

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Menstrual hygiene management among Bangladeshi adolescent schoolgirls and risk factors affecting school absence: results from a cross-sectional survey
AUTHORS	Alam, Mahbub-UI; Luby, Stephen; Halder, Amal; Islam, Khairul; Opel, Aftab; Shoab, Abul; Ghosh, Probir; Rahman, Mahbubur; Mahon, Therese; Unicomb, Leanne

VERSION 1 - REVIEW

REVIEWER	Linda Mason The Liverpool School of Tropical Medicine UK
REVIEW RETURNED	18-Dec-2016

GENERAL COMMENTS	<p>Thank you very much for the opportunity to review this very useful and well written study. It is on an important topic that does need further elucidation and I personally would like to see this published. However, I do have some concerns that mean I have had to answer in the negative for a couple of the checklist categories above. (I hope this will become clearer why I did this) Whilst I don't think the paper can address the concerns mainly re the main outcome measure, I do think that they need to be discussed in depth so that the readers understand the full context and the limitations of the present study. I also think that if the specific measures used in the study were provided (i.e with a copy of the specific questions used) this would also help address some of negatives on the checklist. I very much hope so as this paper has potential to make a good contribution to the literature.</p> <p>The main issue which I feel needs more consideration, is the main outcome measure. This is very subjective – and does not acknowledge the difficulties as described in other studies that have tried to quantify absence from school. For example, in our feasibility study in Kenya – all of the focus groups with girls, parents and teachers acknowledged that absence during menstruation was very prevalent (Mason et al. 2015) Yet, measuring this quantitatively – with daily diaries recording absence from school, and dates of menstruation found that it was minimal. (As yet, we are unable to disentangle the situation) Other authors with quite robust quantitative measures have found similar for example Oster and Thornton collecting daily data on school attendance and menstrual calendars, found that menstruation only had limited impact on school attendance: they estimated girls missed a total of 0.4 days in a 180 day school year. It is also worth looking at the</p>
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systematic review by Sumpter and Torondel 2013 who make mention of measurement of absence.

So in light of this I would like the present paper to have some discussion about this issue. I think a stronger introduction pertaining to issues of absence generally would also be useful – how important it is that girls attend school – and the consequences when they don't (for the present and their long term future) would be useful, as well as some mention of the literature looking at measuring this outcome. Then in the discussion this can be pulled out in relation to the present findings and measurement issues.

I would also like more information on the background to asking teachers which girls had reached menarche why was this done rather than ask them girls themselves? How would the teachers know – is this very subjective? I realize that this issue has been mentioned as a limitation but I think it is important to address this in more detail.

One other measure I would like a little more information is the 'spot checks' – was this done as a one off – or repeated over time....Did the school expect a check to be done within a certain period (e.g to coincide with the interviews) or were they done at completely different times of the year with little expectation from the school. I mention this as it appears that it is fairly common practice for soap and water for example to be available if schools were expecting checks in the near future.

I got a little confused – and I appreciate this was my misunderstanding – with regard to the situation regarding the unlocked toilets. My initial interpretation was that the lock referred to a lock on the inside for the girls to have full privacy, not that it was whether the toilets were locked so that no one had access. Could this be made a little clearer at the start so that the reader doesn't interpret wrongly as I did. (It is clearer later in the paper)

My specific points are as follows:

Background -

Line 10 - Girls' education has a long-term positive impact on development, especially in low income communities[3] – I would like to see this discussed in a little more depth – what is meant by 'development' – is it country development or the girls own...this is very important issue for girls future health and wellbeing and so

