

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Development and validation of the Social Capital Assessment Tool in pregnancy for Maternal health in Low and middle-income countries (LSCAT-MH)
AUTHORS	Agampodi, Thilini; Agampodi, Suneth; Glozier, Nick; Lelwala, T.A.; Sirisena, K.D.P.S.; Siribaddana, Sisira

VERSION 1 - REVIEW

REVIEWER	Akanksha A Marphatia University of Cambridge Department of Geography Cambridge UK
REVIEW RETURNED	30-Nov-2018

GENERAL COMMENTS	Please see comments in attached document - The reviewer also provided a marked copy with additional comments. Please contact the publisher for full details
-------------------------	--

REVIEWER	Josue Almansa UMCG Netherlands
REVIEW RETURNED	12-Dec-2018

GENERAL COMMENTS	<p>Research over Social capital is a topic that is increasingly gaining in popularity. This presents the challenge of how to measure Social Capital quantitatively, and what is relevant to measure specifically in each scenario. Indeed, there is a need for this kind of research. This research paper proposes an instrument applicable to pregnant women in Low and middle income countries. It seems that researches have played large effort in the qualitative part of their research. Nevertheless, I've some important comments regarding the 'quantitative' part of their research. I would suggest to strength this research paper by improving or going deeper in the qualitative part, and put much less emphasis on the quantitative validity (mainly about construct validity – see my comments below).</p> <p>Major comments</p> <p>1) Formative or Reflective? Previous to the development of the structure/construct of any instrument it is strongly necessary to justify the nature of the non-observable measure: Reflective or Formative. Social capital, as a total score, has a clear formative nature. It might be argued that some specific aspects of Social Capital could</p>
-------------------------	--

	<p>be measured in a reflective way. In any case, doing an exploratory factor analyses over a large list of items is not a recommended practice. In the results “Cognitive validation of questions and responses”, and I guess as a results of the qualitative part of the study, the authors come up with a list of important concepts, items are grouped within this concepts. Why are they not already the dimensions you aim to measure? Why do you need to do an EFA with all items together?</p> <p>EFA assumes that items are the results of underlying latent variable(s) that causes the observed items. For me it makes no sense to assume that all social capital can be constructed in a reflective way. Statistics can compute if items are correlated or not, but cannot tell the reason why are they correlated. For example, item about financial-help is in the same factor as spending-time (table 3), when they are clearly two distinct concepts that do not reflect a common underlying latent factor. To some extent they just happen to be correlated but they are obviously different concepts. It make sense that money and time could be not related with each other in a different sample. So their association depends more on the sample than on the nature of the items. I could imagine that some aspects sub-dimensions of social capital could be measured in a reflective way, but a general/total score of social capital cannot be reflective. Thus, putting a large list of items on an EFA is not a convenient approach. It might be better to assess directly with confirmatory factor analyses (or IRT) the validity of the sub-dimensions that were assumed to be reflective, if any. And later suggest a way to compute a total social capital score, if this is an aim.</p> <p>However, if authors still believe that Social Capital is a fully reflective measure please add your reasoning.</p> <p>Cosmin tools also discussed the case of formative measures, in which their construct do not need statistical support : “Evaluating the internal structure of the instrument is relevant for outcome measures that are based on a reflective model. In a reflective model the construct manifests itself in the aspects, i.e. the items or tasks are a reflection of the construct to be measured. Its counterparts is a formative model, in which the aspects within an outcome measure are not supposed to be correlated. Analyses on the internal structure of outcome measures based on formative models can be ignored.” (https://www.cosmin.nl/tools/cosmin-taxonomy-measurement-properties/).</p> <p>2) Results were sometimes shown in a careless way</p> <ul style="list-style-type: none"> -Table 2 is referred in the results section as ‘Parallel analyses’ and in the discussion about dimensions, when table 2 is just a sample descriptive. -What do you mean by “parallel analyses”? There is no such analyses explained in the methods section. -Missing data analyses was not properly reported. Where exactly you use list-wise and where pair-wise deletion? How did you compute a total social capital score when there were missing values on some items? - Why do you need subscales of Social capital if authors use only a total social capital score? -Which instrument was used to measure Mental health? -A comprehensive list of the 40 variables/items considered for the development of the instrument is missing. It should be reported along with some descriptives, etc.
--	--

	-In the cross-cultural validity, there are differences about only 2 and 5 points. Are these clinically and statistically different?
--	---

VERSION 1 – AUTHOR RESPONSE

Response to reviewer 1

Development and validation of the Social Capital Assessment Tool during pregnancy for Maternal Mental Health in Low and Middle-income Countries (LSCAT-MH)

Comments

This study stands to make an important contribution to measuring social capital during pregnancy in LMICs, in a population that is educated (women had on average >10y of education) with excellent availability of health care facilities (although access to these is a different thing).

