Menstrual Hygiene Management intervention in education priority regions of Cameroon

Evaluation Report

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This project was independently evaluated by a team from NatCen Social Research: Georges Poquillon, Liza Benny, Anjhana Damodaran, Ekaterina Stoilova, Elena Cossu, Terry Ng-Knight, Molly Scott; and from ASOWWIP: Niying Roger Mbihbiih, Ayunifor Kingsly, and Fosi Laura

Georges Poquillon was the principal investigator who led the evaluation through to completion of endline testing, analysis and reporting. Niying Roger led the implementation and process evaluation and was also in charge of data collection at ASOWWIP.

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Executive Summary

The MHM intervention was a programme to address challenges with menstrual hygiene management among schoolgirls in Cameroon. It comprised various components including the construction or renovation of safe toilet facilities for girls, provision of menstrual products and educational materials, establishment of MHM clubs in schools, teacher training to develop MHM leaders in schools, and engagement with local communities. The intervention was delivered to 40 randomly selected schools across four priority education zones in the East, Far North, North West and South West regions of Cameroon.

Each intervention school selected two staff members (MHM focal points) to lead the initiative. Trained using UN Women Cameroon manuals, these focal points covered topics such as menstruation awareness, safe hygiene practices, and menstrual waste disposal, and were encouraged to share their knowledge with at least 15 additional school staff members. The intervention also involved engaging the surrounding communities through meetings with parents and local leaders to raise awareness about MHM and secure support for girls' menstrual hygiene needs. The MHM intervention was delivered by UN Women partnering with local delivery partners: Federation des Reseaux Des Association Feminines De L'extreme-Nord (FERAFEN-Far North); KMERPAD (East); Centre for Advocacy in Gender Equality and Action for Development (CAGEAD-North West); and Authentic Memorial Empowerment Foundation (AMEF-South West).

The project was a two-arm cluster randomised control efficacy trial. 80 schools were recruited and randomised, with 40 schools receiving the MHM intervention and 40 serving as the control group. The primary outcome for the evaluation was girls' school attendance rates, measured using school attendance registers. Secondary outcomes included educational attainment, assessed through end-of-term tests, and MHM knowledge, attitudes, and support, collected via pupil surveys. Data collection for the IPE included key informant interviews, focus group discussions, observations by researchers, and menstrual diaries filled out by female students. The trial took place in schools from January to June 2024. The study was commissioned by eBASE Africa with funding from EEF and BHP Foundation.

Table 1: Key conclusions

Key Conclusions
1. The MHM intervention had a positive effect on school attendance for female learners. Girls in MHM intervention schools had on average 1.57 percentage points higher school attendance in January to May 2024, compared to girls in comparison group schools. The 95% CI suggests that the true effect may lie between an increase of 1.26 percentage points and 1.94 percentage points. These effects translate to reductions in school absences by about 21% (compared to the control group mean of 7.6%), comparable to the range of effects found in similar studies on MHM interventions. This result has a moderate security rating.
2. There was no evidence that the MHM intervention had an impact on knowledge of menstruation, attitudes towards menstruation, and support of menstruation. This finding contrasts with the logic model which suggests that a comprehensive MHM intervention would improve understanding of MHM within schools and promote increased support from male students in the short run. The sample size of pupil survey respondents used in this analysis was too small for the statistical analysis to detect small effects, so it is uncertain whether the intervention had an effect on these outcomes.
3. There was no evidence that girls in MHM schools had higher levels of educational attainment in mathematics, French, and English compared to girls in comparison group schools. Though the logic model suggests that the MHM intervention would have a long-run impact on girls' class performance, this was dependent on the intervention timescales following ideal timelines. A short evaluation timeframe may have meant that endline test scores were measured too soon for 'long-run' impacts to have emerged, so it is not possible to conclude whether the MHM intervention impacted attainment.
4. The MHM intervention had high fidelity, with the intervention positively received by stakeholders. The implementation included core components of the intervention, though there were some regional and school-specific adaptations. The construction and renovation of safe spaces was completed, though primarily through renovations rather than new constructions, and were highly appreciated by students and school administrators. The distribution of dignity kits and the training of teachers and students on MHM practices also proceeded as planned, with positive feedback indicating that these components were well-received and beneficial.
5. Both students and teachers felt that the MHM intervention had benefited them. Adolescent girls said that they experienced improved menstrual hygiene practices, increased comfort, and higher school attendance due to improved facilities and resources. Teachers received a deeper understanding of menstruation's impact on education through targeted training, which enabled them to support students better. The creation of MHM clubs also promoted awareness among students and helped reduce the stigma around menstruation, which contributed to a more inclusive and supportive school environment.

EEF security rating

The findings for the primary outcome (female school attendance rate) have a moderate security rating. The trail was a well-designed 2-armed cluster randomised control trial which was powered to detect an effect of 0.2. However, attrition was relatively high at 36.7% emanating from baseline-endline matching, gender discrepancies and class discrepancies. Though attrition was high, most dropouts were due to linkage issues between baseline and endline rather than pupil-specific factors. Hence, attrition is likely to be systematically related to pupil characteristics.

Additional findings

The MHM intervention was particularly effective in improving attendance for girls in Forms 4 and 5 (aged 14-16), suggesting the intervention's relevance for girls close to menarche. The impact on attendance was more pronounced in urban areas compared to rural areas, with no significant regional differences. The impact of the intervention was also more pronounced in schools that were fully compliant with the intervention procedures, indicating the importance of implementing all components of the intervention to achieve outcomes as intended.

The MHM intervention results show a reduction in absenteeism of about 20% from 7.6% to 6.03%. This effect is in line with existing evidence that MHM interventions reduce school absences by 7% to 24% (Betsu et al., 2024; Belay et al., 2020; Montgomery et al., 2016; Sol et al., 2021). Similarly, there is no evidence that the intervention changed knowledge and attitudes towards menstruation among pupils. This contrasts with evidence from other studies that found menstrual interventions in school could shift perceptions (Austrian et al., 2019; Betsu et al., 2024).

Cost

The average cost of the MHM intervention was around £52.71 per pupil for an academic year. Nevertheless, this amount drops to about £18.52 per pupil for the following academic years. This amounts to approximately £89.75 per pupil over three years.

Impact

Table 2: Summary of impact on primary outcome(s)

Outcome/ Group	Effect size (95% confidence interval)	Estimated months' progress	EEF security rating	No of pupils	P Value	EEF cost rating
Female attendance rate	0.16 (0.126, 0.194)	+2		7116	0.028	

Introduction

Background

Policy background

UNICEF (2019) notes that while menstruation is a global monthly reality for 1.8 billion girls and women, a significant proportion of girls who menstruate are deprived of the right and/or lack the means to manage their monthly cycle in a dignified and healthy manner. Factors such as discriminatory socio-cultural norms, taboos, poverty and inadequate basic health services can contribute toward the unmet Menstrual Hygiene Management (MHM) needs of women and girls (Ibid). These unmet MHM needs have far-reaching negative consequences for adolescent girls, notably in terms of school attendance. A review of 2020 survey data from Burkina Faso, Niger and Nigeria found that 17%, 15% and 23% of female respondents respectively had reported missing school in the last year due to menstruation (Hennegan et al., 2021). High drop-out rates and low completion rates persist among girls due to menstruation, the inability to manage it, as well as other puberty-related problems.

Existing evidence

Unfortunately, the understanding of what works to improve MHM remains poor in the education, Water Hygiene and Sanitation (WASH) and health sectors. A study by Crankshaw et al. (2020) produced varying results regarding the extent to which menstrual safe spaces can reduce absenteeism among female pupils. Ngeno (2019) found that the provision of sanitary pads reduced absenteeism among girls by 30%. The study also showed that lack of sanitary pads is one among many reasons for girls staying away from school. Results from qualitative studies provide further insight on experiences around MHM in schools and in communities in Africa (Chinyama et al., 2019; Rheinländer et al., 2019; Wall et al., 2018). Studies conducted in Nepal and sub-Saharan Africa suggest mixed results of some MHM approaches on attendance and performance (Ngeno, 2019; Oster & Thornton, 2009).

A quasi-randomised control trial conducted in Uganda revealed that providing sanitary pads and puberty education had a positive impact on girls' school attendance (Mongomery et al., 2016).[1] However, the intervention was not comprehensive, as only sanitary pads and puberty education were offered. Other limitations of the study included the small sample size (8 schools), a sub-optimal randomisation process, and a change in the method of collecting school attendance outcomes mid-way through the study.[2] The study was also affected by high participant drop-out, with an overall retention rate of 57.5%.[3] A scoping review (Coast et al., 2019) highlighted that the body of evidence available for decision making lags behind the rise in interest from practitioners as well as the development (and evaluation) of puberty and/or menstruation interventions, thus the need for trustworthy evidence.

A pilot study of a menstrual health intervention conducted in Uganda (MENISCUS) found that a multi-component MHM intervention was effective in improving knowledge about menstruation and management of menstruation. The intervention was also found to be acceptable and feasible to deliver in this context. This intervention prioritised teacher training in the use of menstrual kits and pain management, incorporating drama skits, the provision of analgesics, and improvements to school water and sanitation hygiene facilities (Kansiime et al., 2020).

Context for this evaluation

In Cameroon, inadequate knowledge of menstrual hygiene practices in schools, poor maintenance of school sanitation facilities used by girls during menstruation, and the negative impact of the absence of waste management systems on living conditions, have been identified as major challenges to proper MHM (WSSCC and UN Women, 2015). Likewise,

[1] The quasi-randomised methodology used by the study authors involved first grouping schools into pairs to maximise the distance between clusters and then allocating the first school in each pair to one of four treatment conditions according to alphabetical order.
[2] In the baseline period of the trial, school attendance was collected by copying school attendance records for two school terms. At follow-up, the strategy was amended to collect data for a single week across each of the three follow-up terms, rather than collecting a full term's worth of data by copying from attendance registers.
[3] The overall sample sizes for the study were 1,008 participants at the outset, with follow-up data collected for 580. The retention rate per treatment arm was 65% for the education-only arm, 60% for the pads-only arm, 62% for the pads and education arm, and 37% for the study control group.

some surveys on menstruation indicated that more than 70% of girls have only approximate knowledge about MHM, and do not engage in discussions on sexual health with their families (WSSCC and UN Women, 2015). Furthermore, the Minister of Secondary Education noted that there are more than 200 secondary schools and colleges in the country without toilets and WASH facilities, which represents serious social and health risks for pupils in general and girls in particular.[4] In addressing this situation, the Minister of Secondary Education launched the "Clean School Concept", which targets among other things, the provision of clean and modern gender sensitive toilet facilities in secondary schools across the country. While this concept has been able to register some success, the reality is that MHM facilities are still lacking in the majority of public and private secondary schools in Cameroon. Furthermore, the scope of the "Clean School Concept" is limited since it did not approach MHM from a holistic perspective. As such, further research is needed to identify the extent to which the presence or lack of MHM facilities in secondary schools in Cameroon affects the attendance, attainment and attitudes of female pupils.

About the MHM intervention in this evaluation study

This trial focused on a multi-component MHM intervention implemented in Cameroon. The intervention was previously piloted in 15 schools across three regions of Cameroon in 2021-22. The pilot study[5] found that:

(i) The intervention showed promise in improving the attendance rates of menstruating girls. The attendance rate in participating schools showed a small increase over the course of the pilot, and the intervention was received enthusiastically by participating schools.
(ii) There was encouraging evidence that the intervention can be feasible to deliver on a larger scale, although challenges arose with intervention during the pilot (specifically, delays and partial delivery of some components). However, the key elements of the intervention were ultimately delivered as planned, and the experiences of the pilot created valuable lessons learned to improve delivery for a future trial.
(iii) The intervention was deemed ready to be scaled further and evaluated in a full trial.

For more details on the MHM pilot study, please refer to the full report on the eBASE **website**.

This trial provided an opportunity to extend the preliminary evidence obtained from the pilot and provide causal evidence on the extent to which a comprehensive MHM intervention could influence the attendance and attainment of adolescent schoolgirls as well as change attitudes, perceptions, and knowledge of boys, teachers and community members.

Integrated evaluation design

Impact evaluation

The MHM evaluation was structured as a two-arm cluster randomised controlled efficacy trial, with schools as the unit of randomisation and pupils as the unit of analysis. Schools were selected based on specific eligibility criteria, including the absence of existing MHM interventions, low toilet-to-pupil ratios, and the inclusion of marginalised populations, ensuring the study targeted schools with the greatest need. A total of 80 schools were recruited and randomised. Schools were randomised within regions and stratified by area type (urban or rural), ensuring that within each region-area type (urban/rural) strata, there was a 50:50 chance of assignment to the intervention or control group.

The primary outcome of the trial was girls' attendance, measured using administrative data from school attendance registers at baseline and endline. Secondary outcomes included educational attainment assessed through school-administered (i.e. non-standardised) end-of-term tests, and MHM knowledge, attitudes, and support to girls collected via pupil surveys. For girls' attendance, school-level attrition was below 2% while pupil-level attrition amounted to 37%, mainly because of pupil data linkages.

While the trial design supports strong internal validity within the sampled population, the findings may not be generalisable to regions of Cameroon without conflict or with greater educational investment due to the study's focus on disadvantaged and conflict-affected areas, as schools from non-conflict zones were not included in the sample.

[4] See https://mimimefoinfos.com/secondary-education-ministry-reveals-over-200-schools-without-toilets-in-cameroon/
[5] See https://ebaselearning.org/projects/menstrual-hygiene-management-project

However, surveys as part of IPE collected information on attitudes towards, knowledge of and support for MHM that may be applicable to schools outside disadvantaged/conflict zones.

Implementation and process evaluation

The IPE was designed to complement the impact evaluation by providing deeper contextual understanding of the programme's outcomes. The two components – the IPE and the impact evaluation – were analysed independently of each other to avoid one set of findings influencing analysis or interpretation of the other. While the impact evaluation investigated research questions around whether the MHM intervention achieved the planned programme impacts, the IPE findings provided evidence towards the different components of the logic model and also explained potential reasons behind why perceived changes were observed. The IPE sought to elucidate the mechanisms underlying the observed impacts by examining the programme's implementation fidelity, quality, participant experiences and perceived impact. The IPE was guided by 10 research questions which were analysed with the use of FGDs, interviews, observations, and an MHM diary for girls.

Intervention

The MHM intervention was delivered by UN Women in conjunction with local delivery partners:

- **Federation des Reseaux Des Association Feminines De L'extreme-Nord (FERAFEN – Far North region)**: An Umbrella association that unites various women's organisations in the Far North Region. Their primary objective is to empower women and female children by securing and promoting reproductive and economic rights.
- **KMERPAD (East region)**: Focuses on the production of reusable pads, aiming to make them accessible to young girls in need while addressing environmental concerns related to single-use pads.
- **Centre for Advocacy in Gender Equality and Action for Development (CAGEAD – North West region)**: Primarily engaged in gender equality work, with activities focused on improving knowledge of women's and girls' rights and dismantling harmful stereotypes.
- **Authentic Memorial Empowerment Foundation (AMEF – South West region)**: Works to address the concerns of vulnerable women and girls through capacity building and empowerment initiatives.

The intervention components are described in Table 3.

Table 3: Components of the MHM intervention

Brief Name: Provide the name or a phrase that describes the intervention	Menstrual Hygiene Management (MHM) Intervention
Why: Describe any rationale, theory, or goal of the elements essential to the intervention	The intervention aimed to address unmet Menstrual Hygiene Management (MHM) needs of women and girls, which negatively impact educational outcomes, particularly school attendance. The primary goal of the intervention was to improve school attendance among adolescent girls. It also aimed to improve girls' educational attainment as well as to change attitudes and knowledge of all pupils, teachers, and community members, and improve support for girls who are menstruating.

What (Materials): Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (such as online appendix, URL)	The intervention used various physical and informational materials, including menstrual kits, MHM training manuals (such as UN Women Cameroon's 'training of trainers' manual and UNICEF's Wash in Schools (WinS) and MHM guide), dignity kits, and communication materials (brochures, leaflets, stickers, panels, and giant wheels). Training materials are included in Appendix I to this report.
What (Procedures): Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities	The intervention included several procedures: • Construction or renovation of improved toilet facilities in schools. • Training teachers to act as MHM focal points and leaders. • Provision of menstrual hygiene products and MHM educational materials. • Establishment of MHM clubs within schools. • Community engagement activities to raise awareness about MHM.
Who provided: For each category of intervention provider (such as psychologist, nursing assistant), describe their expertise, background, and any specific training given	Teachers in intervention schools received training to act as MHM focal points. Each intervention school nominated two staff members as MHM focal points to lead the initiative. These focal points underwent training using manuals developed by UN Women Cameroon, which covered essential topics such as breaking the silence around menstruation, ensuring safe and hygienic practices, and proper disposal of menstrual waste. These trained staff members then cascaded their knowledge to at least 15 additional school staff members.
How: Describe the modes of delivery (such as face to face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group	The interpersonal elements of the intervention were delivered face-to-face in schools and communities. It involved both individual and group activities, such as teacher training sessions, MHM club meetings, and community engagement events.
Where: Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features	The intervention took place in 40 schools within four priority education zones in Cameroon: The East, Far North, North West, and South West regions. The intervention also included community meetings in the localities of the intervention schools.
When and how much: Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity, or dose	The intervention was planned to begin in September 2023 but was delayed. The renovation of school toilet facilities was completed by December 2023, with full roll-out of other components beginning in January 2024. The intervention included a two-day teacher training organised in all regions in November 2024. Other components (MHM clubs, provision of dignity kits) were implemented incrementally between January and March 2024.
Tailoring: If the intervention was planned to be personalised, titrated or adapted, then describe what, why,	The intervention followed a structured format to ensure consistency and adherence to the MHM objectives. Activities were guided by predefined manuals, including scripts, lesson plans, and handouts. Delivery partners

when, and how	customised the intervention to address regional requirements. Teachers acting as focal points within schools also tailored aspects of intervention delivery to ensure that it fit the needs of specific schools and student populations. Despite these regional and school-level adaptations, the core components remained uniform across all schools to maintain commonality and fidelity. This approach ensured that while the intervention could be tailored to local needs, the main elements were consistently implemented in all schools.
Modifications: If the intervention was modified during the course of the study, describe the changes (what, why, when, and how)	Some adaptations were made to the MHM intervention. Although the intervention intended to include both construction and renovation of MHM safe spaces, resource and time constraints resulted in most safe spaces being renovated rather than constructed from scratch. Additionally, the intervention timeline was modified multiple times, where the start date was moved from September 2023 to January 2024 to accommodate delays in the completion of safe spaces and the training of focal point teachers. This adjustment reduced the observation period from eight months to five months. Furthermore, the timeline for mid- and end-line data collection was shifted from February-March to September-November 2024 due to logistical challenges and the completion of national examinations.
How well (Planned): If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them	Regular monitoring and tracking of MHM activities were intended to assess intervention adherence and fidelity. The delivery organisations were responsible for ensuring that the intervention components, such as the construction or renovation of safe spaces, distribution of dignity kits, and training of focal point teachers, were implemented as per the predefined standards. Monitoring tools and reporting materials were provided to intervention schools to facilitate this process. The intervention was designed to follow a structured format with predefined manuals to ensure consistency and adherence to the MHM objectives.
How well (actual): If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned	The actual implementation of the MHM intervention faced several challenges that affected its delivery. The crises in the North West and South West regions delayed the intervention and impacted the timeline. Implementing teams experienced difficulties accessing schools in conflict zones, which affected the timely delivery of intervention components. School activities and national exams also clashed with intervention activities, further complicating the implementation process. The geographical spread of schools posed logistical challenges, and there were variations in the extent and quality of the renovations of safe spaces. Despite these challenges, the intervention components were ultimately delivered, and the renovated safe spaces and dignity kits were well-received by students and school administrators. The training sessions improved the knowledge and capacity of focal point teachers, and the MHM clubs effectively engaged students in MHM activities.

The objective of the intervention was to address critical challenges in MHM among schoolgirls. Delivery took place in 40 intervention schools located across four priority education zones in Cameroon: South West, North West, Far North and East regions. These activities included the construction or renovation of safe toilet facilities for girls, provision of

menstrual products and educational materials, establishment of MHM clubs, teacher training to develop MHM leaders, and engagement with local communities. These activities were implemented by trained staff from delivery partner organisations in collaboration with schools and community stakeholders.

Intervention delivery

Within schools randomised to the intervention, all pupils were exposed to the intervention. A sample of girls was provided with dignity kits, while all girls in intervention schools received access to renovated and MHM-supplied toilet facilities and benefited from MHM trained teachers and MHM Clubs.

The intervention was planned to begin in September 2023, aligning with the start of the academic year. However, school toilet renovation was completed a few months later than intended in December 2023, with the full roll-out of other components beginning in January 2024.

Each intervention school nominated two staff members, referred to as MHM focal points, to lead the initiative. Focal points – designated staff responsible for coordinating data collection and intervention delivery – were identified in both intervention and control schools (with only intervention school focal points receiving specialised training). The focal points in intervention schools underwent training using manuals[6] developed by UN Women Cameroon, which covered essential topics such as breaking the silence around menstruation, ensuring safe and hygienic practices, and proper disposal of menstrual waste. These trained staff members then cascaded their knowledge to at least 15 additional school staff members. No teacher nominated to act as focal points in usual practice school was trained. MHM schools were asked to provide an equal balance of male and female focal points. Usual practice schools, on the other hand, had no gender criteria to meet and nominated a higher share (80%) of male teachers to serve as focal points.

The intervention also included comprehensive engagement with communities surrounding the schools. Meetings with parents and local leaders were organised to raise awareness about MHM and garner community support for girls' menstrual hygiene needs.

Implementing partners rolled out the multiple components of the intervention by taking the specificities of their respective regions into consideration, while sticking to a common timeline. Although the partners accounted for regional needs, all interventions adhered to common MHM principles and core components of the programme (see the 'Mode of delivery' section below and Appendix I for the core components), ensuring uniformity in key areas such as intervention delivery and training content. A two-day teacher training was organised in all regions in November 2024, and all toilets were renovated or constructed by the end of December 2024. Other components were implemented incrementally between January and March 2024.

Several challenges arose during the trial. Recruitment was hindered by the withdrawal of some schools, which were subsequently replaced. Inaccessible locations in conflict zones led to adjustments in the school selection process, ensuring participating schools could be adequately reached by delivery teams. Although the intervention achieved gender balance among MHM focal points in intervention schools, usual practice schools nominated a majority of male focal points, which impacted data collection dynamics. Focal points in intervention schools received comprehensive training to deliver MHM components and conduct data collection, whereas in control schools, focal points were designated exclusively to support data collection and monitoring.

The choice between construction of new toilets or renovation of existing toilets was made by assessing the needs of each school based on their existing facilities to uniformly transform them into safe spaces. The construction of safe spaces encountered delays due to logistical constraints, which may have affected the timely delivery of related activities. These issues are explored in greater detail in the results section.

Mode of delivery

The intervention delivery comprised multiple components. Key activities were adapted to the unique needs of the intervention schools.

[6] The training manuals can be found in Appendix I.

Construction or renovation of menstrual hygiene safe spaces for girls

Toilets were built or renovated (depending on the level of existing provision) in 40 schools, adhering to safety regulations and maintaining a suitable distance from facilities designated for boys. The facilities were equipped with materials for menstrual hygiene management, such as: washable and disposable sanitary towels, buckets, soap, and painkillers delivered in bulk at the beginning of the school year. MHM focal points were responsible for ensuring that safe spaces are stocked with menstrual hygiene materials throughout the year (provided by delivery partner organisations) and maintaining an inventory of the supplies. The toilets were also upgraded to include water supply, washing and changing areas, and accessible design for pupils with disabilities. Each toilet facility included a designated space for menstrual waste disposal, designed in line with UNICEF's WinS guide and MHM guide. The amended toilet facilities are referred to as 'safe spaces.'

Provision of dignity kits

Following procurement by delivery partners, dignity kits were delivered to schools where they were distributed to female pupils by local delivery partners in collaboration with focal point teachers. The dignity kits contained essential items such as reusable sanitary towels, disposable sanitary pads, soap, underwear, detergent, and backpacks. These items were replenished as needed by delivery partners. The local delivery partners distributed the dignity kits in treatment schools in collaboration with focal point teachers, The focal points had been instrumental in identifying girls who were eligible to receive the dignity kits.

MHM activities with pupils

A train-the-trainer model was employed such that after delivery partners conduct a two-day training for focal points, the focal points, in turn, delivered MHM training sessions to schoolgirls. Schoolgirls were trained to produce washable, reusable sanitary towels, and other menstrual hygiene management techniques. MHM clubs were set up in each intervention school and coordinated by designated focal points. The clubs created platforms for discussions to raise awareness and reduce stigma by involving male pupils in MHM discussions.

Distribution of communication and reporting materials

Communication materials on MHM (including brochures, leaflets, stickers, panels and giant wheels) were produced in French and English using locally available materials and were provided to schools. Additionally, intervention schools received supplementary materials to monitor the delivery of MHM and track overall progress.

MHM activities with the community

In each of the communities where the intervention schools were located, meetings were organised by delivery partner organisations with parents and community leaders on menstrual hygiene management issues. They were sensitised on the importance of healthy menstrual hygiene management practices for girls, and how communities could support them in the process.

Intervention Content

The intervention followed a structured format to ensure consistency and adherence to the MHM objectives. Activities were guided by predefined manuals, including scripts, lesson plans, and handouts. As mentioned earlier, while delivery partners made regional adaptations to implementation based on local contexts, focal points customised implementation at the school level. Similar to delivery partners, focal points had some flexibility in tailoring examples to the local context but significant deviations from the manuals were not permitted. Fidelity checks ensured that core elements (see 'Mode of delivery' section below and Appendix I for the full list of core elements) were consistently implemented across all schools. This approach facilitated the maintenance of core programme fidelity and uniformity across schools while allowing necessary flexibility to account for differing needs.

The training component was delivered using MHM training manuals, which were provided to trained teachers to continue to use in schools during the year. These manuals included UN Women Cameroon's 'training of trainers' manual, and

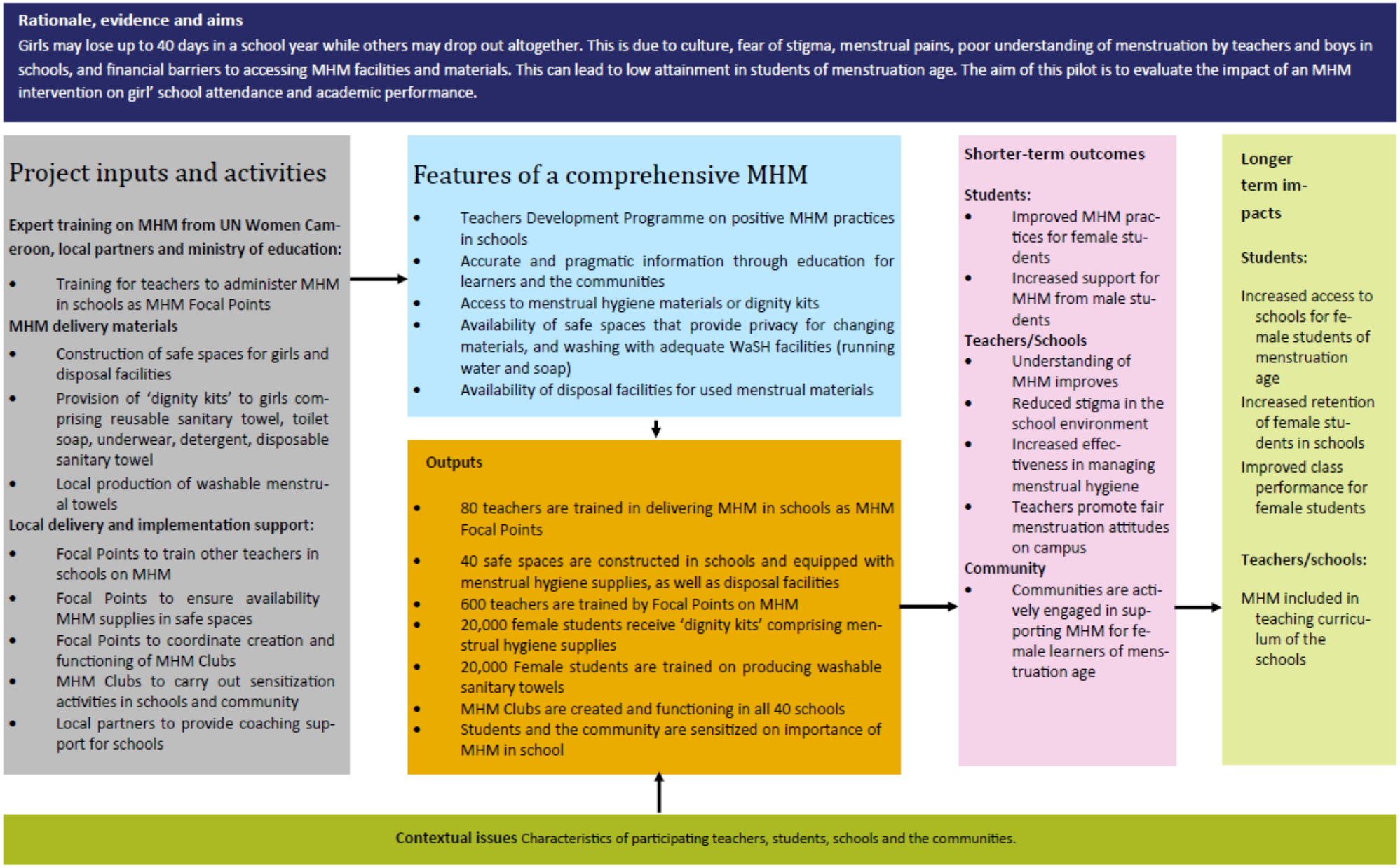
UNICEF's Wash in Schools (WinS) and MHM guide.[7] These documents were designed in line with the three pillars of the MHM. The first pillar focuses on breaking the silence around menstruation by raising awareness that menstruation is a normal biological process and should not be a source of shame for girls. The second pillar is to ensure safe and hygienic management of menstruation by enhancing schoolgirls' knowledge about good menstrual hygiene practices. The third pillar emphasises proper disposal of menstrual products and waste, equipping schoolgirls with the skills to manage disposal safely while protecting the environment.

Intervention logic model

To support implementation and the overall evaluation, a logic model was developed in consultation with the intervention designers at the outset of the trial. This model mapped the intervention's underlying mechanisms and assumptions, including how changes in MHM practices would improve girls' school attendance, hygiene, and dignity. The model also accounted for the interdependence of intervention components, such as how safe spaces and dignity kits would facilitate improved hygiene, while MHM clubs would foster awareness and reduce stigma. The logic model underpins the overall evaluation, with outcome measures for the impact evaluation selected based on the logic model, and the IPE used to test the assumptions in the logic model. Further analysis and updates to the model, based on trial findings, are discussed in the 'Impact evaluation and IPE integration' section of this report.

[7] WSSCC. WASH and Health for Menstrual Hygiene Management Training of Trainers Manual WSSCC Learning Series Menstrual Health Management. 2013.

Figure 1: Logic model



Evaluation objectives

Research questions

The impact evaluation and implementation and process evaluation (IPE) questions were focused on understanding the programmes impact and mechanisms behind observed effects.

Impact evaluation

The impact evaluation addresses the following research questions:

IE_RQ1: To what extent did the MHM intervention improve girls' attendance at school? *(primary outcome)*

IE_RQ2: To what extent did the MHM intervention improve girls' educational attainment, as measured by their grades in Maths and language assessments (English or French)? *(secondary outcome)*

IE_RQ3: To what extent did the MHM intervention improve male and female pupils' MHM knowledge and attitudes, and support to girls? *(secondary outcome)*

IE_RQ4: To what extent did the MHM impact on girls' attendance and educational attainment differ by grade, area type (urban/rural) and region? *(subgroup analysis)*

IE_RQ5: To what extent did the MHM impact on pupil's MHM knowledge, attitudes, and support to girls differ by gender? *(subgroup analysis)*

Implementation and Process Evaluation (IPE)

The implementation and process evaluation (IPE) research questions were developed using **EEF's IPE guidance**[8] (EEF, 2022b). The findings draw on the wide range of IPE data collection approaches, including observations, interviews and surveys (see Methods). The IPE findings address the following process evaluation research questions, in addition to seeking to provide explanations for the results of the impact evaluation:

IPE_RQ1: To what extent has the MHM trial in schools been implemented as intended? *(Fidelity)*

IPE_RQ2: What are the potential obstacles which may affect the delivery of the intervention (timeline, logistics, crisis etc.)? *(Quality)*

IPE_RQ3: How well is the MHM trial delivered in the intervention schools? *(Quality)*

IPE_RQ4: How, why and to what extent changes have been made to the MHM intervention? *(Adaptation)*

IPE_RQ5: How much of the intended intervention has been delivered and/or received? *(Dosage)*

IPE_RQ6: How well do adolescent girls engage with the MHM intervention? *(Responsiveness)*

IPE_RQ7: How different is the MHM intervention from other interventions? *(Differentiation)*

IPE_RQ8: What perceived impact do teachers and adolescent girls think could arise from the MHM intervention? *(Perceived impact)*

IPE_RQ9: What it the average cost of the intervention per pupil? *(Cost)*

[8]https://d2tic4wvo1iusb.cloudfront.net/documents/evaluation/evaluation-design/EEF-IPE-Guidance-August-2022.pdf?v=1660741017

Ethics and trial registration

Institutional Review Board procedures

The trial has been approved by NatCen's Research Ethics Committee (REC) in July 2023. The REC review followed the standard process at NatCen. This involved the research team submitting a detailed research proposal to the ethics committee, following which the ethics committee conducted an initial review to ensure all necessary information (including the study objectives, methodology, data collection processes, participant recruitment strategies, and potential ethical issues) was included. A more comprehensive review was then conducted focusing on key ethical considerations including informed consent, confidentiality and anonymity, risk and harm, and data protection. Following the initial submission, the REC provided the NatCen research team with a list of comments to address, including:

1. Providing a more detailed explanation of why alternatives to an RCT were rejected.
2. Providing detail on what was done to reduce burden on schools and pupils from control group schools.
3. Clarification of who among the delivery partners, had access to the pupil survey and diary narrative data, and how disclosure was managed.
4. Acknowledge that the study could lead a an 'above normal' level of psychological/physical risk for interviewers and researchers and describe how this risk could be mitigated, borrowing from learnings from the study pilot.

An unconditional approval was granted by the REC in July 2023 after the review of the amended application that addressed the above comments.

This evaluation protocol was submitted to eBASE ethics board and the **3ie Transparent, Reproducible and Ethical Evidence (TREE)** review process, both of which aimed to complement NatCen's internal ethics review. The TREE review process was particularly valuable as it provided a distinct framework from NatCen' REC, ensuring a more exhaustive coverage of the various ethical implications of the study.

In addition to the above, to comply with national regulation and research best practice, the trial protocol was submitted to the Cameroon National Ethics Committee for review in the 4th week of August 2023 and was subsequently approved by the National Body.

Consent and assent forms

An assent form was provided by enumerators to girls and boys aged between 10-18 years old for their parents' consent, and an informed consent form was administered in writing to all girls aged 18 years and older. Consent and assent forms included a description of the objectives of the intervention, the notion of voluntary participation, the right to withdraw from the study at any time, and the right not to answer any questions. The consent forms also contained information on the risks, benefits and purpose of the study. Each form was signed by both parents/guardians and the participants and verified by the enumerator who ensured that all participants' informed consent had been provided. Enumerators were responsible to follow up with pupils to ensure that a signed copy of the form is returned within 48 hours. To safeguard participants during the study, the survey questionnaire was administered in a space that was visible to others and where respondents freely expressed themselves confidently.

For parents who are unable to read, the participants were advised to solicit the services of more literate family members or neighbours in order to understand the information contained in the assent/consent forms. In some cases, the data collectors explained and clarified the consent and assent forms to parents/guardians since data collectors also come from the communities where the pupils lived.

Study participants and their parents or guardians received consent and assent forms in either French or English, depending on which language they were more comfortable with. Forms and questionnaires were not translated to local languages due to the large number of different dialects and the fact that most people in Cameroon understand either French or English.

Research stakeholders' power dynamics and relationships

In designing this trial, careful consideration was given to minimising any unfair power dynamics between the various stakeholders involved in the research. Firstly, the principle of transparency and equity were cornerstones in interactions between the funder (EEF), project owner (eBASE Africa) and the evaluation team (ASOWWIP & NatCen). These

principles were translated into regular stakeholder meetings where issues were discussed collectively, and where each party had opportunities to contribute meaningfully. Such meetings ensured that all parties had access to the same information, fostering a collaborative working environment. Clear terms of reference were established to set out roles, responsibilities, and expectations, which then held parties accountable and responsible towards each other. This framework facilitated the sharing of progress reports and identification of potential challenges, so that solutions were discussed and developed collaboratively. This approach helped promote transparency and ensured the trial followed inclusive decision-making processes. The same principle of equity and transparency was applied to the relationship between the evaluation team and schools involved in the trial. Schools and families of pupils were provided with comprehensive information about the trial and its objectives, ensuring that schools were kept informed and felt empowered to support the trial implementation. There were no conflicts of interest identified during the trial. Relationships between the funder, project owner and the evaluation team were kept independent to ensure that findings were credible. Ethical guidelines were also adhered to in order to protect confidentiality of participants.

