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Menstrual Practice Needs Scale short form (MPNS-SF) and rapid (MPNS-R): development in Khulna, Bangladesh, and validation in cross-sectional surveys from Bangladesh and Uganda

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ABSTRACT

Objectives Develop and validate short and rapid forms of the 36-item Menstrual Practice Needs Scale (MPNS-36).

Design Item reduction prioritised content validity and was informed by cognitive interviews with schoolgirls in Bangladesh, performance of scale items in past research and stakeholder feedback. The original MPNS-36 was revalidated, and short and rapid forms tested in a cross-sectional survey. This was followed by further tests of dimensionality, internal consistency and validity in multiple cross-sectional surveys.

Setting and participants Short form (MPNS-SF) and rapid form (MPNS-R) measures were developed in a survey of 313 menstruating girls (mean age=13.51) in Khulna, Bangladesh. They were further tested in the baseline survey of the Adolescent Menstrual Experiences and Health Cohort, in Khulna, Bangladesh (891 menstruating girls, mean age=12.40); and the dataset from the MPNS-36 development in Soroti, Uganda (538 menstruating girls, mean age=14.49).

Results The 18-item short form reflects the six original subscales, with the four core subscales demonstrating good fit in all three samples (Khulna pilot: root mean square error of approximation (RMSEA)=0.064, 90% CI 0.043 to 0.084, Comparative Fit Index (CFI)=0.94, Tucker-Lewis Index (TLI)=0.92. Cohort baseline: RMSEA=0.050, 90% CI 0.039 to 0.062, CFI=0.96, TLI=0.95. Uganda: RMSEA=0.039, 90% CI 0.028 to 0.050, CFI=0.95, TLI=0.94). The 9-item rapid form captures diverse needs. A two-factor structure was the most appropriate but fell short of adequate fit (Khulna pilot: RMSEA=0.092, 90% CI 0.000 to 0.158, CFI=0.93, TLI=0.89). Hypothesised associations between the MPNS scores and other constructs were comparable between the MPNS-36 and MPNS-SF in all populations, and replicated, with attenuation, in the MPNS-R. Internal consistency remained acceptable.

Conclusions The MPNS-SF offers a reliable and valid measure of adolescent girls' menstrual hygiene experience while reducing participant burden, to support implementation and improve measurement in menstrual health research. The MPNS-R provides a brief measure with poorer structural validity, suited to short surveys and including menstrual health within broader research topics.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Item reduction was informed by stakeholder experiences, girls' perceptions of item importance and item performance in existing datasets while aiming to maintain content validity.
⇒ Dimensionality, reliability and validity of the short form Menstrual Practice Needs Scale short form and rapid form were assessed across multiple populations.
⇒ Items adapted for the shorter forms were not collected in older samples (Uganda) and were thus not directly comparable.
⇒ Due to eligibility to answer questions related to disposal, reuse and managing menstruation in the school or workplace, small samples limited assessments of scale dimensionality.
⇒ There are few validated measures capturing aspects of menstrual experiences against which to test convergent or divergent validity.

INTRODUCTION

Quantification of adolescent girls' menstrual health needs—essential to population monitoring and evaluating the effectiveness of interventions—has been limited by a lack of measures for core concepts.[1 2] The Menstrual Practice Needs Scale (MPNS-36)[3] was published in 2020 to address this gap and has seen rapid uptake in research and practice.[4–12] However, this comprehensive scale is 36-items in length, presenting a barrier to implementation in short needs assessments

or multicomponent surveys. Stakeholders have requested a short form to enable greater uptake.

The MPNS-36 measures respondents' experience of menstrual blood management during their last menstrual period.[3] It assesses the extent to which an individuals' needs for menstrual materials, disposal, spaces for changing and laundering reusable materials were met. In doing so, it provides a participant-centred measure of a key requirement for menstrual health outlined in the 2021 definition of menstrual health: 'women, girls, and all other people who experience a menstrual cycle are able to care for their bodies during menstruation such that their preferences, hygiene, comfort, privacy and safety are supported.'[13] As such, it is also a measure of menstrual hygiene experience.[14] Individual scale items can be used to understand the experiences and needs of respondent population,[9] while changes in total and subscale scores can be used to evaluate the effectiveness of menstrual health interventions.[8 11] The scale can also be used in research to test associations between risk and protective exposures and menstrual experience, and to quantify relationships between unmet menstrual management needs and consequences for women's and girls' health, social and educational outcomes.[15] This broad range of uses must be considered in developing a shorter form.