The methods utilized, including a systematic literature review, qualitative study, expanded interviews with women to test validity/reliability of questions and expert evaluation are noteworthy and robust. Whilst the English is mostly correct, the manuscript would benefit from a final editorial check.

Addressing the below comments would help this currently good paper become an excellent one. I would also recommend slightly adapting the title to better clarify what you did, see suggestions in red in title above.

Thank you very much for the valuable and encouraging comments.

We agree with the added words “during pregnancy”. The study is a validation study to develop a tool to measure social capital and health. Mental health was used just as the outcome measure of hypothesis testing in assessment of concurrent validity. The initial systematic review, qualitative studies were aimed on the broader concept of health and was not confined to mental health. Thus the tool is for measurement of social capital and any type of health during pregnancy and not merely mental health. We agree and it was observed that mental health is more sensitive than other health issues to social capital in our initial qualitative studies. But here in the title we believe that leaving it as health rather than mental health is more rational. Therefore we will leave the title as; Development and validation of the Social Capital Assessment Tool during pregnancy for Maternal Health in Low and Middle-income Countries (LSCAT-MH)

I have 4 major suggestions:

1. Better explain, from the onset, why social capital during pregnancy is important for maternal health. In other words, why is it important for expectant mothers to have high levels structural and cognitive bonding, social contribution and structural bridging? How does this 'social capital' contribute to maternal health? This can be brief as I understand you undertook a systematic literature review on the topic. Including this summary would help to better highlight the unique contribution this paper can make in how to best measure social capital during pregnancy.

A brief para included. LN 151-167

2. Better explain why 'social' capital includes measures of domestic cohesion. I would think the word 'social' means beyond the household? It is not to say you should not include it, but that you need to better justify its inclusion.

Thanks for the comment which lead us to find evidence for this argument. In the definition of Social capital James Coleman indicated that social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure' (Coleman 1990).

Family is the smallest structure of a society. In explaining bonding social capital Islam (2006) indicate that bonding social capital refers to the relations within homogenous groups. In other words, these are the strong ties that connect family members, neighbors, and close friends and colleagues (Islam et al 2006).

This was explained in cognitive validation under domestic cohesion. We could not think of any better place. LN 303-308

3. Clearly define which aspects of maternal health you are measuring as outcomes. Is it mental health, specifically antenatal depression and anxiety?

Yes. Mentioned. LN 239-240

In the 'Concurrent validity' section (p 15) you state the correlation between social capital during pregnancy and mental health is weak. Why is this so? If it is weak, then is social capital really a good measure of mental health in pregnancy? If I have misunderstood that better explain what this weak correlation means.

Social variables are multifaceted and as predictive factors there are diverse factors affecting

mental health. It is usually difficult to come out with at least a weak correlation with these broad concepts. Hardly that the studies done on social capital and mental health reports about correlation. Usually they only present as associations between different quantiles of the social capital score and EPDS positiveness as a correlation is difficult to demonstrate unless rigorous measurements were done. We believe that the LSCAT -MH is a better tool because it was able to pick this at least weak negative correlation. If the reviewers think that including this statement will downstream the study and the tool it can be removed, but we believe it is a positive and a good finding. We included this fact in the discussion. LN 456-461

Did you also test the association of social capital and specifically which of the 4 components are effective in increasing mental health during pregnancy? Report findings. In Results (p 14, line 31) the mean social capital score was 92.4 presumably this very high? So, how was this score then associated with their mental health outcomes? We agree with the comment. This needs in-depth analysis of social capital factors and EPDS score which is beyond the scope of this paper. As mentioned above only the correlation was presented as a measurement of concurrent validity as the paper is a tool validation paper.