Sexual harassment as a component of data collection was also taken into consideration in this study. Sexual harassment featured among the training modules that were provided to the data collectors and focused on ensuring that in particular, male data collectors were conscious of the possibility of sexual harassment.

It was deemed necessary by the project team to include sexual harassment as part of the training modules to avoid or minimise the risk of exposure to possible scenarios or situation that could lead to sexual harassment. Moreover, eBASE Africa also mandated that a module on sexual harassment had to be provided as part of the training modules.

Legality

ASOWWIP through eBASE Africa received a letter No 2183/23/L/MINSEC/CAB from the Minister of Secondary Education in Cameroon on 01 December 2023 entitled "Authorisation to EBASE and Partners to Collect Data From Selected Schools Endorsed by the Minister". In addition, Letters of Authorisation were secured from Regional Delegates in all four regions in which research was conducted. For example, in the South West the Regional Delegate replied to ASOWWIP's application for research with the letter Ref536/590/MINSEC/PDSW/SDGA on 23 November 2023 addressed to Dr Niying Roger and entitled "Subject: Permission to collect data for research project". The research team had adhered to the principle of legality by engaging, informing, working with and receiving authorisation from relevant stakeholders in Cameroon.

Data protection

The data collection for this project was led by ASOWWIP, who implemented the quantitative data collection of outcomes for the impact evaluation, carried out qualitative data collection for IPE fieldwork, and also led on monitoring the trial implementation and data collection procedures. This project, like all others, carried out by ASOWWIP, was governed by ASOWWIP's data protection policy, which was reviewed by eBASE during due diligence. Aspects of the policy include storing participants signed consent forms in a secured location and saving audio recordings and transcripts in an unshared Dropbox folder. A data security plan was prepared, which includes information such as the names of persons with access rights to respondent sensitive data, information about third parties (such as transcribers) involved in the project, and particular data de-identification procedures. Data collected from the project was stored at the end of the project as this data could be useful during a future trial which was clearly stated in the informed consent forms.

NatCen was not involved in the data collection process. Data collected by ASOWWIP was anonymised and uploaded on a secured NatCen server complying with GDPR requirements. All data collected during the study was kept in strict confidentiality by the ASOWWIP. eBASE only received anonymised findings.

The data gathered by ASOWWIP was not shared with anyone other than the parties listed in Table 4 in the Project team section below. The research team used anonymised findings to develop this report, which is meant to be publicly accessible. Neither the general public nor stakeholders such as UN Women, eBASE, or EEF had access to the raw data. In drafting this final report, ASOWWIP and NatCen ensured that opinions and views expressed by individual participants could not be directly linked back to them. Additionally, any materials such as photos taken during field observations were only captured by ASOWWIP after obtaining written consent from participants (in cases where the photos involved participants).

Project team

The MHM intervention was delivered by UN Women in collaboration with regional partners and evaluated by ASOWWIP and NatCen. Table 4 lists the different people involved in delivering and evaluating the intervention and their role.

Table 4: Team members

Team Members	Primary Role	Affiliation	Specific Tasks within the Research
Delivery Team			
Bouchard Zambo	Gender Expert	UN Women Yaoundé Cameroon	• Training of local partners for the delivery of Menstrual Hygiene Management intervention
Clotilda Andiensa	Team Lead for CAGEAD	The Centre for Advocacy In Gender Equality And Action for Development (CAGEAD) North West Region	• Training of focal points on MHM in schools • Step down training for teachers • Construction of safe spaces in the schools • Distribution of dignity kits in the schools • Creation of MHM clubs in schools through the trained focal points • Training in MHM clubs on production of reusable dignity kits • Sensitisation on MHM in the communities
Mvondo Mvogo Olivia	Team Lead for KMERPAD	KMERPAD East Region	• Training of focal points on MHM in schools • Step down training for teachers • Construction of safe spaces in the schools • Distribution of dignity kits in the schools • Creation of MHM clubs in schools through the trained focal points • Training in MHM clubs on production of reusable dignity kits • Sensitisation on MHM in the communities
Hadja Aie	Team Lead for FERAFEN	Federation Des Reseaux Des Association Feminines de L'extreme-Nord Far North Region	• Training of focal points on MHM in schools • Step down training for teachers • Construction of safe spaces in the schools • Distribution of dignity kits in the schools • Creation of MHM clubs in schools through the trained focal points • Training in MHM clubs on production of reusable dignity kits • Sensitisation on MHM in the communities
Atim Evenye	Team Lead AMEF	Authentique Memorial Empowerment Foundation (AMEF), South West Region	• Training of focal points on MHM in schools • Step down training for teachers • Construction of safe spaces in the schools • Distribution of dignity kits in the schools • Creation of MHM clubs in schools through the trained focal points • Training in MHM clubs on production of reusable dignity kits • Sensitisation on MHM in the communities
Bouchard Zambo	Gender Expert	UN Women Yaoundé Cameroon	• Training of local partners for the delivery of Menstrual Hygiene Management intervention
Evaluation Team			
Ramatu Abdu	General Coordinator	ASOWWIP	• Coordinate activities among the different evaluation stakeholders • Plan and organise meeting updates with the different stakeholders

			• Ensure finance is readily available for the different stakeholders during the evaluation process
NJI Valery CHE	Principal Investigator (past)	ASOWWIP	• Participate in the development of the evaluation protocol. • Coordinate and produce final drafts of evaluation instruments and reports. • Liaise with all evaluation partners to ensure consensus and compliance with evaluation objectives, and other duties required to fulfil the evaluation mandate.
Niying Roger Mbihbiih	Co-Principal Investigator	ASOWWIP	• Contribute to the development of evaluation instruments and reports • Training enumerators and supervising data collection • Serve as the primary point of contact with regards to working documents such as the child protection and data protection policies. • Supervise the process of data collection and management • Supervise the collection of qualitative data in the North West Region • Participate in the development of literature review and logic model • Participate in writing all final reports of the intervention • Coordinate and contribute to data processing, analysis, and reporting • Perform other duties linked to the evaluation
Ayunifor Kingsly Yunisha	Data Manager	ASOWWIP	• Serve as data lead • Participate in the training of data collectors • Code data collection instruments into data collection software • Ensure data quality and data cleaning
Fosi Laura	Research Assistant	ASOWWIP	• Serve as data collection coordinator • Participate in the training of data collectors • Code data collection instruments into data collection software • Ensure data quality and data cleaning
Georges Poquillon	Impact Evaluation Lead (up till Feb 2025)	NatCen	• Lead the development of the impact evaluation section of the protocol • Review all reports within the evaluation team • Lead the impact evaluation analysis and reporting • Provide quality assurance to the final evaluation report
Liza Benny	Impact Evaluation Lead (from Feb 2025)	NatCen	• Review all reports within the evaluation team • Lead the impact evaluation analysis and reporting • Provide quality assurance to the final evaluation report
Anjhana Damodaran	Senior Researcher	NatCen	• Support the development of the impact evaluation section of the protocol • Support the impact evaluation analysis and report writing

Methods

Trial design

The impact evaluation of the MHM programme was designed as a stratified, two-arm cluster randomised control efficacy trial, with secondary schools as the unit of randomisation and pupils as the unit of analysis. The randomisation was stratified by region and area type (urban/rural), to help ensure that schools from the same region in a similar area were evenly allocated to the usual practice and intervention groups. Table 5 summarises the design of the cluster-RCT.

Schools allocated to the intervention group participated in the MHM programme from January to June 2024. Conversely, comparison schools (usual practice schools) continued their standard practices without implementing any MHM-specific activities. Access to the intervention was not conditional on participation in the evaluation. School administrators and focal points in these schools received financial incentives of FCFA 100,000 and FCFA 50,000, respectively, for their participation in the evaluation. Additionally, these schools were granted FCFA 375,000 to support the procurement of school materials, disbursed in September or October 2024. A portion of these funds were used to incentivise focal point teachers, who assisted data collectors, with some additional funds for school administrators. These incentives were designed to promote engagement and compliance with the data collection process throughout the evaluation period.

The outcome measures selected for the impact evaluation were aligned with the MHM intervention logic model and chosen in collaboration with the delivery team. The measures were designed to assess the intervention's impact on improving school attendance, attainment and pupils' knowledge of, attitudes and support towards menstruation. The outcome measures are discussed in more detail in the 'Outcome measures' section below.

Table 5: Trial design

Trial design, including number of arms		Two-arm cluster randomised controlled efficacy trial
Unit of randomisation		Schools
Stratification variable (s) (if applicable)		Region and area type (urban/ rural)
Primary outcome	Variable	Girls' attendance
	Measure (instrument, scale, source)	Proportion of school days that a pupil attended classes from January 2024 (start of the intervention) until May 2024, measured from school registers
Secondary outcome(s)	Variable(s)	Education attainment Knowledge and attitudes relating to MHM
	Measure(s) (instrument, scale, source)	Attainment: Grade received in school Maths and language assessments (English or French) taken in March and June 2024 (third term of the 2023-24 academic year), measured from existing school records. Knowledge and attitudes relating to MHM: measured from pupil survey questions (primary data collection) carried out in May 2024.
Baseline for primary outcome	Variable	Girls' attendance for two weeks in November-December 2023.
	Measure (instrument, scale, source)	Proportion of lessons that a female pupil attended over two weeks in November-December 2023, measured from school registers.

Baseline for secondary outcome(s)	Variable	Educational attainment: Score received in school Maths and language assessments (English or French) taken at the end of the first term of the 2023-24 academic year. Knowledge and attitudes relating to MHM: Knowledge and attitudes measured in November 2023 (baseline).
	Measure (instrument, scale, source)	Educational attainment: Pupil assessments carried out in December 2023 (end of the first term of the 2023-24 academic year). Test scores were standardised at the school-year-level (e.g. Form 1 pupils in school A). Knowledge and attitudes relating to MHM: The baseline measures were constructed from the baseline pupil survey carried out in November 2023. Indices were designed to capture pupils' MHM knowledge, attitude, and support.

Changes from protocol

The intervention was intended to start in September 2023; however it was delayed as construction of safe spaces and the training of focal point teachers were not completed as planned. The intervention officially began in January 2024. The intervention, which included both construction and renovation of MHM safe spaces, primarily focused on renovations due to resource and time constraints. Less than 10 percent of the MHM safe spaces were constructed from scratch as opposed to 90 percent of safe spaces which were renovated and upgraded from already existing safe spaces. The timeline for midline and endline data collection was also adjusted from February-March and May-June to September-November 2024 to accommodate logistical challenges and the completion of national examinations. The core components of the intervention, such as the distribution of dignity kits, teacher training, and establishment of MHM clubs, were successfully implemented.

Despite these changes, the evaluation maintained its focus on the primary outcome of school attendance and the secondary outcomes of educational attainment and MHM knowledge of, attitudes and support for menstruation. Data collection methods and instruments remained consistent with the original protocol, ensuring that the evaluation could still assess the impact of the MHM intervention effectively.

As stated in the protocol, pupil level data used for the impact evaluation was de-identified during transcription by assigning pseudonymised identifiers to replace student names and anonymising class numbers, ensuring individual identities were protected. The assignment of pseudonymised identifiers resulted in many instances where pupil records were not linked between baseline and endline, which led to high levels of sample attrition. Additional robustness checks, not included in the protocol, were implemented by conducting analysis on aggregated school-grade level datasets. These robustness checks assessed whether results were sensitive to the poor linkage.

A further change from the protocol was the implementation of robustness checks for categorical outcome measures from the pupil survey, which were additionally analysed using negative binomial regressions to assess whether results changed from the main specifications using linear regressions.

In addition to the research questions mentioned in the protocol, additional exploratory analysis also considered whether impact on the knowledge, attitudes and support outcomes measured using the pupil survey differed by pupil gender. The protocol included the pupil survey with questions on knowledge, attitudes and support dimensions. However, the research question related to these secondary outcomes did not mention the support dimension in the protocol. This has now been included in the report.

Lastly, an additional research question on subgroup analysis to measure the extent by which knowledge, attitudes and support for menstruation varied by gender was conducted. We carried out subgroup analysis by gender for the three pupil survey outcomes of knowledge of menstruation, positive attitudes towards menstruation and open attitudes towards girls discussing menstruation with others. These analyses considered whether the MHM intervention had a differential impact for boys compared to girls.

Participant selection

School selection and recruitment

First, the eligibility criteria for schools to be included in the trial were defined. Eligible schools needed to meet the following characteristics:

- Schools with girls of menstruating age (10 to 20 years).
- Schools without any existing MHM interventions or menstrual hygiene education activities.
- Schools with limited or zero MHM facilities for pupils.
- Public and private schools.
- Day schools only (boarding schools were excluded).
- Public and private schools in conflict zones.
- Schools that welcome pupils from specific groups (e.g., displaced, disabled, refugees, children bereaved of both parents).

Schools were excluded if:

- There were less than 200 female pupils enrolled in 2022. That is if the student population of the school and the enrolment for girls is relatively small compared to other schools.
- They participated in the previous 2021 pilot evaluation.
- They had a high toilet-to-pupil ratio (1:40 or higher).

These criteria were shared with the government, who then provided a long list of more than 300 secondary schools across four regions of Cameroon to the research team.

The number of intervention schools recruited for this trial (40) was mainly informed by budget constraints, which prevented the intervention to be implemented at a larger scale. As a result, not all schools with similar needs could be included in the study, necessitating further selection restrictions. To further narrow this list to the sample of schools for the evaluation, the research team applied additional criteria:

- Logistical considerations that meant that the delivery team was able to physically access intervention schools.
- Considerations around whether data collection could be carried out in schools.
- Low risk of contamination, ensuring that usual practice schools were not too close to intervention schools to avoid spillover effects (e.g., pupils in the intervention school sharing dignity kits with pupils from the usual practice school). If two schools were too close to each other[9], the school with the highest number of pupils was selected to maximise the sample size.

These criteria were used to obtain a long list of 100 secondary schools (25 schools from each region) in Cameroon from the Ministry of Secondary Education. Schools on the long list were purposively selected by the Ministry of Education (MoE) to include schools meeting the above selection criteria.

Once the final list of 100 schools was drawn, random allocation of the intervention was assessed as a fair and ethical selection process. NatCen researchers randomised the schools on the 100-school list into the intervention and usual practice groups in July 2023, according to the process outlined in the Randomisation section below. This process entailed the random sampling of 80 schools for inclusion in the trial with the remaining 20 schools assigned to the back-

[9] Proximity between schools was assessed using geographical coordinates (longitude and latitude) from Google Maps to compute the distance, together with knowledge of the regional coordinator.

up list in case any selected schools did not agree to be included in the trial. The 80 selected schools were then randomly allocated between intervention and comparison groups.

The schools were recruited by ASOWWIP with input/advice from eBASE. Schools were given information materials designed by ASOWWIP. Each school received information about the trial and what their participation would involve. Schools that agreed to take part signed a MoU to confirm their participation. At the point of being informed about the trial, schools were also told whether they are part of the intervention group or the usual practice control group. NatCen was not involved in the recruitment process.

Pupil eligibility

All female pupils in intervention schools were eligible to receive dignity kits and access improved toilet facilities in their school. Female pupils under 18 needed to receive parental consent to receive a dignity kit. All pupils were eligible to participate in MHM clubs (including boys).

While all pupils were eligible to participate in evaluation activities, the evaluation team selected a sub-sample of eligible pupils for different data collection efforts. The sampling approach varied depending on the specific evaluation activity, as described in the *Outcome measures* and in the *Implementation and process evaluation design* sections.

External validity

The random allocation of selected schools to either the MHM intervention or usual practice groups was intended to strengthen internal validity by reducing selection bias. However, it is important to note that the eligibility criteria were relatively strict, especially in terms of geography, as this trial focused on schools located in conflict-afflicted or disadvantaged areas. As a result, the findings of this study may not be generalisable to schools in other regions of Cameroon where there is no conflict and/or higher levels of public and private investment in education. Moreover, this trial selected schools that had a particularly low number of toilets per student, and that included pupils from minorities or marginalised groups, which, again, may not be representative of the average schools in Cameroon.

Randomisation

Randomisation was conducted at the school level and stratified by region and area type (urban/rural). Schools were randomly assigned to either the MHM intervention or usual-practice control group, with a 50:50 allocation within each stratum. Randomisation was carried out using Stata software, ensuring reproducibility by setting a specific seed.

Initially, randomisation took place in July 2023, ahead of data collection and the originally planned start of intervention delivery in September 2023. This early randomisation allowed UN Women and delivery partners sufficient time for planning.

Following this, a second round of randomisation occurred in August 2023 for schools in the Far North and East regions, as some schools were excluded due to proximity concerns and other practical issues. Data on the stratum variables was available in advance from the Ministry of Education school list and consists of time-invariant characteristics. Following the first randomisation, it was found that some schools in the Far North and East regions could no longer be part of the study for practical reasons. Those reasons include some schools being too close to the others. ASOWWIP reviewed the sample of 80 schools across four regions (East, Far North, North West and South West) and replaced three schools (two in the Far North and one in the East regions) for accessibility reasons. ASOWWIP shared with NatCen a revised list of schools for both the Far North and East regions, excluding the schools previously identified as not fit for the analysis.

The same randomisation process was carried out again for the revised list in August 2023, resulting in a final list of 80 schools (40 in the intervention group and 40 in the usual practice group) – and a 20-school back-up list - to be approached for participation in the trial. Two usual practice schools (one in the East and one in the South West regions) from the main list were replaced with two schools from the back-up list after randomisation because school administrators refused to take part in the study. Also, the intervention allocation of two schools in the East region was swapped due to an error of the delivery team that mistook a usual practice school with an intervention school as they had similar names. Since this error took place at the onset of the intervention, we informed eBASE and received their approval before changing the designation of the schools considering that they both shared the same characteristics and had been randomised.

Carrying out randomisation before the start of data collection does pose a risk that schools assigned to the usual-practice group are unwilling to participate in future data collection activities. This risk was mitigated by informing schools in the usual-practice group that they would receive some components of the intervention (e.g. teacher training, MHM clubs, dignity kits) in the following academic year, and by drawing a replacement list in case some usual practice schools drop out. Moreover, the control schools were given a small participation fee in September-October 2024 to compensate them for their efforts to participate in the trial.

A total of 80 schools across four regions participated in the trial. Intervention schools implemented all components of the MHM programme as described, while control schools continued their usual activities. Randomisation ensured comparable baseline characteristics across groups, enabling an unbiased estimation of the MHM intervention's causal effects.

Outcome measures

Data collection context

This section describes the data that was collected for the impact evaluation component of the trial. Data collection for the IPE element is discussed in the *Implementation and process evaluation design* section below.

All data collection activities, that is, for the impact evaluation and IPE, were exclusively carried out by ASOWWIP.

Data collector recruitment process

ASOWWIP recruited local data collectors to collect data on attendance and test scores from schools and share them electronically with their data manager. Local data collectors were recruited due to the volume of data collection required, given that data collectors would need to visit schools weekly to collect attendance records. Data collector recruitment was carried out in each of the communities within which the schools were located to ensure there was an element of familiarity between data collectors and the school environments. Eligibility requirements for recruitment were based on: (i) previous data collection experience in academic or professional settings; and (ii) possession of an Android smartphone with the capacity to download and use the Kobo collect app. The enumerators received in-person training on RCT data collection procedures, covering various aspects of the study, including: an overview of MHM (module 0); the structure of the intervention (module 1), collecting attendance and test score data (module 2); the observation checklist; the survey questionnaire (module 4); conducting Focus group discussions (module 5); conducting key informant interviews; timeline for data collection (module 7); and research ethics (module 8). The data collection training workshops, led by ASOWWIP, were facilitated by experienced members of the evaluation team and external subject matter experts.

The in-person training for baseline data collection ran for three days and covered a wide range topics, such as research ethics, securing informed consent and assent[10], and conducting data collection in insecure contexts, among other key areas. While the training did not include a specific session on the "protection of human subjects", the training emphasised the ethical norms and best practices for conducting research with human subjects, with an added lens on working with adolescent girls and boys. For endline data collection, additional training sessions were conducted, including the recommended human subject certification training.

Regarding the demographic of the data collectors, the majority (80%) were females. No data collector-student gender match was performed when administering the pupil survey, resulting in female data collectors surveying male pupils and vice versa. While acknowledging the power dynamics linked to male enumerators interviewing female respondents, it was decided that solely utilising female data collectors would reinforce the idea that MHM was a female-only subject. Moreover, the deployment of male data collectors during the pilot, or at the pupil survey pre-test stage, did not provide any evidence suggesting that the data collector's gender had any impact on respondents' answers.

Primary outcome

Measurement approach

[10] See Appendix J for the consent and assent forms used.

The primary outcome was the school attendance rate of girls during the implementation period of the MHM intervention in the 2023-24 academic year, specifically the period from January to May 2024. Attendance was measured as the proportion of daily lessons attended out of the total of lessons delivered over the same period (in most schools, eight lessons were delivered daily). This outcome was measured using daily attendance records for female pupils.

Rationale for the timing of collecting attendance outcomes

We chose to define the primary attendance outcome during the January 2024 to May 2024 period as this corresponded to the portion of the 2023-24 academic year during which the MHM intervention was implemented. The decision to end the data collection in May stemmed from the fact that June is usually dedicated to the preparation and administration of national certificates such as the General Certificate of Education (GCE) and the Baccalaureate. As a result, most curriculums ended in May with third-term holidays officially commencing in late-May or early June. Moreover, access to schools during the certificate exams were prohibited, which further prevented any data collection in June.

Originally, delivery of the MHM intervention was intended to begin in September 2023. In line with this, the original plan was that the evaluation team would measure pupil attendance outcomes from September 2023 to June 2024 to allow a full academic year during which to observe potential impacts on pupil attendance.

Given the delays to intervention roll-out, we considered extending attendance data collection into the 2024-25 academic year. We decided not to do this for the following reasons. It was possible that some elements of the intervention were not delivered in full in the academic year. While toilet construction remained in place, there was a risk that MHM focal teachers may transfer schools (reducing the momentum behind MHM clubs and other activities) and pupils may run out of the disposable pads provided in dignity kits. If this happened, then it was possible that we would not observe any impacts in 2025 due to the intervention no longer being (fully) implemented. However, this measurement period is in line with existing research evidence that suggests that five months (January to May 2024) may be enough to observe any impact on attendance from the MHM intervention (Montgomery and others, 2012; Dolan and others, 2013). Finally, from a logistical perspective, linking pupils from 2023/2024 to 2024/2025 attendance books would add a non-negligible burden on the data collection team, because such linkage would have to be done by name. Accordingly, the endpoint for attendance data collection was May 2024 (as originally planned).

We also considered the possibility of retrospectively measuring baseline attendance over the January to May 2023 period, but this option was dismissed due to increased logistical difficulties and attrition risks arising from requesting data for a previous academic year.

Sample selection

Attendance data was captured for two classes in each grade (e.g. Form 1), which were randomly selected by ASOWWIP at the beginning of baseline data collection in November 2023. Since there are seven forms in secondary school in Cameroon (Form 1, Form 2, Form 3, Form 4, Form 5, Lower 6th and Upper 6th), attendance was taken for a maximum of 14 classes per school.

Data collection approach

Data collectors visited schools in person to take photos of attendance registers, which were later used for manual entry into a spreadsheet. Photos of attendance registers capturing attendance of the selected classes were taken on a weekly basis by data collectors. Collecting attendance weekly increased reliability by reducing the risk that information in attendance book is modified ex-post, or that attendance books are no longer available (most schools do not have robust archiving processes, partly due to a lack of storage space). We did not record attendance for pupils who enrolled after November 2023.

This data collection approach resulted in a large volume of data (more than two million data points). This was rendered possible through the implementation of a rigorous data entry protocol, comprehensive data collection training, and the recruitment of locally based data collectors.

As the data collection involved data collectors visiting schools to take photos, their access to school registers was monitored by school principals or administrators. Therefore, it was possible that some school staff were aware of which pupils had been selected to participate in the study. Based on our experience from the pilot study, we assessed that

there was a low risk that selected pupils could be under stronger scrutiny by school staff, such as pressure to attend school or perform well on test, as no such situations were reported in the pilot study.

Validation approach

To ensure that attendance data obtained from schools was valid, a data manager from ASOWWIP carried out random spot-checks to compare entered data against photos of attendance registers. This helped to assess whether data was accurately recorded from registers. ASOWWIP's data manager who participated in the trial served as an assistant during the pilot study and implemented these spot checks as a continuation of the data quality protocols that had been used during the pilot.

Baseline attendance data

We used pupil attendance during two weeks in November-December 2023 as a baseline measure. Baseline attendance was measured using the same approach as the primary outcome of endline attendance.

If the attendance rate of a pupil was correlated over time (i.e. if attendance patterns in November-December 2023 are predictive of attendance patterns in May 2024) then the inclusion of baseline attendance as a covariate in the statistical analysis was expected to improve the precision of estimation.

A potential limitation of the chosen attendance baseline data was that it was measured over a different period compared to that of the endline (November -December against January-May), and that it covered a much shorter period. While this should not introduce any bias in the analysis, low levels of correlations between the baseline and endline attendance, for instance if there are seasonality effects at play, would reduce the explanatory power of the baseline attendance covariate, and reduce the precision of the impact estimates.

Secondary outcomes

Educational Attainment

Measurement approach

The first secondary outcome was educational attainment in language (either English or French, depending on the region) and maths for female pupils. It was measured using the mean end-of-term marks in these subjects, as recorded in school registers. This outcome was collected at three points in time:

- December 2023 (end of the first term of the academic year 2023-24). This measurement served as a baseline value for attainment outcomes.
- March 2024 (end of the second term of the academic year 2023-24).
- June 2024 (end of the third term of the academic year 2023-24)

One limitation of relying on school-administered, non-standardised test scores – where test scores are designed and marked at the school level without standardisation guideline – is that the same mark may be indicative of different attainment levels from one school to another. This variation depends on factors such as grading strictness and the average difficulty of the test set by individual teachers. Additionally, schools graded on different scales, with the grading scale of the collected tests varying across schools and subjects. The highest scores possible on these tests were therefore unknown at the point of analysis. Schools collected up to two (in a few cases, three) test scores per subject.

We undertook the following steps to standardise test scores to be more comparable measures of educational attainment across schools:

1. Test scores were rescaled to a common scale. All test scores were adjusted to be out of 100. This was done to address the following:
    - In the East and Far North regions, maximum test scores in most classes were 20. This corresponded to the grading scale specified in the data collection form for test scores.

- In the South West and North West regions, maximum test scores varied across classes but were generally above 20 and below 100. The grading scales (and highest scores possible) on these tests were therefore unknown.

Across all regions, the following was done to rescale the test scores to a common scale:

- If the maximum score for a class was 20 or lower, the grading scale was assumed to be out of 20. Scores in these classes were proportionally adjusted to be out of 100.
- Where the maximum score for a class was above 20, the grading scale was assumed to be out of 100. Scores in these classes were rescaled to be out of 100 in the few cases where maximum scores were higher than 100.

The scaled scores were then averaged across tests for each pupil within each subject, as test scores were reported for more than one test per subject. Each pupil would therefore have a single subject-specific score to be used in analysis.

2. Converted the rescaled subject-specific pupil test scores into z-scores, standardising them to have a mean of 0 and a standard deviation equal to 1 within each school and grade (e.g. Form 1 in school A) at baseline, as shown in the following equation:

$$\boldsymbol{z_{t0}} = \frac{(\mu_{t0} - \hat{\mu}_{t0})}{\sigma_{t0}} \quad (1)$$

where $\boldsymbol{z_{t=0}}$ is the test z-score at baseline ($\boldsymbol{t0}$) of a given student, $\boldsymbol{\mu_{t0}}$ is the student's raw score at baseline, $\boldsymbol{\hat{\mu}_{t0}}$ is the school-year average raw score, and $\boldsymbol{\sigma_{t0}}$ is the school-year standard deviation.

Similarly, endline test scores were standardised as follows:

$$\boldsymbol{z_{t1}} = \frac{(\mu_{t1} - \hat{\mu}_{t0})}{\sigma_{t0}} \quad (2)$$

Where $\boldsymbol{\mu_{t1}}$ is the raw score of a given student measured at endline ($\boldsymbol{t1}$). Standardising based on the baseline distribution allowed us to capture changes in test scores between baseline and endline. This standardisation approach follows that used in Robinson et al (2021) and Wake et al (2023).

Attainment was therefore measured using pupils' standardised scores in each subject, where the endline subject score was standardised relative to the baseline distribution of rescaled scores for the subject within the pupils' school and year. The impact estimates for educational attainment outcomes are expressed as adjusted differences in means, which represent the differences in test scores between pupils in intervention and comparison schools, expressed in school-year specific standard deviations. These standard deviations are not readily interpretable, due to the variation in school-year specific standard deviations. The Hedges' g effect sizes therefore take into account the across-school variation in these standard deviations by standardising the adjusted difference in means by the overall population variance of the standardised test score.

Rationale for the timing of outcome measurement

Pupils take assessments at the end of every term. Due to the delay in the implementation of the intervention, we considered extending the data collection of attainment data until December 2024 (i.e. first term of the 2024-25 school year), in case June 2024 was too soon to observe any intervention impact on this outcome. However, it was decided to maintain the original timeline and collect endline assessment data in June 2024.

The decision to stick to the original timeline was motivated by the following points. With the intervention starting in January-February and ending in May-June (most schools close early June in order to prepare the classrooms to host end-of-year national exams), 4-6 months of exposure may be too short to produce long-lasting effect on educational attainment. Extending the data collection to December 2024 would require us to link pupil information of 2023-24 and 2024-25 assessment registers, since most pupils would have moved to the next year in between, which would probably result in attrition due to linkage issues. Attrition would also result from pupils moving to different schools.

Sample selection

We measured attainment data for the same pupils that are included in the attendance data collection. This covered all pupils who were enrolled in school as of November 2023, in 2 randomly sampled classes per form (resulting in up to 14 classes per school). Note, however, that no Term 3 assessment data was available for pupils in their last year of secondary school (e.g. Form 7 and Terminales), as those pupils were taking the national exam at that time. Insights on the intervention impact on the educational attainment of those pupils was derived from the analysis of term 2 data.

Impact analysis for educational attainment was conducted for high school girls in years 1 to 4 across all regions. Girls in years 5 and above were excluded from analysis. This is because year 5 and 7 pupils did not tend to have endline scores as they sit public exams at the end of the academic year. Furthermore, test scores were not available for English, Maths, and French for pupils in years 6 and 7, as they tend to specialise into a smaller number of subjects in these years instead of following a general curriculum.

Baseline attainment data

Due to the delay in the start of intervention delivery, pupil assessments completed in December 2023 were treated as a baseline for attainment. It was not feasible to collect 2022-23 assessment scores (attainment from the previous academic year) for our baseline. Baseline test scores were calculated using the approach described above, and similar to endline test scores, were standardised at the school-year group level.

Pupil survey

Measurement approach

We administered a pupil survey to measure knowledge, attitudes and support around MHM, a secondary outcome for the trial. The survey questionnaire also contained some questions to support the IPE component of the trial. Survey data collection was carried out by trained enumerators using KoboCollect, an open-source application for survey data collection. Baseline data collection was conducted for the pupil survey in November 2023, with endline surveys administered in June 2024.

A total of six secondary outcomes were constructed from the pupil survey:

1. **Knowledge**: This outcome measured pupils' knowledge of menstruation and scores them on whether responses to three questions were correct:

    a. Blood comes from the vagina or uterus. Do you **agree** or disagree with this statement?

    b. Girls may experience some discomfort or pain when they are menstruating. **Agree** / Disagree

    c. Approximately how often does a girl get her period, if she has ever started her period? Once in her life; Once a year; **Every month**; Every week; Every day/all the time; Other answer; Don't know

    The knowledge score was calculated as the average number of correct responses (indicated in **bold** above) for these three items, out of all responses including 'Not sure' responses.

2. Positive attitudes: This outcome measured the extent to which pupils' attitudes towards menstruation were positive, using responses to the following three items:

    a. Menstruation is something normal for women and girls. Do you **agree** or disagree with this statement?

    b. Menstruation is a curse. Do you agree or **disagree** with this statement?

    c. There are some daily activities that women and girls who are menstruating should not do. Agree / **Disagree**?

    The positive attitudes outcome was calculated as the average number of non-missing responses showing positive attitudes (indicated in **bold** above) on these three questions. Responses that were missing or 'not sure' were not included in the calculation of the positive attitudes score.

3. Open attitudes: This outcome measured the extent to which pupils had open attitudes towards girls discussing menstruation with others, using responses to the question 'Is it okay for a girl to talk about menstruation with:

a. a girl she knows (for example, a friend or classmate)

b. women in her family (for example, mother, sister or aunt)

c. a boy she knows (for example, a friend or classmate)

d. men in her family (for example, father, brother or uncle)

e. female teachers

f. male teachers

The open attitudes outcome was calculated as the average number of 'Yes' responses to these questions. Responses that were missing or 'not sure' were not included in the calculation of the average score and were dropped from analysis.

4. Boys' lack of support towards menstruation: This outcome was a binary indicator of whether a male pupil responded 'Yes' to the question: 'Have you yourself ever made fun of a girl about her period?'. Responses that were missing or 'not sure' were not included in the outcome measure calculation and were dropped from analysis.

5. Girls' experience of support for menstruation: This outcome was a binary indicator of whether a female pupil responded 'Yes' to the question: 'Have you yourself ever been made fun of about periods?'. Responses that were missing or 'not sure' were not included in the outcome measure calculation and were dropped from analysis.

6. Girls' perceptions of support while menstruating: This outcome measured the extent to which girls' who have had their first period perceived others in school as supportive during their last period, using responses to the following questions:

    a. During your last menstrual period, were your female classmates supportive?

    b. During your last menstrual period, were your male classmates supportive?

    c. During your last menstrual period, were your teachers supportive?

    The outcome was calculated as the average number of responses of 'Yes' to these three questions, out of responses including 'not sure' or 'can't remember'. Responses where the girl was not in school during her last menstrual period were not included in the measure and were dropped from analysis.

Rationale for the timing of outcome measurement

In response to the delay in the intervention start date, we opted to retain June 2024 as the endpoint for measurement of MHM knowledge and attitudes, rather than shifting this into the 2024-25 academic year. This decision was informed by:

- Our understanding (as stated above) of the MHM logic model, whereby pupil knowledge and attitudes are expected to be a more proximate outcome of the programme that can plausibly respond within a relatively short timeframe after exposure to the intervention.

- There are risks of extending the pupil survey data collection into 2025. Since the survey is based on a smaller sample of pupils than attendance and attainment data collection, the risks of attrition in between academic years would be more costly in terms of power and the potential introduction of bias.

Sample selection

We sampled one class per form for the pupil survey, combining upper and lower 6th into one form. These classes were randomly selected from among those that are included in the attendance and attainment data collection. Within each class, we randomly sampled 6 pupils (3 girls and 3 boys) to take part in the survey. Data collectors visited the schools

several times at the time of the endline to attempt to reduce attrition as much as possible, in case not all pupils surveyed at baseline were not in school on the first day of data collection.

Survey details

The pupil survey was made of 5 modules: (i) demographics (8 questions); (ii) MHM knowledge (6 questions); (iii) MHM attitudes (5 questions); (iv) MHM support – boys only (5 questions); and (v) MHM support – girls only (12 questions). Note that the questionnaire was piloted in two schools before being finalised and administered at baseline. The questionnaire was different from that used in the pilot study, as it more extensively surveyed pupils on their knowledge of, attitudes to menstruation and discussion of it, and their support for menstruating girls.

Due to the sensitive nature of the topic of this survey, questions around menstruation may have been distressing for some participants and could have caused psychological stress. There may have been customs, taboos, or cultural practices operating in some locations for the study that brought elevated risks around this topic.

Various measures were put in place to minimise risks of harm to participants who are asked about sensitive issues:

- The data collection team, comprising a mixture of men and women, were recruited from across the local areas where the study took place. They were familiar with local customs, including those around menstruation. They were also familiar with local vernacular across the different regions where the study is taking place. This helped researchers conducting interviews to communicate effectively with participants, build trust and understand how to approach these topics sensitively in view of local norms.
- The interview team received briefings before the data collection starts that provided them with strategies for managing any difficult dynamics in interviews or FGDs and handling sensitive topics.
- Interview guides began with a short 'ice-breaker' to help participants to relax. For example, the guides suggested asking pupils about favourite foods and activities, before starting the interview.
- Interviews took place in quiet locations – e.g. under a tree on the school premises, but out of earshot of other pupils.