	<p>needs to be emphasized as it helps show why this study and topic generally is so important.</p> <p>Line 21 - mentions that little attempt has been made to quantify the complex ways by which menstruation affects girls at school – this might be pulled out more here and include some mention of difficulties with measurement – (to be followed up in the discussion with mention of the specific measure used in the present study)</p> <p>Methods – Design</p> <p>Line 50 - I am curious why 2 separate sources were used for rural and urban sampling frame – particularly as the national population and housing census was more recent than that used for the urban.....</p> <p>Selection of participants –</p> <p>Line 14 - As stated above, I would like more information on how teachers knew which girls had reached menarche. Limitations – states that girls were identified ‘with the help’ – this is not clear – did the teachers actually state who had reached menses – and on what basis they did this.</p> <p>Data collection –</p> <p>Line 42 - As stated above, I would like more information on the spot checks. Also can you add refs for the variables reported in published studies of menstrual hygiene to direct the reader if they want more information here.</p> <p>Line 53 - Outcome and exposures –</p> <p>I feel this section would benefit from an appendices which provides the actual questions and how they were coded, or whether they were open ended. If this isn’t possible then some of the variables need to be described in more detail – In particular I think it is important to include how were girls asked to define absence....was it ‘ever’ ‘usually’ ‘for your last menses?’the description provided here means the reader isn’t as clear on the measures as they could be. Do the authors think this was a robust measure? - another example regards the reasons for girls absence – was this an open question or were girls provided with a list – (and did the list include menstrual cramps?)– another example is the question on what is ‘current perception about menstruation’? When looking at the results it would appear there are 4 responses – all negative – were these responses that the girls could choose from – if so were any positive responses provided?, or was the question open ended and these were as the girls stated.....).</p>
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	<p>Results</p> <p>I think it is important to highlight the lack of female teachers – so could this be a sentence also in the narrative, It then follows that it is emphasised in the discussion (important not just for teaching but also as a go to person if the girls have problems whilst in school)</p> <p>Discussion</p> <p>Line 8 – mention of other studies rates of absence would be a good point to insert discussion of the measure itself – and indeed may be one of the reasons for the much lower reported absence in the Maharashtra study (Or this could be put into the limitations)...</p> <p>Line 24 – states that negative attitudes were reasons for absence which I don't think was shown – the reasons for absence were 'feel uncomfortable' ' remain sick' etc as per table 3...this just needs rewriting to the effect girls appeared more likely to be absent if they had negative attitude.....</p> <p>Conclusion –</p> <p>Line 38 - In light of difficulties with measurement of absence related to menstruation it might be best to remove specific quantification here and be more general –that perhaps just acknowledge it is an issue and there are many contributing factors which can be addressed (as you have done)</p>
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REVIEWER	Kayako Sakisaka Teikyo University Graduate School of Public Health.Tokyo, Japan.
REVIEW RETURNED	16-Jan-2017

GENERAL COMMENTS	<p>Overall Comments: Issues covered by this study are extremely significant, urgent issues for upgrading girls' education, particularly in the middle-income countries. In this sense, this study is worth publishing. Yet, I would like to point out following several points to improve this manuscript before acceptance.</p> <p>1. Back ground and Methods section were well written, however Adjusted Prevalence Difference (APD)was not easy to be understood for readers. Even this APD appears in Abstract Section without any explanation in advance. Authors should explain APD, why you use this, what are the advantages of use of APD.</p> <p>2. Readers would like to know comparison of factors associated with 41% of missing school during menstruation group and not missing school group— rest of 59%. Authors should add analysis on this point carefully.</p>
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	<p>3. Several important new findings this MS identified, however, the tables were not easy to understand. Authors should add results of usual regression analysis such as logistic analysis/multiple linear regression analysis (show determinants of school absence group, or longer days school absence group and associated factors). Authors should also show p-value as well, not only 95% CI. In addition, values in tables (Table 1-4 all) about 95% CI is confusing to readers.</p>
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REVIEWER	Penelope A Phillips-Howard Liverpool School of Tropical Medicine, UK
REVIEW RETURNED	24-Jan-2017