In the 'Methods' section, define the different constructs you used to test for validity and reliability (e.g. construct, structural validity) and measures (e.g. 0 to 1 with 1 greatest internal consistency)

Mentioned LN 224,229, 234-241,

There are a several additional aspects which can be better emphasized in the paper:

1. Abstract

Define maternal social capital Need to discuss limitations here

Both mentioned LN 28, 60

2. Summary box

Define social capital

Added LN 76-78

Include 1 sentence explaining why it is relevant in the context of the obstetric transition

Added LN 104-106

Replace last paragraph in 'What is already known' section with what we know. What is described here is what your study adds

Done

Change 'discriminate' (negative connotation) to 'differentiate' (added value of the tool)

Done

2. Intro

Explain why social capital is rarely used

Mentioned LN

Explain in which ways social capital during pregnancy is unique (this then, would highlight the unique contribution of your study better)

Added LN 118-28

Rewrite study aims. The first sentence needs to mention you are measuring social capital during pregnancy and it needs to define maternal health (isn't it mental health you are measuring?). The second sentence is unclear.

The tool is universal to health but mental health was used as the outcome in hypothesis testing as this is only a validation study.

3. Methods

Expert panel: Include how many were there? How many males and females?

Mentioned LN 209

5. Study setting

What is the maternal mortality rate in these areas?

Included (38.9/100000 LB) LN 252-53

Either here or in the discussion on Table 2, mention that you have a well-educated population (women mostly have >10y of schooling) with very high coverage/availability of antenatal coverage through the public health system. This is a unique feature of your study but also potentially limits the applicability of the tool for less educated/illiterate women with low availability to health care. It means your study needs to be adapted to those contexts -- and this publication will be very useful in guiding those who are interested in doing so, on how to do it.

Thank you for pointing out this important fact. Included in the discussion. LN 507-512

5. Results

Please explain why respondents felt the adjectival scale was more applicable and the cognitive process easier. This is crucial to understand, and an excellent point to raise.

Explained. Thanks. LN 462-72

This may not have been tested, so ignore if not. It would be helpful to understand whether you examined whether a 5-point vs. 3-point scale is better?

We did not test this.

Can you include a full list of items in Appendix? Or is it too long and Table 3's abstract is sufficient? If you chose to only present Table 3 then can you organize the examples by the 4 different constructs you use (e.g. domestic cohesion, neighbourhood, etc.)?

Organized LN 390

Group membership: explain why women were less interested to participate in groups during pregnancy.

Explained LN 341-8

What were the 10 items which had a low endorsement ratio and hence not retained? Describe briefly and include in appendix if further explanation is required

Added as supplementary LN 354

Figure 2 was not included in the manuscript.

Sorry. Included

Table 2. Include whether women came from a joint/nuclear family; socio-economic status of households

Included Table 2 LN 362

Did you measure whether women had freedom of movement/physical mobility? Presumably you can only access social capital (beyond the household) if you can move around freely or are given permission to do so.

In the in-depth qualitative studies freedom was not a prominent issue except in few cases. As the measurement should aim at the asset or the capital we measured structural social capital using several items which include both bonding and bridging in the tool.

Cross cultural validity, p 16. Were the differences by geographic area in terms of social capital statistically significant? Why do you think these differences exist?

Thank you very much for the genuine interests in getting to know this study. In in-depth qualitative

studies it was noticed that social capital differs according to the context due to socio-cultural and economic issues (some of them need further exploration to be explained). The areas for the validation study were selected based on these baseline findings and we were very happy to observe the same patterns quantitatively which made the research credible. However, we think that describing contextual differences is beyond the scope of this paper.

7. Discussion

Another important contribution of your study that could be included is that by having tested the reliability and validity of the social capital tool during pregnancy, you have helped to better measure it, and thus, to help policy makers to better evaluate it, and to identify which specific aspects can be improved. So there is an important link between research, policy and practice that you are helping to strengthen.

Thank you so much for making this comment. Included. LN 526-531

Thank you very much for the valuable comments made. We are sure it helped a lot to improve this paper!

Response to reviewer: 2 (new inclusions and corrections in red font, highlighted)

Reviewer Name: Josue Almansa

Institution and Country: UMCG, Netherlands

Please state any competing interests or state 'None declared': None

Please leave your comments for the authors below

Research over Social capital is a topic that is increasingly gaining in popularity. This presents the challenge of how to measure Social Capital quantitatively, and what is relevant to measure specifically in each scenario. Indeed, there is a need for this kind of research. This research paper proposes an instrument applicable to pregnant women in Low and middle income countries. It seems that researches have played large effort in the qualitative part of their research.