Sample size

Minimum detectable effect size (MDES) calculations and estimation of intra-cluster correlations (ICCs)

Primary outcome: attendance rate of female pupils

At the protocol stage, there was no certainty on whether a baseline attendance could be collected, thus power calculations did not include any pre-post correlations at that point. However, information from the 2021-2022 MHM pilot an indicative pupil (level 1) pre-post correlation of 0.214. In terms of the sample size, we estimated that there would be 350 female pupils per school on average, and that all pupils would be included in the study via attendance book records.[11] Since no pilot data could be exploited to estimate the ICC, the ICC was set to 0.1 at that stage as a conservative assumption. Given the type of intervention (i.e. construction of toilet facilities, large distribution of MHM product) and the strong support of the study by the government, we did not anticipate high levels of school-level attrition. This was further supported by low levels of attrition in the pilot study. At the time of randomisation, all schools had accepted to join the study. Therefore, MDES at the protocol and randomisation stage were identical.

We followed a similar approach to estimate the MDES at the analysis stage, updating the parameters based on final data. The pupil-level (level 1) pre-post correlation amounted to 0.64 and at the school-level (level 2) to 0.090. Attendance data on girls could not be used in 5 schools, leading to a total of 75 schools included in the analysis. This attrition is mainly due to challenges in the linkage of pupils across different attendance books. This issue is discussed in more details in the Attrition section. The average number of girls per school was also lower than anticipated at the protocol

[11] Given that secondary schools contain up to 7 forms, with an average of around 25 girls per class, this amounts to an expected sample size of around 25 girls * 2 classes * 7 forms = 350 girls per school.

stage, amounting to 178 – for a total of 13,369 pupils, for similar pupil-linkage attrition reasons. The ICC revealed to be higher than anticipated at the protocol stage (0.210 against 0.100), which negatively affected the MDES.

MDES at the protocol/randomisation and analysis stages are reported in Table 6. Both MDES were calculated using a Type I error rate of 0.05 and a Type II error rate of 0.20 (i.e. power of 0.80). Power calculations were conducted using the PowerUp! Tool[12]; (Dong and Maynard, 2013). At the analysis stage, the overall MDES for girl's attendance associated with the sample characteristics is 0.210.

Table 6: MDES at the protocol/randomisation and analysis stages

		Protocol/Randomisation	Analysis
MDES (Cohen's D)[13]		0.200	0.210
Pre-test/ post-test correlations	level 1 (pupil)	0	0.640
	level 2 (school)	0	0.090
ICC	level 2 (school)	0.100	0.210
Alpha		0.050	0.050
Power		0.800	0.800
One-sided or two-sided?		2	2
Average cluster size		350	178
Number of schools	Intervention	40	37
	Control	40	38
	Total	80	75
Number of pupils	Intervention	14,000	7,116
	Control	14,000	6,253
	Total	28,000	13,369

Secondary outcomes: MHM knowledge, attitudes, and support to girls.

Table 7 reports the MDES at the protocol and analysis stages for the knowledge, attitudes, and support outcomes from the pupil survey. As above, we used a Type I error rate of 0.05 and a Type II error rate of 0.20 (i.e. power of 0.80). Power calculations were done using the PowerUp! Tool; (Dong and Maynard, 2013). Parameters including intra-cluster correlations and pre-post correlations at the analysis stage were calculated using the analysis samples for each outcome. At the analysis stage, MDES range from 0.316 to 0.461, depending on the outcome of interest.

Table 7: MDES at protocol/randomisation and analysis stages – pupil survey outcomes

		Protocol	**Knowledge**	**Positive attitudes**	**Open attitudes**	**Boys' lack of support**	**Girls' experiences of negative support**	**Girls' perceptions of support while menstruating**
MDES (Cohen's d)		**0.224**	**0.316**	**0.320**	**0.322**	**0.461**	**0.401**	**0.427**
Pre-test / post-test correlations	Level 1 (pupil)	0	0.114	0.039	0.225	0.153	0.070	0.086
	Level 2 (school)	0	0.100	0.249	0.621	0.413	0.149	0.374
ICC	Level 2 (school)	0.100	0.184	0.200	0.328	0.255	0.219	0.333
Alpha		0.05	0.05	0.05	0.05	0.05	0.05	0.05
Power		0.80	0.80	0.80	0.80	0.80	0.80	0.80

[12] This tool requires to input the R^2 rather than pre-post correlations, which was estimated using the square of the pupil-level (0.64^2 = 0.41) and the school-level (0.09^2=0.008).

[13] Reported MDES are calculated as Cohen's d effect sizes, whereas impact estimates are reported as Hedges' g effect sizes, which are calculated similarly but additionally correct for small sample sizes. The formula for Hedges' g is

Hedges' g = Cohen's d x $\left(1 - \frac{3}{4(n_1+n_2)-9}\right)$

One-sided or two-sided		2	2	2	2	2	2	2
Average cluster size		36	15.0	14.9	15.0	6.1	5.58	4.84
Number of schools	Intervention	40	39	39	39	27	36	39
	Control	40	37	37	37	24	35	36
	Total	80	76	76	76	51	71	75
Number of pupils	Intervention	1,440	662	654	662	209	278	276
	Control	1,440	662	659	662	182	308	266
	Total	2,880	1324	1313	1324	391	586	542

Statistical analysis

Primary analysis

The primary outcome analysis aims to address research question 1:

IE_RQ1: To what extent did the MHM intervention improve girls' attendance at school?

We used an Intention-to-Treat (ITT) approach to estimate the causal effect of the MHM intervention on the primary outcome. Under ITT, all female pupil enrolled in a school assigned to receive the MHM intervention were included in the analysis, regardless of their actual engagement with any of the specific intervention components.

Given the clustered design with pupils grouped within schools, the impact was estimated using a multi-level model. We used a random effect model with a random school-level intercept. The causal effect of the intervention on attendance was estimated using the following statistical model:

$$Attendance_{1,is} = \beta_0 + \boldsymbol{\beta_1} Attendance_{0,is} + \boldsymbol{\beta_2} INT_s + \rho + \mu_s + \varepsilon_{is} \quad (3)$$

where $Attendance_{1,is}$ is the post-intervention percentage of attended lessons between January and May 2024 by pupil i in school s, $Attendance_{0,is}$ is the pre-intervention value of attendance for pupil i in school s, INT_s is a binary variable equal to 1 for schools that have been assigned to receive the MHM intervention and 0 for usual practice schools, ρ is a stratification block fixed effects comprising region and area type (urban/rural), μ_s is a school random effect, and ε_{ist} the error term. The causal intervention effect is captured by the β_2 parameter. Additional sensitivity analyses was conducted using models with robust standard errors to account for heteroskedasticity in the data.

The unadjusted model of endline attendance regressed on the treatment indicator only. It provided the raw difference in means between intervention and control groups, without controlling for baseline attendance or stratification variables. The adjusted model controlled for baseline attendance and stratification variables (region and area type - urban/rural).

Our model follows **EEF statistical analysis guidance** (EEF, 2022a)[14].

Secondary analysis

The secondary outcome analysis aimed to address research questions 2 and 3:

IE_RQ2: To what extent did the MHM intervention improve girls' educational attainment, as measured by their grades in Maths and language assessments (English or French)?

IE_RQ3: To what extent did the MHM intervention improve male and female pupils' MHM knowledge, attitudes, and support to girls?

We estimated the impact of the MHM intervention on end-of-term test scores. The analytical model for the secondary analyses was analogous to that of the primary analysis shown above (equation 3). For each pupil, we collected a maximum of three test-score observations for each subject (Maths and French or English) – i.e. corresponding with school assessments carried out in December 2023, March 2024, and June 2024. We used the December 2023 measure

[14]https://d2tic4wvo1iusb.cloudfront.net/production/documents/evaluation/evaluation-design/EEF-Analysis-Guidance-Website-Version-2022.14.11.pdf?v=1699621596

as the baseline value of attendance, and the June 2024 measure as the main outcome variable. Standardised test scores as described in equations 1 and 2 were used in this analysis.

An equivalent model was used to estimate the impact of the intervention on MHM knowledge and attitudes, measured in June 2024, as described above. In this case, pre-intervention outcome measures were collected during the November 2023 baseline survey.

Analysis in the presence of non-compliance

In this project, we define compliance as a set of requirements that need to be fulfilled at the school level. This continuous measure is based on five primary criteria, each with its own set of sub-criteria as outlined in Table 8. The sub-criteria were created post-hoc at the analysis stage using the observation checklist, where each checklist item was allocated to one of the five compliance criteria as a sub-criterion. The sub-criteria were then equally weighted within each criteria to have a total score of 1 (e.g. with four sub-criteria under a compliance criteria, each sub-criteria would have a score of 0.25).

An observation checklist administered in June 2024 was used to assess schools' adherence to each criterion. Schools were assigned a compliance score ranging from 0 (no criteria met) to 1 (all criteria met), reflecting the proportion of fulfilled criteria. For each criterion, the sub-criteria scores were averaged to produce a criterion-level score, and the final compliance measure was calculated by averaging these five scores.

Full compliance consists of meeting all the following requirements as in Table 8 below.

Table 8: Compliance criteria and indicators

Number	Compliance criterion	Sub-criteria	Data source	Compliance indicator
1	Toilets were constructed or renovated	None	Observation checklist	Toilets are either newly built or renovated to required standards
2	MHM safe spaces are supplied accordingly throughout the year	(a) Availability of MHM waste disposal (b) Availability of storage space for spare dignity kit	Observation checklist	MHM safe spaces are continuously provided to girls who menstruate
3	Dignity kits are distributed to all eligible girls	Availability of dignity kits containing: (a) Washable sanitary towel (b) Toilet soap (c) Underwear (d) Detergent (e) Disposable sanitary towels (f) Toothbrush and toothpaste (g) Locally produced menstrual pads	Observation checklist	Every eligible girl receives a dignity kit
4	MHM clubs are formed and maintained throughout the year	None	Observation checklist	Active MHM clubs operate regularly throughout the year
5	Teachers are trained on MHM practices	(a) Availability of 2 Focal MHM points (b) Step down training	Observation checklist	At least one teacher per school completes MHM training sessions

This was measured using an observation checklist tool carried out in June 2024.

It is worth noting that the above definition of compliance ignores compliance at the pupil level. This decision was motivated by the fact that pupils are not the end and/or sole users of all components of the intervention (e.g., teacher training), and tracking actual compliance of pupil for safe space use and MHM club attendance would have added significant logistical burden.

Since there could be several instances where only some of the five compliance criteria were not met, we defined compliance as a continuous measure taking values between 0 and 1, where 0 means no compliance over all criteria, and 1 means full compliance. A Complier Average Causal Effect (CACE) analysis was conducted by drawing on an

instrumental variable[15] (IV) approach and using a two-stage least squares (2SLS) estimation to obtain the intervention effect for those schools which complied with the intervention (see Angrist and Imbens, 1996).

The first stage of the IV estimation estimated whether assignment to the MHM intervention group encouraged schools to implement the components of the intervention, which provided an estimate of the compliance rate. The first stage results provided the correlation between the intervention assignment and the implementation of the intervention components, as well as an F-test (EEF, 2022a). In the second stage, the compliance-adjusted effect of the intervention was estimated by predicting the outcome of interest using the compliance rate estimated at the first stage, rather than the intervention assignment binary variable. This approach isolates the causal effect of the intervention specifically for schools that complied. The CACE was estimated for the primary outcome only.

Sub-group analyses

The sub-group analysis address research questions 4 and 5:

IE_RQ4: To what extent did the MHM impact on girls' attendance and educational attainment differ by grade, area type (urban/rural) and region *(subgroup analysis)*

IE_RQ5: To what extent did the MHM impact on pupil's MHM knowledge, attitudes, and support to girls differ by gender?

We carried out sub-group analysis to explore whether the MHM intervention has a differential impact on outcomes for pupils in different grades, area type (urban/rural) and region (South West. North West, Far North and East). For girls' attendance, we also used pupil-level attendance with complete data. The model used for subgroup analysis for the attendance outcome was as follows:

$$Attendance_{1,is} = \beta_0 + \boldsymbol{\beta_1} Attendance_{0,is} + \boldsymbol{\beta_2} INT_s + \beta_3 Subgroup_{is} + \beta_4 INT_s * Subgroup_{is} + \rho + \mu_s + \varepsilon_{is} \ (4)$$

Where two additional parameters are estimated compared to the primary outcome model. $Subgroup_{is}$ is a (set of) indicator variable(s) denoting subgroup membership for pupil i in school s, and the interaction term(s) $INT_s * Subgroup_{is}$ takes the value one for pupils in intervention schools belonging to the subgroup, and zero otherwise. The coefficient β_4 therefore represents the differential effect of the intervention on the subgroup. A separate model was estimated for each subgroup similar to the primary outcome model described above, to obtain the effect size for each subgroup. The restricted sample models with separate estimates for each subgroup are the preferred specification, as the interaction models report the effects relative to a reference subgroup.

For the secondary analysis of MHM impact on pupil knowledge and attitudes, we also carried out sub-group analysis by gender. This was done by using adding an **interaction term** to each analysis model between the intervention group indicator and the subgroup indicator, with separate models additionally run for each gender subgroup to estimate effect sizes.

Additional analyses and robustness checks

To ensure robustness of the primary analysis, attendance rates were aggregated at the school and grade level (e.g. Form 1) to avoid pupil linkage issues (more details on the attendance sample attrition rate in the *Attrition* section). The corresponding specification is captured in equation 4 below:

$$Attendance_{1,gs} = \beta_0 + \boldsymbol{\beta_1} Attendance_{0,gs} + \boldsymbol{\beta_2} INT_s + \rho + \mu_s + \varepsilon_{gs} \ (4)$$

where $Attendance_{1,gs}$ is the average attendance rate observed in grade g in school s and $Attendance_{0,gs}$ is the value of the attendance rate observed at baseline in grade g in school s. Other variables and parameters are similar to those in equation 3.

[15] We did not anticipate major risks that the exclusion restriction assumption would not hold. Such a situation would arise if being assigned to receiving the MHM intervention affected the primary outcome of interest (pupil attendance rate) through other channels than those pertaining to the intervention. For instance, if MHM schools decided to engage in additional MHM activities, or use the intervention as an opportunity to implement a specific policy to boost female attendance, which seems unlikely. Should we have evidence that this happened, we would use sensitivity analysis (Huber and Mellace, 2015) to measure the bias introduced in the analysis by the violation of the exclusion restriction assumption.

Comparing the estimation of the intervention impact at the pupil (equation 3) and grade (equation 4) levels sheds light on whether the pupil-level results suffer from non-random attrition bias. A notable difference between both estimates would indicate that pupil-linkage issues were systematic rather than random, meaning that specific types of pupils (e.g. those with lower attendance) may be underrepresented in the analysis sample. While this would not introduce a bias in the treatment effect estimates, if the attrition pattern affected intervention and control pupils similarly (i.e. no differential attrition), it could affect the generalisability of findings, as the observed intervention impact would be based on a specific subset of pupils rather than the full original sample.

Pupil survey outcomes

Additional robustness checks involved running the analysis of outcomes from the pupil survey using multi-level logistic or negative binomial regression models, for binary and count indicators, respectively. The outcome measures used in these analyses were defined as follows:

- Knowledge of menstruation: count measure of the number of correct responses to the three items included in the measure (where ‘Not sure’ are taken as incorrect).
- Positive attitudes towards menstruation: count measure of the number of responses indicating positive attitudes towards menstruation on the three items included in the measure (not including ‘not sure’ responses in this analysis).
- Open attitudes towards girls discussing menstruation: count measure of the number of responses indicating that it was okay for girls to discuss menstruation with the six groups considered in the measure (not including ‘not sure’ responses in this analysis).
- Boys’ lack of support towards menstruation: binary indicator coded as in the main analysis - taking value one for boys responding 'Yes' to the question: 'Have you yourself ever made fun of a girl about her period?', and zero for other responses (not including ‘not sure’ responses).
- Girls’ experiences of negative support towards menstruation: binary indicator coded as in the main analysis – taking value one for girls responding ‘Yes’ to the question: 'Have you yourself ever been made fun of about periods?', and zero for other responses (not including ‘not sure’ responses).
- Girls’ perceptions of positive support while menstruating: count measure for the number of responses indicating that groups were supportive out of the three groups included in the measure, where 'not sure' or 'can't remember' responses indicated unsupportive groups (not including responses where the girl was not in school for their last menstrual period in this analysis).

In addition to Hedges’ g standardised effects, these analyses also present Cox index standardised measures of effect sizes for the binary outcomes, calculated as recommended in EEF statistical guidelines (EEF, 2022). The Hedges’ g standardised effect sizes are calculated by standardising the marginal effects estimated from the logistic or negative binomial regression as coefficient estimates are usually standardised.

Imbalance at baseline

We undertook descriptive analysis to check whether there was any imbalance in baseline characteristics. Imbalance was first assessed at the school level by intervention allocation status, covering region and rural-urban distribution. Pupil distributions in intervention and comparison schools were then compared in terms of these and gender and year group distributions. This analysis was exploratory and additionally included at the analysis stage. We report the balance of school- and pupil-level characteristics in *Pupil and School Characteristics* below. We also report additional sensitivity analysis of the primary outcome specification, additionally controlling for covariates that were imbalanced at baseline.

Missing data analysis

We examine the extent to which missing data could affect the impact estimation using descriptive analysis. We explored whether there is a pattern in missingness using a ‘drop-out’ model, estimated using a logistic regression. The outcome is a binary indicator taking the value one where the primary outcome is missing, and zero otherwise. This ‘drop-out’ model includes all covariates included in the primary analysis, in addition to a random effect for settings. Missing data for these covariates will be coded up as separate binary variables in the model.

The drop out model uses the following specification:

$$Missing\ attendance\ indicator_{is} = \alpha_0 + \alpha_1 Attendance_{0,is} + \alpha_2 INT_s + \alpha_3 MissingBaselineAtt_{is} + \rho + \mu_s + \varepsilon_{is}$$

where $Missing\ attendance\ indicator_{is}$ is a binary indicator of whether endline attendance is missing for pupil i in school s, $Attendance_{0,is}$ is the pre-intervention value of attendance for pupil i in school s, $MissingBaselineAtt_{is}$ is a binary indicator of whether baseline attendance is missing for pupil i in school s, INT_s is a binary variable equal to 1 for schools that have been assigned to receive the MHM intervention and 0 for usual practice schools, ρ is a stratification block fixed effects comprising region and area type (urban/rural), μ_s is a school random effect, and ε_{is} the error term.

Estimation of effect sizes

We used the effect sizes (ES) for cluster-randomised trials, as adapted from Hedges (2007):

$$ES = \frac{(\overline{Y}_I - \overline{Y}_C)_{adjusted}}{\sqrt{\sigma_S^2 + \sigma_{error}^2}}$$

Where $(\overline{Y}_I - \overline{Y}_C)_{adjusted}$ is the adjusted mean difference between the intervention (MHM group) and control (usual-practice group), accounting for baseline characteristics, while $\sigma_S^2 - \sigma_{error}^2$ is an of the overall population standard deviation, incorporating variability across schools and individual pupils.

To calculate the ES, we used the adjusted means and variances from the primary outcome model. These variances represent the total variance across schools and pupils, derived from a basic multi-level model without predictors (referred to as a "null" model). We report a 95% confidence interval (CI) for each effect size, accounting for the clustering of pupils within schools. Effect sizes were calculated for all models included in the analysis, following a similar procedure.

Estimation of ICC

At the analysis stage, the ICC for the MHM study was calculated based on the primary outcome measure (as specified in the protocol). The ICC represents the proportion of variance in outcomes attributable to differences between schools rather than individual pupils.

The ICC was calculated using a model including covariates, as outlined in the main analytical approach. A simpler "empty" model with no covariates was run accounting only for the clustering of pupils within schools. ICCs were estimated using Stata's *estat icc* command, which is designed to calculate ICCs directly from multi-level models.

Implementation and process evaluation[16]

Research methods

The IPE collected data from Key Informant Interviews (KIIs), MHM Diaries, Focus Group Discussions (FGDs)[17], and observation checklists The IPE activities were implemented based on the protocol with slight modifications regarding the timeline due to logistical and delivery delays. These instruments were pre-tested and adjusted prior to data collection.

Interviews

Interviews were conducted with various actors involved in the intervention such as members of the delivery team, female and male students, Parent Teacher Association Presidents, MHM focal point teachers, Divisional Delegates of Education and community members. The interviews conducted with members of the delivery aimed to ascertain fidelity and dosage. It elicited information on how the local delivery partners through their project staff had implemented the interventions in terms of the delivery components such as the training of focal point teachers, the distribution of MHM kits, the construction and/or renovation of safe spaces among others. Also, interviews conducted with female and male students sought to elicit their perception and views regarding the delivery components such the safe spaces, dignity

[16] See **IPE guidance** for further details.
[17] IPE data collection tools can be found in Appendix K.

kits, MHM clubs and training. The interviews with students aimed to understand how the intervention had influenced their knowledge, attitudes and practices toward MHM. Additionally, interviews conducted with focal MHM focal point teachers and school administrators intended to understand how the latter had perceived the intervention within the school community. Specifically, the interviews with MHM focal point teachers also intended to ascertain how these teachers had managed and coordinated the activities of MHM clubs. Finally, interviews with community members aimed to understand the community perception about the MHM intervention with emphasis on how the community perceived menstruation and its relationship with the education of female students.

MHM Diaries

In addition, 215 MHM diaries were collected from 60 girls (15 per region) over the course of five months (January to May 2024). The objective of using MHM diaries was to ascertain the responsiveness and experiences of female students exposed to the intervention. Five female students were randomly sampled from three schools (one urban control, one rural treatment and one urban treatment) across the four regions to receive diaries. The diaries provided a unique perspective, first hand on how girls engaged with the intervention, how they managed their menstruation, and the source of support they received.

The first part of the MHM diary was designed to capture information on the school and class of the respondent. The instruction of use directed the respondent to capture (to the best of their abilities) their menstruation experiences of the month either during the period of their menstruation or immediately after. Specifically, the questions required the students to report how they felt while menstruating and if menstruation affected their ability to attend and perform in school. Additionally, the diary enquired whether girls received support from teachers, other girls, boys and parents during menstruation. In addition to this, the diary asked the students to report their experiences in accessing resources provided by the MMH intervention such as pain killers, MHM pads, MHM clubs and safe spaces. Last but not least, the diary sought to ascertain the experiences of the female students on their use of the re-usable pads. The final question on the diary enquired if the respondents had any further thoughts to share. Regarding the applicability of the diaries, data collectors who had been designated to collect weekly attendance data, were also charged with the collection of MHM diaries.

The diary collection process took place at the beginning of each month. Data collectors, with the assistance of the school focal points, contacted the selected diary respondents to retrieve the completed diary for the previous month and simultaneously distributed a new diary for the next month. The hard copies of the diaries were then handed over to the regional coordinators who proceeded to transcribe and transfer the diaries to the data manager. It is important to note that the identities of the diary respondents were anonymised leaving only their school, ages and classes as qualifiers.

Focus Group Discussions

Similarly, FGDs were organised across the four regions to ascertain how the respondents encountered the intervention. We used FGDs to further check and triangulate the data collected from interview sources. These FGDs were organised with female students, male students, and focal point teachers.

Observations

Observations were also used to collect information on the delivery of the intervention. Data collectors and research assistants regularly visited schools in which the intervention was being delivered. These observations were collected both at baseline and end line periods with the use of an observation check list.[18] The checklist was designed to track and capture data on all aspects of the intervention delivery as well as a means of verifying the extent to which the delivery organisation had fulfilled their responsibilities regarding intervention delivery. In addition, the data collectors physically inspected and observed tangible aspects of the delivery such as the renovated safe spaces and quality of the dignity kits. This permitted us to ascertain the extent to which the local implementing partners had adhered to the delivery components of the intervention.

[18] The observation checklist contained ten items which focused on all delivery components. A means of verifying these components was also integrated in the tool.

Data collection

We trained and deployed 80 enumerators to collect the qualitative data across the four regions. The data collectors were recruited from the communities in which the intervention was delivered due to their familiarity and proximity to these communities.

Analysis

The qualitative data was cleaned and sorted before we commenced analysis. Thematic analysis focused on the research questions that guided the IPE. The themes focused on fidelity, quality, adaptation, dosage responsiveness, differentiation, perceived impact and cost. The analysis used the logic model as a gauge to understand how well the results aligned with the short-term outcomes and long-term impacts of the intervention. To protect the identity of the participants, all qualitative data was anonymised through the use of unique code. Key informants, focus group participants and girls who completed the MHM diaries were assigned unique codes. These unique codes replaced any personal identifiers during the transcription and analysis.

Table 9: IPE data collection methods

Research methods	Data collection methods	Participants/ data sources	Data analysis methods	Research questions addressed	Implementation/ logic model relevance
Quantitative	Questionnaire	Students (female and male)	Descriptive statistics	R6, RQ8	Responsiveness, perceived impact
Qualitative	Interviews	Students,	Deductive Coding/thematic analysis	RQ1, RQ3. RQ5, RQ6,	Fidelity, quality. Adaptation, dosage, responsiveness, , perceived impact
Qualitative	Interviews	Teachers (focal points)	Deductive Coding/thematic analysis	RQ1, RQ3, RQ8	Fidelity, quality. Adaptation, dosage, responsiveness, , perceived impact
Qualitative	Interviews	School administrators	Deductive coding/Thematic analysis	RQ1, RQ2, RQ3, RQ6, RQ7	Fidelity, quality, responsiveness, perceived impact
Qualitative	FGD	Students	Deductive Coding/Thematic analysis	RQ1, RQ2, RQ3, RQ7, RQ8	Fidelity, Quality, Dosage, Responsiveness, Perceived impact
Qualitative	Observation (on-site visits)	Dignity kits, renovated toilets, training manuals	Deductive Coding/ Thematic analysis	RQ1, RQ3, RQ4, RQ5, TQ6	Fidelity, Quality, Dosage, Adaptation, Responsiveness
Qualitative	Diaries	Female students	Deductive Coding/Content Analysis	RQ6, RQ8	Responsiveness, perceived impact

Costs

The cost associated with the MHM program delivery was calculated in accordance with EFF's prescriptions outlined in the EFF cost guidelines (EEF, 2023). This guideline emphasises the ingredient method principle (Levine et al., 2018) which only factors the entirety of resources that were required to implement the MHM intervention regardless of who incurs the cost. We recognise EEFs recommendations to anchor cost estimates to primary outcome analysis which in this case would be attendance rates of female students in the treatment schools. As such, we will use the sample size

of the female students who were considered in the analysis of the primary outcome. Data on the cost of the intervention was provided by eBASE Africa.

We calculated the cost of the intervention based on an appraisal of the four major categories of the cost breadown. These categories were; personnel cost and preparation for program delivery; capacity building for implementation of intervention; facilities, equipment and materials for implementation and; personnel cost for implementation of the intervention. The cost associated to the cost ingredients of these major cost categries were summated and divided with the sample size of the primary outcome measure (14,000).

The cost breakdown received from eBASE Africa did not provide cost details on a regional basis to enable us to understand if there were variations in the cost of delivery inputs from a school or regional basis. As such, we relied on EEFs guidelines which recommend that the cost on a per person basis can be ascertained by dividing the overall cost by the sample size of the primary outome measure. We therefore adopted this approach in ascertaining the cost per individual for the MHM intervention. ..

Timeline

Dates	Activity	Staff responsible/ leading
June 2023	Trial set-up meetings and design stage	ASOWWIP and NatCen
July 2023	NatCen REC approval received	ASOWWIP and NatCen
July 2023	Randomisation	NatCen
September 2023	Submit trial for ethical approval to Cameroon national Ethics Committee, and for a TREE review by 3ie	ASOWWIP and eBASE
November 2023	Published Evaluation protocol	ASOWWIP and NatCen
November 2023	Pupil surveys, pupil attendance and diaries data collection (baseline)	ASOWWIP
December 2023	Pupil attainment data collected (baseline)	ASOWWIP
December 2023	Toilet construction and renovation in intervention schools	UN Women and partners
January 2024	Expected roll-out of teacher training, MHM clubs, dignity kits and community sensitisation activities.	UN Women and partners
May 2024	Pupil surveys, pupil attendance and attainment data collected (second term test scores)	ASOWWIP
September_ December 2024	Pupil attainment data collected, KIIs and FGD organised	ASOWWIP
January 2025	KIIs and FGDs sorted and cleaned	ASOWWIP
January-March 2025	Analysis	ASOWWIP and NatCen
March 2025	Draft report	ASOWWIP and NatCen
July 2025	Published report	ASOWWIP and NatCen

Impact evaluation results

Attrition

Primary outcome: Girls' attendance

Girls' attendance data was collected directly from schools' attendance books over two main periods: November-December 2023 (baseline) and January-May 2024 (endline). Due to the volume of data, daily attendance was collected in monthly batches (i.e. one file including attendance for a given school for a given month). Pupils were identified by class (e.g. Form 1.1), their serial number (corresponding to their alphabetical rank in the class), and their gender. Only two classes per grade were included in each school. For anonymity purposes, class names were modified, where the two randomly selected classes per grade were labelled as "FormX.1" and "FormX.2", irrespectively of the actual designation. In cases where attendance was available for more than two classes in the same grade, only the first two classes were included. This ensured that an individual pupil could not be identified based on their serial number.

Although all schools provided a large majority of the required attendance data, attrition arose through the pupil linkage process across the different data files. In order to reduce the risk that a pupil was assigned the attendance of one of their classmates through inaccurate linkage, and to ensure that a pupil's attendance was observed both at baseline and endline, we developed a list of inclusion criteria to construct the analysis samples. Those criteria are listed in Table 10.

Table 10: Pupil-linkage inclusion criteria

1	Baseline-endline data available	Only pupils with both pre- and post-intervention attendance were included. Note that pupils with partial[19] post-intervention data (e.g. only three out of five months of post-intervention data) were retained.
2	Gender inconsistencies	Only pupils with a consistent gender across all the data files were included.
3	Class size inconsistencies	Only pupils for which the class size was constant across all files were included. Class size is expected to be constant over time, as pupils who drop out remain in the book. Difference in the class size is likely to indicate that different classes were given the same label

The different sources of attrition and the attrition rates are reported in Table 11. Initially, 79 schools were retained, with only one school (control) excluded in the East region due to missing baseline data, resulting in 6,253 pupils in the control group and 7,116 pupils in the intervention group. The average attrition rate amounts to 36.7%, with notable variations across regions, ranging from 16.5% (East) to 49.7% (South West). The attrition rate is found to be slightly higher in the intervention (37.7%) than in the control (35.9%) group.

When restricting the sample to pupils with complete data only (i.e. November-December 2023 to May 2024), it led to a substantial increase in the final attrition rate. In particular, this would have caused the exclusion of 16 schools, 10 of which were in the South West region, where no pupil met the inclusion criteria. We used a more relaxed criterion, restricting the sample to only those with two observations – one each at baseline and endline, resulting in the attrition of four schools, finally retaining 75 schools for the primary analysis.

Although the attrition rate is relatively high, it is mostly driven by linkage issues so that there is a reduced risk that missingness may be entirely systematic. Linkage issues primarily resulted from data quality issues, which meant that pupil records were not consistently available and link-able across multiple spreadsheets of data. Data requirements for inclusion were minimal to ensure analysis (attendance available at least once each at baseline and endline), in order to minimise attrition. The timing of data collection was not expected to systematically affect different regions differently These linkage issues were not evenly spread across the sample, so that the South West and North West regions had higher attrition than the Far North and East regions. Though attrition from linkage issues is not expected to be systematically linked with individual pupil-level characteristics, there may be some correlation with school or regional

characteristics that may affect findings. We test whether results are sensitive to missing data using a drop out model, and do not find evidence of systematic attrition (refer section on results from missing data analysis below).

Figure 2: Sample randomisation and attrition at baseline and endline

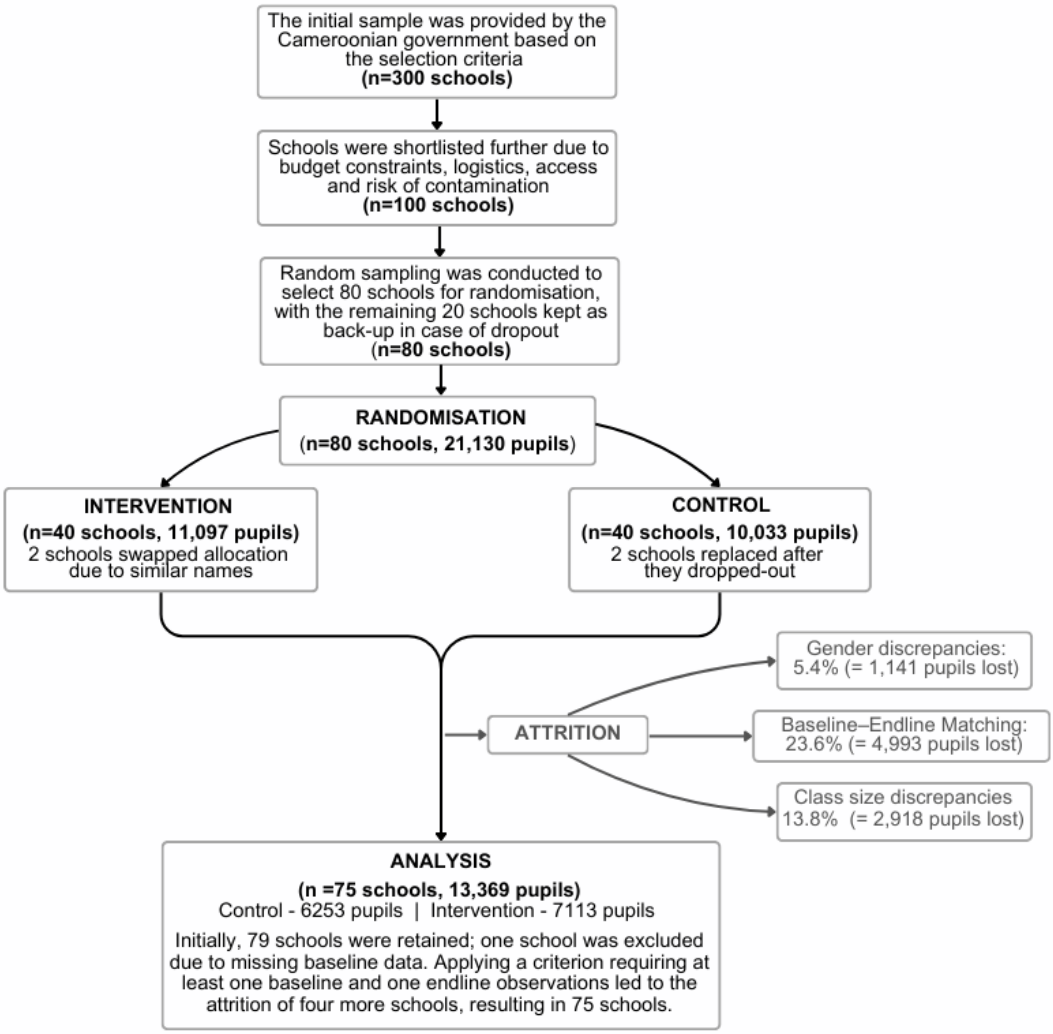


Table 11: Attrition in girls' attendance data

		East	Far North	North West	South West	Entire sample
Attrition						
Attrition sources	Baseline-endline matching	13.4	14.6	23.7	34.4	23.6
	Gender discrepancies	4.7	6.3	7.1	3.7	5.4
	Class size discrepancies	6.0	18.3	16.2	14.0	13.8
Attrition rate (%)	Control	20.6	27.6	32.2	55.7	37.7
	Intervention	11.6	37.2	39.9	43.5	35.9
	Total	**16.5**	**32.7**	**37.0**	**49.7**	**36.7**
Sample size						
Initial sample	Control	2246	1930	2032	3825	10033
	Intervention	1848	2139	3360	3750	11097
	Total	**4094**	**4069**	**5392**	**7575**	**21130**
Final analysis sample	Control	1783	1397	1377	1696	6253
	Intervention	1634	1343	2020	2119	7116

	Total	**3417**	**2740**	**3397**	**3815**	**13369**

Secondary outcomes: educational attainment

Table 12: Pupil level attrition from the trial (test scores)

		Intervention	Control	Total
Number of pupils (number of schools)	Randomised	8,783 (39)	7,489 (39)	16,272 (78)
	Analysed: overall	7,559 (35)	5,729 (34)	13,288 (69)
Pupil attrition (from randomisation to analysis)	Number	1,224	1,760	2,984
	Percentage	13.9%	23.5%	18.3%

Table 12 summarises pupil level attrition for educational attainment outcomes. Baseline test score data was available for 16,272 high school girls in years 1 to 4 across 78 schools. Endline test score data was available for 14,978 high school girls in years 1 to 4 across 70 schools in May-June 2024.

Baseline test scores were collected from 8,783 girls in years 1 to 4 in 39 intervention schools and 7,489 girls in 39 comparison schools – a total of 16,272 girls in 78 schools. Similarly, endline test scores were collected from 6,642 girls in years 1 to 4 in 35 intervention schools and 8,336 girls in 35 comparison schools – totally 14,978 girls in 70 schools.