GENERAL COMMENTS	<p>Thank you for this very thorough paper. It is an important study improving understanding on the possible, and potential, contribution of menstruation toward school absence among girls in Bangladesh. It has a high standard of research, with a well-balanced discussion on the findings and limitations. This paper deserves publication, and there are only minor suggestions to develop the text on some areas of interest.</p> <p>1. Could the authors include in the introduction, and in the discussion, any information they have on myths and taboos around menstruation? They note the role of negative attitudes and perceptions, but it would be useful to know whether social norms within the culture shape these, including traditions to restrict girls' movement and activities during menstruation. The van Eijk systematic review suggests in India, that restrictions relating to taboos does not seem to have reduced over time, illustrating how entrenched this is, and the challenges faced by girls, and education to dispel these.</p> <p>2. Absence is difficult to measure, and this study finds evidence of an association with menstruation, by asking girls if they are absent from school when they menstruate in a cross-sectional survey. I could not quite see – was reported absence in a specified time i.e. 'in the past month', or 'in the past year' or was the question more general? It would be helpful to have the specific question in the methods, to help others to word accordingly. The authors may be interested in the recent paper in BMJ Open which attempted to use girls' calendars in Kenya, with discussion around the difficulty in generating such data (noting a 4-fold higher absence during menstruation), but inadequately robust data to compare between intervention groups and over time, when conducted longitudinally (Menstrual cups and sanitary pads to reduce school attrition, and sexually transmitted and reproductive tract infections: A cluster randomised controlled feasibility study in rural western Kenya, BMJ Open; 6(11):e013229. doi:10.1136/bmjopen-2016-013229, 2016). Would the authors consider absence as an outcome associated with menstruation has a stronger evidence-base in countries of south-east Asia, than Africa?</p> <p>3. The authors provide a strong discussion around toilets affecting girls' absence. There is an interesting and worthwhile 'quoting' study from India, by Anjali Adukia, which examined the number of toilets constructed and school absence: Adukia A. Sanitation and Education. Harvard University, 2014.</p>
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VERSION 1 – AUTHOR RESPONSE

Response to reviewer # 1 comments

Reviewer Name: Linda Mason

Institution and Country: The Liverpool School of Tropical Medicine, UK Competing Interests: None declared

1. The main issue which I feel needs more consideration, is the main outcome measure. This is very subjective – and does not acknowledge the difficulties as described in other studies that have tried to quantify absence from school. For example, in our feasibility study in Kenya – all of the focus groups with girls, parents and teachers acknowledged that absence during menstruation was very prevalent (Mason et al. 2015) Yet, measuring this quantitatively – with daily diaries recording absence from school, and dates of menstruation found that it was minimal. (As yet, we are unable to disentangle the situation). Other authors with quite robust quantitative measures have found similar for example: Oster and Thornton collecting daily data on school attendance and menstrual calendars, found that menstruation only had limited impact on school attendance: they estimated girls missed a total of 0.4 days in a 180 day school year. It is also worth looking at the systematic review by Sumpter and Torondel 2013 who make mention of measurement of absence.

So in light of this I would like the present paper to have some discussion about this issue. I think a stronger introduction pertaining to issues of absence generally would also be useful – how important it is that girls attend school – and the consequences when they don't (for the present and their long term future) would be useful, as well as some mention of the literature looking at measuring this outcome. Then in the discussion this can be pulled out in relation to the present findings and measurement issues.

Response: Thank you so much for your suggestions. We now reference the broader difficulties with measuring absenteeism and with attributing absenteeism to menstruation in the discussion and interpret the findings considering these other results (page 15, 16). We have also modified the background to frame the paper more around absenteeism (page 6):

“However, little attempt has been made to quantify the complex ways by which menstruation affects girls at school[1]. The present study measured school absence reported by students and used this to quantify its relationship with MHM.”

We have added in the discussion (page 15, 16):

“Other studies have noted marked difficulties in measuring school attendance[1-3]. In some qualitative studies girls reported missing school because of menstruation[4-6], but when investigators attempted to quantify this effect systematically they have not always replicated these findings[2, 3, 7].