Nevertheless, I've some important comments regarding the 'quantitative' part of their research. I would suggest to strength this research paper by improving or going deeper in the qualitative part, and put much less emphasis on the quantitative validity (mainly about construct validity – see my comments below).

Major comments

1) Formative or Reflective?

Previous to the development of the structure/construct of any instrument it is strongly necessary to justify the nature of the non-observable measure: Reflective or Formative.

Social capital, as a total score, has a clear formative nature. It might be argued that some specific aspects of Social Capital could be measured in a reflective way. In any case, doing an exploratory factor analyses over a large list of items is not a recommended practice. In the results “Cognitive validation of questions and responses”, and I guess as a results of the qualitative part of the study, the authors come up with a list of important concepts, items are grouped within this concepts. Why are they not already the dimensions you aim to measure? Why do you need to do an EFA with all items together?

EFA assumes that items are the results of underlying latent variable(s) that causes the observed items. For me it makes no sense to assume that all social capital can be constructed in a reflective way. Statistics can compute if items are correlated or not, but cannot tell the reason why are they correlated. For example, item about financial-help is in the same factor as spending-time (table 3), when they are clearly two distinct concepts that do not reflect a common underlying latent factor. To some extent they just happen to be correlated but they are obviously different concepts. It make sense that money and time could be not related with each other in a different sample. So their association depends more on the sample than on the nature of the items. I could imagine that some aspects sub-dimensions of social capital could be measured in a reflective way, but a general/total score of social capital cannot be reflective. Thus, putting a large list of items on an EFA is not a convenient approach. It might be better to assess directly with confirmatory factor analyses (or IRT) the validity of the sub-dimensions that were assumed to be reflective, if any. And later suggest a way to compute a total social capital score, if this is an aim. However, if authors still believe that Social Capital is a fully reflective measure please add your reasoning.

Cosmin tools also discussed the case of formative measures, in which their construct do not need statistical support : “Evaluating the internal structure of the instrument is relevant for outcome measures that are based on a reflective model. In a reflective model the construct manifests itself in the aspects, i.e. the items or tasks are a reflection of the construct to be measured. Its counterparts is a formative model, in which the aspects within an outcome measure are not supposed to be

correlated. Analyses on the internal structure of outcome measures based on formative models can be ignored.” (<https://www.cosmin.nl/tools/cosmin-taxonomy-measurement-properties/>).

Thank you for letting us to think on this valuable point. We would try to explain our view as much as possible. We have included a para in the discussion on this important aspect. LN 473-97

We would friendlyly argue that the study is reflective within a broader formative frame (Type 2 model explained by Jarvis et al(2003)(Jarvis, Mackenzie and Podsakoff, 2004). In social capital which is known to be a multifaceted concept, a total score is generated for measurement purposes. We think that the latent variables identified would have different reflections on health; describing them is not within the scope of this paper.

We conducted prior qualitative studies because the social capital in pregnancy is not described in literature. We wanted to identify the full scope of social capital, starting from zero which led to the in-depth inductive qualitative design. But as social capital do have a framework or already known dimensions, we grouped our findings of the qualitative study according to the available knowledge framework. Here the constructs like social contribution that emerged new were added to the framework. Although we categorized what we found about social capital in pregnancy into known dimensions, at many instances we observed that the real life verbatim in the qualitative study deviate from the known dimensions which can be explained only by the reflective nature within the context and in pregnancy. That is why we wanted to identify the underlying latent variables and thus conducted EFA.

The statements “spending time with neighbors make me happy” and “In an emergency, there is someone who can help me financially”, similar to other constructs in factor two, resembles neighborhood cohesion. It was from the neighbors (not relatives living far) that the mothers asked and got financial support when they face an emergency. This statement we assume depicts cognitive rather than structural support according to the reflections in the qualitative study. The three items on social support did not come together in EFA as in routinely known dimensions. They fall into different factors structural and cognitive (but both bonding) and implies with the real-life reflections that were observed.