The MPNS-36 was developed to measure the experiences of adolescent girls in schools,[3] and subsequently adapted for adult working women.[6] The scale is comprised of 36 items which can be delivered as personalised statements for self-report or as questions for enumerator administered surveys. Each item asks about the frequency of experience during the last menstrual period on a four-point Likert scale from *never* to *always*. Adolescent subscales include material and home environment needs, material reliability concerns, change and disposal insecurity, and transport and school environment needs, along with reuse needs and reuse insecurities. The scale was developed to assess experiences across the breadth of blood management practices and perceptions of the environments used for menstrual management, with practice domains derived from a systematic review of qualitative studies of menstrual experiences in low-and-middle-income countries (LMICs).[16] This comprehensiveness contributed to the length of the measure, but also provides a granular picture of population needs. In evaluating interventions, the MPNS ensures that management tasks that may not be the target of the intervention are assessed. For example, many interventions focus on delivering menstrual products. Without considering individuals' experiences of disposal for single-use products or laundering for reusables, evaluations are likely to provide an incomplete and inaccurate picture of the effect of interventions on menstrual experience.

The present study

We aimed to provide short and rapid versions of the MPNS to meet the needs of different users, and to compare the performance of the measure at shorter lengths. For the short form we aimed to halve the length of the MPNS-36, and to halve this again for a rapid version.

Guiding principles for item reduction were set a priori based on past research and theory. First, we prioritised content validity (the extent to which the scale reflects the construct being measured)[17] and retaining the breadth of experiences assessed through the measure above structural validity (the extent to which scale scores capture the dimensionality of the construct; that is, they identify consistent subdomains consistent with the theory of the construct).[17 18] Item selection was not driven by item factor-loadings alone. As noted above, the experiences measured draw on systematic review of qualitative research and ensure that intervention evaluations capture holistic menstrual management experiences. Second, single items from the MPNS have been included as part of recommended indicators for national and global monitoring of menstrual health and hygiene.[19 20] We prioritised retaining these in shorter forms to enable comparability of data collected using the scale with national data. Third, we decided a-priori to retain items in the MPNS that capture experiences separately relating to the home and school environments. Research has consistently highlighted differing experiences at home and at school (for adolescents[9 16 21]) or work (for adults), and studies using MPNS data have consistently shown differing experiences of menstruation in these settings.[6 9] While duplicate items contribute to length of the scale, they are useful for policy and practice. In needs assessment, they highlight areas of greatest need, while in evaluations differences in items over time or between study sites can provide feedback on environments improved by the intervention. Fourth, we prioritised retaining a balance of positively and negatively orientated items in shortened versions. Assessments of MPNS dimensionality have consistently found that items capturing positive appraisals of experience such as satisfaction with the available changing facilities or having enough menstrual products, load on separate but correlated factors to those capturing insecurities such as worries about privacy or leaking.[3 4 6] As noted in the original development, including both positively and negatively framed experiences balances framing in administering the items with participants and offers a more nuanced assessment of experience. Combined scores across positively and negatively scored items have demonstrated stronger relationships with hypothesised correlates than these item sets alone across multiple studies.[3 6 15]

METHODS

The development and assessment of the short form (MPNS-SF) and rapid (MPNS-R) was undertaken over multiple phases and drew on stakeholder feedback and past research outlined in the Background. First, we re-validated the full MPNS-36 in Bangladesh using cognitive interviews with girls to assess item comprehension and quantitatively through a pilot cross-sectional survey in

Khulna, Bangladesh. Second, we developed a candidate short form. Items were prioritised drawing together findings from the same cognitive interviews with girls using participatory activities to understand their perspectives on item importance, factor loadings for items observed across existing studies, use of MPNS items as national indicators and theoretical considerations outlined in the Background. Third, the factor structure of the candidate short and rapid forms were tested and validated using the Khulna pilot survey data. Fourth, MPNS-SF and MPNS-R validity and reliability were appraised in the original MPNS development dataset (Soroti, Uganda), and the baseline of the Adolescent Menstrual Experiences and Health Cohort (AMEHC) study[22] in Khulna, Bangladesh (Khulna Cohort, Bangladesh).