Attendance is difficult to measure. Schools are often compensated based on the number of students enrolled, so there is a strong incentive to over-report attendance on routine monitoring, thus making official records invalid measures[8]. Various investigators have used different approaches to address this issue including diaries of girls[2, 9], and assessing attendance by study personnel on unannounced visits[8, 9]. It is also difficult to attribute absence to menstruation. Girls might be unwilling to mention menstruation as a reason they missed school because of stigma associated with menstruation[5, 7]. Girls also may leave school early and miss hours of a school day due to menstruation, that would not be counted as absence[10].

Nevertheless, several studies support the idea that menstruation affects attendance. Multiple intervention trials that have improved facilities for menstrual hygiene have measurably improved girls' attendance[8, 9, 11-16]. In Bangladesh, a six-month educational intervention among 416 girl students

aged 11- 16 years from three schools demonstrated a 31% increase in students' knowledge about menstruation and a 5.1% decrease in self-reported school absence among participants from baseline[13]. In Ghana, a menstrual hygiene education program increased girls' school attendance where attendance data were collected from teachers' register book, by around 6 days per 65 days term (9% of a girls' school year)[9]. A study conducted in Kenyan schools found that toilet access was more effective in reducing absence among girls than among boys due to its impact on menstrual hygiene management[8].

Not all studies have found a convincing relationship between menstruation and absenteeism. Oster and Thornton collected daily data on school attendance and menstrual calendars, and found that menstruation had only limited impact on school attendance[3]. That study included 198 schoolgirls from seventh and eighth grade of four schools and the mean age of girls was 14.2 years which was 1.4 years older than our surveyed girls. At the beginning of menarche, girls may miss more school days as they may not have fully developed strategies for coping with menstruation[3, 17]. An intervention trial providing a menstrual cup or sanitary pads compared to puberty and hygiene training found no impact on school absence among girls receiving the menstrual cup or pads [18]. This study, however, only enrolled schools with gender specific girls' toilet, while in our study we found the absence of an available gender specific toilet was one reason for school absence during menstruation. In addition, puberty and hygiene training may also have better prepared schoolgirls to manage menstruation in the control schools.”

2. I would also like more information on the background to asking teachers which girls had reached menarche why was this done rather than ask them girls themselves? How would the teachers know – is this very subjective? I realize that this issue has been mentioned as a limitation but I think it is important to address this in more detail.

Response: We asked the female teachers at the beginning to mark on the attendance registry which of the girls present in school on the day of the survey had reached menarche. We have done this as students had to seek permission from teachers before leaving school due to any urgent matter and usually girls inform female teachers of the school about the issue related to menstruation. We have added above sentence in the revised manuscript in page 7.

3. One other measure I would like a little more information is the 'spot checks' – was this done as a one off – or repeated over time...Did the school expect a check to be done within a certain period (e.g to coincide with the interviews) or were they done at completely different times of the year with little expectation from the school. I mention this as it appears that it is fairly common practice for soap and water for example to be available if schools were expecting checks in the near future.

Response: The Field team made unannounced visits to schools, met with the head teacher and asked his/her permission to conduct the survey. After getting his/her permission field staff conducted the spot check where they collected information on water source, toilet and hand washing by visual inspection. We conducted spot checks before conducting the interview. We have revised the text in the manuscript (page 7) as “Trained female data collectors administered the survey verbally and recorded responses using a computer tablet-based structured questionnaire and conducted facility spot checks. Visits to schools were unannounced and surveys were conducted after obtaining informed consent from the school authority.”