Pupils' test scores at baseline and endline were linked together using school name, class name (year group and division), and pupil serial number. Out of the linked sample, only girls in years 1 to 4 with consistent gender between baseline and endline, and with gender non-missing at endline were retained for analysis. The analysis sample also included only girls in years 1 to 4 with at least one non-missing test score. This resulted in a total of 13,288 girls in years 1 to 4 from 69 schools in the analysis sample – comprising 7,559 girls in 35 intervention schools and 5,729 girls in 34 comparison schools.

Table 13 summarises the sources of attrition for test scores between randomisation and analysis. Around 7.5% of pupil attrition was due to pupils having all test scores missing. The second largest source of attrition for test scores is because pupils were dropped from schools that did not have any relevant data for years 1 to 4 at endline – this arose where schools did not have test scores for pupils in years 1 to 4.

Table 13: Sources of overall attrition for educational attainment outcomes

		Intervention	Control	Total
Pupils dropped from schools that did not have any relevant endline data for years 1-4	Number	364	813	1,177
	Percentage	4.1%	10.9%	7.2%
Individual pupils not linked between baseline and endline	Number	217	269	486
	Percentage	2.5%	3.6%	3.0%
Gender missing at endline or inconsistent with baseline	Number	50	43	93
	Percentage	0.6%	0.6%	0.6%
Test scores missing for all subjects	Number	593	635	1,228
	Percentage	6.8%	8.5%	7.5%

Secondary outcomes: pupil survey

Table 14: Pupil level attrition from the trial (survey outcomes)

		Intervention	Control	Total
Number of pupils (number of schools)	Randomised	959 (40)	912 (38)	1871 (78)
	Analysed: overall	818 (39)	791 (37)	1609 (76)
Pupil attrition (from randomisation to analysis)	Number	141	121	262
	Percentage	14.7 %	13.3%	14.0%

Table 14 summarises pupil level attrition for survey outcomes. Baseline pupil survey data was available for 1,919 pupils from 80 schools. Endline pupil surveys were collected from 1,711 pupils across 79 schools in May-June 2024.

An additional 48 pupil surveys which were collected from two schools not in the trial and were excluded from analysis – these have not been included in the attrition table above. Baseline surveys were therefore collected from 959 pupils in 40 intervention schools and 912 pupils in 38 comparison schools – a total of 1,871 pupils from 78 schools. Similarly, endline surveys were collected from 829 pupils in 39 intervention schools and 834 pupils in 38 comparison schools – a total of 1,663 pupils from 77 schools.

Pupils' baseline surveys and endline surveys were linked together using school, pupil ID, gender, age, and school year. This resulted in 1,609 surveys linked between baseline and endline, for pupils from 76 schools – 818 pupils from 39 intervention schools, and 791 pupils from 37 intervention schools. This linked sample corresponds to the analysis sample for the pupil survey.

Table 15 summarises the sources of attrition for the pupil survey between randomisation and analysis. While 77 schools had pupil surveys at baseline and endline, only 76 schools were included in the analysis sample, as one school dropped out of the sample because no pupil surveys could be linked for this school using the identifiers mentioned above. Around 12% of pupil attrition was due to issues with linking pupil surveys between baseline and endline.

Table 15: Sources of overall attrition for survey outcomes

		Intervention	Control	Total
Pupils dropped from schools that were not in endline data	Number	24	0	24
	Percentage	2.5%	0.0%	1.3%
Pupils not linked between baseline and endline	Number	117	121	238
	Percentage	12.2%	13.3%	12.7%

Table 16 summarises numbers and rates of responses for the outcomes analysed using pupil survey data. The numbers randomised reflect the number of pupils who were eligible to respond to the questions. Numbers analysed reflect the numbers of responses included in analysis. The analysis samples for each outcome were lower than the total number of respondents to the survey due to pupils not responding to large sections of the survey, as well as due to specific questions having lower numbers of analysed responses than others. Response rates were lowest at 42% for boys' reporting their lack of support towards menstruation. Response rates were highest at 70.8% for knowledge of menstruation, open attitudes towards menstruation, and girls' perceptions of support when on their last menstrual period.

Table 16: Response numbers and rates for pupil survey outcomes

		Intervention	Control	Total

Knowledge	Randomised	959	912	1871
	Analysed	662	662	1324
	Percentage	69.0%	72.6%	70.8%
Positive attitudes	Randomised	959	912	1871
	Analysed	654	659	1313
	Percentage	68.2%	72.3%	70.2%
Open attitudes	Randomised	959	912	1871
	Analysed	662	662	1324
	Percentage	69.0%	72.6%	70.8%
Boys' lack of support towards menstruation	Randomised	477	454	931
	Analysed	209	182	391
	Percentage	43.8%	40.1%	42.0%
Girls' experiences of negative support	Randomised	482	458	940
	Analysed	278	308	586
	Percentage	57.7%	67.2%	62.3%
Girls' perceptions of support while menstruating	Randomised	388	377	765
	Analysed	276	266	542
	Percentage	71.1%	70.6%	70.8%

Pupil and school characteristics

Table 17 presents the distribution of school and pupil characteristics at baseline across the intervention and control groups, based on the analysis sample (i.e., complete cases only as per the inclusion criteria in the Attrition section above). The table shows the breakdown by region, area type (urban/rural), gender, and grade to ensure comparability between the two groups.

Schools were evenly distributed across the four regions with 20 schools per region, however the number of pupils within the schools varied across regions. The highest number of pupils were in the North West region schools (5884) and the lowest in the East region schools (1585). Rural schools made up 30% of the intervention group in the East and North West regions, compared to 22.2% and 40% in the control group for the same regions, respectively. The proportion of rural schools was higher in the South West region at 33.3% and Far North at 40% with control groups at 20 and 40% respectively.

Gender distribution was relatively balanced between the groups, with 45.5% to 55.2% of female pupils in the intervention group and 44.6 % to 62.3% female pupils in the control group in the East, Far North and North West regions. South West had a relatively higher percentage of female pupils with 70% in the intervention schools and 65.4% in control schools.

When disaggregated by grade level, pupils from Form 1 to 5 had roughly similar proportions in the intervention group with the highest being 18.6% and the lowest being 10.2% in the South West, North West and East regions. In South West and North West regions, proportions of pupils in Form 6-7 generally fell within the similar range as the rest of the years. In East and Far North regions, however, Form 6 and 7 had very low proportions compared to the rest of the year levels ranging between 6.3 to 9.7%. Unlike other regions, Far North region had a larger variation between Form levels ranging between 24.1% to 20.7% across Forms 1 to 3 and dropping to 12.8% at Form 4 and then 7.6% at Form 5. Across regions, the proportions of pupils in Form 1 were generally higher in the control group, while the intervention group had higher proportions in other year levels.

The table below suggests some variations between intervention and usual practice groups, particularly in gender distribution and year-level composition. The subgroup analysis section will explore whether year-level imbalances may have an effect on the findings. Each entry in the 'n/N (missing)' field shows the distribution of responses. The first number (n) indicates the count of cases showing the attribute of interest (for example, rural status or being female), while the second number (N) shows the count of cases not exhibiting the attribute. The figure in parentheses is the number of observations where the data were not recorded. For example, '1955 / 1585 (132)' under 'Proportion of female pupils in the schools' for the Intervention group means that 1,955 pupils are female, 1,585 are not (i.e. male), and there are 132 cases with missing data for this variable.

Table 17: Characteristics of groups as randomised

	Intervention		Control	
	n/N (missing)	Count (%)	n/N (missing)	Count (%)
East				
Proportion of schools in rural areas	3 / 7 (0)	30	2 / 7 (0)	22.2
Proportion of female pupils in the schools	1955 / 1585 (132)	55.2	2284 / 1385 (197)	62.3
Proportion by year level				
Form 1	624 / 2985 (63)	17.3	1085 / 2781 (0)	28.1
Form 2	673 / 2936 (63)	18.6	728 / 3138 (0)	18.8
Form 3	555 / 3054 (63)	15.4	506 / 3360 (0)	13.1
Form 4	591 / 3018 (63)	16.4	554 / 3312 (0)	14.3
Form 5	491 / 3118 (63)	13.6	471 / 3395 (0)	12.2
Form 6	349 / 3260 (63)	9.7	323 / 3543 (0)	8.4
Form 7	326 / 3283 (63)	9	199 / 3667 (0)	5.1
Far North				
Proportion of schools in rural areas	4 / 6 (0)	40	4 / 6 (0)	40
Proportion of female pupils in the schools	3839 / 4594 (391)	45.5	2865 / 3558 (182)	44.6
Proportion by year level				
Form 1	1824 / 7000 (0)	20.7	1289 / 5208 (108)	19.8
Form 2	2084 / 6740 (0)	23.6	1214 / 5283 (108)	18.7
Form 3	2128 / 6696 (0)	24.1	994 / 5503 (108)	15.3
Form 4	1129 / 7695 (0)	12.8	728 / 5769 (108)	11.2
Form 5	669 / 8155 (0)	7.6	1017 / 5480 (108)	15.7
Form 6	436 / 8388 (0)	4.9	515 / 5982 (108)	7.9
Form 7	554 / 8270 (0)	6.3	740 / 5757 (108)	11.4
North West				
Proportion of schools in rural areas	3 / 7 (0)	30	5 / 4 (1)	55.6
Proportion of female pupils in the schools	6108 / 5884 (611)	50.9	2635 / 1902 (246)	58.1
Proportion by year level				
Form 1	1774 / 10825 (4)	14.1	726 / 4051 (6)	15.2
Form 2	1341 / 11258 (4)	10.6	1028 / 3749 (6)	21.5

Form 3	1581 / 11018 (4)	12.5	729 / 4048 (6)	15.3
Form 4	1627 / 10972 (4)	12.9	664 / 4113 (6)	13.9
Form 5	1873 / 10726 (4)	14.9	741 / 4036 (6)	15.5
Form 6	1788 / 10811 (4)	14.2	320 / 4457 (6)	6.7
Form 7	1390 / 11209 (4)	11	473 / 4304 (6)	9.9
North West				
Proportion of schools in rural areas	3 / 6 (1)	33.3	2 / 8 (0)	20
Proportion of female pupils in the schools	6211 / 2663 (380)	70	5705 / 3021 (304)	65.4
Proportion by year level				
Form 1	1413 / 7772 (69)	15.4	1247 / 7688 (95)	14
Form 2	1450 / 7735 (69)	15.8	1494 / 7441 (95)	16.7
Form 3	1646 / 7539 (69)	17.9	1450 / 7485 (95)	16.2
Form 4	1349 / 7836 (69)	14.7	1368 / 7567 (95)	15.3
Form 5	1603 / 7582 (69)	17.5	1440 / 7495 (95)	16.1
Form 6	654 / 8531 (69)	7.1	1102 / 7833 (95)	12.3
Form 7	1070 / 8115 (69)	11.6	834 / 8101 (95)	9.3

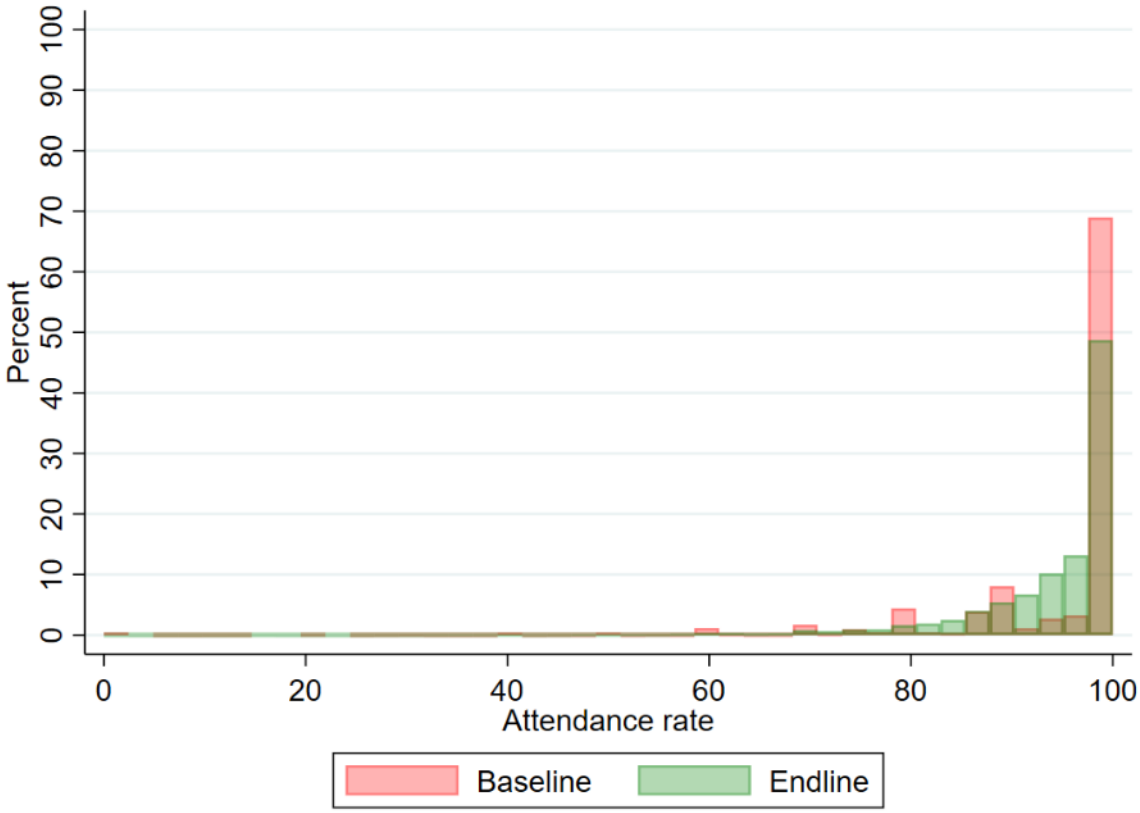
Outcomes and analysis

Primary analysis

The distribution of the female pupil attendance rate is shown in Figure 3, with the baseline distribution in pink and the endline distribution in green. The primary analysis sample includes 13,369 female pupils in Form 1 to Form 7. The attendance rate ranges between 0 and 100 with an overall mean of 94.5 and a standard deviation of 12.3 at endline.

The distribution of the outcome, both at endline and baseline, is not normally distributed with a skew towards high attendance rates and a ceiling effect towards 100 percent (i.e. full attendance). Although the attendance rate distribution is skewed and exhibits a ceiling effect, this pattern aligns with expectations given near-universal school attendance. Nonetheless, these distributional characteristics may reduce sensitivity to detect larger changes, which implies that the observed improvement might be conservative. Plotting endline residuals against fitted values (see Appendix E: Figure E1) reveals some slight variations in the dispersion of residuals, with higher variance towards the extremes of the fitted values distribution, suggesting mild evidence of heteroskedasticity. However, the variance of the residuals appears relatively constant for the large majority of the sample. Given the slight heteroskedasticity observed, we report both conventional and robust standard errors.

Figure 3: Primary outcome measure – distribution of attendance at baseline and endline



As described in the method section, the primary analysis follows an ITT approach using a multi-level model. Results from this analysis are presented in Table 18 with the corresponding effect sizes reported in Table 19.[20]

The adjusted mean difference amounts to 1.57 percentage points with an associated p-value equal to 0.028. The corresponding effect size is equal to 0.160 (95% CI: 0.126, 0.194). This finding suggests an improvement of the female pupil attendance rate in the intervention group relative to the control group. Despite the ceiling from the high levels of attendance even in the absence of the intervention, the adjusted mean difference of 1.57 percentage points could represent a relative improvement that is meaningful in a context where attendance is already near universal.

Additional sensitivity analysis using a specification with robust standard errors produced a nearly identical treatment effect (1.57, robust SE = 0.68, p = 0.020; 95% CI: 0.24, 2.90), suggesting that findings are not sensitive to heteroskedasticity. Appendix Tables G3 and G4 present sensitivity analysis results from models that include covariates that were imbalanced at baseline (year group and the proportion of female pupils in the school). Results are similar to those presented in the main specification with an effect size of 0.173 (95% CI: 0.139-0.217).

Table 18: Primary outcome analysis results

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	variance of outcome	n (missing)	variance of outcome	
Attendance rate (female)	2.71	1.57	7116 (4566)	64.9	6253 (4053)	129	95.1

Table 19: Primary outcome analysis – effect size estimation

Outcome	Unadjusted means		Effect size
	Intervention group	Control group	

[20] Pre-post correlations between baseline and endline measures are reported for all outcomes in Appendix D.

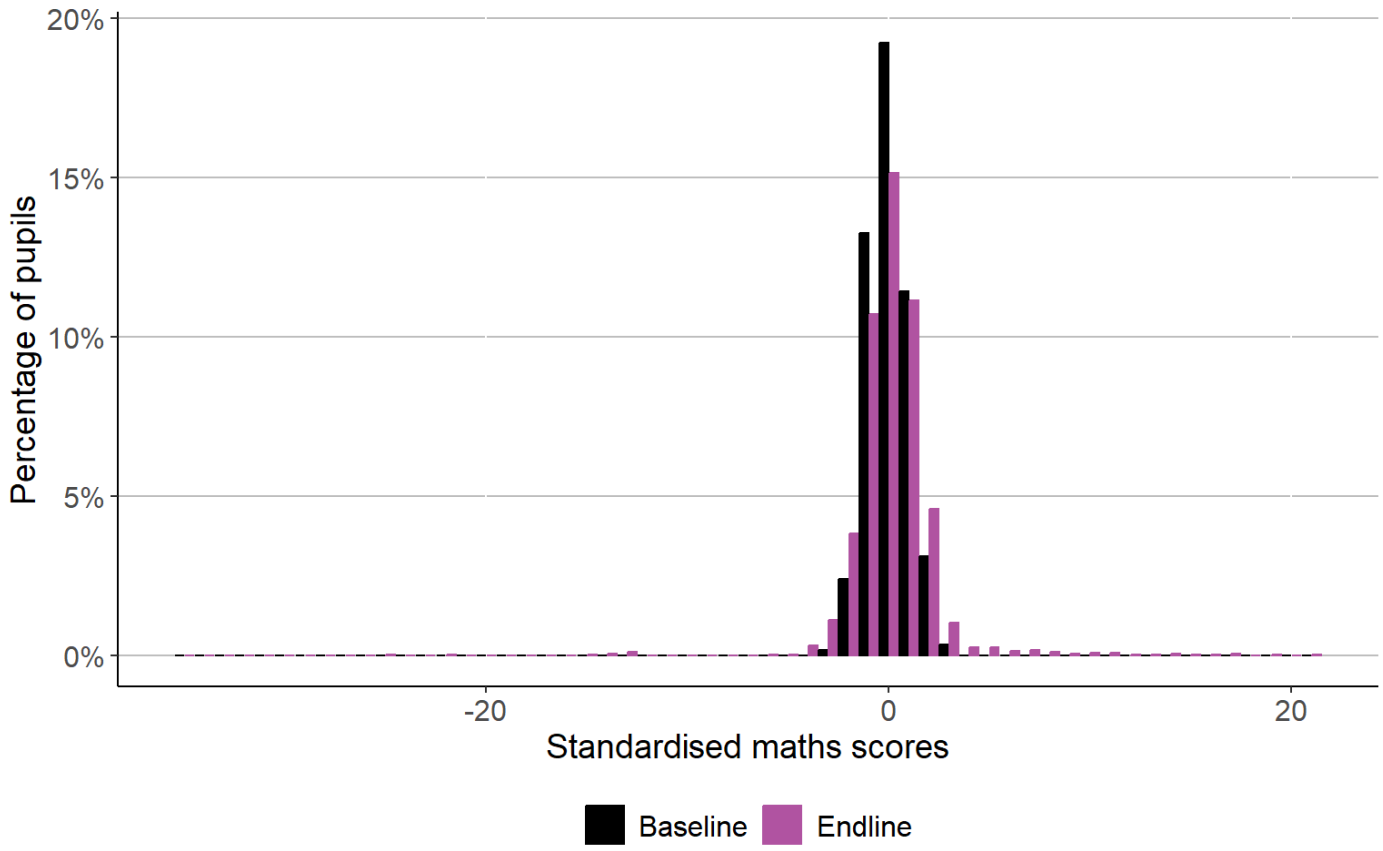
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (intervention; control)	Hedges g (95% CI)	p-value
Attendance rate (female)	7116 (4,566)	95.1 (94.9, 95.3)	6253 (4,053)	92.4 (92.1, 92.7)	13369 (7116: 6253)	.16 (.126,.194)	0.028

Educational attainment outcomes

Girls' maths test scores

The distributions of girls' attainment in maths tests at baseline and endline are shown in Figure 4. The outcome is a continuous measure of maths test scores at endline standardised by school and year group specific baseline maths scores. The analytical sample for this outcome consists of 11,886 girls in years 1 to 4 with non-missing maths test scores at endline and baseline. The outcome ranges from -35.006 to 20.624 for this sample, with an overall mean of 0.150 and standard deviation of 2.644.

Figure 4: Secondary outcome measure – distribution of girls' standardised maths test scores at baseline and endline



Results from secondary analysis of this outcome are shown in Table 20, with Table 21 reporting impact estimates.

Table 20: Secondary outcome analysis results – girls' maths test scores

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Girls' maths test scores	-0.263	-0.612	6,611 (2,172)	8.463	5,275 (2,214)	5.115	6.977

Table 21: Secondary outcome analysis for girls' maths test scores – effect size estimation

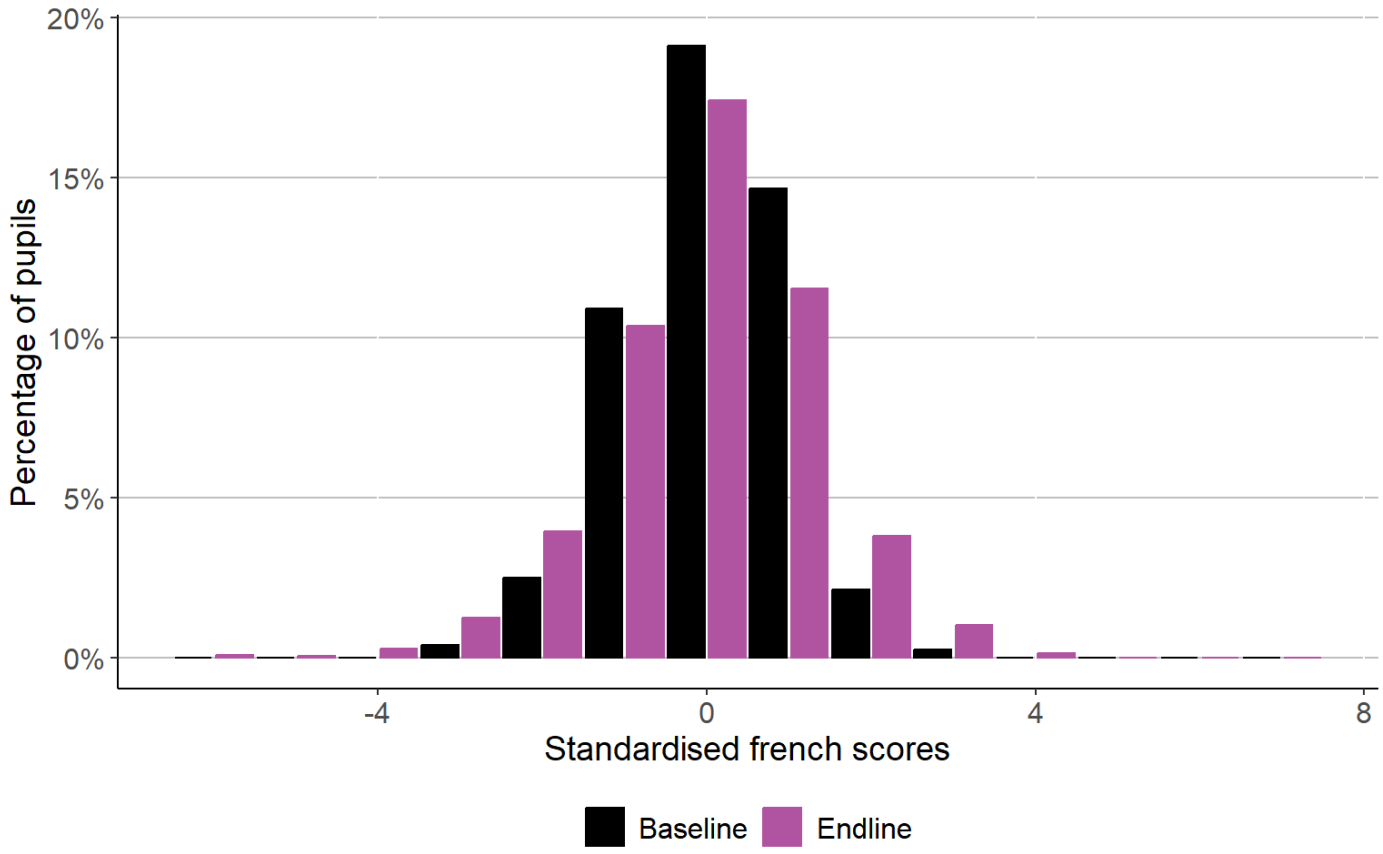
	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Girls' maths test scores	6,611 (2,172)	0.034 (-0.036, 0.104)	5,275 (2,214)	0.297 (0.236, 0.358)	11,886 (6,611; 5,275)	-0.232 (-0.575, 0.112)	0.217

The adjusted difference in means for girls' maths attainment is -0.612, with a p-value of 0.217, and an associated effect size of -0.232 (95% CI: -0.575, 0.112). These results do not provide evidence of an effect of the MHM intervention on pupils' maths attainment at endline, as the confidence intervals span zero, indicating uncertainty about the nature of the effect on girls' maths scores. Girls in control group schools improved by a larger amount relative to the baseline maths scores in their school-year group compared to girls in intervention schools, as indicated by their unadjusted mean standardised scores at endline. The adjusted difference in means is more pronounced when accounting for baseline maths performance relative to their school-year group, indicating that girls from control schools were likely to have higher endline scores than even girls with similar levels of baseline maths performance (relative to their school-year specific average maths scores) in intervention schools from the same location types and regions.

Girls' French test scores

The distributions of the outcome measuring girls' attainment in French tests at baseline and endline are shown in Figure 5. The outcome is a continuous measure of French test scores at endline standardised by school and year group specific baseline French test scores. The analytical sample for this outcome consists of 5,328 girls in years 1 to 4 in the East and Far North regions with non-missing French test scores at endline and baseline. The outcome ranges from -6.437 to 6.542 for this sample, with an overall mean of -0.028 and standard deviation of 1.273.

Figure 5: Secondary outcome measure – distribution of girls' standardised French test scores at baseline and endline



Results from secondary analysis of this outcome are shown in Table 22, with Table 23 reporting impact estimates.

Table 22: Secondary outcome analysis results – girls' French test scores

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Girls' French test scores	-0.083	0.265	2,683 (905)	1.767	2,645 (930)	1.467	1.618

Table 23: Secondary outcome analysis for girls' French test scores – effect size estimation

	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Girls' French test scores	2683 (905)	-0.070 (-0.12, -0.019)	2,645 (930)	0.013 (-0.033, 0.059)	5,328 (2,683; 2,645)	0.209 (-0.117, 0.53)	0.246

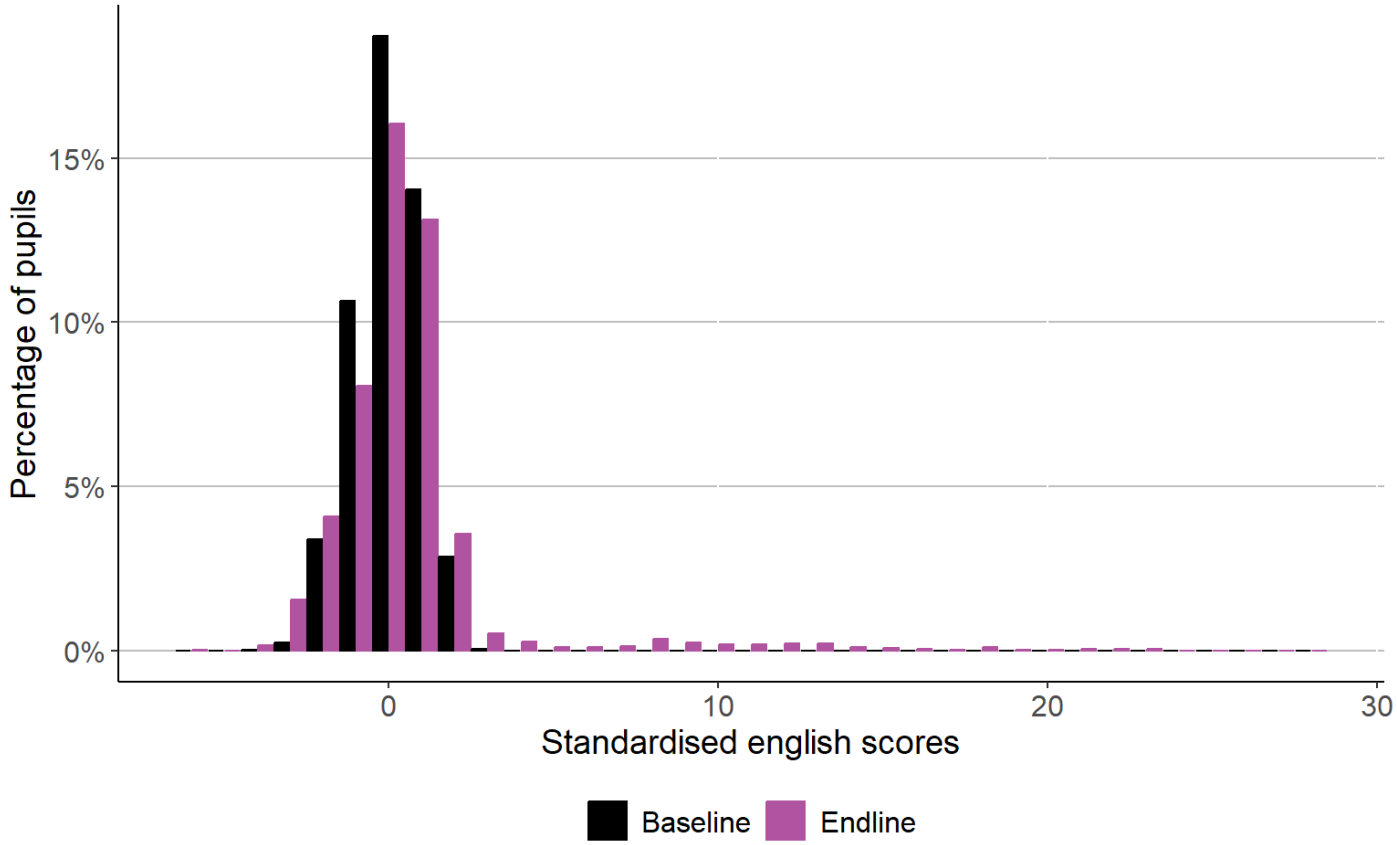
The adjusted difference in means for girls' French attainment is 0.265, with a p-value of 0.246, and an associated effect size of 0.209 (95% CI: -0.117, 0.530). The unadjusted means indicate that girls in intervention schools had lower standardised French scores at endline (relative to their baseline school-year specific averages) compared to girls in control schools. However, after accounting for their baseline French attainment and differences in region and location

type, girls in intervention schools were likely to have higher standardised French scores at endline compared to their counterparts in control schools. However, the wide confidence intervals indicate uncertainty about whether there was any effect of the intervention on girls' French test scores. These results do not provide evidence of a positive effect of the MHM intervention on pupils' French attainment at endline.

Girls' English test scores

The distributions of the outcome measuring girls' attainment in English tests at baseline and endline are shown in Figure 6. The outcome is a continuous measure of English test scores at endline standardised by school and year group specific baseline English test scores. The analytical sample for this outcome consists of 7,059 girls in years 1 to 4 in the North West and South West regions with non-missing English test scores at endline and baseline. The outcome ranges from -6.377 to 27.670 for this sample, with an overall mean of 0.618 and standard deviation of 3.008.

Figure 6: Secondary outcome measure – distribution of girls' standardised English test scores at baseline and endline



Results from secondary analysis of this outcome are shown in Table 24, with Table 25 reporting impact estimates.

Table 24: Secondary outcome analysis results – girls' English test scores

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Girls' English test scores	0.468	0.142	4,376 (819)	10.457	2,683 (1,231)	6.616	8.997

Table 25: Secondary outcome analysis for girls' French test scores – effect size estimation

	Unadjusted means	Effect size

	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Girls' English test scores	4,376 (819)	0.796 (0.701, 0.892)	2,683 (1,231)	0.328 (0.231, 0.426)	7,059 (4,376; 2,683)	0.047 (-0.484, 0.579)	0.869

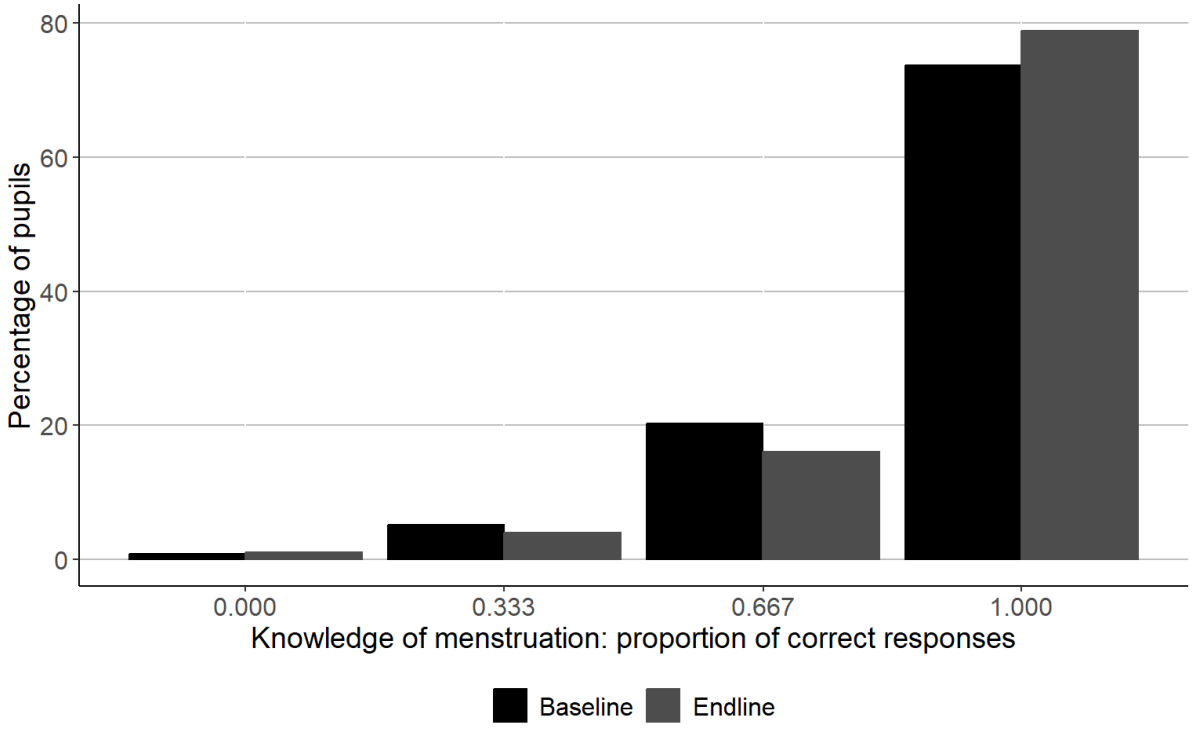
The adjusted difference in means for girls' English attainment is 0.142, with a p-value of 0.869, and an associated effect size of 0.047 (95% CI: -0484, 0.579). The unadjusted means indicate that intervention schools had higher levels of attainment on average, with a positive difference relative to comparison schools. However, this positive difference is accounted for by including girls' baseline English attainment and stratification variables (location type and region) in the adjusted model. There is no evidence that the MHM intervention had an effect on pupils' English attainment at endline.

Secondary analysis

Knowledge of menstruation

The distributions of the outcome measuring knowledge of menstruation at baseline and endline are shown in Figure 7. For pupils in the analytical sample (1,324 pupils with observed data on all variables), the knowledge outcome has an overall mean of 0.909 and standard deviation of 0.195 at endline. The range for the analytical sample for the knowledge outcome is from 0 to 1, with higher values equating to greater knowledge.

Figure 7: Secondary outcome measure – distribution of knowledge of menstruation at baseline and endline



Observations are not normally distributed as most pupils have accurate knowledge of menstruation, indicating a ceiling effect may be in place for this outcome. Plotting the residuals against the fitted values shows that residual variance for the adjusted model does not vary substantially over the central range of fitted values. There is mild evidence of

heteroskedasticity in residuals with smaller variances towards the higher and lower ends of the distribution of fitted values (Appendix Figure E1).[21]

Similar to the primary analysis, the secondary analysis of the survey outcomes uses a multi-level model following an intention-to-treat approach. Results from the analysis of the outcome measuring knowledge of menstruation are shown in Table 26, with effect sizes shown in Table 27.