Study samples and data collection

Khulna pilot, Bangladesh

Prior to the launch of the AMEHC study, a preparatory mixed-methods research programme was undertaken to understand the menstrual health challenges in the setting and to refine cohort measures. Khulna District, specifically Khulna City Corporation (urban) and Dumuria Upazilla (rural), were selected as sites for the AMEHC study through collaboration among the cohort research partners.[22] Study measures, including the MPNS-36, were translated from *English* to *Bangla* by bilingual research team members and reviewed in group sessions.

Cognitive interviews

Ten cognitive interviews focused on the MPNS were undertaken with 20 adolescent schoolgirls in pairs in September 2022, facilitated by a trained female interviewer and lasting 60–90 min. Girls participated from five of the six schools that had been purposively selected as part of the qualitative phase of research. Schools had a strong relationship with the study nongovernmental organisation (NGO) partner and included co-educational, single-sex and madrassa (religious education) school types. Participants were provided with a written copy of the MPNS questions, grouped by subscale and discussed their answer, rationale and understanding of each item. Most groups engaged with half of the survey items (three subscales) to avoid fatigue. At the end of each subscale, participants were provided with flashcards of each question and asked to sort them into three categories 'most important', 'important' and 'least important'. The interviewer used the interview audio-recording to produce a written English summary of participant rationale for item responses and prioritisation. Daily debriefing sessions among the research team refined the *Bangla* translation of items, and updated translations were deployed in the following day's interviews.

Survey

A pilot survey including the MPNS-36 was undertaken across 10 purposively selected schools with girls attending classes 6–9 and aged 12–16 in October 2022. A target sample of 360 participants provided 10 participants per MPNS item. Female enumerators received 5 days of training and administered the survey verbally, entering responses into tablets and uploading to the BRAC James P Grant School of Public Health KoboToolbox server. Girls were provided with a written copy of the survey if they wished to follow along and read the questions for themselves. The printed survey included the visual response tool for the MPNS depicting the four response options.[3] Surveys lasted 45–60 min for post-menarche participants.

Cognitive interviews and the survey followed sensitisation workshops at each school notifying teachers and parents about the study. Parents/guardians provided written consent, and girls provided written assent to participate.

Khulna cohort, Bangladesh

Methods and sampling for the AMEHC study are detailed elsewhere.[23] In brief, 101 schools from Khulna City Corporation and Dumuria Upazilla were selected using a proportional random sampling approach to achieve a representative sample of adolescent girls attending co-educational, single-sex and madrassa schools. All girls attending class 6 were eligible to participate. Following 6 days of training, surveys were administered by female enumerators. Participants were provided a written copy of the survey. Data were collected between February and March 2023. Surveys with girls who had reached menarche were an average of 30 min duration and included the MPNS-SF. Parents/guardians provided written consent, and girls provided written assent to participate. Data relevant to this publication for the pilot and cohort are available in an Open Science Framework repository.[24]

Soroti, Uganda

Methods and results of the original MPNS-36 development and validation in Soroti, Uganda have been published previously.[3] The dataset is publicly available.[25] 12 schools engaged with the partnering NGO were recruited. Adolescent girls attending primary school class levels 4–7 were included, with most participants from primary class levels 5–6. Paper copies of the survey in English were provided to groups of no more than six girls. Trained female enumerators facilitated the survey, providing verbal translation of each item in Ateso, with participants indicating their own responses on the paper survey. Data collection was undertaken between March and May 2019. Surveys lasted 75–90 min, and included all candidate items for developing the MPNS-36. Schools consented to participation and informed parents through parent–teacher meetings with the option to opt-out of the study. Girls provided written assent.