Therefore, we think that the already confirmed framework that we used to categorize the constructs is slightly different from the latent variables identified in the EFA. It is only after having these variables that we were able to see the importance of the reflective nature of social capital in

pregnancy. If we straight away conducted confirmatory we would have lost these findings. For further strengthening of the tool the investigators plan to conduct CFA on studies done on different samples using the tool which was beyond the scope of this study. Due to these reasons we followed COSMIN closely. IRT was not performed because social capital do not fit the two basic assumptions that should be there to perform IRT; 1) the scale is unidimensional i.e the items tap only one trait or ability – social capital is multidimensional, and the dimensions are multifaceted. 2) Local independence of the items i.e. probability of answering one item in a positive direction is unrelated to the probability of answering any other item positively – many items especially the ones that measure cognitive social capital overlaps and are not consistent with this assumption. This is mentioned in the manuscript (although not elaborated) and the reference is given (Streiner and Norman, 2008).

References

Jarvis, C. B., Mackenzie, S. B. and Podsakoff, P. M. (2004) 'A Critical Review of Construct Indicators and Measurement Model Misspecification in Marketing and Consumer Research', 30(September 2003).

Streiner, D. L. and Norman, G. R. (2008) *Health Measurement Scales: A practical guide to their development and use*. 4th edn. Oxford: Oxford University Press. doi: 10.1093/acprof:oso/9780199231881.001.0001.

2) Results were sometimes shown in a careless way

-Table 2 is referred in the results section as 'Parallel analyses' and in the discussion about dimensions, when table 2 is just a sample descriptive.

Thank you for pointing out we have corrected this mistake.

What do you mean by "parallel analyses"? There is no such analyses explained in the methods section.

It is merely a step in the EFA which helps to decide on the number of factors to retain. It is a simple test compares the eigenvalues generated from the data matrix to the eigenvalues generated from a Monte-Carlo simulated matrix created from random data of the same size.

As it is only a single step in EFA we did not mention it specifically in the methods section.

Missing data analyses was not properly reported. Where exactly you use list-wise and where pairwise deletion?

List-wise deletion was used in EFA and in calculating total scores.

Pair-wise deletion was used in hypothesis testing with mental health status. Included LN 361

How did you compute a total social capital score when there were missing values on some items?

Cases missing were removed

Why do you need subscales of Social capital if authors use only a total social capital score?

Analysis of outcome measures according to the subscales will generate knowledge on which aspects of social capital is more related to the outcome indicating policy level changes to be made in health service provision. But subscale analysis is beyond the scope of this article as this is only a tool validation paper.

-Which instrument was used to measure Mental health?

The Edinburgh Postpartum depression scale (EPDS). It is mentioned under Assessment of construct validity. LN 240

-A comprehensive list of the 40 variables/items considered for the development of the instrument is missing. It should be reported along with some descriptives, etc.

Items removed due to poor endorsement ratio and poor correlation were added as a supplementary.

In the cross-cultural validity, there are differences about only 2 and 5 points. Are these clinically and statistically different?

Yes. Mentioned. LN 389

Thank you very much for the valuable comments which helped to make this paper better!

VERSION 2 – REVIEW

REVIEWER	Josue Almansa Department of Health Sciences, Community & Occupational Medicine University Medical Center Groningen (UMCG) University of Groningen The Netherlands
REVIEW RETURNED	11-Apr-2019

GENERAL COMMENTS	<p>I would like to respond to the comments of the authors and indicate some very minor additional suggestions.</p> <p>1. The paper that made me doubt about the nature of social capital scale was this one: Jacqueline van Beuningen, Hans Schmeets. "Developing a Social Capital Index for the Netherlands". Soc Indic Res (2013) 113:859–886. DOI 10.1007/s11205-012-0129-2. Of course, they use different social capital concepts that do not apply in your context, but just the fact that they considered the total</p>
-------------------------	---