Table 26: Secondary outcome analysis results – knowledge of menstruation

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Knowledge of menstruation	0.037	0.028	662 (297)	0.03	662 (250)	0.045	0.038

Table 27: Secondary outcome analysis for knowledge of menstruation – effect size estimation

	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Knowledge of menstruation	662 (297)	0.927 (0.914, 0.941)	662 (250)	0.891 (0.875, 0.907)	1324 (662; 662)	0.143 (-0.063, 0.352)	0.205

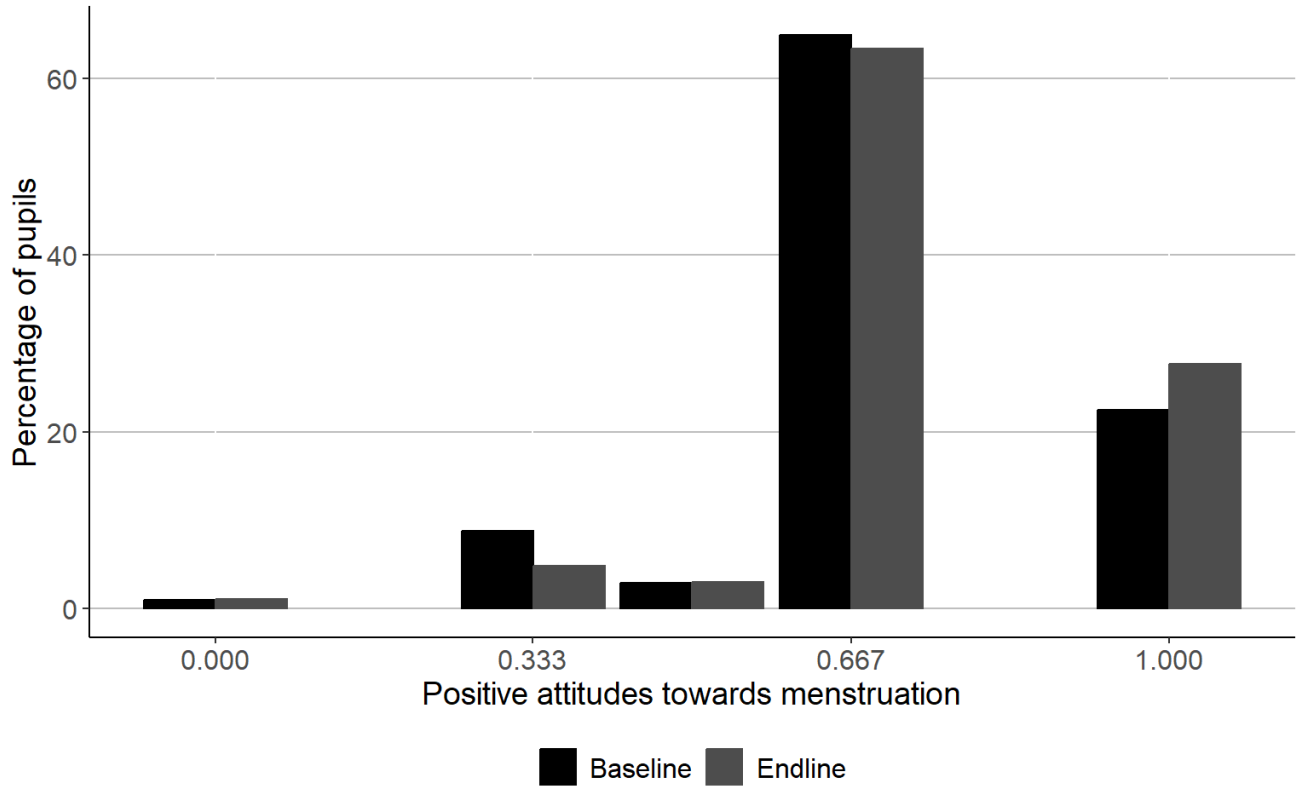
The adjusted difference in means for the knowledge outcome is equal to 0.028, with a p-value of 0.205, and an associated effect size of 0.143 (95% CI: -0.063, 0.352). This finding does not indicate that the MHM intervention increased pupils' knowledge of menstruation, as confidence intervals span zero and include negative values suggesting uncertainty as to whether the intervention had a positive impact. This uncertainty about the effect of the intervention speaks to the analysis being statistically underpowered. The analysis only had statistical power to detect standardised effects of 0.316 or larger on the pupil survey outcomes (refer to MDES Table 4 above).

Positive attitudes towards menstruation

The distributions of the outcome measuring positive attitudes towards menstruation at baseline and endline are shown in Figure 8. For pupils in the analytical sample for this outcome (1,313 pupils with observed data on all variables), the positive attitudes outcome has an overall mean of 0.733 and standard deviation of 0.200 at endline. The range for the analytical sample for the positive attitudes outcome is from 0 to 1, with 1 equating to more positive attitudes.

[21] Findings do not differ qualitatively when pupil survey outcome models are estimated with cluster robust standard errors.

Figure 8: Secondary outcome measure – distributions of positive attitudes towards menstruation at baseline and endline



The outcome measure takes a limited number of values and is not normally distributed, with pupils tending to have more positive attitudes towards menstruation on average. Appendix Figure E2 shows that residuals have largely constant variance over the range of predicted scores for this outcome measure.

Results from the analysis for the outcome measuring positive attitudes towards menstruation are shown in Table 28, with effect sizes reported in Table 29.

Table 28: Secondary outcome analysis results – positive attitudes towards menstruation

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Positive attitudes towards menstruation	0.004	0.002	654 (305)	0.040	659 (253)	0.036	0.038

Table 29: Secondary outcome analysis for positive attitudes towards menstruation – effect size estimation

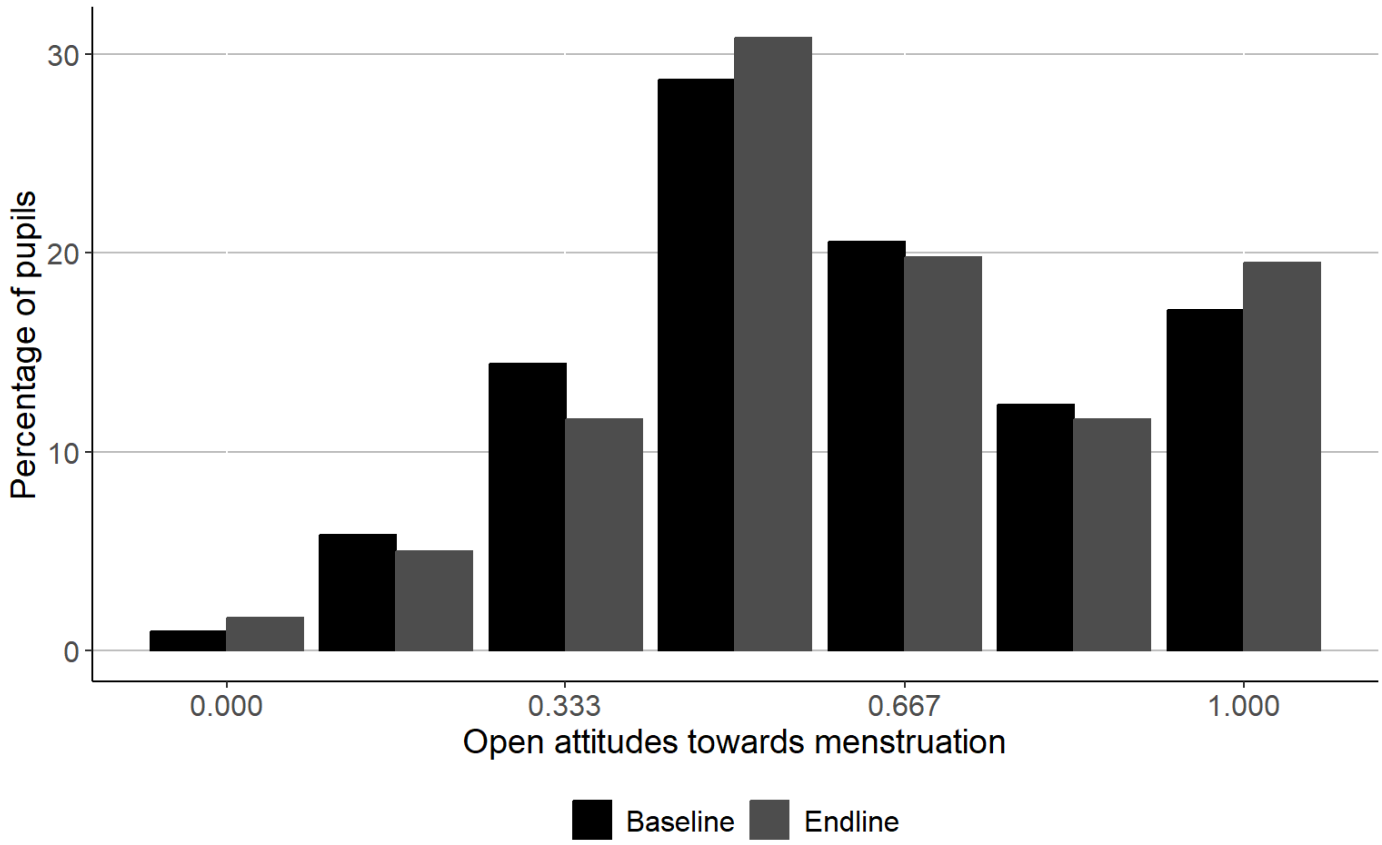
	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Positive attitudes towards menstruation	654 (305)	0.733 (0.718, 0.748)	659 (253)	0.729 (0.714, 0.743)	1313 (654; 659)	0.010 (-0.190, 0.209)	0.927

The adjusted difference in means for the positive attitudes to menstruation outcome is close to zero at 0.002, with a p-value of 0.927. The corresponding standardised effect size is 0.010 (95% CI: -0.190, 0.209). There is no evidence to indicate that the MHM intervention enhanced positive attitudes towards menstruation, as endline attitudes towards menstruation were similar on average across intervention and comparison school pupils, though analysis was likely statistically underpowered.

Open attitudes towards discussing menstruation

Figure 9 shows the distributions of the outcome measuring openness of attitudes towards discussing menstruation with others at baseline and endline. There are 1,324 pupils in the analytical sample with data on all variables included in analysis for this outcome. The outcome measure at endline has an overall mean of 0.625 and standard deviation of 0.254 for pupils in the analytical sample. The outcome measure ranges from 0 to 1, with one equating to the highest level of open attitudes.

Figure 9: Secondary outcome measure – distribution of open attitudes towards menstruation at baseline and endline



Observations are not normally distributed, as the distribution of attitudes has a heavy right tail and is also skewed towards lower values. Appendix Figure E3 shows that residual variance is larger at the centre of the score distribution as fewer observations have scores towards the higher and lower end of the distribution. As there is no strong evidence of heteroskedasticity, no additional analysis is conducted to account for this.

Results from secondary analysis of the open attitudes outcome are shown in Table 30, with Table 31 reporting impact estimates.

Table 30: Secondary outcome analysis results – open attitudes towards discussing menstruation

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance

Open attitudes towards discussing menstruation	0.055	0.036	662 (297)	0.060	662 (250)	0.068	0.064

Table 31: Secondary outcome analysis for open attitudes towards discussing menstruation – effect size estimation

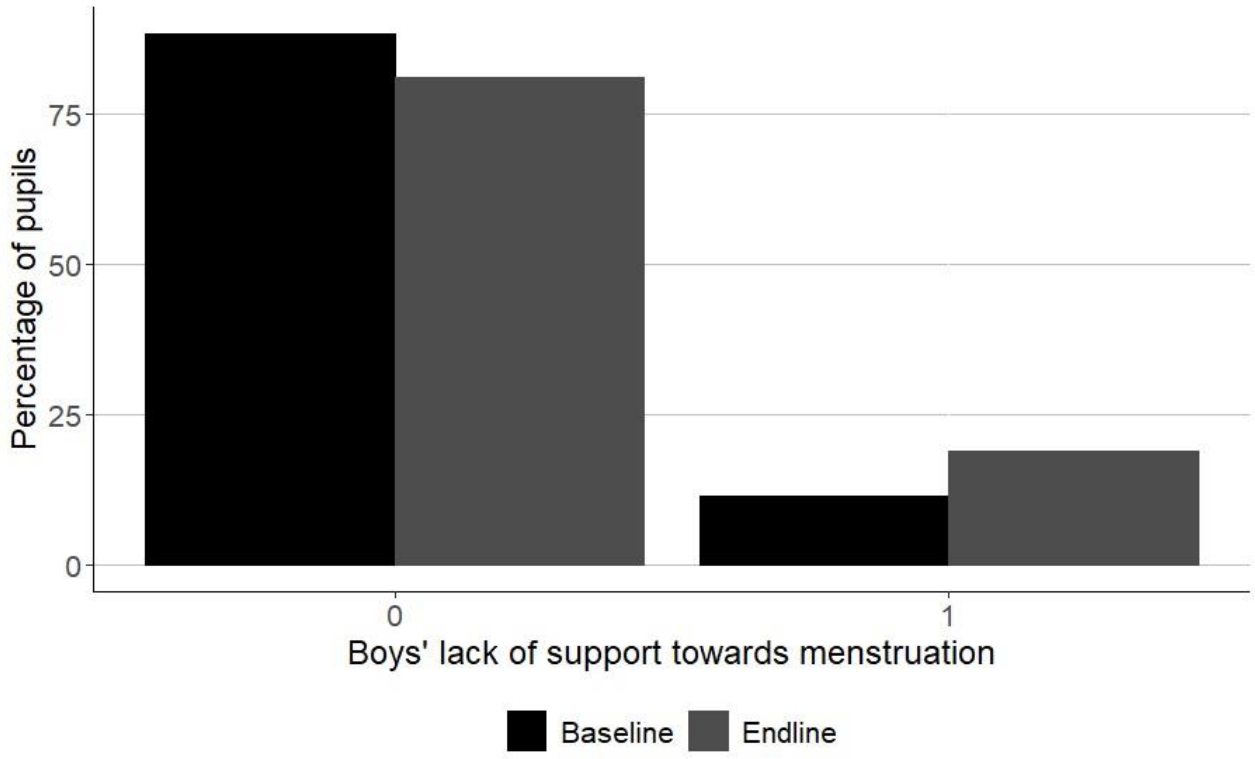
	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Open attitudes towards discussing menstruation	662 (297)	0.653 (0.634, 0.671)	662 (250)	0.597 (0.577, 0.617)	1324 (662; 662)	0.142 (-0.088, 0.373)	0.257

The adjusted difference in means for the open attitudes outcome is 0.036, with a p-value of 0.257. This is associated with a standardised effect size of 0.142 (95% CI: -0.088, 0.373). There is no evidence to suggest that the MHM intervention increased pupils' openness towards girls' discussing menstruation with others, as confidence intervals span zero and include negative values.

Boys' lack of support towards menstruation

Figure 10 shows distributions at baseline and endline for the binary indicator of whether boys' reported making fun of others about periods. For the 391 male pupils in the analytical sample for this outcome, the overall mean was 0.189 with a standard deviation of 0.392. The outcome is a binary indicator taking the values 0 or 1, where 1 equates to boys reporting making fun of others about periods.

Figure 10: Secondary outcome measure – distributions of boys' lack of support towards menstruation at baseline and endline



Results from secondary analysis of this outcome are shown in Table 32, with Table 33 reporting impact estimates.

Table 32: Secondary outcome analysis results – boys' lack of support towards menstruation

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Boys' lack of support towards menstruation	0.005	-0.029	209 (268)	0.156	182 (272)	0.153	0.154

Table 33: Secondary outcome analysis for boys' lack of support towards menstruation – effect size estimation

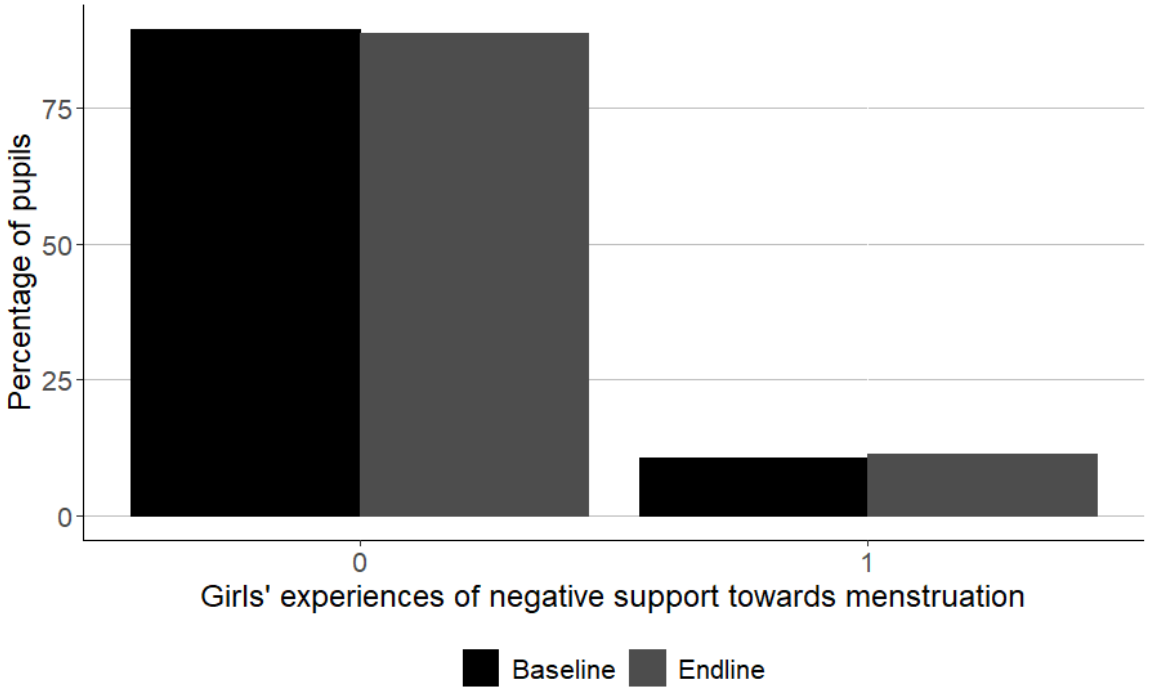
	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Boys' lack of support towards menstruation	209 (268)	0.191 (0.138, 0.245)	182 (272)	0.187 (0.13, 0.244)	391 (209; 182)	-0.073 (-0.343, 0.204)	0.631

The adjusted difference in means for this outcome is equal to -0.029 with a p-value of 0.631. The standardised effect size is -0.073 (95% CI: -0.343, 0.204). Though the adjusted difference in boys' reported behaviour indicates that boys in intervention schools were less likely to report making fun of others about periods, there is no evidence of this effect showing a reduction in boys' lack of support towards menstruation, given the wide confidence interval. As the confidence interval spans positive and negative values, there is a high level of uncertainty as to whether the MHM intervention led to a marked change in boys' support towards menstruation in any direction. Note that the question that is used for this outcome asks boys to report instances of making fun at any previous time. This measure therefore includes long-term behaviour and does not necessarily only capture behaviour since the start of the intervention. It may therefore be limited in the extent to which it can demonstrate changes in behaviour after the intervention.

Girls' experiences of negative support for menstruation

The distributions of the outcome measuring girls' experiences of being made fun of about menstruation at baseline and endline are shown in Figure 11. For pupils in the analytical sample for this outcome (586 female pupils with observed data on all variables), the outcome has an overall mean of 0.110 and standard deviation of 0.314. The outcome is a binary indicator taking the value 0 or 1 for all pupils included in analysis, where 1 equates to a girl reporting that she had experienced being made fun of about menstruation.

Figure 11: Secondary outcome measure – distribution of girls' experience of negative support at baseline and endline



Results from secondary analysis of this outcome are shown in Table 34, with Table 35 reporting impact estimates.

Table 34: Secondary outcome analysis results – girls' experiences of negative support towards menstruation

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means)	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Girls' experiences of negative support towards menstruation	0.039	0.023	278 (204)	0.116	308 (150)	0.086	0.100

Table 35: Secondary outcome analysis for girls' experiences of negative support towards menstruation – effect size estimation

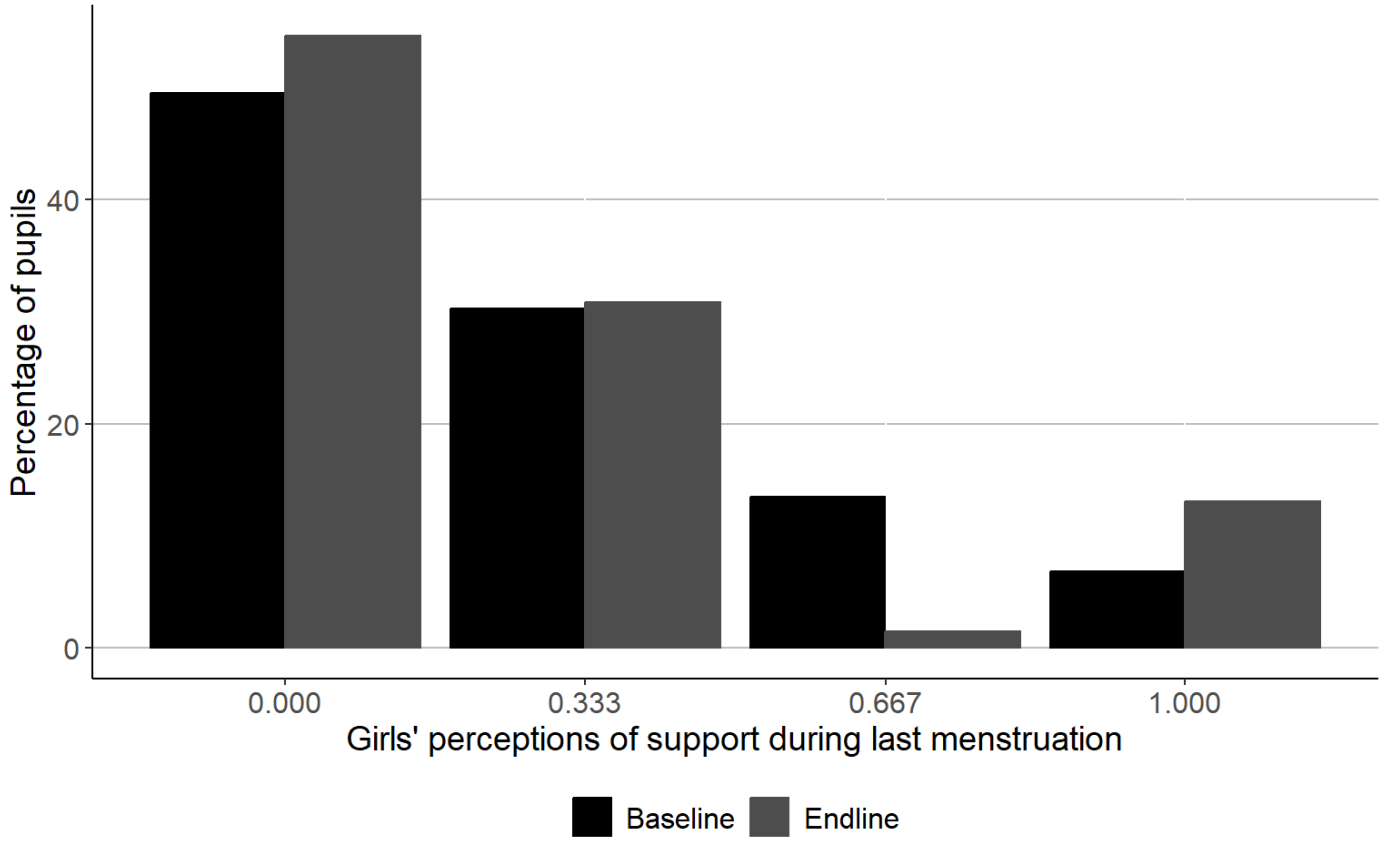
	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Girls' experiences of negative support towards menstruation	278 (204)	0.133 (0.093, 0.173)	308 (150)	0.094 (0.061, 0.127)	586 (278; 308)	0.072 (-0.166, 0.312)	0.577

The adjusted difference in means for girls' experiences of negative support is equal to 0.023, with a p-value of 0.577, and an associated effect size of 0.072 (95% CI: -0.166, 0.312). These results do not provide evidence of a positive effect of the MHM intervention on pupils' knowledge of menstruation, as the wide confidence intervals indicate uncertainty about the nature of the effect on girls' experiences of support. Similar to the question used to measure boys' lack of support this question also asks about instances of being made fun of at any point, not restricted to time since the start of the intervention. This may restrict the degree to which this outcome may demonstrate change, as the outcome may only capture longer term behaviour.

Girls' perceptions of support while menstruating

Figure 12 shows distributions of the outcome measuring girls' perceptions of supportiveness in school while on their last menstrual period at baseline and endline. There were 542 girls included in the analytical sample for this outcome, with mean of 0.244 and standard deviation of 0.336 at endline. The outcome measure took values ranging from 0 to 1 (where 1 equals high perceived support).

Figure 12: Secondary outcome measure – distribution of girls' perceptions of support while menstruating at baseline and endline



Observations were skewed towards the right as the majority of girls did not feel that others in school were supportive during their last period. Appendix Figure E4 shows that there is mild heteroskedasticity as residuals from the adjusted model for the analysis of this outcome show lower variance towards the ends of the distribution. Results from secondary analysis of this outcome are shown in Table 36, with Table 37 reporting impact estimates.

Table 36: Secondary outcome analysis results – girls' perceptions of support towards menstruation

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Girls' perceptions of support towards menstruation	0.129	0.083	276 (112)	0.136	266 (111)	0.081	0.109

Table 37: Secondary outcome analysis for girls' perceptions of support towards menstruation – effect size estimation

	Unadjusted means		Effect size
	Treatment group	Control group	

Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Girls' perceptions of support towards menstruation	276 (112)	0.307 (0.263, 0.35)	266 (111)	0.178 (0.144, 0.212)	542 (276; 266)	0.250 (-0.024, 0.533)	0.099

The adjusted difference in means for this outcome is equal to 0.083, with a p-value of 0.099 and an associated standardised effect size of 0.250 (95% CI: -0.024, 0.533). This finding does not provide strong evidence that the MHM intervention had a positive effect on girls' feeling positively supported when attending school while menstruating. The confidence intervals around the effect size span zero and include negative values, indicating uncertainty about the nature of the true effect of the intervention.

Analysis in the presence of non-compliance

A continuous compliance measure was developed at the school level to reflect overall adherence. A CACE analysis for the primary outcome (girls' attendance) was performed on complete cases only. Results are presented in Table 38.

Out of the 40 schools that received the MHM intervention, the average compliance score was calculated to be 0.863. 1 school has a score of 0 (non-compliance), and 17 schools have a score of 1 (full compliance).

The first stage of the analysis regressed the compliance indicator on the intervention status, yielding a coefficient of 0.863 ($p < 0.001$) and an F-test statistic of 13,169, demonstrating that the instrument is relevant and highly correlated with the compliance indicator. In the second stage, after instrumenting for compliance, the adjusted difference in means for attendance was estimated at 1.82 percentage points (se = 0.775). The corresponding Hedges' g effect size was 0.186 (95% CI: 0.152; 0.220). Because the confidence interval does not include zero, we reject the null hypothesis that the intervention had no impact on schools that complied with intervention delivery requirements. These findings show evidence of stronger impact for schools that had greater levels of compliance with the MHM intervention delivery.

Table 38: CACE Analysis for the Primary Outcome

Model	Total n (pupils)	Total n (schools)	Predictor	Adjusted Difference in Means	Effect size (95% CI)	p-value
IV Model: Stage 1 Compliance regressed on intervention	13,369	75	Intervention status	0.853	N/A	<0.001
IV Model: Stage 2 Attendance regressed on compliance	13,369	75	Compliance indicator	1.82	Hedges' g = 0.186 (0.152, 0.220)	0.019

Missing data analysis

Missing data on the primary outcome attendance primarily arises due to loss of observations during linkage between baseline and endline, as shown in Table 8. There is limited pupil-level attrition for attendance. Though attrition was high, most dropouts were due to linkage issues rather than pupil-specific factors, therefore, attrition is less likely to be systematically related to pupil characteristics. For the secondary outcomes relating to educational attainment, Table 13 shows there was some pupil level attrition due to linkage issues between baseline and endline, as well as due to missing test scores.

Drop-out models were estimated for the primary outcome of attendance and secondary outcomes of educational attainment. These models estimate logistic regressions of binary indicators of whether the outcome of interest is missing or not on the following covariates: treatment allocation indicator, strata (location type - region), baseline outcome measures, school year, as well as indicators of whether any of these covariates were missing in the data. School year and baseline outcome values were replaced with the sample average where missing, for this analysis. The estimated models also included school-level random effects. The coefficients of the drop out model are presented in Table H1 in Appendix H.

Given that the attendance outcome is mostly missing due to linkage issues, missingness is likely to be at random, and not systematically associated with pupil-level characteristics. Across most outcomes, school year is systematically

associated with the outcome being more likely to be missing. Data was more likely to be missing for girls in higher grades for both attendance and English test scores, with intervention schools showing higher rates of missingness by school year for both outcomes. Baseline attendance or test scores were not systematically linked with missingness across all schools.

In intervention schools, higher baseline attendance was linked with higher levels of missingness - this is counterintuitive for pupil-level attrition, as girls with higher attendance at baseline may theoretically be less likely to drop out at endline. Similarly, girls with higher standardised maths scores at baseline in intervention schools were more likely to have missing data in the outcome regressions.

Sub-group analyses

Girls' attendance

We conducted subgroup analyses to assess whether the MHM intervention's impact on the female pupil attendance rate varied by grade, area (urban/rural), and regions. Results from the subgroup analysis are in Tables 39 and 40.

Table 39: Results from subgroup analysis of primary outcome: girls' attendance

			Treatment group		Control group		Overall
Outcome: Girls' attendance	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Year 1	3.114	1.758	1382	58.892	1371	110.317	84.502
Year 2	2.082	0.418	1334	70.832	1174	141.251	103.793
Year 3	1.871	1.194	1315	90.099	1026	115.349	101.164
Year 4	3.542	2.206	1135	43.436	871	152.32	90.706
Year 5	2.593	1.837	967	42.44	1030	100.944	72.616
Year 6	4.55	1.16	508	83.164	427	184.774	129.559
Year 7	2.699	4.479	475	66.149	354	155.245	104.179
Rural	2.706	1.038	2169	65.004	2010	122.32	92.571
Urban	2.719	1.573	4947	64.821	4243	132.898	96.251
Region: East	3.445	1.369	1634	57.643	1783	200.31	132.089
Region: Far North	2.113	2.088	1343	79.576	1397	129.193	104.873
Region: North West	3.099	0.306	2020	50.18	1377	109.336	74.156
Region: South West	1.411	1.731	2119	70.054	1696	65.975	68.24

These results report results and effect sizes from separate multi-level models run by subgroup samples.

Table 40: Primary outcome analysis – effect size estimation for subgroup analysis

	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome: girls' attendance	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Year 1	1382	95.503 (95.098-95.908)	1371	92.389 (91.833-92.946)	2753 (1382; 1371)	.191 (.116 - .266)	0.039

Year 2	1334	94.612 (94.16-95.064)	1174	92.53 (91.849-93.210)	2508 (1334; 1174)	.041 (-.037 - .119)	0.653
Year 3	1315	94.047 (93.533-94.56)	1026	92.175 (91.517-92.833)	2341 (1315; 1026)	.119 (.037 - .2)	0.357
Year 4	1135	95.468 (95.084-95.852)	871	91.926 (91.105-92.747)	2006 (1135; 871)	.231 (.143 - .32)	0.007
Year 5	967	96.317 (95.906-96.728)	1030	93.724 (93.11-94.338)	1997 (967; 1030)	.215 (.127 - .303)	0.010
Year 6	508	94.461 (93.666-95.256)	427	89.91 (88.617-91.203)	935 (508; 427)	.102 (-.027 - .23)	0.650
Year 7	475	95.556 (94.823-96.289)	354	92.857 (91.555-94.159)	829 (475; 354)	.438 (.299 - .577)	0.186
Rural	2169	95.395 (95.055-95.734)	2010	92.689 (92.205-93.173)	4179 (2169; 2010)	.108 (.047 - .169)	0.621
Urban	4947	94.972 (94.748-95.196)	4243	92.253 (91.906-92.600)	9190 (4947; 4243)	.16 (.119 - .201)	<0.001
Region: East	1634	94.863 (94.494-95.231)	1783	91.418 (90.761-92.076)	3417 (1634; 1783)	.119 (.052 - .186)	0.074
Region: Far North	1343	92.940 (92.462-93.417)	1397	90.827 (90.231-91.424)	2740 (1343; 1397)	.204 (.129 - .279)	0.121
Region: North West	2020	96.645 (96.336-96.954)	1377	93.547 (92.994-94.099)	3397 (2020; 1377)	.036 (-.033 - .104)	0.873
Region: South West	2119	95.182 (94.825-95.538)	1696	93.771 (93.384-94.158)	3815 (2119; 1696)	.21 (.146 - .274)	0.131

Additional results in Appendix F are reported from multi-level regression models with interaction terms between the intervention binary indicator and the moderators of interest. The regression output showing the heterogeneity of the intervention impact across grades is reported in Appendix Table F1, with Appendix Table F2 reporting analysis of the heterogenous intervention effect across school areas, and Appendix Table F3 reporting interaction term coefficients by region.

The subgroup analysis by year group indicates that the effect of the MHM intervention on attendance may have varied by age. The MHM intervention had a positive impact of increasing attendance for girls in Form 1 (aged about 10-11 years) with an effect size of 0.191 (95% CI: 0.116-0.266) and a p-value of 0.039. Effect sizes are also statistically significant for girls in Forms 4 and 5 with effect sizes of 0.231 (95% CI: 0.143-0.320) and 0.215 (95% CI: 0.127-0.303) and p-values of 0.007 and 0.010, respectively. A positive effect on first form attendance may indicate lower levels of drop-out for girls because of community mobilisation and engagement about girls' schooling, more details of which are included in the IPE findings. Forms 4 and 5, when girls are aged around fourteen to sixteen correspond to when most girls will have started menstruating[22], and may that the intervention was more effective for girls in these ages compared to younger girls. The interaction model coefficients show that compared to the reference group of Form 1 girls, girls in Forms 3 and 4 had higher increases in attendance – in line with the results from the restricted sample, girls in Form 4 (aged about 15) show the highest effects, though no differences are reported for girls in Form 5 compared to Form 1 girls. The interaction model also shows higher effects on attendance for Form 6 girls, which may arise due to self-selection: pupils who continue beyond Form 5 may differ systematically (e.g., in terms of motivation or academic engagement) from those who leave school, which could interact with the intervention's impact.

There is no evidence from the subgroup analysis that there was a differential impact of the intervention in rural and urban locations. The subgroup analysis indicates that the MHM intervention had an effect on girls' attendance primarily

[22] Average age at menarche in Cameroon is about 14.6 years. **https://worldpopulationreview.com/country-rankings/age-of-menarche-by-country**.

in urban areas (effect size 0.160, 95% CI: 0.119-0.201; p-value <0.001), with no evidence of an impact in rural areas. The interaction models in Appendix Table F2 support this finding, showing no evidence of a differential impact on rural areas, compared to the reference group of schools in urban areas. Finally, there is no evidence from the subgroup analysis that the intervention had differential impacts by region.

Pupil survey outcomes

We carried out subgroup analysis by gender for the three pupil survey outcomes of knowledge of menstruation, positive attitudes towards menstruation and open attitudes towards girls discussing menstruation with others. These analyses considered whether the MHM intervention had a differential impact for boys compared to girls. Multi-level linear regression models were fit, as with the secondary analysis specifications for these outcomes. These models additionally included separate terms for gender (indicator term for boys) and interaction of the treatment indicator with gender (taking value 1 for boys in intervention schools, and 0 otherwise). The regression output for these models can be found in Appendix Table F4. Separate models following the main analysis specification were also run for subsamples of boys and girls, full findings of which are presented in Appendix Table F5 and Appendix Table F6.

In Appendix Table F4, the interaction term coefficient for boys in intervention schools for the knowledge outcome is 0.001, with a p-value of 0.953. The standardised effect sizes from the separate models are: for boys, 0.105 (95% CI: -0.163, 0.381), and for girls, 0.210 (95% CI: -0.003, 0.426). These results are indicative that the MHM intervention weakly improved girls' knowledge of menstruation (p-value 0.073), with no evidence of impact on boys' knowledge of menstruation.

For the outcome measuring positive attitudes towards menstruation, the interaction term coefficient for boys in intervention schools is -0.035, with a p-value of 0.078. This finding indicates weak evidence that the MHM intervention had a differential impact on positive attitudes towards menstruation based on pupil gender. The estimated effect of the MHM intervention is larger for girls than for boys. The standardised effect sizes from the separate models are: for boys, -0.112 (95% CI: -0.347, 0.124), and for girls, 0.135 (95% CI: -0.091, 0.358). These results do not provide evidence that the impact of the MHM intervention on pupils' having positive attitudes towards menstruation differed by pupil gender, as confidence intervals are wide and include zero for both subgroups.