Measures

Sample demographics and menstrual practices

Participants self-reported their age, class level and the materials they used to absorb or catch menstruation. In all three data collections, girls self-reported if they

washed and reused any menstrual materials during their last period. In both Bangladesh data collections, girls also self-reported if they attended school during their last menstrual period, and if they changed their menstrual materials at school. These were used as subsequent eligibility criteria for MPNS items.

The MPNS

The full MPNS-36 was administered to girls in the Khulna pilot. The subsequent cohort baseline used the short-form items only. Both Bangladesh surveys used the interview version of the MPNS, which presents each item in question format, for example, 'During your last menstrual period, were your menstrual materials comfortable?'. The full set of questions are displayed in tables in the results section. Participants provide responses on a 4-point Likert scale: never, some of the time, most of the time, always. These terms were determined to be appropriate in the *Bangla* translation, however training with enumerators also highlighted that the middle options could also be interpreted as 'less than half of the time' and 'more than half of the time'. Prior to asking the MPNS items, in both the pilot and cohort surveys, enumerators administered a brief exercise to familiarise girls with the response options. This included asking girls about daily activities such as 'Over the past week, how often did you have street food?'. Girls were also presented with a printed copy of the survey which displayed the response options and MPNS visual response tool.[3] Participants were asked to respond to MPNS items concerning the disposal (Items 12–15) of menstrual materials if they reported disposing of materials during their last period, including disposing of single-use or reusable products at the end of their life. They were asked to respond to questions about laundering materials if they reported washing and reusing any material during their last period (items 29–36). Girls who reported that the 'never' changed their materials at school during their last period were not asked questions about the experience of changing materials at school (items 25–28).

In Soroti, Uganda, as part of the original MPNS-36 development, girls completed a longer set of candidate scale items. These were delivered as statements which girls responded to on their own survey, for example, 'During my last menstrual period, my menstrual materials were comfortable' with response options: never, sometimes, often and always.

MPNS subscale and total score are calculated using the mean of included items. Positively worded items are scored from 0 to 3 and negatively worded items from 3 to 0. Higher MPNS scores represent more positive experiences of menstrual blood management.

Hypothesised correlates

Mental health was assessed across all three datasets using a translated version of the Depression Anxiety Stress Scale (DASS-21).[26 27] In the Khulna cohort baseline and study sample in Soroti, Uganda, only the Depression and Anxiety subscales were used. A continuous total score of included items was calculated. Higher scores represent greater endorsement of depression and anxiety items and thus poorer psychological health. Although more research is needed, the DASS has been widely used across contexts, and has exhibited a bifactor structure scoring across items.[28] A *Bangla* version of the DASS-21 has previously been validated among adults in Bangladesh.[29]

Confidence to manage menstruation was assessed using similar self-report items across all three datasets. Participants were asked to report their agreement on a 4-point Likert scale (very unconfident, unconfident, confident, very confident) to the question relevant to home and then to school: *How confident do you feel that you can manage your menstruation [pad yourself, change your materials, dispose of them or wash and dry them] when you are at home?* In Bangladesh, to remain consistent with past research,[21] confidence at home was dichotomised to compare girls who reported being 'very confident' to those giving other responses, whereas confidence at school was dichotomised to compare girls who reported being 'very confident' or 'confident' to those who were not confident. In the Soroti dataset, girls who reported feeling 'confident' at both home and school were compared with 'not confident'. Groupings were maintained for comparability with the original MPNS-36 development.

School participation was assessed through two self-report items in the Bangladesh studies, one capturing self-reported absence from school during the last menstrual period, and the second asking girls to report if they had trouble participating in school, such as participating in class, due to their last menstrual period. This question asked for a yes or no response, and was aligned with new recommendations for monitoring menstrual health and hygiene.[19 20] Participation during menstruation was not included in the study in Soroti, so only self-reported absence during the menstrual period was used.