4. I got a little confused – and I appreciate this was my misunderstanding – with regard to the situation regarding the unlocked toilets. My initial interpretation was that the lock referred to a lock on the inside for the girls to have full privacy, not that it was whether the toilets were locked so that no one had access. Could this be made a little clearer at the start so that the reader doesn't interpret wrongly as I did. (It is clearer later in the paper)

Response: We have revised the sentence as “Eighty-two percent of schools had an improved toilet for girls, but only 28% of schools had one or more improved toilet that was unlocked from the outside therefore accessible to students.”

My specific points are as follows:

Background -

5. Line 10 - Girls’ education has a long-term positive impact on development, especially in low income communities[3] – I would like to see this discussed in a little more depth – what is meant by ‘development’ – is it country development or the girls own...this is very important issue for girls future health and wellbeing and so needs to be emphasized as it helps show why this study and topic generally is so important.

Response: We have revised this section. Now the revised paragraph is (page 6):

“Girls’ education has a long-term positive impact on personal welfare and health as well as economic and social development, especially in low-income communities[19]. Better educated women are more likely to be healthier than uneducated women, participate more in the formal labor market, earn higher incomes, get married at a later age, have fewer children, potentially ensuring better health status and education for their children[20] which can reduce poverty and contribute to a country’s development.”

6. Line 21 - mentions that little attempt has been made to quantify the complex ways by which menstruation affects girls at school – this might be pulled out more here and include some mention of difficulties with measurement – (to be followed up in the discussion with mention of the specific measure used in the present study).

Response: We have added suggested points here. Now the revised text is (page 6):

“However, little attempt has been made to quantify the complex ways by which menstruation affects girls at school[1]. The present study measured school absence reported by students and used this to quantify its relationship with MHM.”

7. Methods – Design

Line 50 - I am curious why 2 separate sources were used for rural and urban sampling frame— particularly as the national population and housing census was more recent that that used for the urban.....

Response: We have stated the reason in the text. Now the revised text is (page 7):

“For the selection of rural clusters we used National Population and Housing Census 2011 data[21], and for the urban sampling frame we used the 2006 Urban Health Survey data[22] as primary data from National Population and Housing Census 2011 on the urban area were not available during the design phase of our study.”

8. Selection of participants –

Line 14 - As stated above, I would like more information on how teachers knew which girls had reached menarche. Limitations – states that girls were identified ‘with the help’ – this is not clear – did the teachers actually state who had reached menses – and on what basis they did this.

Response: Students had to seek permission from teachers before leaving school due to any urgent matter and usually girls inform female teachers about the issues related to menstruation (page 6). That is why, female teachers usually know whether girls have reached menarche. But the limitation was, female teachers might only know menstruation status of girls who had difficulties managing menstruation or issues related to menstruation and we have noted this in the manuscript.

9. Data collection –

Line 42 - As stated above, I would like more information on the spot checks. Also can you add refs for the variables reported in published studies of menstrual hygiene to direct the reader if they want more information here.

Response: We have revised text and added references (page 7).

10. Line 53 - Outcome and exposures –

I feel this section would benefit from an appendices which provides the actual questions and how they were coded, or whether they were open ended. If this isn't possible then some of the variables need to be described in more detail – In particular I think it is important to include how were girls asked to define absence....was it 'ever' 'usually' 'for your last menses?'the description provided here means the reader isn't as clear on the measures as they could be. Do the authors think this was a robust measure? – another example regards the reasons for girls absence – was this an open question or were girls provided with a list – (and did the list include menstrual cramps?)– another example is the question on what is 'current perception about menstruation'? When looking at the results it would appear there are 4 responses – all negative – were these responses that the girls could choose from – if so were any positive responses provided?, or was the question open ended and these where as the girls stated.....).

Response: We have revised the outcome and exposures section (page 8):

“The primary outcome variable was reported average number of school absence days in the last three menstrual cycles. The interviewer asked girls “Did you miss any class during menstruation in the last three months?” If the respondents answered yes, the interviewer asked “how often (average of last three months in school days)?” The girls’ attitude and knowledge about menstruation, reason for school absence during menstruation and practices related to menstruation were collected by asking open ended, multiple-choice questions. The interviewer coded the response into categories with an option for other if an appropriate category was not listed. The full questionnaire is included in the appendix 1.”