Finally, for the outcome measuring open attitudes towards girls discussing menstruation with others, the interaction term coefficient for boys in intervention schools is -0.044, with a p-value of 0.065. The standardised effect sizes from the separate models are: for boys, 0.072 (95% CI: -0.172, 0.320), and for girls, 0.217 (95% CI: -0.039, 0.473). There is no evidence that the MHM intervention had an effect of increasing girls' openness towards discussing menstruation with others. There is also no evidence of corresponding changes in boys' attitudes.

Robustness checks

The attendance data was aggregated at the school and year level to reduce the influence of outliers, handle clustering and mitigate floor/ceiling effects. Aggregating involved calculating mean attendance rates per schools, stratified by treatment status.

Girls' attendance

Given the relatively high attendance attrition rate due to pupil linkage, as a robustness check, the analysis is run at the grade-level on a sample of 517 school-grade units. The adjusted difference in means is equal to 1.94 with a p-value of 0.006, showing robust evidence of impact (see Tables G1 and G2 in Appendix G). In terms of magnitude, the observed mean difference is similar to that measured in the primary analysis (1.94 against 1,57), which confirm the validity of the primary analysis findings. Note that the effect size associated with the school-grade-level analysis amounts to 0.348 (95% CI: 0.174, 0.521) is notably larger than of the primary analysis (0.16). However, this difference can likely be attributed to the aggregation method, which reduces the overall pooled variance of the outcome, causing the effect size to inflate.

Pupil survey outcomes

As a robustness check, the analysis of outcomes from the pupil survey was re-run using multi-level logistic or negative binomial regression models, for binary and count indicators, respectively. The full results from these analyses are included in Appendix Table G3 and Appendix Table G4.

The findings are in line with the main findings from secondary analysis of the pupil survey outcomes. Hedges' g standardised effect sizes tend to be smaller with the logistic and negative binomial models than with the linear models in the main analysis. The results for girls' perceptions of support while menstruating are more definitive in showing positive impact when using logistic regressions. These suggest that the MHM intervention had an impact on girls perceiving all three groups (teachers, female and male classmates) as supportive, with a Hedges' g standardised effect size of 0.261 (p-value 0.022).

Estimation of ICC

ICCs were estimated using a two-level multilevel model of attendance rates, with baseline and endline data from both control and treatment settings. It was first calculated using the empty model, without any covariates, followed by a model including treatment status, baseline attendance, and stratification. A similar process was used to calculate ICCs for secondary outcomes. The post-intervention ICCs were estimated from endline attendance data in both groups. The ICC is 0.175 when calculated with no adjustments (the empty model). When controlling for covariates, the ICC for the primary outcome is 0.141 (see Table 41 below for ICCs for the empty model for all outcomes).

Table 41: ICC for primary and secondary outcomes

Measure	ICC (empty model)
Primary outcome: Girls' attendance	0.175
Secondary outcome: Education attainment in maths – standardised test scores	0.471
Secondary outcome: Education attainment in French – standardised test scores	0.189
Secondary outcome: Education attainment in English – standardised test scores	0.618
Secondary outcome: Knowledge of menstruation	0.184
Secondary outcome: Positive attitudes towards menstruation	0.200
Secondary outcome: Open attitudes towards menstruation	0.328
Secondary outcome: Boys' lack of support towards menstruation	0.255
Secondary outcome: Girls' experiences of negative support towards menstruation	0.219
Secondary outcome: Girls' perceptions of positive support when last menstruating	0.333

Implementation and process evaluation results

Fidelity

RQ1: To what extent has the MHM trial been implemented as intended?

This section provides information on the implementation of the MHM intervention compared to its original design. It focuses on how much the intervention delivery aligned with the objectives and standards established prior to the intervention and how well the intervention was delivered (quality).

Fidelity

RQ1: To what extent has the MHM trial been implemented as intended?

The intervention was implemented as intended even though some deviations from the logic model could be observed. All project inputs and activities identified in the logic model were implemented and delivered. For example, 80 focal point teachers were successfully trained in the four regions; safe spaces were renovated in the 40 treatment schools; dignity kits were distributed to 20,000 students, female students in treatment schools were trained on the production of reusable MHM pads and MHM clubs were successfully created in the treatment schools. Other inputs such as step-down training by focal point teachers and community sensitisation on MHM were successful implemented by the delivery teams. However, slight deviations from the logic model could be observed in how the delivery team implemented the interventions. This deviation was evident in how safe spaces, dignity kits, and training of teachers were delivered. The logic model had previewed the construction of safe spaces, yet in the majority of cases, existing safe spaces had been renovated. The renovated safe spaces in the face place deviated from the previewed construction and as such no uniform standards were applied across the board in so far as the renovations were concerned. Additionally, the contents of the dignity kits did not align with the prescriptions of the logic model which had previewed that each dignity kits was to contain a reusable sanitary towel, toilet soap, underwear, detergent, and a disposable sanitary towel. The results revealed that the distributed dignity kits did not contain all the items mentioned in the logic model. Female students who were interviewed primarily mentioned that the dignity kits contained both reusable and single use pads, and toilet soap. This means that items such as underwear and sanitary towels were hardly included in the contents of the dignity kits. The remainder of the delivery inputs and activities were implemented as intended and previewed by the logic model.

Dosage

RQ5: How much of the intended intervention has been delivered or received?

Construction/renovation of safe spaces

The construction of safe spaces/toilets was one of the project inputs and activities outlined in the logic model. As such, a total of 40 safe spaces were constructed/renovated in the treatment schools across the four regions by the local implementing partners. These safe spaces were handed over to the administrations of the intervention schools in January 2024 and were immediately put to use. The existing (pre-intervention) safe spaces were poorly maintained and insufficient. Renovation and construction of new spaces resulted in an extended intervention rollout period by three months (initially, the intervention was supposed to be rolled out in September 2023 but due to delays, it was rolled out in January 2024). There was some variation in how safe spaces were constructed or refurbished across regions. In the East (KMERPAD) and the Far North (FERAFEN), approximately 10% safe spaces were newly constructed and 90% involved the renovation of existing facilities. In the case of the South West and North West regions, the intervention focused entirely on the renovation of existing facilities. Results from the KIIs revealed that the new toilets were appreciated by students, and school administrators. For example, a project staff from the delivery organisation (FERAFEN) in the Far North Region noted that:

> *It was a question of rehabilitating the infrastructures that we found on site and that means when we arrive, electricity and water are the first things when we talk about MHM. It turned out that in certain establishments, there was only poorly constructed and maintained toilets. Some establishments had difficulty with the water pressure, since they had installations which date back too long and which no longer work. There are places*

where instead of only rehabilitating we have built new structures. For example, in MORA there was no water, we had to dig a borehole, it's in a mountain area and everything…. We had to drill to get the water out, well I think that apart from that it was still difficult but we didn't have to do it everywhere, we didn't go beyond because not only the girls' toilets, There is also the reflection of boys' toilets, where we had not planned for girls and boys, we all had to do to distinguish, dissociate, the toilet of girls and boys (Team Lead FERAFEN, 14/10/2024).

Similarly, a lower sixth form student in an intervention school in the North West noted that:

> "*The toilets used to be very dirty. Many students never liked to use the old toilets. The toilets used to smell terribly. The new toilets are better, neat and the smell has gone away*" (NWG001CCAST Bambili, 23/09/2024).

In addition, another form 5 female student in GBHS Mutengene (South West Region) observed that:

> *"Yes. I like to use the toilets. At least the toilet now is better, it's clean, it's well equipped, it has a flushing system. But the flushing system is not actually active. We have someone that is cleaning the toilet that the person carries water and puts in a drum when you ease yourself, you use it, and you flush the toilet with it. Now boys have sections and girls have their own sections. First boys and girls were in the same place"* (SWST010GBHS Mutengene, 4/10/2024).

Views from other female students highlighted the fact that the new toilets were very different from what used to exist as toilets. A female student at terminale (Upper sixth) in CES Palar noted that:

> "*We actually did not have a toilet, we just had a small hole and plywoods were used to cover it, some of the woods were even bad, making us to use bushes around the school instead of the dirty toilet, but now we have a good and well equipped toilet with mirror, wash hand basin, a place to disposed all used pads*" (FN003CESPalar, 22/10/2024).

Similarly, focal point teachers were unanimous in noting that the safe spaces represented a marked improvement from the status-quo. The focal point predominantly expressed the view that, the quality of the MHM spaces motivated girls to use them in managing their menstruation while in school.

These views align with the majority of opinions shared by local delivery organisations, female students, focal point teachers, school administrators and community members in the four regions. While the logic model of the intervention had previewed the construction of safe spaces for girls, the majority of the safe spaces were focused on the renovation of existing facilities. This renovation included sprucing up already existing school toilets in the following ways; improving the plumbing and making water available; plastering the walls and floors; applying a fresh coat of paint; installing wash hand basins, faucets, toilets seats, mirrors and cupboards; and erecting a clear partition between boys and girls. Overall, from the views of respondents, the toilets were highly appreciated and had a significant role to play with regards to the experiences of students in intervention schools.

Distribution of dignity kits

Additionally, the logic model had previewed the distribution of dignity kits for adolescent girls. The local delivery organisation distributed 20,000 dignity kits (5,000 per region) to adolescent girls in the treatment schools. The distribution schedule of the dignity kits varied according to the timetable of the various local delivery partners.[23] In the Far North, East, South West and North West Regions, the local implementing partners successfully distributed the planned amount of dignity kits to students. In schools that had infirmaries, additional dignity kits were also stocked there to support ongoing needs. For schools without infirmaries, these extra kits were entrusted to the school counsellors. Usual practice reveals that school counsellors are usually the main actors who address menstruation related challenges in schools. The additional dignity kits were reserved in schools for emergency cases in which female students soiled themselves while in school and did not have the necessary MHM resources to cope with that situation.

[23] While the distribution schedule varied, the dignity kits were distributed between 7-8 March 2024 and also during the celebration of the international day of the girl child in the Far North; for the East region, the distribution took place between 6-9 February 2024; in the East region, and finally between early January and March 2024 for the two other regions.

Delivery organisations distributed 5,000 dignity kits per region with each treatment school receiving 500 dignity kits. At inception, the dignity kits were supposed to contain sanitary towels, reusable sanitary pads, soap, underwear, detergent, and backpacks. The results showed that the contents of these dignity kits were uniform across the four regions. In the North West, the dignity kits were made up of detergent, underwear, sanitary pads, rubbing oil and re-usable pad.[24] In the South West, the kits were made up of detergent, underwear, reusable and disposable pads whereas in the East region, the kits contained disposable pads, re-usable pads, detergent and underwear.[25] Finally, in the Far North, underwear, disposable and reusable pads and detergent made up the contents of the dignity kits.

The results from KIIs and FGDs reveal that the recipients of the dignity kits were enthusiastic and appreciated the kits, noting that they helped them in better managing their menstruation. In fact, female students across the treatment schools noted that since the pads were reusable, they could use them on several occasions thereby limiting the cost they had previously incurred in purchasing pads. The cost serving dimension of the pads was highlighted by female students who fall within equity deserving groups such as Internally Displaced Persons (IDPs in the Far North, South West and North West as well as refugees in the East region). As an illustration, a female IDP in the Far North noted that:

> *In my house, my parents do not buy me sanitary pads every month. With the re-usable pads, I can use them repeatedly* (NWST034GBHS Down Town, 13/10/2024)

An 18 year old female lower sixth form student in GHS Fiango Kumba highlighted the importance of the MHM kits with emphasis on the re-usable pads by stating that previously she had used old dresses to pad herself due to absence of funds. But with the arrival of kits, she could use them comfortably and repeatedly while saving cost on single use pads. This and similar views align with the shorter-term outcomes of the logic model which aimed to achieve improved MHM practices for female students.

> *I felt so good and could not wait for my menses to come so I could try them and when I eventually did it was so good and soft, at times the old dresses I used gave me wounds, but this one did not wound me. As compared to the single used, the single used is still very good, but I have been using the reusable even when my parents give me money to buy pad, I save the money and use the reusable one* (SWST006GHS Fiango, 08/10/2024).

Analysis of the MHM diaries also supports this view as an overwhelming majority of female student revealed that the MHM kits were helpful to address their MHM needs by enabling them to stay longer in school. This also aligns with the longer-term impact of the intervention outlined in the logic model which envisaged increased access to schools for female students of menstruating age.

With regards to the other elements of the MHM kits such as underwear and soap, many students noted that they found these items to be useful. As an illustration, a 16 year old female student in Troisieme (form 4) in the East region (Lycee Technique de Kpokolota) made the following observation.

> *What I found particularly useful were washable disposable sanitary napkins and underwear. They were very good underwear. Yes it was very good underwear it holds up well when you wear your pads* (EST004KPOKOLOTA, 24/10/2024).

Furthermore, parents and guardians were overwhelmingly appreciative regarding the distribution of the MHM dignity kits to their daughters. However, in some cases, mothers cautioned their daughters to wash the reusable pads with detergent before they could use them. There were scenarios in which fathers were surprised by the MHM kits and supported the idea. This is demonstrated by the views expressed by the following female student.

> *My father did not believe it when he came back from work and my mother told him. He called for me to show him and he was very happy. My sister from other school where this was not distributed was angry, but I shared the items with her and she felt better* (SWST006GHS Fiango, 08/10/2024).

[24] Focused Group Discussion with female students in CCAST Bambili
[25] Interview with female form four student in Lycee Technique de Doume

In summary, the MHM kits were welcomed and appreciated by the recipients. Their contents and the significance that was attached to them by all categories of female students clearly demonstrated that they were instrumental in modifying the attendance behaviours of female students.

Teacher training and development

Two teachers from all treatment schools were trained by the delivery teams at the onset of the intervention between November and December of 2023.[26] These teachers were trained to serve as MHM focal points and club coordinators in the respective treatment schools. One male and one female teacher was selected in all the treatment schools across the four regions to receive these trainings making a total of 80 teachers. The training sessions focused on a wide range of issues relating to MHM and its impact in the school environment. The modules used and materials distributed during these trainings were developed and provided by UN-Women and aligned with their existing modules on MHM and WASH.

The impact of these trainings on building the capacity and knowledge base of focal point teachers in so far as menstruation is concerned was quite significant. Both male and female focal point teachers unanimously agreed that the trainings were able to improve their understanding of menstruation and how it relates with the education of female students. The trainees felt empowered and better equipped to address the menstruation incidences within the school environment, as well as within their homes.

According to the female focal point of Lycee de Batouri in the East region, the training:

> *…was useful because until now we had not seen the impact that the menstrual period has on school attendance, it is something that we neglect a lot which means that when a girl comes and says that she is sick we really do not ask what she has, we only give permission and she will come and explain and make up those hours. So this training allowed us to know that this is a fairly complex problem and we have to take it seriously* (FPFE0013, 22/10/2024).

In addition, male teachers attested that the trainings could help them in various contexts. According to the male focal point of GBHS Limbe the training helped him to become a better teacher. He observed that:

> *It actually drew my attention on things that I knew but did not pay attention to because as a biology teacher, I teach them about menstruation and the changes that occurs in the human body and telling them how important it is. The training help me to pay attention to that part* (FPMSW004, 04/11/2024).

Other focal points noted that because the trainings were so relevant, they shared the information with their colleagues who had not been exposed to the trainings. This tied with the delivery design in which the focal point teachers were to cascade the trainings to their colleagues. The views shared by focal point teachers from KIIs and FGDs revealed that they had indeed carried out the step-down training sessions with their colleagues. The ability of the trainees to further cascade the trainings could be likened to the fact that the delivery organisations impressed the focal persons with their training approach and methodology. Across the four regions, focal point teachers noted that the facilitators had been very engaging and effective during the trainings. Other focal point teachers were of the opinion that the training material and logistics used by the local delivery organisation had made their communication more effective. Better still, other focal points opined that the participatory approach was guided by context specific information which made their understanding of the training modules very effective.

> *The training was excellently done and they had lots of materials and training manuals. The communication they were very fluent and express a good background knowledge of what they were talking about. The information was very clear and they didn't mix their word and they have evaluation forms that enable us to give feedback* (FPMSW, 03/10/2024)

[26] These trainings were organized in the regional capitals of the four regions. In the East, the training took place in Bertoua; in the South West it was in Buea and in the North West it was in Bamenda.

Our analysis suggests that teachers' understanding of MHM improved across treatment schools. This meets the shorter-term outcome of the intervention identified in the logic model. The views expressed by the focal point teachers reveals how their understanding of MHM had been positively improved. Regarding the integration of MHM in the school curricular, which pertains to the longer-term impact outlined in the logic model, it can be argued that certain aspects of MHM are already found in the school curriculum even though they are not categorised as MHM. In most schools, biology teachers address issues of menstruation as part of their lesson units in human reproduction while counsellors also teach girls on how to deal with menstruation. Of course, these are isolated channels and do not target MHM in a comprehensive manner. As such, the potential to integrate MHM in school curricular is very high if multi-stakeholder engagements between local NGO's, PTAs, Teachers Trade Unions and education administrators from school to ministerial levels leverage the findings of this impact evaluation.

Creation of MHM clubs

MHM Clubs were created and coordinated by focal points who had been trained at the onset of the intervention by the local implementing partners.[27] These clubs were created as part of the efforts to build the capacity of students, influence knowledge dissemination and change attitudes in the school environment. Local delivery organisations supported the creation of these clubs in collaboration with the school administration and focal points.

> *Let me say for example for the MHM clubs that we created in those schools. We go to the clubs and monitor their functioning. We even go there at times to facilitate some of the clubs' sessions and we also like you to know that in these clubs we have 35 girls and 15 boys. We develop a tracking form and we gave to these clubs and they give us feet backs and we see that they are actually carrying out the club sessions, they run successfully with the help of the MHM manual that we give them* (Project Staff, CAGEAD, 04/102024).

The results demonstrated that the clubs were quite effective in engaging both boys and girls within the school community in its activities. KIIs and FGD with female students, male students, focal point teachers and members of the delivery organisations revealed that the clubs provided an important avenue for girls to gain knowledge on MHM and for boys to become more accepting of menstruation as a natural phenomenon.
A female focal point teacher ~~for Lycee de Mandjou~~ in the East region observed that:

> *It [the training] allowed us to create a group, an MHM club to raise awareness. When it is the students who raise awareness, the information goes more well. We even had certain students who begged to be in the club and even the male gender was forced to integrate and the training helped us to* (FPFE003, 22/10/2024)

Even though the sex distribution of the clubs was dominated by girls, 15 boys on average could be identified in most of these MHM clubs as opposed to an average of 35 girls. These clubs organised weekly[28] meetings and addressed a variety of issues during their club activities. It is important to note that, prior to the existence of these clubs, these activities had been handled by the school counsellor or nurse. For example, one of the Principals in Donga Mantung, which is located in a rural community noted how significant the MHM club in his school had been in terms of providing information, skills and knowledge to female (and male) students who experienced challenges with menstruation while on campus. Similarly, the clubs had both male and female coordinators who made significant efforts to implement and supervise the activities of the MHM clubs. According to the project staff of AMEF in the South West;

> *The focal points have been fully engaged and you will also like to know that we have a male and a female just to tell you that the schools were engaging men and women at least the school that are more engaged in these activities. For example, during the distribution of the MHM dignity kits all the focal point teachers were on board to assist us in the distribution and some of them were even talking to the children not to miss this opportunity*

[27] On site observation visit and feedback from MHM diaries reveal that in a treatment schools such as Lycee Technique de Mokolo did not have an MHM club.
[28] For example, in the North West, some clubs in the treatment schools organized their activities on Tuesdays while others preferred Thursdays. This could be explained by the fact that most schools had other social clubs and activities already planned in the remainder of the days.

and encouraging those to learn more and teach others who are not able to be in the clubs so all of them are engaged in the activities (Project Staff, South West, 18/10/2024).

The effect of the focal persons was very significant when they doubled as the school counsellor. For example, a male focal point teacher in GBHS Limbe shared the view that;

The role of the school counsellor and school nurse in galvanizing and coordinating the girls has helped the MHM club to be this effective. They are always busy with the girls. The students educate themselves. I think peer education can be an asset. It really is the main way that the club is growing through. Peer education has been very instrumental. I have personally been to the MHM club. The turnout was massive. I think the girls are excited to share and learn from one another. This is a good thing because there is no other way to know more than the young ones learning from the older students (FPMNW08, 04/10/2024).

The local delivery organisation also played an important role in ensuring that the MHM clubs were created and functioned accordingly. They ensured that the clubs had materials, followed up on the activities of the clubs and regularly assigned some of their staff to support the clubs together with focal point teachers. In the East and Far North regions, it was observed that the local delivery organisations had been very committed in ensuring that the activities of MHM clubs were effectively implemented. For example, the female project staff for KMERPAD in the East region and the female project staff in the North West region made the following observations respectively;

Yes, let me say for example for the Menstrual Hygiene Club that we created in those schools. We go to the clubs and monitor their functioning. We even go there at times to facilitate some of the clubs' sessions and we also like you to know that in these clubs we have 35 girls and 15 boys and we also have the track. We develop tracking forms and we gave to these clubs and they give us feedback and we see that they are actually carrying out the club sessions, they run successfully with the help of the manual that we give them and also the students are effectively using the MHM facilities provided to them and it has been helping them (KMERPAD project Staff, 18/10/2024).

We can actually confirm that the students have been attending their MHM because we have gone to the schools during club sessions and we have seen them use the materials we gave them. We also developed a menstrual hygiene management game which is a way for them, for the girls to know how to properly take care of themselves during menstruation. We have gone there and we have watched the students play this game, we also have a menstrual cycle prototype in which we have indicated the 28 days which make up a complete cycle. We used these cycles to teach the children on how to manage their menstruation; we also gave them materials like menstrual pocket calendars, a giant menstrual wheel that indicates the 28 days cycle and the ovulation process. we also have a tracking form which we have given to the school and to the school infirmary where they check the number of girls that come to the infirmary to collect pads and pants since we left them in the school to make sure that they effectively manage their menstruation (Project Staff, CAGEAD, 04/102024).

Community mobilisation

The delivery organisations mobilised various stakeholders such as Parent Teacher Association (PTA) presidents, regional and divisional delegates of secondary education and other members of the community to be involved in this intervention. Community stakeholders found the intervention to be important, noting that it addressed a critical need in schools, particularly for female learners. They expressed strong support for the initiative and a desire for similar interventions to be implemented in their communities as well other communities. Community members such as PTA presidents and presidents of women's groups were aware of the intervention and took an active interest in ensuring that the intervention succeeded. In the Far North for example, FERAFEN mobilised a wide range of stakeholders to mark the celebration of the International Day of the Girl child. As part of the celebrations, they conducted sensitization activities targeting community members on MHM, including single mothers. During this event FERAFEN presented a talk on MHM in which 80 female students from 5 intervention schools together with women in neighboring communities. The Divisional Delegate of the Ministry of Women's Affair and the Family (MINPROFF) for Diamare who presented a welcome address during the event, praised FERAFEN for the initiative and encouraged the continuation of such interventions. They used promotion materials such as placards, handheld signs and powerpoint presentations to pass across their message. In the North West, CAGEAD carried out extensive sensitization in the community with communities benefiting extensively from the outreach activities.

> *During one of our dialogue sessions in Mezam we spoke to parents about menstruation and most of them now have knowledge about menstruation and they promised to help their girl children during menstruation. For example, some parents were not even aware that they were supposed to get pads or help children during their menstruation and now their ideas have changed. Parents even promised to be able to talk to their children and find when they start menstruating and how they can guide them during their menstrual period. So, I think the community has embraced the intervention* (Project Staff, CAGEAD 04/10/2024)

Similar sensitization events at the level of the community were organised in the South West and East regions by AMEF and KMERPAD respectively. The following views were shared by FGD respondents in one of the communities in the South West (Bokwango Community) which hosted a treatment school;

> *It [the intervention] was very helpful, you know this is the only government secondary school in this community and most of the children here school there. They are all our children and when you do something good to them, you do it for us and the community as a whole. It is our duty to provide those facilities for them and when we are supported like that we are very happy. We say we still need more and are still waiting for you* (FGDR2SWR, 2/10/2024, emphasis added).

Another female respondent during the FGD added that;

> *It [the intervention] was very helpful because children were trained to know about menstruation at a younger age, which is very good, some of us got to know about menstruation when we were almost ready for marriage. The girls are also producing pads for themselves and that is wonderful and reduces cost. One of my duty as the quarter head here is to ensure that the community is clean, and when such projects comes in to helps the children stay clean in school and at home, I am happy, because if individual hygiene is practice by everyone, the community too will be clean* (FGDR4SWR, 2/10/2024)

The results demonstrate that the community members were fully in support of the MHM intervention particularly the dimensions which involved the construction of MHM facilities and the distribution of dignity kits. As such, communities in which the treatment schools are located were fully engaged in supporting MHM for female learners. In line with the logic model, this outcome from the intervention shows that most communities are interested in addressing the menstruation challenges women and girls in general and girl students in particular experience. From the views expressed, there is a serious need for MHM advocacy in communities in Cameroon.

Training on production of reusable pads

The MHM intervention had also envisaged training 20,000 female students in treatment schools on the production of reusable MHM kits. The rationale behind the training was to empower young girls with skills on how to produce MHM pads in contexts of insecurity as well as reduce on the cost associated with single-use menstrual pads. These training sessions were organised and implemented by the delivery organisations in collaboration with the focal point teachers and members of MHM clubs. The findings confirm that the planned trainings were successfully delivered, and participants expressed appreciation for the skills and knowledge gained. It is important to note some local NGOs in Cameroon are advocating that menstrual pads should be free particularly in conflict situations and rural communities. For example, findings from KIIs with local implementing partners in the South West revealed that;

> *Pads now in the South West Region are about 700frs. We travelled from Buea to Kumba and noticed that there was an almost 15% increase in the prices of pads as the price moved from 700 frs to 800frs. This made our training of girls on how to produce reusable pads relevant. By using local materials, it will help them to avoid the expensive cost of single use pads and they can use them for a longer period of time which is sustainable. Some of the students can also use it as a source of income* (Project Staff, South West, 18/10/2024).

Quality

RQ2: What are the potential obstacles which may affect the delivery of the intervention (timeline, logistics, crisis, etc)
RQ3: How well is the MHM trial delivered in the intervention schools?

The MHM intervention confronted some obstacles that influenced the quality and consistency of its delivery across treatment schools.

Crises

The crises in the North West and South west regions delayed delivery of the intervention which had implications on the timeline. AMEF and CAGEAD experienced difficulties in terms of reaching and accessing intervention schools in Kumba in the South West Region and Nkambe in the North West Region. This is because these schools are in locations which are more vulnerable and susceptible to violence than those in the urban towns. In Nkambe for example, school staff in a treatment school were kidnapped by separatist fighters while in a different instance, a data collector was molested and exhorted by the same fighters. Additionally, children in some treatment schools were affected by the detonation of local bomb whilst participating in an official event. In most instances, whole periods are declared as “Ghost Town’ or ‘Lock Down” during which movement is prohibited. Considering that the implementing organizations are based in urban areas their ability to access these schools in far off communities became really problematic. Moreover, in certain periods of ‘lock down’ and ‘ghost town” parents do not permit their children to attend school, thereby further complicating the implementation of the delivery activities. These issues which are more pronounced in the North West and South West regions acted as significant obstacles to the effective delivery of the intervention.

> *It is very risky to travel to Kumba especially when they have declared ghost town. Infact, getting a vehicle from Mile 17 to Kumba is usually very expensive during this period as drivers take advantage of the situation and levy expensive prices to customers. There was a time in which I had to travel to GHS Fiango to supervise MHM clubs but on our way, the road had been blocked in Ekona and all vehicules were asked to return to Buea. This situation and others seriously affected us and made our job difficult at times* (AMEF Project Staff, 18/10/2024.

Exams and school activities

School activities also affected the implementation of certain aspects of the intervention. Considering that all schools in Cameroon have an academic calendar and must adhere to it, these already planned activities tended to clash and affect certain activities of the MHM intervention. For example, in 2024, the FENASCO games implied that students must engage in certain sport preparation activities which in most cases prevented students from participating in certain aspects of the MHM intervention. Additionally, the buildup and preparation of national certificate exams such as the GCE and Probatoire implied that access to school was restricted.

Distance between treatment schools

Distance between the treatment schools was a serious challenge experienced by the local delivery organisations. During the selection process of treatment schools, protocols had been put in place to ensure that a reasonable distance separated treatment schools from control schools. This was meant to reduce the risk of contamination. As such, the distribution of the schools spanned wide geographical area. Local delivery organisations reported that timely access to schools was a major challenge, which at times prevented them from delivering intervention activities according to schedule. This view was shared by AMEF, CAGEAD, FERAFEN and KMERPAD. As an illustration, the project staff of KMERPAD observed that:

> *At the beginning I made the mistake of going to a travel agency in Abong Mbang where I could spend 2 to 3 hours and sometimes I left Bertoua at 11 a.m. You can imagine it's Wednesday and I have to supervise the MHM club at 12:30 and by 11:00 I am yet to be on transit. I was always stressed. But the focal point of Doumé told me to no longer use the travel agencies but rather to try hitchhiking. So I was leaving for Bonis and I was hitchhiking and in 30 minutes I was in Doumé and there we had solved the problem of accessibility* (KMERPAD project Staff, 18/10/2024)

This situation impacted the intervention negatively because some of the difficult to reach schools benefited less in terms of the amount of time the local implementing partners could spend in their schools for activities such as training female students on the production of reusable pads and supervising MHM activities.

MHM safe spaces

In recognising that the local implementing partners had to either renovate existing toilets or construct new ones from scratch, it was observed that there were significant variations in the nature and extent of renovations done. While some renovations were exhaustive and made significant changes to the state of existing toilets, others were very basic and mediocre. These variations were significant among and between local delivery organisations. For example, during a site visit to GBHS Tiko, it was observed that the renovations works had included affixing doors on the toilets, applying a fresh coat of paint, and replacing the toilet holes with toilet bowls. In another site visit in GBHS Nkambe, it was observed that the renovation works had not been exhaustive as well with water being a scarcity in the toilets. On the other hand, in Lycée Bilingue de Mora, the local delivery organisations executed exhaustive renovation works and in the case of some treatment schools, constructed the toilets from scratch. While the overall effect of the renovations of these safe spaces was a significant transformation and improvement from the existing structures, these variations in reveals that there were some lapses which affected uniformity of the safe spaces and quality of the final products within and across regions. Despite the lack of uniformity and quality in the renovation of the safe spaces, the renovated safe spaces were highly appreciated by the school administration and students. This is captured by the view shared by a project staff for CAGEAD:

> *The standard that we built and left in schools was good because if we are fortunate to share the pictures you will see the difference in the before and after pictures. The school principals and PTA persons testified to the fact that we have done a great job and the students were very happy. Some of the schools had toilets that did not have roads, the students were not able to use them and the walls had collapsed. We have provided them with those facilities where you could put your bag and change your pad, we even constructed some wells them to have water. Schools that did not have those facilities could get boreholes we had to get them barrels where could fetch water* (Project Staff, CAGEAD 04/10/2024).

Variations in the quality of renovated safe spaces could be attributed to differences in renovation and/or construction costs across regions and communities. Although funding allocations per safe space were consistent across all delivery organisations, local cost variations likely influenced the extent and quality of renovations undertaken. That notwithstanding, it is important to highlight that the renovated toilets were a significant improvement from what existed prior to the intervention.

Distribution of dignity kits

Selection of recipients of the dignity kits was based on the discretion of the delivery teams and the focal point teachers. The process of distribution did not specifically target equity deserving groups such as girls from minority communities such as the Mbororo and Internally Displaced Girls in the North West and South West regions. Also, the majority of girls who received the dignity kits were in the upper forms (forms four to seven) while girls in the lower form (forms one to three) were not considered on the same basis. This situation indicated that, the process of distribution did not fully acknowledge groups of girls who are particularly affected by demographic factors such as their age, income level and status of stability in the society.

Variations in the duration of training and capacity building of focal point teachers

Interviews with delivery team members indicated that there were some variations in the durations of trainings conducted with focal point teachers, female students and the step-down sessions conducted by focal point teachers in their respective schools. For instance, focal point teachers in the South West revealed that the training had been conducted for one day rather than the two days initially planned. The focal point teacher for GHS Fiango observed that:

> *The training was to last for 2 days but due to the nature of our region, they had to carried on with the training just for a day and it was very successful* (FPFSW011, 10/10/2024).

Similarly, the training in the Far North was organised over a period of one day as opposed to the two days initially previewed. This is confirmed by the female focal point teacher of Lycée Classique de Maroua:

> *It was a whole day of training. We started at 8 a.m. and it was around 3 or 4 p.m that the training came to an end. We had two breaks in between but the training was for the whole day* (FPFFN05, 15/10/2024)

In the North West on the other hand, the training was organised over a period of two days as noted by the male focal point teacher for GHS Tabenken:

> *The training took place for two days. The first day we actually did much work than the second day. The second day we just went to do some final touches but the first day we took about more than five hours training. So the first day was really long* (FPMNW09, 12/11/2024).

Regarding the step-down trainings and training of female students on the production of reusable menstrual pads, there were also variations in terms of the number of teachers who received the trainings, the duration of the trainings and the modules covered. The number of girls, the duration and the extent of the training depended on the logistical capacity of the local implementing partners and the specific contextual realities of each region. Overall, these variations could be used to conclude that the treatment schools were not exposed to the same degree of information or training in so far as the trainings were concerned.

Timeline

The intervention timeline was revised on multiple occasions due to implementation delays and logistical challenges. The intervention was meant to start in September 2023 but started in January 2024. This delayed the implementation and observation period from eight months to five months. These changes also impacted data collection timelines. Mid-line data collection originally planned for February to March 2024 was shifted to September to November 2024. Similarly, the collection of third term test scores, scheduled for May 2024 was delayed until October 2024.

Adaptation

RQ4: How, why and to what extent changes have been made to the MHM intervention?

Certain adaptations were made regarding the MHM intervention. Amongst these, the most obvious being the nature of the MHM safe spaces that were provided to treatment schools. In the logic model, it was previewed that the MHM safe spaces were either going to be constructed from scratch or renovated. However, as stated, most MHM safe spaces were primarily renovated. The decision by the local implementing partners was influenced by resource and time constraints. The local implementing organisations noted that the resources to build the toilets from scratch were not adequate. Constructing a safe space from scratch requires extensive preparatory work and may require a significant amount of time before it is completed. As a result of these two factors, the local implementing partners in concert with the UN-Women agreed on the renovation option which took less time and could be completed with the resources earmarked for that purpose. That notwithstanding, FERAFEN which serves as the local implementing partner in the Far North constructed some safe spaces from scratch.

Responsiveness

RQ5: How well do adolescent girls engage with the MHM intervention?

It can be reasonably argued that the MHM intervention in the treatment schools ignited a very positive response from adolescent girls. From the qualitative data gathered through MHM diaries from girls and interviews with female students, teachers and school administrators, it was observed that young girls were very enthusiastic, appreciative and supportive of the MHM intervention. Based on the design, all girls in the treatment schools benefitted from the intervention in very significant ways. Firstly, a cohort of 500 girls per treatment school directly received MHM materials and resources such as MHM Dignity Kits and Training on the fabrication of re-usable menstrual pads. This category of girls in all treatment schools were extremely appreciative and supportive of the intervention and demonstrated a strong desire for the intervention to continue and for it to be extended to other schools. Other girls in these schools who had access only to the MHM safe spaces and refurbished toilets also felt that the intervention had been very instrumental in facilitating their school attendance and attainment experiences.

Results from the MHM diaries also revealed interesting perspectives on how female students responded to the intervention. In the East region, for example the findings from the MHM diaries revealed fluctuations in the degree of responsiveness of female students towards the MHM intervention. In diary entries from March 2024, respondents in

some schools showed that the female students complained about the state of the MHM safe spaces in terms of their cleanliness. They noted that the toilets were unkempt, had a pungent odor and were generally unfit for them to use. A female respondent (East003, March 2024) in Lycée Bilingue de Bertoua observed that the cleanliness of the bathrooms was not adequate. On the contrary, a female respondent in Lycée Technique de Batouri (East006, March 2024) applauded the state of their MHM safe spaces. She observed that "*Speaking of the cleanliness of the bathrooms, it is always clean*." The data from the diaries in the East also revealed how girls navigated menstruation in the school community and at home. For the duration in which diary data was collected, (January to April 2024) the students were able to share the challenges they experience while in school as well as the solutions that they employed vis-à-vis menstruation. For example, the diaries revealed overwhelmingly that female students experience serious menstrual cramps and soiling which perturbs their ability to stay in school.