Analyses

Quantitative analyses were undertaken in Stata V.17 and in R V.4.3.1. Revalidation of the MPNS-36 drew on girls' reflections in cognitive interviews used to refine translation and check interpretability of the questions. Quantitative revalidation was undertaken in the Khulna Pilot data. Descriptive statistics were used to summarise sample responses to each MPNS item and identify missing data. Confirmatory factor analysis (CFA) using the *lavaan*[30] package for R was undertaken using a diagonally weighted least squares estimator (DWLS). We considered root mean square error of approximation (RMSEA) ≤0.08 as indicative of a fair fit, and Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) ≥0.90 as indicative of acceptable fit (with CFI and TLI ≥0.95 indicative of close fit).[18] Factor loadings ≥0.30 were considered acceptable. Scaled estimates are presented. Internal consistency was assessed using Cronbach's alpha, and ordinal alpha calculated using the polychoric correlations given the four-point response scale.[31] Validity was assessed by exploring

associations between the MPNS-36 total and subscales with constructs hypothesised to be related.

To develop the short and rapid forms, girls' perception of item importance from cognitive interviews were integrated with a priori defined priorities for item selection. Girls' scoring of the importance of items in cognitive interviews was used qualitatively and in the context of interview discussion of these decisions.

The dimensionality, internal consistency and validity of the short form were tested in the Khulna Pilot survey following the same procedures used for the MPNS-36 revalidation described above. For tests of dimensionality (structural validity), we first undertook CFA, hypothesising the original subscales would be replicated in the short form. To supplement this assessment, we also undertook exploratory factor analyses (EFA) using the polychoric correlation matrix and oblique rotation (*promax*) to investigate alternative structures, however the original was the best fit for the data for the short form. To test the dimensionality of the rapid form, we undertook EFA, and CFA testing hypothesising one-factor and two-factor structures.

Tests of dimensionality of the short and rapid forms using CFA were then replicated in the Khulna Cohort Baseline, Bangladesh and Soroti, Uganda datasets. We note that DWLS requires complete data and so analyses reflect the sample of participants with no missing items. In the dataset from Soroti, Uganda, we used the first multiple imputation data generated using chained equations with the *mice* package[32] in R from the original study.[3] Internal consistency using Cronbach's alpha and ordinal alpha, along with tests of associations with hypothesised correlates was undertaken. Correlation coefficients or binary logistic regressions were used as appropriate to the distribution of the outcome.

Patient and public involvement

NGO practitioners and researchers as the potential users and audience for the measure informed original development of the MPNS. Feedback from users shared with the development team informed considerations for short and rapid form development and cognitive interviews with girls were undertaken to support item selection. Community consultation for the broader AMEHC study was undertaken[22] but this did not include focus on the MPNS.

RESULTS

Survey sample characteristics

Sample characteristics of the three quantitative datasets used in the study are presented in table 1.

Re-validation of the MPNS-36 in Bangladesh

20 girls across classes 6–9 and aged 13–16 participated in cognitive interviews testing comprehension of MPNS items, translation and informing the subsequent short-form development. Initial cognitive interviews highlighted easily understood questions, and those that required further amendments to translation. Most translation improvements were grammatical, relating to the ordering of sentence content. There were also modifications based on individual words. For example, 'comfortable' had multiple translations in *Bangla* dependent on physical or emotional comfort. MPN1 refers to physical comfort, whereas items such as MPN10 referred to 'feeling comfortable' in English and the selected translation prioritised mental safety/peace comfort. By the conclusion of early translation modifications, all MPNS items were well-understood by respondents. In interviews, participants described varied circumstances and preferences that influenced their response selection. Quotations are presented in online supplemental materials 1.

The MPNS-36 exhibited strong performance in the survey data collected in the Khulna pilot in Bangladesh. The original MPNS-36 factor structure was an acceptable fit for the data (CFI=0.924, TLI=0.927, RMSEA=0.075, 90% CI=0.060–0.090). Subscales and total scale exhibited good internal consistency (total scale α=0.86) and the total and subscales showed multiple expected relationships with other constructs, including mental health, participation in school and confidence managing menstruation at school. Full tables and text reporting the revalidation are presented in online supplemental materials 2. This

Table 1 Sample characteristics for included populations

	Khulna pilot, Bangladesh	Khulna cohort, Bangladesh	Soroti, Uganda
No. menstruating girls	313	891	538
Age range	12–16	10–16	11–19
Age mean (SD)	13.51 (SD=1.13)	12.40 (SD=0.94)	14.49 (SD=1.20)
Exclusively used disposable commercial pads during last menstrual period % (n)	61.98 (194)	47.19 (420)	29.37 (158)
Used reusable materials during the last period % (n)	22.36 (70)	41.01 (365)	54.49 (291)
Changed materials outside the home (most likely at school) during their last period	–	–	87.71 (472)
Changed materials at school during the last menstrual period	31.52 (87)	14.78 (116)	–

supplement also reports the responses to each survey item in this population.

