Reviewer’s report

Title: Formative Research for the Design of a Scalable Mobile Health Program on Water, Sanitation, and Hygiene: CHoBI7 Mobile Health Program

Version: 0 Date: 01 Feb 2019

Reviewer: Sonia Hegde

Reviewer's report:

This paper describes a potentially important tool for reducing cholera and overall diarrheal disease burden in Bangladesh. Though the paper describes some of the qualitative methods and results in depth, it fails to present the necessary information in the methods and results that leads the authors to conclude it presents a theory-driven evidence-based approach. Additionally, it's unclear what was done in prior manuscripts (ref 39 and 40 and 45) and how this manuscript is different. Was the theory work done in reference 45? Please clarify. I suggest changing the conclusions in this manuscript to match the objectives presented here. My detailed comments are below.

Page 4 Line 4 I suggest changing to "Sharing mobile messages with household members and having consistent phone access." to make it more clear.

Page 5 Line 50 Are there other examples of text message reminders being used for household behavior change (aside from vaccination)?

Page 6 Line 10 I suggest refraining from making such statements. The idea that you are the first to do something is an unnecessary claim. Omit this sentence.

Page 6 Line 19 What does it mean to tailor an intervention message for the target population? Perhaps elaborate if this is a key point of the novelty of your work.

Page 6 Line 29 Seems like an important part of the paper to support the idea of using theory-based intervention approaches. As such, will be better to explain what the difference is between theory-based interventions and health education alone. Please elaborate on this.

Page 7 Line 46 The findings in reference 39 seems to be central to this manuscript. As such, would be good to provide more information. Same with reference 40. Also, is important to distinguish the methods and findings from these prior manuscripts to the manuscript here in question. It's inconsistently presented throughout this manuscript.

Page 7 Line 51 For reference 40, for example, would be useful how long the intervention lasted, how long home visits lasted and if there was monitoring after 12 months?
Page 9 Line 36 This is a bit awkwardly worded. Do you mean "intervention sustainability" instead of "maintenance"?

Page 9 Line 46 What do you mean by "response efficacy?"

Page 10 Line 14 What questions were asked in the group discussion and semi structured interviews. Was there a discussion guide? Would be useful to share, particular if the purpose of this endeavor is to expand the use of this already successful mobile messaging tool.

Page 10 Line 36 Make the website an actual reference with a reference number.

Page 10 Line 46 How exactly is the pilot study in this manuscript different than the prior CH0B17 study? Is the pilot using the same protocol developed in the prior study?

Page 11 Line 7 What percentage of diarrhea case households did not have a mobile phone?

Page 11 Line 14 Perhaps a chart or figure to outline the timeline of interventions (of visits and calls) would be helpful...I suggest adding one to the supplement.

Page 11 Line 58 Please elaborate on what you mean by convenience based sampling - does this mean only available government stakeholder members were asked to participate?

Page 12 Line 34 What are the key research questions for the analysis that were asked? Are they the same questions asked in the patient group discussion? This is a major part of your methods.

Page 12 Line 46 Again, please specify what convenience sampling means. Do you mean cases and individuals from case households who were at the hospital were asked to participate? It's unclear.

Page 12 Line 51 Here you describe the purpose of the group discussion with patients and patient family members. Would be nice to do this for the semi structured interviews with government stakeholders as previously stated. Why were those interviews done? What questions were asked?

Page 13 Line 16 What themes did you examine in your thematic analysis? Please be more specific. Seems important to highlight the specific themes especially if the hope is for this to be expanded and repeated in other cities or countries.

Page 16 Line 48 Seems a major point in Bangladesh WASH studies to have in-person visits in order to achieve sustained behavior change - across different studies. However, this point is not expanded on much in the discussion. Would be useful to expand on this more in the discussion.