11. Results

I think it is important to highlight the lack of female teachers – so could this be a sentence also in the narrative, It then follows that it is emphasized in the discussion (important not just for teaching but also as a go to person if the girls have problems whilst in school)

Response: We added a narrative sentence in the results (page 10):

“In primary schools 61% of teachers were women whereas in secondary schools only 22% of teachers were women.”

12. Discussion

Line 8 – mention of other studies rates of absence would be a good point to insert discussion of the measure itself – and indeed may be one of the reasons for the much lower reported absence in the Maharashtra study (Or this could be put into the limitations)...

Response: Revised accordingly in page 15.

13. Line 24 – states that negative attitudes were reasons for absence which I don't think was shown – the reasons for absence were 'feel uncomfortable' 'remain sick' etc as per table3...this just needs rewriting to the effect girls appeared more likely to be absent if they had negative attitude.....

Response: We have shown the reported reasons for school absence in table 3. However our multivariate modeling showed that “believe menstrual problems interfere with school performance”

was significantly associated with absence from school. We have revised the sentence as (page 16): “Girls were more likely to report absence from school if they also reported negative attitudes about menstruation, such as perceiving it as something unhealthy, shameful, or obstructive to learning.”

14. Conclusion –

Line 38 - In light of difficulties with measurement of absence related to menstruation it might be best to remove specific quantification here and be more general –that perhaps just acknowledge it is an issue and there are many contributing factors which can be addressed (as you have done)

Response: We have dropped that sentence (page 18).

Response to reviewer # 2 comments

Reviewer Name: Kayako Sakisaka

Institution and Country: Teikyo University Graduate School of Public Health. Tokyo, Japan.

Competing Interests: None.

Overall Comments:

Issues covered by this study are extremely significant, urgent issues for upgrading girls' education, particularly in the middle-income countries. In this sense, this study is worth publishing. Yet, I would like to point out following several points to improve this manuscript before acceptance.

1. Back ground and Methods section were well written, however Adjusted Prevalence Difference (APD) was not easy to be understood for readers. Even this APD appears in Abstract Section without any explanation in advance. Authors should explain APD, why you use this, what are the advantages of use of APD.

Response: We have described why we used APD (page 3).

2. Readers would like to know comparison of factors associated with 41% of missing school during menstruation group and not missing school group— rest of 59%. Authors should add analysis on this point carefully.

Response: We have revised table 4 and added data for both groups (page 13).

3. Several important new findings this MS identified, however, the tables were not easy to understand. Authors should add results of usual regression analysis such as logistic analysis/multiple linear regression analysis (show determinants of school absence group, or longer days school absence group and associated factors). Authors should also show p-value as well, not only 95% CI. In addition, values in tables (Table 1-4 all) about 95% CI is confusing to readers.

Response: We estimated prevalence difference with the precision at 95% CI. We have agreed with your comment about p-values, so we have inserted p-values in the tables.

Response to reviewer # 3 comments

Reviewer Name: Penelope A Phillips-Howard Institution and Country: Liverpool School of Tropical Medicine, UK Competing Interests: None declared

Thank you for this very thorough paper. It is an important study improving understanding on the possible, and potential, contribution of menstruation toward school absence among girls in

Bangladesh. It has a high standard of research, with a well-balanced discussion on the findings and limitations. This paper deserves publication, and there are only minor suggestions to develop the text on some areas of interest.

1. Could the authors include in the introduction, and in the discussion, any information they have on myths and taboos around menstruation? They note the role of negative attitudes and perceptions, but it would be useful to know whether social norms within the culture shape these, including traditions to restrict girls' movement and activities during menstruation. The van Eijk systematic review suggests in India, that restrictions relating to taboos does not seem to have reduced over time, illustrating how entrenched this is, and the challenges faced by girls, and education to dispel these.

