Author’s response to reviews

Title: Requiring smartphone ownership for mHealth interventions: Who could be left out?

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Responses to Reviewers

Richard T Lester, M.D. (Reviewer 1): The authors present a paper that examines smartphone ownership and its associations as a secondary analysis of a VDOT study of 151 TB patients qualifying for standard DOT in San Diego, San Francisco, and New York City. It is a simple but very important study as it provides the literature with critical data on access to smartphone related technology for mHealth. I think readers will find it a useful reference. The analysis is appropriate, and the message is clear. The found that patients who were older, male, less educated, or had lower annual income were less likely to own smartphones. While unsurprising, it is an important reference backed by data.

Thank you very much. We appreciate your careful review of our work.

I have a few minor points to be addressed:

Discussion
This data did not suggest the gender gap is decreasing, it suggested it may actually be reversing. On the same point, the next paragraph, while interesting, sounds like it was written prior to seeing the data since the data showed that men were less likely to own smartphones than women. Perhaps they can discuss why this might have been the case. An analysis of the associations between gender and income and education in their own data may be helpful. Were women more educated in these cohorts? The discussion about non-smartphone owners being more likely to value in-person DOT or encounters with healthcare providers is interesting. It was still the majority of them who found VDOT useful but supports that the use of technology is probably not best as an 'all or none' approach.

Thank you for pointing this out. We have modified the discussion about our finding that men are more likely than women to not own a smartphone. We specifically reference the declining wage gap between men and women as well as the increasing number of women in the workforce as possible explanations. Within our cohort, there was no difference in income level or education between the two groups.

In the limitations section discussion on generalizability, it should be noted that these findings were in the US. Most of the global burden of TB is in other more resource limited settings, that may also have different levels of cellular phone and internet infrastructure as well as cultural and societal factors such as literacy. In the US, providing smartphones was a solution used in the parent study, but this may not be feasible or possible in some other high burden TB settings. In parts of Africa, for example, especially in rural areas, basic cellular phone access and use is very high which would allow texting and voice calling, but smartphone access required for video is much less. Providing smartphones in these settings may not be as feasible.

As you suggested, we have acknowledged that because the study was conducted in the US, we should be careful to generalize the findings of this study.

The conclusions is well written and balance, but perhaps the term 'resource-limited populations' or some other terminology to reflect the resource limited aspect within US public health would be more accurate that resource-limited settings for this study's findings since it was in the US which is not a resource limited setting by global TB setting standards.

We have modified the term to ‘resource-limited populations’ in the Conclusions section.

Jaranit Kaewkungwal (Reviewer 2): This study aimed to assess the smartphone ownership in relation to mHealth VDOT intervention. The study continued from a previous study on the effectiveness of VDOT in monitoring treatment compliance of TB patients. The study is interesting. However, there are several issues that require clarifications and modifications.

Thank you very much for your thoughtful review and helpful suggestions for strengthening our paper.

1. In the Background and Methods sections, the authors mentioned about VDOT briefly with references to previous papers on VDOT. Please elaborate a little bit more on VDOT so that
the readers who are not familiar with VDOT can understand how the application functions and could be (or has been) used in public health settings.

We have elaborated in the Background section on how VDOT works and its application to TB, both in the US and abroad.

2. In the Results section and Table 1, the authors compared smartphone ownership with some TB risk factors, for examples, lifetime history of cigarette smoking, alcohol use, smoking marijuana, injection drug use, or incarceration. How could such TB risk factors be related to smartphone ownership? Please consider cut off these variables from the analysis.

We agree with the reviewer that TB risk factors are not expected to be associated with smartphone ownership, as we observed in our study. However, the purpose of including these variables in our analysis was to provide the readers with a comprehensive description of the patients included, or potentially excluded, from our sample so they could assess the generalizability of our findings to their own populations of interest. With the editor’s concurrence, we respectfully prefer to keep those variables in Table 1.

3. In the Results section, the authors stated that in univariate analysis (Table 1), income, education, hours worked/week, sex, and age were significantly associated with not owning a smartphone (p<0.05). But in Table 1, the p-value for sex was 0.079. According to the criteria set for variables to enter into multivariable analysis, baseline variables that were significantly associated with smartphone ownership in univariate analysis (p <0.05) were included in a multivariable logistic regression analysis. Please clarify the criteria; otherwise, the multivariable analysis needs to be changed.

The criteria have been clarified to say that the cutoff of p <0.1 was used for multivariable analysis and only those that were significant at the level of p<0.05 were retained in the final model.

4. In Table 2. multivariable logistic regression analysis of baseline participant characteristics associated with not owning a smartphone showed only 4 variables: age, sex, education, annual income. There was no p-value for sex in Table 2; and, the OR and 95%CI changed from 0.52 (0.25, 1.09) (comparing female vs. male) to 2.86 (1.04, 7.87) (comparing male vs. female). For education and age, the OR and adjusted OR were quite similar; but for income, both OR and adjusted OR were the same at 2.29 (1.10, 4.77)? Please check these calculations. There was no hours worked/week in the final model, this might be due to interrelated between hours worked and income; please explain this issue.

We appreciate the reviewer calling our attention to the fact that we reversed the reference group for Sex between Tables 1 and 2. We have now corrected the calculations in table 2. The p-value for sex has been added (p = 0.081) and the AORs have been modified accordingly. Females are used as the reference category since males were more likely to not own a smartphone: 2.86 (1.04, 7.86). The AOR and CI for annual income in Table 2 was also corrected to 3.06 (1.19, 7.89) and the corresponding p-value is 0.020.
The hours worked variable was not included in the final model because it was colinear with the income variable and therefore could not be included in the same model. We chose to include income in the final model because we felt that it was more closely related to smartphone ownership. This explanation is provided in paragraph 2 of the Results section.

5. In the Discussion and/or Conclusion section, corresponding to the authors' point in the introduction about answering the question of who is more or less likely to own a smartphone would help inform the design of future, adequately resourced, sustainable mHealth applications and interventions. If there is inequalities or disparities in smartphone ownership, is it really feasible and possible to provide smartphone for TB patients? What could be done then to resolve or minimize the inequality issue? Will the smartphone ownership make a different; in other word, will the treatment outcome differ when using VDOT (via smartphone) and in-person DOT?

This is a good point and we have modified the text to include a reference to Kumar et al., who studied the use of VDOT for TB treatment in South India. They demonstrated that VDOT has similar treatment outcomes compared to in-person DOT. We have acknowledged that there remains a question of whether it is feasible to provide smartphones to individuals who are at risk of being excluded from such studies.