Regarding menstrual cramps, the diary entries revealed that in the majority of cases, the use of analgesics such as ibuprofen and paracetamol were inadequate to assuage the pain. In such scenarios, the students were forced due to the pain to go back home, thereby forfeiting the day or days in question. This perspective was corroborated by the Focal point teacher for Lycée Technique de Kpokolota when he noted that:

> *There are instances where some girls have severe cramps that they can't even stand up. And during the days of their menstrual they don't come to school. If they forget their painkillers and it starts in school, we'll have to call their parents to come and take them home. So they miss classes within those days* (FPFE013 10/10/2024).

In the case of soiling, since some girls did not possess spare uniforms, they were also forced to return home once clothing had been soiled with the arrival of their menses. In other cases, the diaries revealed that due to the uneven sizes of the re-usable menstrual pads they had received, they could not comfortably use them. As such, they had to revert to using single use pads which they were already aware of and comfortable with. Furthermore, the diaries also revealed the type of support networks that menstruating girls relied on to cope with their menstruation issues and challenges. Across the board, all entries in the diaries revealed that the most significant form of support came from the home and it was principally from mothers and other women in the household such as grandmothers, aunts and sisters. The support provided by these women ranged from purchasing menstrual pads, to preparing local remedies to assuage the pain of menstrual cramps. Mothers definitely understood the challenges that their daughters experienced while menstruating and use local experience-based solutions to address them. The diaries revealed that fathers, as well as men and boys in the family were neither viewed as a source of support nor contacted for support with regards to menstruation related challenges. Rather, the diaries revealed that girls felt more comfortable sharing their menstruation related challenges with their mothers, female classmates and friends.

> *Well, it is very relevant because first of all, the environment, there's a change of environment. Secondly, the stench, the smell we used to find around the place is no longer there. Thirdly, when they clean the place with water, you find it very conducive where you can even eat around the area because it looks more of a living room than a toilet. And thirdly or fourthly, we also have a program in school, the project in school instituted by the ministry called Aka Ejek, where we are given chemicals, we pay for chemicals. We have an employed staff who cleans the toilets every two hours. And so the project came as an enhancement to push from where we were to a higher height. And you can see for yourself, if you go there, and most girls now, they want to go there because at first, some of them will tell you, I feel as if I'm in my period, I want to go home to change. I don't want to use the school toilet, this and that. But now, they like the environment, they like the place. And so sometimes, we even go there, you see a scramble. I want to go to the toilet, I want to go in and they just say, there is a line, you know? So I want to use this opportunity to thank you people for the wonderful work you have done at that place* (Principal, GHS Buea Town, 25/10/2024).

Focal point teachers and male students who were members of MHM clubs also responded positively. The attitudes of boys changed significantly as a result of the sensitization they were exposed to via their involvement with their MHM clubs. These boys were able to learn important aspects regarding MHM and the type of ways in which they could be supportive of girls in school as well as in their families and communities. Similarly, focal point teachers and school administration personnel were also very responsive of the intervention.

Perceived Impact

RQ 8: What perceived impact do teachers and adolescent girls think could arise from the MHM intervention?

The impact of the MHM intervention has been significant for adolescent girls and teachers. Apart from the direct shorter-term outcomes such as the improved MHM practices for adolescent girls and teachers' ability to promote fair MHM practices, in the school community, we can also look at the long-term impacts of the implications as perceived by girls and teachers.

Girls

Adolescent girls generally demonstrated a very receptive and positive attitude towards this intervention. This view was captured by the local implementing partners who noted the improvements they had observed in the female students during the intervention. It can be argued that the intervention has improved the MHM practices in schools and young girls. Also, the knowledge, attitudes and practices of girls has greatly improved. In fact, as observed by a Project Staff of CAGEAD in the North West, prior to the MHM intervention girls were very timid and barely engaged in conversations about menstruation. This could be explained by the stigma and taboos that surrounds menstruation. However, with the implementation of the MHM intervention and with the creation of MHM clubs, as well as the celebration of the world's menstrual hygiene day, it can be observed that knowledge about menstruation and how to manage it is more widespread than prior to the intervention.

The Divisional Delegate for Secondary Education for the Lom and Djerem division in the Far North Region observed that the intervention had been impactful for girls in the Far North region and observed that:

> *It is very useful in improving the quality of health of the girls on campus. It is like a sudden positive change that has made the girls to be more comfortable in being in school. The provision of new clean toilets with pads to female (and male) students is profoundly remarkable. These new facilities are improving life for the girls in the schools concerned. I can confidently say that the cleanliness of the schools has improved remarkably. The schools really value these facilities and I am very much grateful for this intervention. The health of our students is our priority and I am glad that this project was deemed necessary. But I can only urge this kind of gesture to be sustained over some more years. If you plant a seed and do not nurture it, it will wither away. So, it is necessary to have this intervention sustained for the wellbeing of the girls.* (DDSE *Lom and Djerem* , 24/10/2024)

Similarly, the female focal point for GBHS Bamenda hailed the intervention, praising it for improving the education experiences of female and male students in the North West Region of Cameroon.

> *With the coming of your intervention and the doctrine or the training and the information that you have been providing to teachers and students, it has created more awareness. It has even propelled some of them to go and do research online to know more or to try to confirm the kind of information that people give, if it was relative. And that has changed the dynamics, you know? The way people used to take menstruation (or those who are menstruating, it has changed their orientation to accept it. It is nature, and for you to menstruate is a pride to show that probably you are fertile at this age. That's how they used to look at it because when you are not menstruating, on the contrary, it's a problem. So, I think what you people have done has increased the awareness and the interest of knowing more what is about menstruation* (FPMNW011, 24/10/2024).

Similar views corroborating the impact of the intervention on girls have been shared by the focal point teacher of Lycée Technique de Dimako who observed that the intervention:

> *[…] has improved the confidence of female students because they feel free to talk about it now, unlike before they when used to be shy. And even their brothers, or their classmates who are boys, have gone and made extra research to try to find out what is this menstruation all about. And they discuss it now freely. It's no longer a taboo to discuss menstrual situation in school. So, first of all i have to start by tipping my hat to the organization because there will never be excess toilet rooms in high school. Your contribution is very sensitive and timely. I even say I carry the voice of all the teachers and even the students to say thank you for adding one more latrine because it reduces the untimely exit of students who would crowd around a single latrine while waiting to take turns. So now instead of two coming out of one latrine, two coming out of two latrines so the wait is reduced. So really, it's commendable and will go a long way to improve the quality of education students in this establishment experience* (FPMES09, 14/11/2024)

Teachers

The impact of the intervention on teachers was felt through the training of focal points conducted at the regional level. These trainings were further cascaded to colleagues in the various treatment schools. In the first place, the training highlighted the pertinence of menstruation in the school environment by showing how female students' school experiences are shaped and influenced by menstruation. The results from KIIs and FGDs with focal point teachers revealed that teachers in treatment schools for the most part and prior to the intervention did not fully understand how female students navigated menstruation while in school and how in managing their menstruation they tended to experience certain challenges which impacted their attendance rates and learning experiences. As such, the training in particular and the MHM intervention in general effectively made teachers understand that they had to be more sensitive and attentive to female students. In addition, the training expanded the knowledge base of teachers (particularly male teachers) in so far as awareness on MHM is concerned. For the most part teachers noted that they were ignorant about menstruation and how it affected female students in school. This perspective was shared predominantly by male teachers who prior to the intervention did not pay particular attention to menstruation. In fact, the intervention was instrumental in addressing some of the stereotypes that surround menstruation as well as some of the misconceptions about menstruation that male teachers were exposed to. Teachers therefore developed interest in understanding menstruation and as such changed their mentalities and attitudes. Furthermore, as a result of the intervention, the teachers were more predisposed to be supportive of female students who experience menstruation while in school as well as to other female family members and friends.

The intervention's impact on teachers was significant as it enabled them to approach menstruation from a more holistic and sensitive perspective. Focal point teachers who served as MHM club coordinators further engaged with students in the clubs and expanded as well as built more trustworthy relationships with their students. In a nutshell, the impact of the intervention on teachers has been instrumental seeing that it has helped to improve their role as educators and mentors to female and male students.

Usual practice

In the course of September 2023 to May 2024 which denotes the period of the MHM intervention in treatment schools, the control schools continued with their activities in a business as usual manner. First and foremost, none of the input items of the intervention that were introduced in the treatment schools could be observed in the control schools in a manner that mirrors those of the treatment schools. As such, the conditions of toilets did not change in a manner that is comparable to those of the treatment schools. This implies that that likelihood of female students to use the school toilets in the control schools to clean themselves whilst in school was more unlikely as opposed to the treatment schools. That notwithstanding, existing interventions such as the 'Clean School' introduced by the Ministry of Secondary Education and other initiatives undertaken by local NGO's were operational in these schools. Among other aspects, the 'Clean School' initiative of the Ministry of Secondary Education aims to encourage clean toilets in schools. However, this initiative has been in operation for about five years now and it is implemented in all secondary schools in Cameroon. The initiatives of local NGOs on the other are usually one-off events and usually target specific aspects such as advocacy and distribution of single use menstrual pads. Local NGOs throughout the academic year usually carry out these initiatives in some secondary school in the four regions and Cameroon generally speaking. They are however different from the MHM intervention in that they do not approach MHM from a holistic perspective which addresses multiple as the MHM. In a nutshell, we can reasonably argue that the control schools were not exposed to the MHM intervention in a manner that could contaminate their attitudes, change their practices and alter their knowledge vis-à-vis knowledge. As such, it is fair to state that the control schools did not change their practices in a manner that is reflective of the MHM intervention as it was implemented in the treatment schools.

Cost

The cost associated with the MHM program delivery was calculated in accordance with EEF's prescriptions outlined in the EEF cost guidelines (EFF, 2023). This guideline emphasises the ingredient method principle (Levine et al., 2018) which only factors the entirety of resources that were required to implement the MHM intervention regardless of who incurs the cost.

Table 42 summarises the cost associated with implementing the MHM intervention within the timeline. The budget is presented in four major categories which include; (i) personnel cost and preparation for program delivery; (ii) capacity building for implementation of intervention; (iii) facilities, equipment and materials for implementation and; (iv) personnel cost for implementation of the intervention.

We recognise EEFs recommendations to anchor cost estimates to primary outcome analysis which in this case would be attendance rates of female students in the treatment schools. As such, we will use the sample size of the female students who were considered in the analysis of the primary outcome.

Cost per pupil

Based on the cost breakdown presented in Table 42, the cost to implement the MHM intervention amounted to £737,965 for the first year. Over a 3-year period, the cost of implementation is estimated at £1,256,351. The cost covers the categories and budget ingredients presented in Table 42. The average cost of the intervention per treatment school is about £18,449.13 (total amount divided by the number of treatment schools) for the first year, and £31,408.78 over a 3-year period. The average cost per student to implement the intervention over a 3-year period is estimated at £89.75 (total cost divided by 14000 students, the sample size in the treatment schools).

Table 42: Cost of delivering the MHM project

Category	Cost ingredient/Activity	Start-up or recurring cost	Unit cost	Estimated total cost over 3 years	Estimated Total cost per pupil over 3 years
Personnel cost and preparation for program delivery	Set Up Meetings, Training of delivery team members, development of MHM training guides, designing the schedule of delivery of intervention	Start-up	£55,466	£55,466	£3.96
	Stakeholder sessions	Start-up	£40,000	£40,000	£2.86
Capacity building for implementation of intervention	Training of Focal point teachers	Start-up	£52,800	£52,800	£3.77
	Training female students on production of reusable pads	Recurring	£34,700	£104,100	£7.44
Facilities, equipment and materials for implementation	Construction of safe spaces	Start-up	£320,000	£320,000	£22.86
	Distribution of MHM dignity kits (Equipment)	Recurring	£224,493	£673,479	£48.11
Personnel cost for implementation of the intervention	MEL	Start-up	£2,666	£2,666	£0.19
	Travel	Start-up	£7,840	£7,840	£0.56
			£737,965	£1,256,351	£89.75

Table 43: Cumulative costs of MHM (assuming delivery over three years)

	Year 1	Year 2	Year 3
MHM	£52.71	£18.52	£18.52

Conclusion

Table 44: Key conclusions

Key conclusions
The MHM intervention had a positive effect on school attendance. Girls in MHM intervention schools had on average 1.57 percentage points higher school attendance in January to May 2024, compared to girls in comparison group schools. The 95% CI suggests that the true effect may lie between an increase of 1.26 percentage points and 1.94 percentage points. These effects translate to reductions in school absences by about 21% (compared to the control group mean of 7.6%), comparable to the range of effects found in similar studies on MHM interventions.
We did not find evidence that the MHM intervention had an impact on knowledge of menstruation, attitudes towards menstruation, and support of menstruation. This finding contrasts with the logic model which suggests that a comprehensive MHM intervention would improve understanding of MHM within schools, and promote increased support from male students in the short run. The sample size of pupil survey respondents used in this analysis was too small for the statistical analysis to detect small effects, so it is uncertain whether the intervention had an effect on these outcomes.
We did not find evidence that girls in MHM schools had higher levels of educational attainment in mathematics, French, and English compared to girls in comparison group schools. Though the logic model suggests that the MHM intervention would have a long-run impact on girls' class performance, this was dependent on the intervention timescales following ideal timelines. A short evaluation timeframe may have meant that endline test scores were measured too soon for 'long-run' impacts to have emerged, so it is not possible to conclude whether the MHM intervention impacted attainment.
The implementation of the MHM intervention had high fidelity, with the intervention largely positively received by stakeholders. The implementation included core components of the intervention, though there were some regional and school-specific adaptations. The construction and renovation of safe spaces was completed, though primarily through renovations rather than new constructions, and were highly appreciated by students and school administrators. The distribution of dignity kits and the training of teachers and students on MHM practices also proceeded as planned, with positive feedback indicating that these components were well-received and beneficial.
Both students and teachers felt that the MHM intervention had benefited them. Adolescent girls said that they experienced improved menstrual hygiene practices, increased comfort, and higher school attendance due to improved facilities and resources. Teachers received a deeper understanding of menstruation's impact on education through targeted training, which enabled them to support students better. The creation of MHM clubs also promoted awareness among students and helped reduce the stigma around menstruation, which contributed to a more inclusive and supportive school environment.

Impact evaluation and IPE integration

Evidence to support the logic model

The evaluation finds mixed evidence to support the logic model. There is strong evidence that the MHM intervention inputs and activities can be implemented as described in the logic model. The intervention was received largely positively by stakeholders. The outputs arising from the intervention also met expectations set out in the logic model. The IPE found some evidence of improved short-run outcomes for teachers, schools, and communities. The impact evaluation also found evidence that the intervention improved girls' school attendance. The IPE found through interviews with young people and teachers that the MHM intervention raised awareness and improved pupils' knowledge of menstruation. However, the impact evaluation did not find evidence of impact on pupils' knowledge and attitudes towards menstruation (through analysis of around 1,000 pupil survey responses). The evalution also did not find evidence of the intervention having an impact on pupils' educational attainment.

This section describes opportunities to refine the logic model based on the findings from the evaluation.

Inputs, activities and outputs

The MHM intervention was delivered with fidelity, with high levels of compliance across participating schools. Inputs and activities identified as components of the logic model were largely successfully implemented with slight modifications to the delivery of some inputs while core intervention components were delivered as planned. Outputs were met in line with expectations. The IPE found that the inputs to the evaluation enabled activities to be delivered as intended in the logic model.

The core activities of the comprehensive MHM intervention identified in the logic model were: building teacher capacity; constructing safe spaces; distributing MHM dignity kits; training female students in the production of re-usable menstrual pads; creating MHM clubs and; community mobilisation. These elements were mostly delivered as planned, with regional adaptations by local delivery organisations, and further school-specific adaptations made by teachers.

As these adaptations were not originally specified in the logic model, but were adapted to local and regional contextual needs, the logic model could be improved by including additional detail on these adaptations. Describing local and regional adaptations and requirements in greater detail in the logic model could help strengthen the links between intervention delivery and expected outcomes.

The duration of the teacher capacity building training sessions varied across regions, though this regional variation was not originally specified in the logic model. The training was provided to focal point teachers who would be responsible for the MHM clubs and further step-down training of other teachers in their schools. The logic model could provide more specificity about the nature of the training and any regional differences in content or duration that need to be taken into account to deliver a successful intervention. Focal point teachers then shared their skills with an additional 800 teachers through step-down training, more than the 600 estimated in the logic model. The logic model would ideally explicitly include the role of focal point teachers in coordinating MHM clubs with support from local delivery organisations. Setting out specific requirements for successful step-down training would also better define the mechanisms that bring out the broader contextual outcomes affecting the community and wider school context.

The logic model defines the construction and equipment of new toilets and safe space facilities as an intervention activity, while in practice, most safe spaces were renovated to varying extents. Defining which specific features of toilets would need to be built from scratch, or alternatively, renovated (as well as the minimum improvements required for a successful implementation) would enhance the logic model, and improve the ability to roll out the programme fully and with high fidelity in the future.

Similarly, there were regional differences in the contents of the dignity kits, 95% of which matched the specifications of the logic model. Despite these variations, female students appreciated and used the kits, which helped them manage their MHM practices at school and home. The training on producing reusable menstrual pads was effective and helped female students meet their own needs and those of their families. The mechanisms underlying these activities would ideally be explored further in the logic model, especially given some students' initial apprehension regarding reusable pads, and the potential for students to commercialise pad production and the importance of addressing the recurrent cost of single-use pads.

MHM clubs were created in all treatment schools to improve the knowledge and attitudes of students towards MHM activities as indicated in the logic model. Both male and female students engaged with these clubs. The MHM clubs were coordinated mainly by the focal point teachers, with varying levels of support from local delivery organisations across the regions. As regional variations in available support from local delivery organisations are expected to shape inputs, activities, and outputs, these should be incorporated into the logic model as contextual factors affecting implementation.

Community mobilisation events were effective in raising awareness and providing feedback on challenges associated with MHM for female students, women and girls, and community members. The logic model should include the various forms of community engagement, such as community talks, International Day of the Girl Child celebrations, and the involvement of key community actors. It should also clarify the relationship of such events with intended outcomes, and with effective intervention delivery, such as by creating a feedback loop for local delivery partners.

Outcomes

There is mixed evidence of the intervention resulting in outcomes as described in the logic model. The logic model identifies outcomes for students, teachers/schools, and the community, with longer-term outcomes focused on female students and teachers/schools. The impact evaluation only measured outcomes for students , while the IPE explored outcomes for students, teachers, schools, and the community.

The MHM intervention had a positive effect on the primary outcome of school attendance, as outlined in the logic model. Specifically ,the impact evaluation finds that girls in MHM intervention schools had higher attendance of 1.57 percentage points compared to girls in comparison schools (who attended 92.4% of school lessons). There is no evidence that the intervention improved the educational performance of female students. The short timeframes for outcome measurement

may have meant that the evaluation did not allow sufficient time for impacts on attainment to emerge. The logic model could be improved by delineating minimum timelines for implementation required for short- and long-run outcomes and impacts to emerge.

The logic model hypothesised that the intervention would lead to improved MHM practices for female students and increased support for MHM from male students. The MHM intervention led to female students reporting significant short-term improvements in their MHM practices. With clean and modern safe spaces available, students were better able to manage their menstruation at school instead of going home, reducing missed school days. Participation in MHM clubs also equipped them with better knowledge to manage their menstrual cycles.

There is mixed evidence on whether the intervention increased awareness and support for MHM among male students and the wider student body. The presence of spare dignity kits and supportive focal point teachers especially support the hypothesised outcomes in the logic model. However, there is no evidence from the pupil survey of the intervention having an impact on students' knowledge, attitudes, and support towards menstruation. The sample sizes for the pupil survey were smaller than anticipated during the protocol, so that the evaluation findings are not able to conclude whether the intervention had an impact on these outcomes.

The MHM intervention was able to improve understanding of MHM for teachers who attended training and served as focal points and coordinators of MHM clubs. These teachers reported being more likely to be supportive of female students as their understanding of the relationship between MHM and the school attendance of female students improved as a result of the MHM intervention. This improved understanding helps reduce stigma and biases across the school as focal point teachers shared their learning with other teachers, leading to better management of menstruation in schools and potentially increasing female students' attendance.

The MHM intervention also resulted in communities becoming more engaged in supporting MHM for female students, as found in the IPE. Community members such as PTA presidents were more likely to support proposals linked to better management of MHM safe spaces as they gained awareness from community-wide sensitisation events. This support was deemed crucial for maintaining the safe spaces and keeping them clean, which could provide a mechanism to ensure long-run and sustained impacts for girls and female students.

The evaluation did not investigate whether including MHM as a standalone subject in the curriculum is feasible. Involving Ministry of Secondary Education officials and regional political delegates from the implementation regions in the intervention delivery process suggests potential for the MHM intervention to influence curriculum policy in the future. These mechanisms were not initially outlined in the logic model, which could be refined by further including these pathways to implement longer-run impacts.

Interpretation

Adequate menstrual hygiene management is crucial for improving school attendance among female students (Hennegan et al., 2021). Poor knowledge of MHM practices among schoolgirls and in schools, discriminatory norms, poverty, and inadequate sanitation all contribute towards unmet MHM needs for girls, negatively affecting their school attendance (Crankshaw et al., 2020; Ngeno, 2019; Oster & Thornton, 2009). Evidence from interventions in Uganda and other countries have suggested that MHM interventions could be effective in increasing girls' school attendance and broader attitudes towards menstruation (Mongomery et al., 2016). The MHM intervention was previously piloted in 15 schools in Cameroon, and found evidence of promise in improving attendance rates of menstruating girls (Kansiime et al., 2020).

The current trial was designed to explore the impact of the MHM intervention on a broader scale, extending the evidence from the pilot to investigate whether a comprehensive MHM intervention could have an impact on attendance and attainment of schoolgirls, and bring about changes in knowledge and attitudes around menstruation among girls and boys.

In summary, there is evidence of a positive impact on girls' attendance, and we find no evidence of impact on attainment and knowledge/attitude outcomes, though methodological limitations may explain these findings showing no impact. The delivery of the MHM intervention closely followed the original design, with regional and local adaptations made by local delivery organisations and focal point school teachers. The intervention was well-received and broadly perceived to have positive impacts by students, teachers, and community stakeholders.

The MHM intervention improved girls' school attendance suggesting a meaningful improvement in attendance rates from addressing MHM challenges. This improvement is relative to a high control group average attendance rate. Translating these effects to school absence rates implies a reduction in absenteeism of about 20% from 7.6% to 6.03%. This effect is in line with existing evidence that MHM interventions reduce school absences by 7% to 24% (Betsu and others, 2024; Belay and others, 2020; Montgomery and others, 2016; Sol and others, 2021).

The intervention had a larger impact on girls aged about 14 to 16 (largest effects in Form 4), when most girls would likely have had started menstruating. This suggests the intervention is likely to be most effective for girls who are close to menarche, as they may not have sufficient knowledge to adequately manage their menstrual health.

Though the intervention was well-implemented overall, there was regional variation in adherence and support from delivery organisations. Local delivery organisations provided varying levels of support for MHM clubs, and dignity kits, and training of teachers and students, all were executed with regional adaptations. Teacher training sessions, intended to build the capacity of MHM focal points, ranged from one to four days in duration, depending on the region. These differences in compliance were associated with differences in impact on the primary outcome. Compliance analysis indicates that there was a larger positive impact on girls' school attendance in fully compliant schools. Schools that adhered closely to the intervention protocols saw a stronger impact on attendance, indicating that fidelity to the intervention design is crucial for success.

The perceived impacts of the MHM intervention were overwhelmingly positive among students, teachers, and community members. Teacher training sessions were well-received, and teachers felt better equipped to support MHM practices in their schools. Students appreciated the renovated safe spaces and the dignity kits, which included reusable pads, soap, and other hygiene items. These resources helped them manage their menstruation more effectively, reducing absenteeism and improving their school experience. Teachers also reported a significant improvement in their own understanding of MHM and their ability to support female students.

There is no evidence that the intervention changed knowledge and attitudes towards menstruation among pupils. This contrasts with evidence from other studies that found menstrual interventions in school could shift perceptions (Austrian and others, 2019; Betsu and others, 2024). However, there is low confidence in these findings, as the sample sizes for the pupil survey were much smaller than planned for in the protocol. This meant that the analysis did not have sufficient statistical power to detect whether small impacts on these outcomes (of magnitudes smaller than 0.2 standard deviations, as found in this analysis) were statistically meaningful. Furthermore, the question wording in the survey could be further refined to ensure that questions capture change after the implementation – for instance, questions around experiencing negative support would ideally ask pupils to report on experiences of being made fun of after the implementation was in place (within the last academic year), in contrast to the current survey wording.

We also found no evidence that the intervention had an impact on educational attainment, though this finding may be subject to caveats related to the timing of outcome measurement and the length of exposure, and high levels of attrition. The limited timeframe of 4-6 months post-intervention, shorter than the full academic year as originally planned, may not have been sufficient to capture the full impact on learning outcomes, which is expected to operate through sustained increases in attendance. Though attendance is a driver of educational attainment, longer exposure to the programme may be necessary to generate effects on attainment. Existing evidence from the literature on conditional cash transfers suggests that longer exposure to cash transfer programs result in improved attainment (though not across all contexts, even though short-term effects on attendance are observed consistently (Baird and others, 2011; Barham and others, 2013; Glewwe and Muralidharan, 2016). Longer-term tracking would be needed to understand whether increased attendance of the magnitude observed in this trial will have an academically meaningful impact on educational attainment.

In conclusion, the MHM intervention positively impacted girls' school attendance, particularly in schools with higher compliance. While it was well-received and seen to reduce stigma around menstruation in schools, there was no quantitative evidence to suggest that it significantly improved students' knowledge, attitudes, and support towards menstruation. The lack of evidence of an effect on educational attainment suggest that longer-term studies are needed to understand whether MHM interventions can promote learning outcomes. The findings from the study can be used to inform policymakers about the benefits and challenges of implementing MHM interventions in schools, with further investigation required to assess the effectiveness on attitudinal and attainment outcomes.

Limitations and lessons learned

The evaluation had several limitations worthy of discussion. High attrition rates, data linkage issues, and a short timeframe for assessing educational outcomes were significant challenges. These factors underscore the need for more accurate data collection methods and longer-term tracking. Future research should address these limitations - improving data collection methods and ensuring longer-term tracking will help capture the full impact of MHM interventions and provide a clearer picture of their effectiveness.

The evaluation faced significant challenges due to high attrition rates, impacting the robustness of the findings. Attrition was high across all measures, though mainly due to linkage issues rather than systematic student dropout, reducing the risk of non-random missingness. Most missing data for girls' attendance stemmed from difficulties in linking baseline and endline records, suggesting missingness was not systematically associated with pupil characteristics. A dropout model showed that school year was linked to missingness, with higher grades more likely to have missing attendance data. Intervention schools also had higher levels of missing data at endline. These challenges highlight the need for improved data collection methods and robust tracking systems in future research.

A key lesson learned for future trials is to reduce the intensity of the manual workload for data collectors and data managers and data cleaning burden by adopting unified templates and digitising data collection to streamline data entry methods. Improvements in data collection methods would reduce attrition arising purely due to data linkage issues, where pupils' records could not be reliably linked between baseline and endline.

With the intervention lasting less than a full academic year, the exposure period may have been too short to produce a lasting impact on all outcomes, particularly educational attainment, which was hypothesised as a longer-term outcome. A further limitation of the evaluation is that test scores were collected from schools following different curricula, with test content, difficulty, and grading scales all likely to differ across schools and regions. Ensuring that test score ranges are collected alongside the scores obtained by pupils would ensure greater confidence in test score analysis. Future research could explore the possibility of collecting standardised test measures, though this may be costly to implement.

Additionally, the study was designed to detect effects generally across all pupils in the school. This means that differences in impact across pupil subgroups, such as within year groups and regions, may not have had sufficient statistical power to be fully captured. In particular, systematic data collection across year groups would allow for a better understanding of whether the MHM intervention is most effectively targeted to girls beyond menarche.

The school eligibility criteria were relatively strict, especially in terms of geography, given that this trial focused on schools located in conflict or disadvantaged areas. One of the limitations of the evaluation is that the intervention was implemented in disadvantaged schools with lower toilet-to-pupil ratios and a high proportion of marginalised students. While this supports high internal validity, it limits the generalisability of the findings to other regions of Cameroon with greater educational investment.

We are confident in the findings from the evaluation, and though there are some limitations to highlight, the findings regarding positive effect on attendance and the perceived beneficial impacts by stakeholders are robust. The limitations regarding the data highlight that challenges in large-scale data collection from schools need to be carefully planned for when designing trials.

Future research

This trial shows that the MHM intervention increased girls' school attendance and was implemented with high fidelity and perceived positively by most stakeholders. Future research should improve the logic model further by incorporating learning from this trial to investigate the full impacts of the MHM intervention on attitudinal and educational attainment outcomes. Second, research should explore the differential impacts of MHM interventions across various pupil subgroups, such as those with different baseline knowledge levels or access to menstrual hygiene or financial resources, as the intervention may operate more strongly for different groups. Additional research should consider detailed analyses of the implementation process, regional variations in support and adherence, and in-depth case studies of schools with high compliance.

Additionally, future studies should examine the effectiveness of integrating MHM education into the broader curriculum as MHM clubs were largely positively received, and it would be good to test whether extending this further to the curriculum could bring about broader change in attitudes. Future research should make use of the delivery expertise and learning from this trial to effectively fully implement the intervention to test its effects more conclusively across a range of settings.

Findings from this trial that have shown the MHM intervention has improved girls' attendance are valuable insight for policy discussions, particularly around the 'Clean School' initiative, or other related programmes to improve school environments. These findings may be used to motivate a wider roll-out of the intervention to more schools, where there may be more potential to conduct further evaluations. As delivery capacity for this intervention might be limited (based on the known challenges from this evaluation, a staggered roll-out may be best used to facilitate further evaluation and/or monitoring of impacts. A stepped-wedge design or quasi-experimental designs (for instance, using non-randomised allocation and differences in treatment timing to investigate impacts using a staggered difference-in-differences approach) would allow for further evaluation of impacts on attainment or attitudinal outcomes. Other randomised designs, such as active control or nimble designs, could also be used to further determine whether specific aspects of the MHM intervention may be most effective or could be improved to deliver more cost-effectively or efficiently.

There are no planned additional publications for this trial.

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Appendix A: Security classification of trial findings

Rating	Criteria for rating			Initial Score		Adjust		Final Score
	Design	MDES	Attrition					
5	Randomised design	< 0.2	0-10%					
4	Design for comparison that considers some type of selection on unobservable characteristics (e.g. RDD, Diff-in-Diffs, Matched Diff-in-Diffs)	< 0.3	11-20%			Adjustment for Balance [0]		
3	Design for comparison that considers selection on all relevant observable confounders (e.g. Matching or Regression Analysis with variables descriptive of the selection mechanism)	< 0.4	21-30%	3			3	3
2	Design for comparison that considers selection only on some relevant confounders	< 0.5	31-40%			Adjustment for threats to internal validity [0]		
1	Design for comparison that does not consider selection on any relevant confounders	< 0.6	41-50%					
0	No comparator	> 0.6	over 50%					

- Initial padlock score: Experimental design (RCT), MDES at randomisation was 0.2 for attendance outcomes but attrition was at 36.7% attrition = 3 padlocks
- Reason for adjustment for balance (if made): No adjustment made
- Reasons for adjustment for threats to validity (if made): No adjustment made
- Final padlock score: initial score adjusted for balance and internal validity = 3

Appendix B: Changes since the previous evaluation

Appendix Table B1: Changes since the previous evaluation

	Feature	Pilot to efficacy stage
Intervention	Intervention content	Remained similar to the pilot but expanded to the South West region; dignity kits were revised (removing combs, toothbrushes, and toothpaste); and the theory of change and toilet design were refined with input from eBASE Africa and the Ministry of Secondary Education (excluding community input).
	Delivery model	Delivery scaled up from 15 pilot schools in the pilot (9 with survey data) to 80 schools in the trial (final sample of 75 due to data issues).
	Intervention duration	The intervention ran from January to June 2024, delayed from a planned September 2023 start because of safe space construction delays (pilot was slightly shorter from Feb–June 2022).
Evaluation	Eligibility criteria	Eligibility was stricter than in the pilot, focusing exclusively on conflict-affected, disadvantaged schools with low toilet-to-student ratios and marginalised groups, while excluding insecure areas.
	Level of randomisation	Not applicable to pilots.
	Outcomes and baseline	Not applicable to pilots.
	Control condition	Not applicable to pilots.

Appendix C: Effect size estimation

Table C1: Results from analysis of primary outcome: girls' attendance

			Intervention group		Control group			
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance	Population variance (if applicable)
Primary outcome: Attendance rate (female)	2.71	1.57	7116 (4566)	64.9	6253 (4053)	129	95.1	N/A

Table C2: Results from analysis of secondary outcome: education attainment

			Intervention group		Control group			
Outcome – Education attainment	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance	Population variance (if applicable)
Girls' maths test scores	-0.263	-0.612	6,611 (2,172)	8.463	5,275 (2,214)	5.115	6.977	N/A
Girls' French test scores	-0.083	0.265	2,683 (905)	1.767	2,645 (930)	1.467	1.618	N/A
Girls' English test scores	0.468	0.142	4,376 (819)	10.457	2,683 (1,231)	6.616	8.997	N/A

Table C3: Results from analysis of secondary outcome: Knowledge, attitudes and perceptions about menstruation

			Intervention group		Control group			
Outcome: Knowledge, attitudes and perceptions about menstruation	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance	Population variance (if applicable)
Knowledge of menstruation	662 (297)	0.927 (0.914, 0.941)	662 (250)	0.891 (0.875, 0.907)	1324 (662; 662)	0.143 (-0.063, 0.352)	0.205	N/A
Positive attitudes towards menstruation	0.004	0.002	654 (305)	0.040	659 (253)	0.036	0.038	N/A

Open attitudes towards discussing menstruation	0.055	0.036	662 (297)	0.060	662 (250)	0.068	0.064	N/A
Boys' lack of support towards menstruation	0.005	-0.029	209 (268)	0.156	182 (272)	0.153	0.154	N/A
Girls' experiences of negative support towards menstruation	0.039	0.023	278 (204)	0.116	308 (150)	0.086	0.100	N/A
Girls' perceptions of support towards menstruation	0.129	0.083	276 (112)	0.136	266 (111)	0.081	0.109	N/A

Table C4: Results from subgroup analysis of primary outcome: girls' attendance

			Treatment group		Control group		Overall	
Outcome: Girls' attendance	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance	Population variance (if applicable)
Year 1	3.114	1.758	1382	58.892	1371	110.317	84.502	N/A
Year 2	2.082	0.418	1334	70.832	1174	141.251	103.793	N/A
Year 3	1.871	1.194	1315	90.099	1026	115.349	101.164	N/A
Year 4	3.542	2.206	1135	43.436	871	152.32	90.706	N/A
Year 5	2.593	1.837	967	42.44	1030	100.944	72.616	N/A
Year 6	4.55	1.16	508	83.164	427	184.774	129.559	N/A
Year 7	2.699	4.479	475	66.149	354	155.245	104.179	N/A
Rural	2.706	1.038	2169	65.004	2010	122.32	92.571	N/A
Urban	2.719	1.573	4947	64.821	4243	132.898	96.251	N/A
Region: East	3.445	1.369	1634	57.643	1783	200.31	132.089	N/A
Region: Far North	2.113	2.088	1343	79.576	1397	129.193	104.873	N/A
Region: North West	3.099	0.306	2020	50.18	1377	109.336	74.156	N/A
Region: South West	1.411	1.731	2119	70.054	1696	65.975	68.24	N/A

Further appendices:

Please submit any further appendices as a separate document of technical notes. We will be publishing these as a separate document, to reduce the length of reports.