Short and rapid form item selection

There was agreement across the cognitive interviews that the experiences captured in the MPNS items were important and relevant for girls. Girls' ratings in cognitive interviews was used as a starting point for qualitative discussion. We noted there was inconsistency across the interviews in the items rated as most or less important, however, in discussions, girls explained that items were likely to be more important for different individuals, depending on circumstances. For example, groups consistently rated safety at school (MPNS 28) as a less important item because they did not personally have concerns about their safety in school toilets. However, safety at home (MPNS21 and 22) were rated by multiple pairs as 'very important', with girls' emphasising that if this was a concern for girls, it would be a top priority. Pairs who did not wash and reuse materials did not see the relevance of these items, while those with difficulties rated this as 'very important'; particularly privacy for washing and drying materials. In the four subscales that apply to all participants, the most highly prioritised items were:

- Material and home environment needs: comfortable menstrual materials (MPNS1) and being able to wash hands (MPNS11). Hand washing was particularly relevant in the context where menstrual items are considered unclean, and participants described washing their hands after having any contact with items related to menstruation.
- Change and disposal insecurity: being worried others would see disposed menstrual materials (MPNS14) and privacy for changing menstrual materials at home (MPNS20).
- Material reliability concerns: being worried materials would leak (MPNS5).
- Transport and school environment needs: being able to change menstrual materials when desired at school (MPNS23).

The rationale underpinning item prioritisation and selection for the short and rapid forms are summarised in tables 2 and 3. Content validity was the highest priority when reducing the item set. While more similar items, related to more similar practices, often exhibited higher factor loadings and enhanced model fit, we prioritised selecting a single item that represented each practice experience and removed items that provided different perspectives on a similar aspect of blood management experience. Items were also prioritised based on (a) their selection as indicators for national and global monitoring, (b) item performance in past data collections, for example, while items 8 and 9 capture unique experiences of transporting materials they have cross-loaded and created problems for scale factor structure[6] and (c) girls' perspectives on item importance in cognitive interviews.

Short form dimensionality

Dimensionality of the short form was assessed in the Khulna Pilot, Bangladesh. The original four-factor structure, and two reuse factors, remained an acceptable fit. In testing in the Khulna pilot sample, EFA was undertaken and further indicated that the original four-factor structure offered the best subscale solution. Single and two-factor structures did not offer better fit for the data and demonstrated poor factor loading for school-related items and material reliability concerns.

Structural validity was then replicated in the Khulna Cohort Baseline, Bangladesh and Soroti, Uganda populations. CFA findings for all three datasets are presented in table 4. Despite the small sample size among the Bangladesh samples including girls who changed their menstrual materials at school, the four-factor structure was an acceptable fit, achieving a good fit in the original Soroti, Uganda data with a more substantial sample.

For girls who did not change their menstrual materials at school, and thus did not answer MPN27 and MPN28, the four factors were an acceptable fit for the data. However, we note that a Heywood case was observed in the cohort baseline data which excluded these items (see table 4). In exploring this case, we found that both MPN23 and MPN24 have low bivariate correlations with other non-school related items in the measure (all polychoric correlations <0.15 in both the pilot and cohort samples) including some 0 bivariate relationships. They have correlations with MPN27 and MPN28 (polychoric correlations 0.22 to 0.32 across both samples) which in turn have meaningful correlations with other items across the scale. When removing MPN27 and MPN28 to test the factor structure in girls not changing menstrual materials at school, it is likely these zero-correlations (and the low correlation between the remaining school subscale and other factors (correlations=0.07–0.15) results in a Heywood case. It is consistent with our expectations of the measure that girls' satisfaction with the available school facilities will not have a strong relationship to their satisfaction with their materials or home environment, while insecurities in the home and school environment have a closer relationship demonstrated by loading on the same factor. The sample excluding girls who change at school in this analysis also means that girls' reports about their satisfaction with their disposal experience captures only the home environment, further minimising relationships between MPN23/24 and other scale items. As such we did not interpret the Heywood case (a negative variance estimate) as indicating model misspecification.[33] However, this finding suggests that the subscale structure is less stable when the full set of items is not included due to eligibility constraints.