Response: Thank you so much for your suggestions. However, we don't have any information on myths and taboos around menstruation from this survey. We reported the role of negative attitudes and perceptions in our study, but we have not determined whether social norms within the culture, including traditions to restrict girls' movement and activities during menstruation influence these. We discussed these issues based on other studies findings in our discussion section.

2. Absence is difficult to measure, and this study finds evidence of an association with menstruation, by asking girls if they are absent from school when they menstruate in a cross-sectional survey. I could not quite see – was reported absence in a specified time i.e. 'in the past month', or 'in the past year' or was the question more general? It would be helpful to have the specific question in the methods, to help others to word accordingly. The authors may be interested in the recent paper in BMJ Open which attempted to use girls' calendars in Kenya, with discussion around the difficulty in generating such data (noting a 4-fold higher absence during menstruation), but inadequately robust data to compare between intervention groups and over time, when conducted longitudinally (Menstrual cups and sanitary pads to reduce school attrition, and sexually transmitted and reproductive tract infections: A cluster randomised controlled feasibility study in rural western Kenya, BMJ Open; 6(11):e013229. doi:10.1136/bmjopen-2016-013229, 2016). Would the authors consider absence as an outcome associated with menstruation has a stronger evidence-base in countries of south-east Asia, than Africa?

Response: We have tried to elaborate the outcome measure section. Please also see the response to reviewer 1's first comment on outcome measures.

3. The authors provide a strong discussion around toilets affecting girls' absence. There is an interesting and worthwhile 'quoting' study from India, by Anjali Adukia, which examined the number of toilets constructed and school absence: Adukia A. Sanitation and Education. Harvard University, 2014. http://scholar.harvard.edu/files/adukia/files/adukia_sanitation_and_education.pdf .

Response: Thank you so much for referring to this work. We have cited the paper to our discussion on intervention.

As part of manuscript revisions, we have updated the citation numbers throughout the document.

All authors have read and approved these manuscript revisions. Thank you for your kind consideration.

Reference

1. Sumpter, C.T., B., A systematic review of the health and social effects of menstrual hygiene

- management. *PLoS One*, 2013. 8(4).
2. Mason, L., et al., Adolescent schoolgirls' experiences of menstrual cups and pads in rural western Kenya: a qualitative study. *Waterlines*, 2015. 34(1): p. 15-30.
 3. Oster, E. and R. Thornton, Menstruation, Sanitary Products, and School Attendance: Evidence from a Randomized Evaluation. *American Economic Journal: Applied Economics*, 2011. 3(1): p. 91-100.
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 5. Mason, L., et al., "We keep it secret so no one should know": a qualitative study to explore young schoolgirls attitudes and experiences with menstruation in rural Western Kenya. *PLoS One*, 2013. 8.
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 11. Adukia, A., *Sanitation and Education*. 2016, University of Chicago: Chicago.
 12. Birdthistle, I., et al., What impact does the provision of separate toilets for girls at schools have on their primary and secondary school enrolment, attendance and completion?: A systematic review of the evidence. 2011, EPPI-Centre, Social Science Research Unit, Institute of Education, University of London: London.
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 16. WaterAid, *Is Menstrual Hygiene And Management An Issue For Adolescent Girls? A Comparative Study Of Four Schools In Different Settings Of Nepal*. 2009, WaterAid Nepal: Nepal.
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 19. United Nations, *World Population Monitoring 2003: Population, education and development*, in *United Nations Publication*. 2004.
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VERSION 2 – REVIEW

REVIEWER	Linda Mason The Liverpool School of Tropical Medicine, UK
REVIEW RETURNED	17-Apr-2017