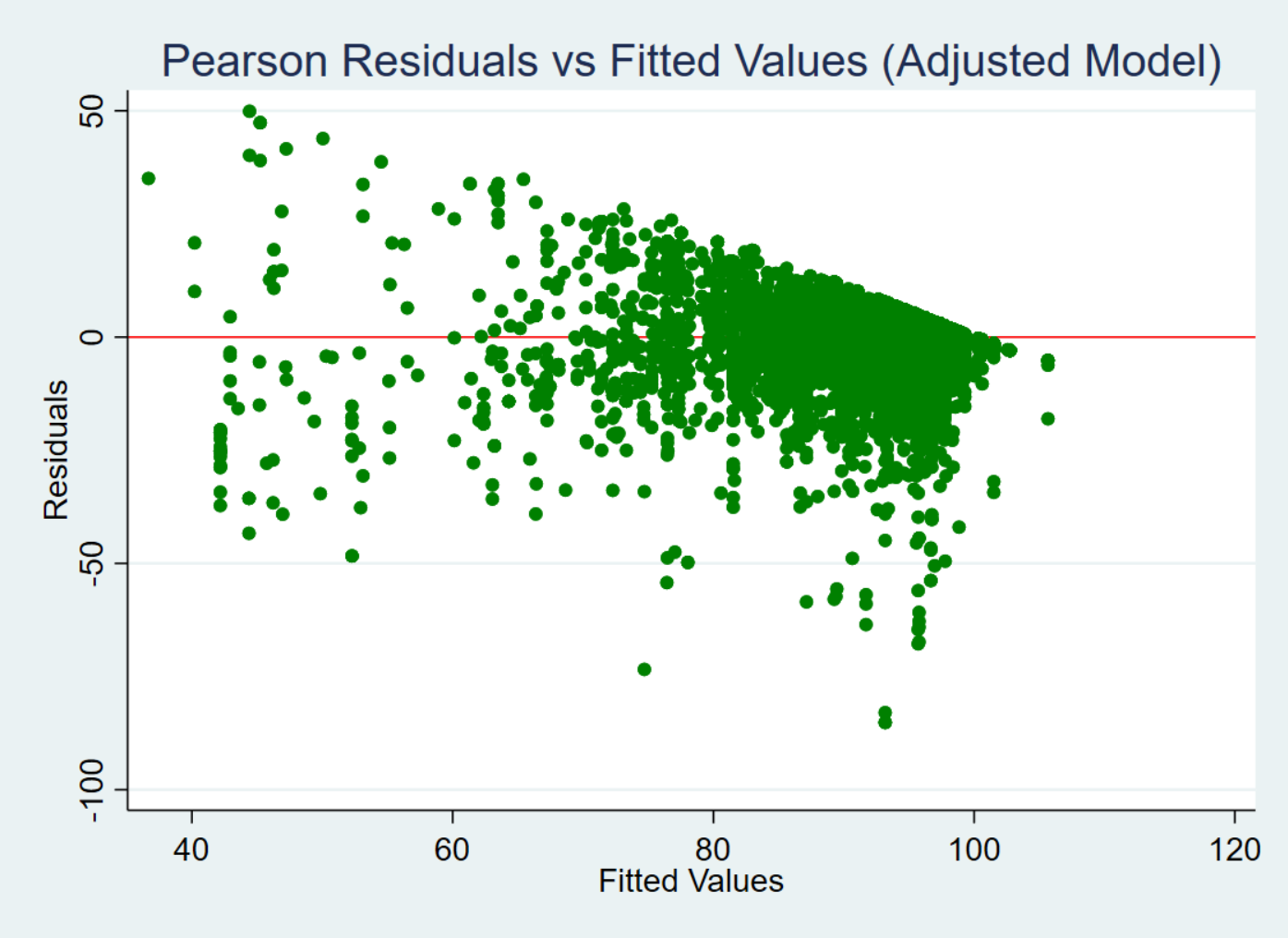
Appendix D: Pre-post correlations for outcome measures

Appendix Table D1: Pre-post correlations for primary and secondary outcome measures

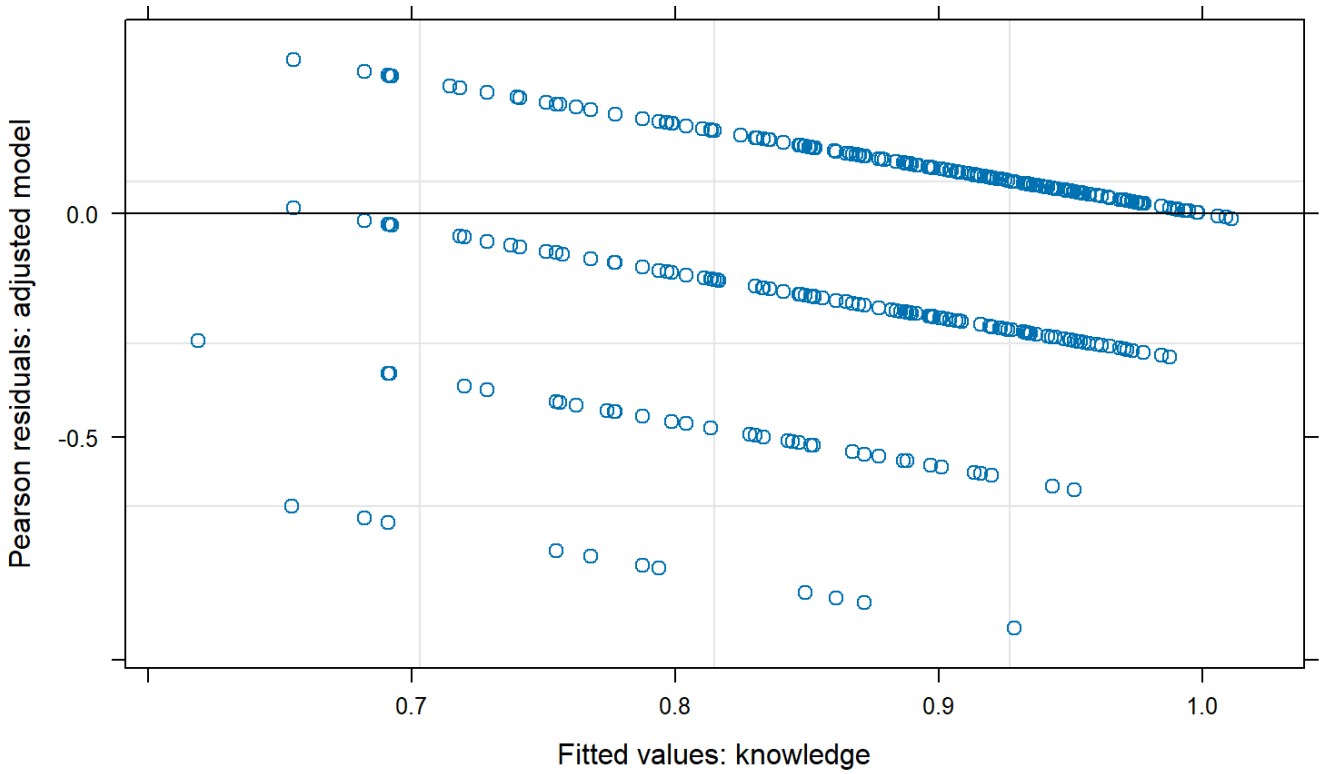
Outcome	Correlation between baseline and endline measures
Girls' school attendance rate	0.640
Girls' standardised maths test scores	0.112
Girls' standardised French test scores	0.177
Girls' standardised English test scores	0.124
Pupils' knowledge of menstruation	0.114
Pupils' positive attitudes towards menstruation	0.040
Pupils' open attitudes towards discussing menstruation	0.225
Boys' lack of support towards menstruation	0.153
Girls' experiences of negative support when menstruating	0.070
Girls' perceptions of positive support when last menstruating	0.086

Appendix E: Residuals plotted against fitted values

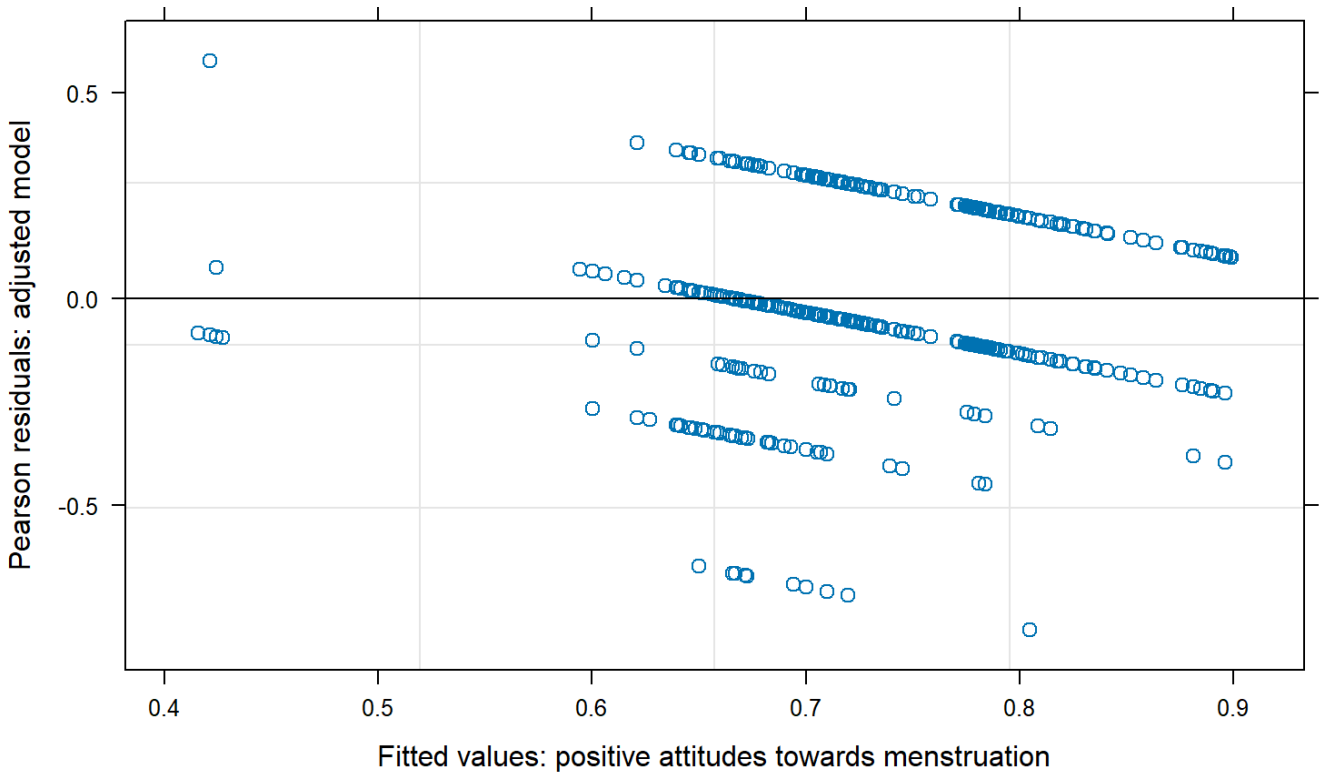
Appendix Figure E1: Residuals for endline attendance outcome - adjusted model



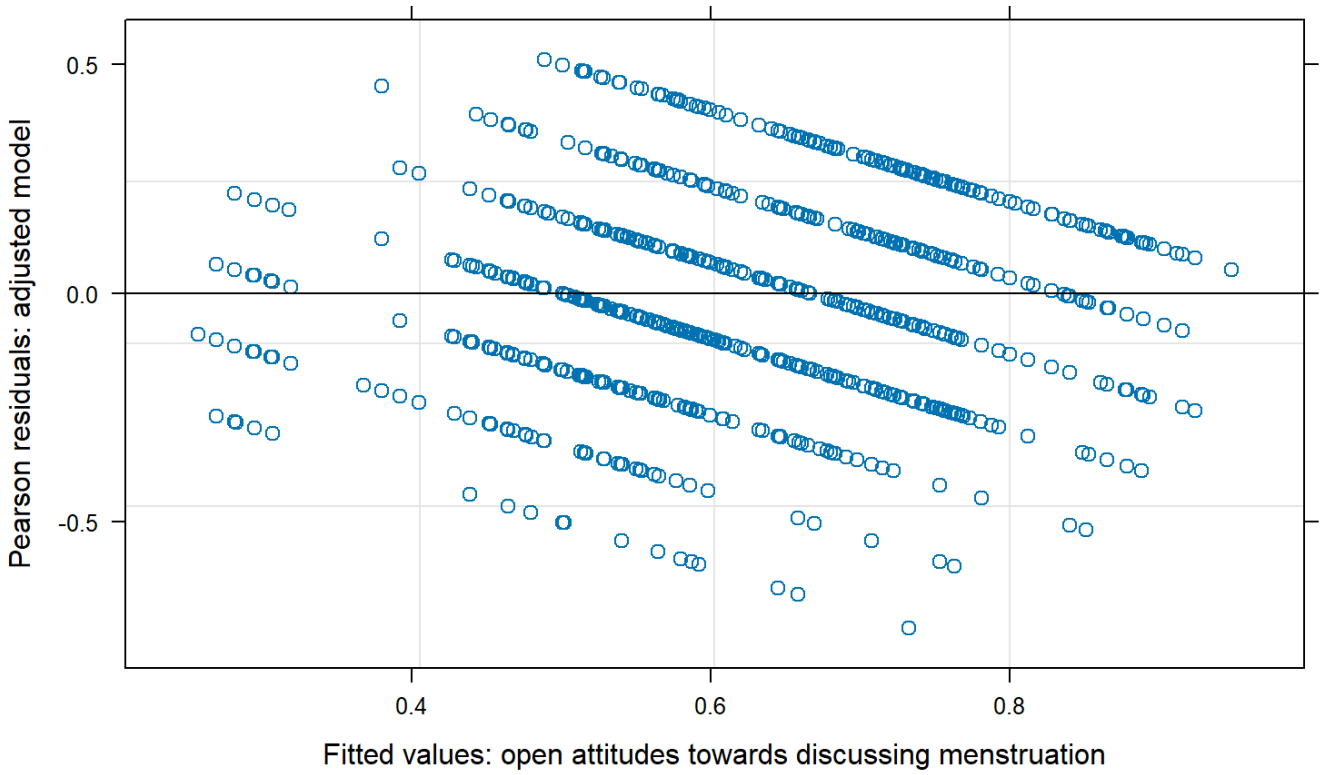
Appendix Figure E2: Residuals for endline knowledge outcome - adjusted model



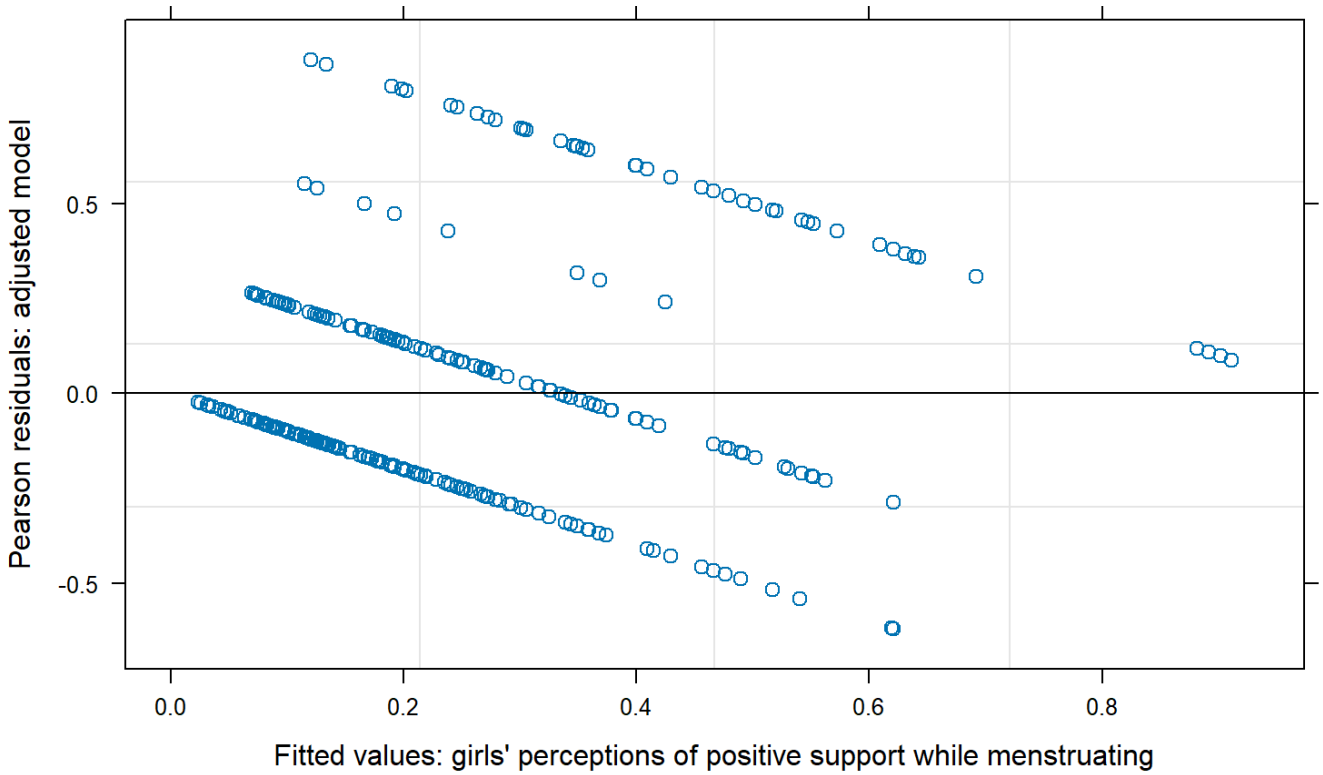
Appendix Figure E3: Residuals for endline positive attitudes towards menstruation outcome - adjusted model



Appendix Figure E4: Residuals for endline open attitudes outcome - adjusted model

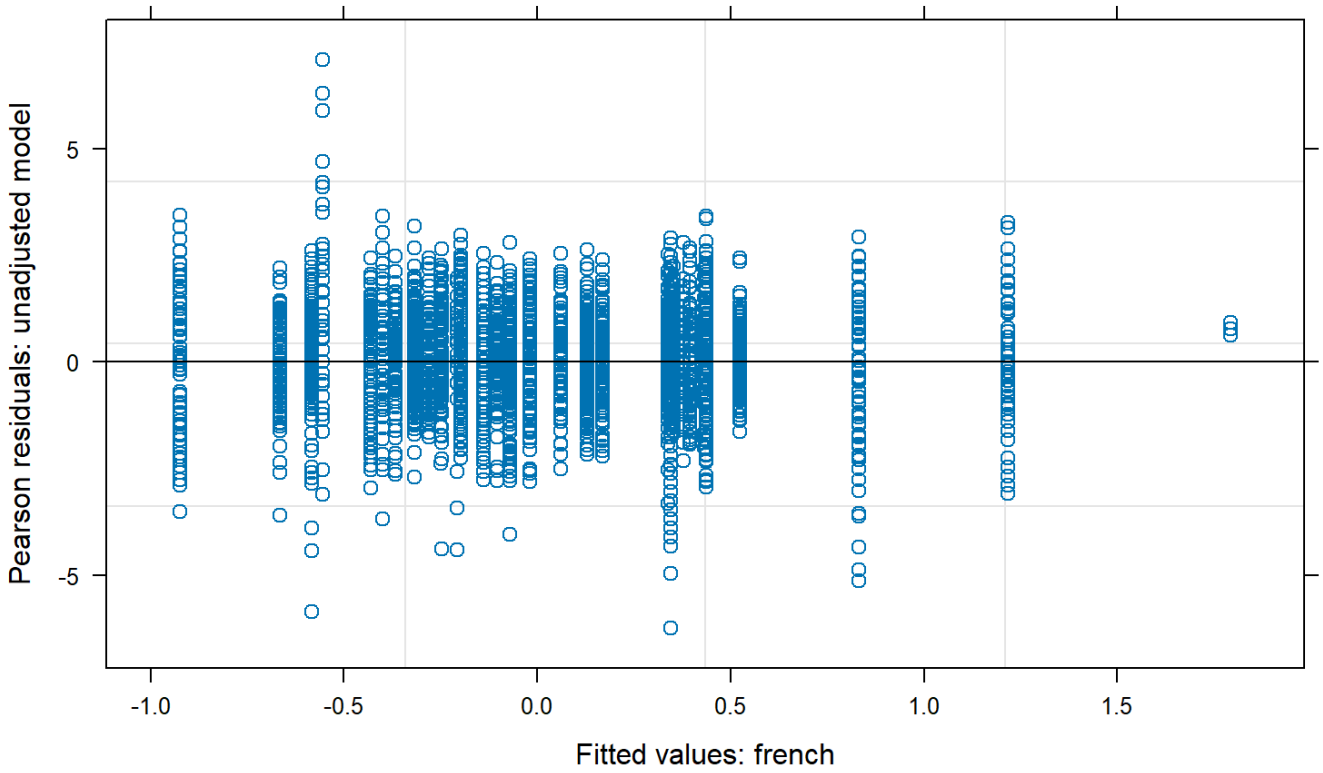


Appendix Figure E5: Residuals for girls' perceptions of support while menstruating at endline – adjusted model

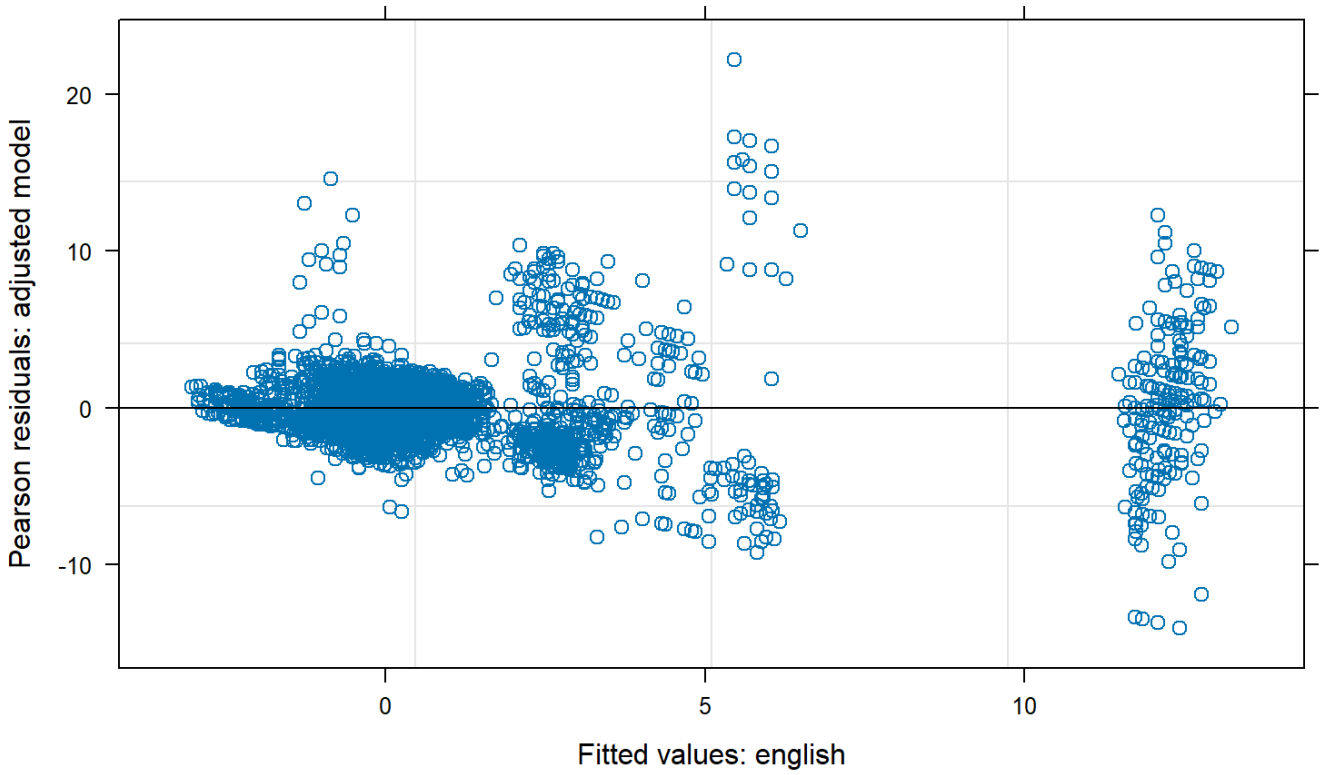


Appendix Figure E6: Residuals for girls' maths test scores at endline – adjusted model

Appendix Figure E7: Residuals for girls' French test scores at endline – adjusted model



Appendix Figure E8: Residuals for girls' English test scores at endline – adjusted model



Appendix F: Subgroup analysis

Appendix Table F1: Subgroup analysis by class – girls' attendance outcomes

Covariate	Impact	P-value	N
Intervention	0.81	0.306	10, 205
	[0.791]		
Intervention x Form 2	0.538	0.231	
	[0.449]		
Intervention x Form 3	1.51	0.001	
	[0.466]		
Intervention x Form 4	1.58	0.001	
	[.486]		
Intervention x Form 5	0.29	0.556	
	[0.5]		
Intervention x Form 6	1.92	0.002	
	[0.612]		
Intervention x Form 7	1.26	0.070	
	[0.697]		

Appendix Table F2: Subgroup analysis by area type (urban/rural) – girls' attendance outcomes

Covariate	Impact	P-value	N
Intervention	1.98	0.029	10, 205
	[0.908]		
Intervention x rural	-1.48	0.352	
	[1.59]		

Appendix Table F3: Subgroup analysis by region – girls' attendance outcomes

Covariate	Impact	P-value	N
Intervention	1.651	0.265	10, 205
	[1.482]		
Intervention x Far North	0.349	0.86	
	[1.978]		
Intervention x North West	-1.167	0.564	
	[2.022]		
Intervention x South West	0.908	0.752	
	[2.868]		

Appendix Table F4: Subgroup analysis by gender – pupil survey outcomes

Variables	(1) Knowledge of menstruation	(2) Positive attitudes towards menstruation	(3) Open attitudes towards discussing menstruation
Comparison: Girls (reference group)	0.856	0.743	0.566

	(0.049)***	(0.045)***	(0.064)***
Intervention: Girls	0.028	0.019	0.057
	(0.024)	(0.023)	(0.034)*
Comparison: Boys	-0.070	0.019	0.020
	(0.014)***	(0.014)	(0.017)
Intervention: Boys	0.001	-0.035	-0.044
	(0.020)	(0.020)*	(0.024)*
Baseline pupil survey measure of outcome	0.058	-0.018	0.072
	(0.026)**	(0.027)	(0.028)***
Strata: EAST - Urban	-0.023	-0.020	-0.063
	(0.047)	(0.045)	(0.069)
Strata: FAR NORTH – Rural	0.006	-0.073	-0.076
	(0.052)	(0.050)	(0.076)
Strata: FAR NORTH – Urban	0.003	-0.059	-0.107
	(0.050)	(0.048)	(0.073)
Strata: NORTH WEST - Rural	0.064	-0.051	0.034
	(0.051)*	(0.049)	(0.075)
Strata: NORTH WEST - Urban	0.095	0.052	0.166
	(0.050)*	(0.048)	(0.073)**
Strata: SOUTH WEST - Rural	0.006	0.084	0.017
	(0.056)	(0.053)	(0.081)
Strata: SOUTH WEST - Urban	0.019	0.047	-0.001
	(0.047)	(0.045)	(0.069)
Observations	1,324	1,313	1,324
Number of groups	76	76	76

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix Table F5: Secondary outcome analysis results – subgroup analysis by gender

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Knowledge of menstruation - boys	0.045	0.024	335 (624)	0.043	319 (593)	0.058	0.051
Knowledge of menstruation - girls	0.032	0.032	327 (632)	0.015	343 (569)	0.030	0.023

Positive attitudes towards menstruation - boys	-0.011	-0.023	331 (628)	0.044	317 (595)	0.041	0.043
Positive attitudes towards menstruation - girls	0.018	0.025	323 (636)	0.036	342 (570)	0.030	0.033
Open attitudes towards discussing menstruation - boys	0.040	0.018	335 (624)	0.061	319 (593)	0.066	0.064
Open attitudes towards discussing menstruation - girls	0.069	0.055	327 (632)	0.058	343 (569)	0.069	0.064

Appendix Table F6: Secondary outcome analysis – effect size estimation

	Unadjusted means				Effect size		
	Treatment group		Control group				
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value
Knowledge of menstruation - boys	335 (624)	0.897 (0.874, 0.919)	319 (593)	0.852 (0.825, 0.878)	654 (335; 319)	0.105 (-0.163, 0.381)	0.475
Knowledge of menstruation - girls	327 (632)	0.959 (0.946, 0.973)	343 (569)	0.927 (0.909, 0.946)	670 (327; 343)	0.210 (-0.003, 0.426)	0.073
Positive attitudes towards menstruation - boys	331 (628)	0.734 (0.712, 0.757)	317 (595)	0.745 (0.723, 0.767)	648 (331; 317)	-0.112 (-0.347, 0.124)	0.378
Positive attitudes towards menstruation - girls	323 (636)	0.732 (0.711, 0.752)	342 (570)	0.713 (0.695, 0.732)	665 (323; 342)	0.135 (-0.091, 0.358)	0.267
Open attitudes towards discussing menstruation - boys	335 (624)	0.652 (0.625, 0.678)	319 (593)	0.611 (0.583, 0.640)	654 (335; 319)	0.072 (-0.172, 0.320)	0.590
Open attitudes towards discussing	327 (632)	0.653 (0.627, 0.680)	343 (569)	0.584 (0.556, 0.612)	670 (327; 343)	0.217 (-0.039, 0.473)	0.120

menstruation - girls							

Appendix G: Robustness checks

Appendix Table G1: Primary outcome analysis results

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	variance of outcome	n (missing)	variance of outcome	
Attendance rate (aggregated)	2.51	1.94	267 (0)	21.7	250 (0)	41.1	31.1

Appendix Table G2: Primary outcome analysis – effect size estimation

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (intervention; control)	Hedges g (95% CI)	p-value
Attendance rate (aggregated)	267 (0)	94.2 (93.6-94.7)	250 (0)	91.7 (90.9-92.5)	517 (267; 250)	.348 (.174 - .521)	0.006

Appendix Table G3: Primary outcome analysis results accounting for imbalanced covariates

Outcome	Unadjusted differences in means	Adjusted differences in means	Intervention group		Control group		Pooled variance
			n (missing)	variance of outcome	n (missing)	variance of outcome	
Attendance rate (aggregated)	2.708	1.692	7116	64.906	6253	129.519	95.127

Notes: These results are from model specifications that additionally include variables that were imbalanced at baseline – year group and the proportion of female pupils in the school.

Appendix Table G4: Primary outcome analysis accounting for imbalance – effect size estimation

Outcome	Unadjusted means				Effect size		
	Intervention group		Control group				
	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (intervention; control)	Hedges g (95% CI)	p-value
Attendance rate (aggregated)	7116 (0)	95.101 (94.914-95.288)	6253 (0)	92.393 (92.111-92.675)	13369 (7116; 6253)	.173 (.139 - .207)	0.019

Notes: These results are from model specifications that additionally include variables that were imbalanced at baseline – year group and the proportion of female pupils in the school.

Appendix Table G5: Secondary outcome analysis results

			Treatment group		Control group		Overall
Outcome	Unadjusted differences in means	Adjusted differences in means	n (missing)	Variance of outcome	n (missing)	Variance of outcome	Pooled variance
Knowledge of menstruation – count of correct responses	0.110	0.107	662 (297)	0.273	662 (250)	0.405	0.339
Positive attitudes towards menstruation – count of responses with positive attitudes	0.105	0.107	654 (305)	0.332	659 (253)	0.297	0.315
Open attitudes towards discussing menstruation – count of responses with open attitudes	0.281	0.249	662 (297)	2.144	662 (250)	2.449	2.297

Boys' lack of support towards menstruation – binary outcome	-0.025	-0.034	209 (750)	0.156	182 (730)	0.153	0.154
Girls' experiences of negative support – binary outcome	0.024	0.017	278 (681)	0.116	308 (604)	0.086	0.100
Girls' perceptions of support while menstruating – count of responses perceiving support at school	0.264	0.259	276 (683)	1.223	266 (646)	0.725	0.979

Appendix Table G6: Secondary outcome analysis – effect size estimation

	Unadjusted means				Effect size			
	Treatment group		Control group					
Outcome	n (missing)	Mean (95% CI)	n (missing)	Mean (95% CI)	Total n (treatment; control)	Hedges' g (95% CI)	p-value	Cox index
Knowledge of menstruation – count outcome	662 (297)	2.782 (2.743, 2.822)	662 (250)	2.672 (2.624, 2.721)	1324 (662; 662)	0.183 (-0.116, 0.483)	0.230	-
Positive attitudes towards menstruation – count outcome	654 (305)	2.078 (2.034, 2.122)	659 (253)	1.973 (1.931, 2.014)	1313 (654; 659)	0.191 (-0.088, 0.469)	0.180	-
Open attitudes towards discussing menstruation – count outcome	662 (297)	3.915 (3.804, 4.027)	662 (250)	3.583 (3.464, 3.703)	1324 (662; 662)	0.164 (-0.063, 0.391)	0.156	-
Boys' lack of support towards menstruation – binary outcome	209 (750)	0.191 (0.138, 0.245)	182 (730)	0.187 (0.13, 0.244)	391 (209; 182)	-0.086 (-0.338, 0.165)	0.500	-0.074 (-0.224, 0.077)
Girls' experiences of negative support – binary outcome	278 (681)	0.133 (0.093, 0.173)	308 (604)	0.094 (0.061, 0.127)	586 (278; 308)	0.053 (-0.146, 0.253)	0.600	0.197 (0.007, 0.387)
Girls' perceptions of support while menstruating – count outcome	276 (683)	0.92 (0.789, 1.051)	266 (646)	0.534 (0.431, 0.637)	542 (276; 266)	0.261 (0.037, 0.485)	0.022	-

Appendix H: Missing data analysis

Appendix Table H1: Determinants of data missingness

	(1) Girls' attendance missing	(2) Girls' maths test scores missing	(3) Girls' French test scores missing	(4) Girls' English test scores missing
Intervention school	-3.714***	-0.002	-2.624**	0.728
	(0.868)	(0.899)	(1.250)	(1.990)
School year	0.061***	-0.417***	0.248	1.370***
	(0.016)	(0.119)	(0.168)	(0.300)
Baseline outcome	-0.0005	-0.207	0.037	0.066
	(0.003)	(0.131)	(0.184)	(0.203)
Baseline outcome missing	-	50.230	36.417	63.581
	-	(16461.957)	(97884.227)	(442119.783)
Intervention school*school year	0.179***	-0.070	0.625**	-0.271
	(0.023)	(0.164)	(0.304)	(0.426)
Intervention school * baseline outcome	0.023***	0.391**	-0.417	-0.384
	(0.006)	(0.166)	(0.310)	(0.295)
Intervention school * baseline outcome missing	-	1.588	1.479	54.467
	-	(31242.247)	(134124.772)	(2412161.702)
Observations	21,950	16,272	7,163	9,109
Number of groups	79	78	39	39

Notes: Coefficients presented are from random-effects logistic regressions of binary variables indicating whether the outcome of interest was missing. All specifications also include stratification fixed-effects in addition to the listed

covariates. School year (in the attendance data specification) and baseline outcome values were imputed with the variable mean if missing. Baseline attendance was non-missing for all girls in the sample considered for analysis. Standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Appendix I: MHM training materials

Appendix Table I1: Training manuals and guidance for MHM

No.	Description	Document
1	MHM Lab Convenor's Manual (in English) This manual guides practitioners in organizing MHM Lab events to address menstrual hygiene across diverse cultural contexts.	 MHM-Lab-Convenors-Manual.pdf
2	MHM Lab Convenor's Manual (in French) Manuel l'attention des organisateurs du Labo GHM	 WSSCC_Lab_Manual_WestAfricaVersion_FR.
3	Guide to menstrual hygiene materials This document provides guidance for staff from UNICEF Supply Division and Programme Division (WASH, Education, and Protection sections) on the selection and procurement of appropriate materials and supplies for menstrual hygiene management, particularly during humanitarian response.	 UNICEF-Guide-menstrual-hygiene-materials
4	Guidance on Menstrual Health and Hygiene This guidance was developed for UNICEF WASH, Education, Health, and Gender specialists or focal points in country offices who are working with their partners to develop programmes related to menstrual health and hygiene (MHH).	 UNICEF-Guidance-menstrual-health-hygiene
5	WASH and Health for Menstrual Hygiene Management Training of Trainers Manual (in English) This manual trains WASH and health practitioners to confidently address menstrual hygiene management issues.	 Training-of-Trainers-Manual-WASH-and-H
6	WASH and Health for Menstrual Hygiene Management Training of Trainers Manual (in French) Manuel de Formation des Formateurs en Gestion de l'Hygiène Menstruelle	 2016-01_ToT_Manual FR- Final version.pdf

Appendix J: Data collection tools

Appendix Table J1: Recruitment documents for MHM

No.	Description	Document
1	Child Assent Form	Child Assent Form.docx
2	Informed consent form	Informed Consent Form.docx

Appendix Table J2: Interview topic guides – baseline for MHM

No.	Description	Document
1	Interview guide for school administrators	Interguide for School Administrators.docx
2	Interview guide for girls	Interview guide for girls.docx
3	Interview guide on MHM for community members	Interview guide on MHM for community
4	Key informant interview guide for key project staff	Key Informant Interview Guide for Ke

Appendix Table J3: Interview/ Focus group discussion topic guides for MHM – endline for MHM

No.	Description	Document
1	Interview/ Focus group discussion topic guides for boys	Focus Group Discussion Guide Bc
2	Interview/ Focus group discussion topic guides for girls	Focus Group Discussion Guide Gi
3	Interview/ Focus group discussion topic guides for community members	FGD_Community_Members.docx

4	Interview/ Focus group discussion topic guides for key project staff	KII_Project_Staff.docx
5	Interview/ Focus group discussion topic guides for school admin	KII_PTA_School Admin.docx
6	Interview/ Focus group discussion topic guides for focal points	FGD_Focal_Points.docx