Rapid form dimensionality

Items in the rapid form prioritised breadth. As a result, most factors were only represented by one or two items; with single item factors unable to be included in CFA for model fit. As we hypothesised based on findings from the

Table 2 Rationale for prioritised and selected short form (SF) and rapid (R) items

Item	SF	R	Priority. Rationale
1. Were your menstrual materials comfortable?	X		High. Priority for assessing material quality/suitability. Girls rated highly in cognitive interviews.
2. Did you have enough of your menstrual materials to change them as often as you wanted to?	X	X	Essential. Included in shortlist of indicators for national and global monitoring of menstrual health.
3. Were you satisfied with the cleanliness of your menstrual materials?			Lower. Greater potential for social desirability bias if participants are embarrassed to report dissatisfaction with cleanliness. Lower ratings in cognitive interviews.
4. Could you get more of your menstrual materials when you needed to?			Lower. Both MPNS4 and MPNS7 capture access to materials. Access rated as lower priority in cognitive interviews in Bangladesh—MPNS7 likely to better capture experience.
5. Were you worried that your menstrual materials would allow blood to pass through to your outer garments?	X	X	High. Only item which captures the effectiveness of menstrual materials and lived experience of concern about leakage. Highly rated by girls in cognitive interviews.
6. Were you worried that your menstrual materials would move from place while you were wearing them?			Lower. Item is more applicable to those not using pads, partially captured by MPNS5, concerns about leakage. MPNS5 and 7 prioritised within this subscale.
7. Were you worried about how you would get more of your menstrual material if you ran out?	X		High. Preferred item to capture access to materials (between MPNS4 and 7). This captures both purchasing materials (for those purchasing their own) or asking their parents (for younger respondents who do not purchase/find their own materials).
8. Did you feel comfortable carrying spare menstrual materials with you outside your home?			Moderate. This item has a history of cross-loading as it bridges multiple locations (carrying from home to elsewhere). Better to remove for structural validity, however, participants often report high rates of *not* feeling comfortable transporting materials and this description is lost without this item.
9. Did you feel comfortable carrying menstrual materials to the place where you changed them?			Lower. Similar to MPNS8 this item often has issues with cross-loading or poorly loading on the school factor. The location for the item is not specified and may elicit different responses across the sample.
10. Did you feel comfortable storing your leftover or cleaned menstrual materials until your next period?			Low. Using this item in different languages we have encountered translation issues, and difficulties in clarity understanding this item.
11. Were you able to wash your hands when you wanted to?			Low. While this item asks about the last menstrual period, handwashing is not exclusive to menstruation and could be assessed as part of other measures.
12. Were you able to immediately dispose of your used menstrual materials?			Moderate. MPNS12 and 13 are often highly correlated (Khulna pilot polychoric correlation=0.60). Immediate disposal may not always be the preferred mechanism; MPNS13 retained.
13. Were you able to dispose of your used materials in the way that you wanted to?	X	X	High. MPNS13 selected between the two disposal needs items.
14. Were you worried about where to dispose of your used menstrual materials?			Moderate. MPNS14 and 15 typically highly correlated (polychoric correlation=0.68 in Khulna pilot). MPNS13 captures use of preferred disposal locations, so privacy item was retained (MPNS15)
15. Were you concerned that others would see your used menstrual materials in the place you disposed of them?	X		High. Selected between MPNS14 and 15. Highest rated in subscale in cognitive interviews with girls.
16. Home—Were you able to change your menstrual materials when you wanted to?	X		High. Measures availability of changing locations at home. MPNS16 and 19 both capture this availability from different perspectives. MPNS16 retained in short form to balance positive and negative items and perceived to be more specific (ability to change) than MPNS 19 (worried would be unable to change).
17. Home—Were you satisfied with the place you used to change your menstrual materials?	X	X	High. Satisfaction can capture multiple dimensions of environment. Suggest item revision to incorporate example: 'For example, it was clean, safe, and had what you needed such as light or water'
18. Home—Did you have a clean place to change your menstrual materials?			Lower. Captured by satisfaction. MPNS17 and 18 highly correlated in multiple samples. Cleanliness added as example to MPN17 with MPNS17 suggested for retention in short form.