	<p>score as formative made me wonder if other researches are aware of the type of items they are dealing with.</p> <p>I found your explanation about the reflective nature of the social capital sub-scales very convincing. Also the fact that you did a systematic review and later a qualitative study, shows that you have thought carefully about the items previously to the EFA analyses. Reading again the (new version) of the manuscript I understood better your aim and approach, and seems valid.</p> <p>About the use of CFA/IRT, I would say that there are multivariate methods for IRT, or even the basic IRT could be used separately per dimension, thus the local independence assumption should hold among items belonging to the same dimension/subscale. So, I would suggest to delete the sentence “Item Response Theory (IRT) tests were not conducted, as the concept did not fulfill the basic assumptions.[21]” from the manuscript.</p> <p>2.</p> <p>In the introduction you mentioned: “However, methods used to assess maternal social capital quantitatively s have ignored the fact that the social capital in pregnancy could be unique (with increased bonding in the micro community, restricted bridging and highlighted linking to health services) [13].”</p> <p>I don’t clearly understand the concept of “unique”. Do you mean the they would have different values and different relationships with other measures? or that you cannot use the instruments of social capital for ‘general populations’ in your target sample? Because saying “increased bonding”, “restricted bridging”, etc., I understand it as if they would just score differently in the sub-scales of Social Capital, but do not imply that the measurement should be done differently. I guess it affects both the measurement constructs and the measured values. From the introduction and the discussion of the manuscript it’s clear that pregnant women in LMIC are a specific population that needs a different set of items (or at least a different formulation of the items). So I would suggest that what you write between brackets makes also emphasis in the content of the items. This will give stronger weight to the fact that you need to develop a new instrument.</p> <p>Additionally, if you mention “social capital in pregnancy could be unique (with increased bonding in the micro community, restricted bridging and highlighted linking to health services)”, I would expect some results per sub-scales, and not only focused on the total scores. Although not being the main goal of your research, wouldn’t it add more detailed information about social capital in pregnant women (and its potential use in other studies/data), and also wouldn’t it give more support to the need of creating such sub-scales (and the construct validity analyses)? No need to do extensive research on sub-scales scores, just report some values per sub-scales as well, for example, correlations with mental health.</p> <p>3. I have not seen the statistical software you used for your analyses (mainly for the EFA part). Please mention it.</p> <p>4. I think that if we agree that total social capital is formative, then the Cronbach’s alpha of the total scale is not so relevant/suitable. I</p>
--	---

	<p>would say that you could drop it, and show only the Cronbach's alpha per subscales.</p> <p>5. There are several typos and punctuation to correct, among others I found these ones:</p> <ul style="list-style-type: none"> - The abbreviation for "low and middle-income countries" sometimes is written as 'LMIC' and others 'LIMC'. -The 's' between "quantitatively" and "have",: "However, methods used to assess maternal social capital quantitatively s have ignored the fact that the social capital in pregnancy could be unique (...)." -"cognitve validiity testing" -"The scale demonstartes high content validity..." -"is easily and quckly understood by the respondent" -"Psychometric Evalaution"
--	--

REVIEWER	Dr Akanksha A Marphatia University of Cambridge Department of Geography UK
REVIEW RETURNED	14-Apr-2019

GENERAL COMMENTS	<p>Thank you for responding clearly to the Reviewer comments and also for highlighting the changes in the manuscript. This was very helpful.</p> <p>I suggest the few grammatical issues and typos in the text added in response to reviewer comments be corrected.</p>
-------------------------	---

VERSION 2 – AUTHOR RESPONSE

Reviewer: 2

Reviewer Name: Josue Almansa

Institution and Country: Department of Health Sciences, Community & Occupational Medicine, University Medical Center Groningen (UMCG), University of Groningen, The Netherlands

1.

The paper that made me doubt about the nature of social capital scale was this one: Jacqueline van Beuningen, Hans Schmeets. "Developing a Social Capital Index for the Netherlands". Soc Indic Res (2013) 113:859–886. DOI 10.1007/s11205-012-0129-2. Of course, they use different social capital concepts that do not apply in your context, but just the fact that they considered the total score as formative made me wonder if other researches are aware of the type of items they are dealing with.

I found your explanation about the reflective nature of the social capital sub-scales very convincing. Also the fact that you did a systematic review and later a qualitative study, shows that you have thought carefully about the items previously to the EFA analyses. Reading again the (new version) of the manuscript I understood better your aim and approach, and seems valid.

About the use of CFA/IRT, I would say that there are multivariate methods for IRT, or even the basic IRT could be used separately per dimension, thus the local independence assumption should hold among items belonging to the same dimension/subscale. So, I would suggest to delete the sentence "Item Response Theory (IRT) tests were not conducted, as the concept did not fulfill the basic assumptions.[21]" from the manuscript.