GENERAL COMMENTS	<p>I would like to commend the authors on their amended and important paper. I very much enjoyed reading this again. I have 2 very minor comments indeed which are not required amendments.</p> <p>There are some occasions when words are joined together. The abstract states the paper is about academic performance but perhaps should be worded as absence which is the main thrust of the paper.</p>
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REVIEWER	Penelope A Phillips-Howard Liverpool School of Tropical Medicine
REVIEW RETURNED	18-Apr-2017

GENERAL COMMENTS	<p>The authors have responded to any concerns raised.</p> <p>Two minor corrections are suggested in the discussion. Authors have added citations to broaden the discussion around difficulties quantifying and interpreting an association (or not) between absence and menstruation found in their's and others' studies, however, there is a small change needed to the literature referenced. On page 15, line 20 onward, Mason et al 2015 (reference 28) is cited to state quantitatively no evidence was found, whereas this was the qualitative component of the pilot trial, and did report positively that schoolgirls perceived a reduction in the in frequency of their absence. The reference requiring citing that no difference quantitatively was evident from the same study is (your reference) 38 - PPH et al, 2016.</p> <p>Note also, where ref 38 is cited (next page, page 16, line 15) authors state the pilot trial 'found no impact' - whereas the paper did not attempt to examine impact using the calendar data because the robustness of the absence data was questionable. Thus, it is likely better to state instead ref 38 'was unable to measure evidence of impact'. This will fit well with the lines that follow, which consider some potential biases (ie selection bias; and overall improvement in girls' school experience) which may have added to an inability to measure prevented ascertainment of attendance in the ref 38 paper.</p>
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VERSION 2 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Linda Mason

Institution and Country: The Liverpool School of Tropical Medicine, UK

Competing Interests: None declared

Comments: I would like to commend the authors on their amended and important paper. I very much enjoyed reading this again.

I have 2 very minor comments indeed which are not required amendments.

There are some occasions when words are joined together.
 The abstract states the paper is about academic performance but perhaps should be worded as absence which is the main thrust of the paper.

Response: Thank you for your careful review. We have tried to identify and separated joined word. We replaced the word "academic performance" by "school absence" in the abstract (page 4).

Reviewer: 3

Reviewer Name: Penelope A Phillips-Howard

Institution and Country: Liverpool School of Tropical Medicine, UK

Competing Interests: None declared

Comments: The authors have responded to any concerns raised.

Two minor corrections are suggested in the discussion. Authors have added citations to broaden the discussion around difficulties quantifying and interpreting an association (or not) between absence and menstruation found in their's and others' studies, however, there is a small change needed to the literature referenced. On page 15, line 20 onward, Mason et al 2015 (reference 28) is cited to state quantitatively no evidence was found, whereas this was the qualitative component of the pilot trial, and did report positively that schoolgirls perceived a reduction in the in frequency of their absence. The reference requiring citing that no difference quantitatively was evident from the same study is (your reference) 38 - PPH et al, 2016.

Note also, where ref 38 is cited (next page, page 16, line 15) authors state the pilot trial 'found no impact' - whereas the paper did not attempt to examine impact using the calendar data because the robustness of the absence data was questionable. Thus, it is likely better to state instead ref 38 'was unable to measure evidence of impact'. This will fit well with the lines that follow, which consider some potential biases (ie selection bias; and overall improvement in girls' school experience) which may have added to an inability to measure prevented ascertainment of attendance in the ref 38 paper.

Response: Thank you so much for this suggestions. On page 15, line 20 onward, we have cited PPH et al, 2016 instead of Mason et al 2015. In addition, we revised the sentence in page 16, line 15, and the revision is now: "An intervention trial providing a menstrual cup or sanitary pads compared to puberty and hygiene training was unable to measure evidence of impact on school absence among girls receiving the menstrual cup or pads [30]."

VERSION 3 – REVIEW

REVIEWER	Penelope Phillips-Howard Liverpool School of Tropical Medicine
REVIEW RETURNED	10-May-2017

GENERAL COMMENTS	The authors have responded to all comments
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