Page 17 Line 24 Seems that another point that is not discussed much in the discussion is reaching persons who can't read and write. It's suggested that both voice and text messages are useful for this reason, but there is also no mention of how much of the population is illiterate (in urban vs rural Bangladesh) and how much of an impact this fact has on the program.
Page 24 Line 45 There is also little mention of the role of gender in the program roll out when it seems incorporating literature on gender dynamics in the household alongside results from the group discussions is critical. Seems this should also be discussed at greater length in the discussion as it is pertinent to the primary objective of creating a feasible, effective program.

Page 26 Line 30 The beginning of the Intervention Development section discusses the targeted five key behaviors/psychosocial factors of the mHealth message, but doesn't clearly state that the formative work of relating the WASH behaviors to the psychosocial factors was done in a prior publication. That seems imperative to mention/reference. Furthermore, Table 2 shows how the messaging relates to the IBM-WASH framework but nowhere in this manuscript is it described or discussed though it seems to be a major part of what you're claiming to be a strength of the paper. Was the work for Table 2 done just for this manuscript or is it also from another reference? Please clarify. If it is for this manuscript - then it seems beneficial to talk about the theory-based approach more in detail as that is a central part of the conclusion. Again, please clarify how the objectives and results are different in this manuscript than prior manuscripts.

Page 27 Line 50 Are participants able to text/call Dr. Chobi back with questions? Is there a hotline? Please clarify.

Page 28 Line 33 You state that phone messages were sent to husbands to inform them that their wife's phone would also be messaged - would be nice if you could also cite other literature on how to reach mothers/women in households.

Page 29 Line 20 You continually state that you are presenting a novel theory driven evidence based approach - but it seems that work was actually done in another manuscript and the purpose of this manuscript was to design program implementation based on qualitative data. There is no theory discussed in this manuscript except for Table 2, which is not discussed at all in detail in this paper. I suggest editing this sentence to say what was actually done in this manuscript - even to say "using a previously developed theory driven approach..."

Page 29 Line 40 I suggest omitting this sentence - better to refrain from making such claims.

Page 30 Line 53 The fact that many female household member did not have consistent access to mobile phones seems quite critical even though both male and females in households are being sent voice and text messages. If many females don't even have access to phones, it defeats the purpose. What percentage of women do not have mobile phones? (urban vs. rural) This seems important for the ministry to know in order to assess how to roll out the program. Is contacting men vs women more effective in households?

Page 31 Line 53 Was a formal cost-effectiveness analysis done comparing different interventions?
Page 32 Line 31 So changes were made to the mHealth messages based on the pilot study - but in this manuscript it is very unclear what exactly the before and after were. Seems it was more how the delivery of messages happened rather than changes to the messages themselves as I think the five main factors still stayed the same correct? Again, I think it would help to clarify what was done previously and what new methods and results are being presented in this manuscript. Additionally, in this paragraph on strengths you mention that the use of health theory is a strength - it is indeed a strength and sadly seldom used. However, again, this manuscript fails to go into detail of the theories that were used and how they were used to develop the interventions. Please clarify.

Page 33 Line 4 Does mobile phone ownership decrease as you move farther away from urban areas? What does that distribution look like? Seems important for stakeholders to know for program implementation.

Page 33 Conclusion - Seems this method of intervention delivery could also be useful for surveillance, particularly if household members are able to text back if other household members get sick. Could expand on the potential utility of mHealth in Bangladesh as the purpose of this manuscript started with the Ministry asking for formative work on feasibility of program delivery and utility. Discussion of the potential for a mobile app would also be interesting.

Overall, I think this paper needs great clarity on what its objective is and how it is different than prior papers. After defining that, it needs to focus on presenting results specific to this objective and conclusions specific to this objective and not results or conclusions from prior work. Because as is, there is no theory discussed in the body of this manuscript. If I am mistaken and Table 2 was in fact developed for this manuscript, then it needs to be described in the methods and results section in more detail. Either way, this paper is not clearly presented. However, I do feel the results are indeed important to share - that a mHealth WASH intervention is effective.

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

No

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

Yes

**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

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