We removed it from the methods section but included it in the limitations as this is a question that arise first and foremost in health measurement scale validation. LN 479-482

2.

In the introduction you mentioned:

"However, methods used to assess maternal social capital quantitatively s have ignored the fact that the social capital in pregnancy could be unique (with increased bonding in the micro community, restricted bridging and highlighted linking to health services) [13]."

I don't clearly understand the concept of "unique". Do you mean the they would have different values and different relationships with other measures? or that you cannot use the instruments of social capital for 'general populations' in your target sample? Because saying "increased bonding", "restricted bridging", etc., I understand it as if they would just score differently in the sub-scales of Social Capital, but do not imply that the measurement should be done differently.

A sentence added. LN106-108

Thank you for pointing out these important points. We would say social capital in pregnancy is different based on our extensive qualitative work and the very few quantitative studies done on pregnancy social capital in the world. The results of the qualitative work are already published. A general scale on social capital would include many dimensions in social capital which were identified "not relevant" to pregnancy during the qualitative work (we would like to mention here that very few studies are done on social capital during pregnancy; we are trying to fill this research gap) Although these constructs seemed to be irrelevant, initially we included them in the tool as to have a holistic approach of the concept. But our cognitive validation indicates that the answers to these questions are not credible in pregnancy (eg. Trust in other services, group membership). Therefore, our aim was to develop a tool that include the most relevant dimensions for pregnant women in LMICs so that the use of this tool becomes credible rather than just using a general tool and getting a score which is invalid for pregnancy.

I guess it affects both the measurement constructs and the measured values. From the introduction and the discussion of the manuscript it's clear that pregnant women in LMIC are a specific population that needs a different set of items (or at least a different formulation of the items). So I would suggest that what you write between brackets makes also emphasis in the content of the items. This will give stronger weight to the fact that you need to develop a new instrument.

As the best items for pregnancy have been selected for the tool, one cannot argue that there should be a difference in the scoring for each dimension. But as all above was considered during the development procedure the tool comprises of more items on bonding compared to bridging in order to capture social capital in pregnancy in LMIC. This is added to the discussion. LN 401- 403

Additionally, if you mention "social capital in pregnancy could be unique (with increased bonding in the micro community, restricted bridging and highlighted linking to health services)", I would expect some results per sub-scales, and not only focused on the total scores. Although not being the main goal of your research, wouldn't it add more detailed information about social capital in pregnant women (and its potential use in other studies/data), and also wouldn't it give more support to the need of creating such sub-scales (and the construct validity analyses)? No need to do extensive research

on sub-scales scores, just report some values per sub-scales as well, for example, correlations with mental health.

Thanks, we agree. However, this study includes lot of data on subscales and mental health. As this is only a paper on tool validation we would like to present only the correlation of the total social capital score to mental health and keep the other analyzed data for a different composition.

3. I have not seen the statistical software you used for your analyses (mainly for the EFA part). Please mention it.

Mentioned. LN 210-211

4. I think that if we agree that total social capital is formative, then the Cronbach's alpha of the total scale is not so relevant/suitable. I would say that you could drop it, and show only the Cronbach's alpha per subscales.

We agree, but when we are searching for scientific evidence reporting the Chronbach's alpha of the total scale as well comes very first, while the argument on total score of social capital whether formative or reflective is not common in dialogue and depicts in-depth consideration of the concept and theories of scales. Therefore, we think that it should be kept.

5. There are several typos and punctuation to correct, among others I found theses ones:

- The abbreviation for "low and middle-income countries" sometimes is written as 'LMIC' and others 'LIMC'.

- The 's' between "quantitatively" and "have",: "However, methods used to assess maternal social capital quantitatively s have ignored the fact that the social capital in pregnancy could be unique (...)."

- "cognitve validiity testing"

- "The scale demonstartes high content validity..."

- "is easily and quickly understood by the respondent"

- "Psychometric Evalaution"

Checked and corrected.

Reviewer: 1

Reviewer Name: Dr Akanksha A Marphatia

Institution and Country: University of Cambridge, Department of Geography, UK

Please leave your comments for the authors below

Thank you for responding clearly to the Reviewer comments and also for highlighting the changes in the manuscript. This was very helpful.

I suggest the few grammatical issues and typos in the text added in response to reviewer comments be corrected.

Thanks, corrected