudden decline in immunization coverage, in a state where vaccines were uncritically accepted as a social good in the past.....” will also then not hold true. The first causal loop (Fig 2) will then need to be revisited as well. (Please note these observations are in case DLHS 1 data shows a fall from round 1 to round 2).

Response:
Thanks for the suggestion. The immunization coverage data from DLHS 1 survey for the study districts is now included in the manuscript. It shows a marked drop in immunization coverage in Kozhikode district after the DLHS 2 survey period. The period before DLHS2 shows improvement in immunization coverage. This change corresponds with the events described in the study. The revised manuscript includes a new graph that shows trends in vaccination coverage at the district, state and national levels.
Also, we included additional references to show the concerns raised by public health community on declining immunization coverage in some of the districts of Kerala.

2. Findings
Under findings the authors have included a brief description of part of their methodology and then moved on to the interpretation of their data but not actually given their findings. What did the data show? What were the differences in the data in the two districts? And in the low and high performing areas within the same district? What were the similarities and differences in the observations from the different stakeholders?

Response
The findings section in the revised draft include an analysis of the historical data from two districts. A brief analysis is given in the introductory section of the manuscript is relocated to findings section with additional information from DLHS 1
data. Though, the study areas within districts showed only marginal differences, we also commented on the low and high coverage areas of each district based on qualitative data.

3. The authors need to explain why the first causal loop they have developed (Fig 2) did not function in the poor performing areas of the high coverage district. Similarly why did the second CLD (Fig 3) not come into play in the high coverage areas in Kozhikode?

Response:
As explained, the difference in coverage within a district was only marginal and the study was not designed to capture the reasons for this difference in vaccination coverage. This is explained in the revised manuscript. The reason for including different regions from study districts was to ensure heterogeneity of the study contexts. Nevertheless, as advised, we have included our observations on immunisation coverage in different regions within the district based on qualitative information.

4. Phase 2: Opposition, paras 4 and 5. When the divide between the allopathic doctors and practitioners of alternate medicine was as old as 1970s and the latter’s protests began with the IPPI campaign, why was the adverse impact of such campaigning seen only after DLHS 2?

Response:
As reported in the study, the public protest against immunization started from 2002 after the KGMOA strike and gained strength after 2005 when homeopathic professionals and others joined the fight against polio campaign and went public with it. DLHS 2 for 2002 -2004 period would not have captured the impact of it. Protests by many other groups emboldened the homeopaths and made their information campaign against much more effective.

Minor essential revisions –
1. Phase 2; Opposition, para 3 – In the sentence “In 2002, the Kerala Government Medical......” the year (2002) does not match the year given for the same event in the Table 1.

Response:
Thanks for pointing out this discrepancy. The error in the table is corrected.

Discretionary revisions –
1. Discussion – Para 1 – In the sentence “For example the decision making for immunization during the phase of vaccine resistance in northern Kerala showed a shift from mothers to male members of the households” – At no place in the text before this has it been elucidated that mothers were the decision makers. Authors may wish to include that finding in the data they provide.

Response:
Thanks for pointing this out. It may not be correct to say that mothers were the vaccination decision makers in the households. It is now rewritten to emphasise the central role the mothers played during acceptability phase as she held the
information regarding immunization. The role that male members played during vaccine resistance phase that undermined the role of mother is now described. We have added a quote from one of the interviewees to support this.

2. Fig 2 - The direction of the arrow around the letter ‘R’ symbolizing reinforcement should be clockwise.

Response:
Thanks for this comment. We have now redone the CLDs.

Level of interest: An article of importance in its field
Quality of written English: Needs some language corrections before being published
Statistical review: No, the manuscript does not need to be seen by a statistician.
Declaration of competing interests: I declare that I have no competing interests

2. Reviewer's report
Title: Advancing the application of systems thinking in health: Understanding the Growing Complexity Governing Immunization Services in Kerala, India
Version:1 Date:6 April 2014
Reviewer: Peter Hovmand

Reviewer's report:
Major:
1. Although the paper makes a good case for the CAS perspective and role of feedback loops, the diagrams (Figure 2 and 3) actually show relatively few feedback loops and the narrative makes little use of the diagrams for explaining the system (e.g., no references to specific feedback loops as part of the story). The paper needs to have a much better integration of the narrative with the diagrams and use the diagrams as a way to tell the story with references to specific loops.

Response:
Thanks for these valuable suggestions. We have significantly improved the figures and have now included all the feedback loops that emerged with clear denotations of the direction of the effects. We have strengthened figure 2 &5 by adding the variable ‘households trust in vaccination’ to contribute to the dynamics of vaccines acceptability and to link the figure more closely to the text as suggested by the reviewers.

We have also strengthened the link between the CLDs and the text by breaking down components of Figure2&5 into smaller parts and linking the respective paragraphs directly to them to guide the reader into the dynamics in question and make the narrative much easier to follow.

2. The shown in Figure 1 seem to be at odds with the story and do not reflect an appropriate dimension in time for highlighting the trends. This is a common mistake, but it's important to note that the coverage (reported over several years) is not the same as the actual x-coordinate in time leading to a distorted presentation. Figure 1
should be plotted as a proper x-y plot. In many cases, survey reports are over several years, and the authors will need to decide how to handle this.

Response:
There was an error in the periods given corresponding to the immunization surveys in the earlier graph. This is now corrected. The coverage data is from surveys that were conducted at three time periods. Each survey took 2 to 3 years to complete and the only authentic data on immunization at the district level. We have also added data for districts for the 1998-99 periods as suggested by the reviewer.

3. The authors use weighted lines to convey strength of relationships, but do not explain how these weights are justified. Line weights as strength of relationships is not a standard convention in causal loop diagrams, so this should probably just be dropped, especially in lieu of the limited feedback perspective.

Response:
Thank you for this suggestion. We have now changed to match with the standard conventions

4. The clockwise/counter-clockwise direction of the balancing and reinforcing loops should, by convention, correspond to direction of causality around the loop, and does not have any meaning in standard conventions in terms of balancing or reinforcing loops.

Response:
The feedback loops in the CLDs have changed to correspond with the direction of the causality. The reinforcing and balancing loops are denoted by separate signs for clarity

Minor:
5. Figures are hard to read with text that is too small, and generally could be improved through better layout. It seems it would also be fine to just have Figure 3.

Response:
The font sizes of the figures are increased in the revised manuscript. We are retaining the figure 2.

6. It is unclear what the implications were on the researcher also having to play the role of public health expert. Did this mean that the public expert interjected views in focus groups or augment the model based on expert knowledge? This needs to be explained better.

Response:
The role was mentioned in the context of participant observation, when the first author had involved in community mobilization activities for vaccination along with the community workers. Here the researcher had to work as a public health expert, though the research observations were used as the qualitative data. This is now explained in the text under the methodology section.

Discretionary:
None.

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**
No competing interests.