Continued

Table 2 Continued

Item	SF	R	Priority. Rationale
19. Home—Were you worried that you would not be able to change your menstrual materials when you needed to?			Moderate. Retained item MPNS16 captures the availability/accessibility of spaces for changing materials, in favour of MPNS19.
20. Home—Were you worried that someone would see you while you were changing your menstrual materials?	X	X	High. Highly rated by girls in cognitive interviews. Privacy for changing in schools is included as a recommended indicator for national and global monitoring.
21. Home—Were you worried that someone would harm you while I you were changing your menstrual materials?	X		High. Applies to fewer participants, but incredibly important when it does apply. Safety in changing location at school included as recommended indicator for national and global monitoring.
22. Home—Were you worried that something else would harm you while you were changing your menstrual materials (eg, animals, insects, unsafe structure)?			Moderate. While safety of infrastructure and concerns about other harms are important, MPNS21 was prioritised. We considered combining MPNS21 and MPNS22 to capture safety more broadly, however we felt that retaining an understanding of concerns about safety from others was most important as reflective of concerns about gender-based violence. This granularity would be lost in a more general question.
23. School—Were you able to change your menstrual materials when you wanted to?	X	X	High. Highest rated in cognitive interviews with girls of 'transport & school needs' subscale. Captures accessibility and availability of changing spaces.
24. School—were you satisfied with the place you used to change your menstrual materials? Revised to: Were you satisfied with the places available at your school for changing your menstrual materials (eg, it was clean, safe and had what you needed such as light or water)?	X		High. Matches with selected home-related item MPNS17. As for MPNS17, with added examples this can capture cleanliness as well as other required needs in the space. We have found that in multiple studies there are many participants who do not change their menstrual materials at school/work. This item was revised for the Khulna pilot and shortform to be relevant to those who do and don't use facilities.
25. School—Did you have a clean place to change your menstrual materials?			Moderate/Essential. While this question is included as a recommended indicator for national monitoring, MPNS24 capturing satisfaction (with expanded example text) is able to capture cleanliness along with broader needs. MPNS24 could be used to assess comparability with the national indicators and MPNS24 and 25 are highly correlated (polychoric correlation 0.80 in the Khulna pilot).
26. School—Were you worried that you would not be able to change your menstrual materials when you needed to?			Moderate. Both MPNS23 and 26 capture access to changing locations when needed/wanted. MPNS23 was selected, consistent with the item selected to capture experiences at home. Retaining balance between positively and negatively coded items.
27. School—Were you worried that someone would see you while you were changing your menstrual materials?	X	X	Essential. Recommended indicator for national and global monitoring, high priority for girls who do change menstrual materials at school.
28. School—Were you worried that someone would harm you while you were changing your menstrual materials?	X		Essential. While less often reported, highlights important safety concerns and perceptions of gender-based violence.

MPNS, Menstrual Practice Needs Scale.

full and short form MPNS, a single-factor solution was not an acceptable fit for the data (excluding reuse items) in the Khulna pilot dataset (CFI=0.897, TLI=0.828, RMSEA 0.131, 90% CI 0.058 to 0.205). A two-factor solution offered the best fit in the Khulna Pilot but did not reach thresholds of acceptable fit for all metrics, and this was replicated in the other two datasets (see table 5). School-related items loaded poorly on the two factors. However, we note the small sample size to test the full set of rapid-form items in the Khulna pilot and cohort datasets given the limited number of girls who changed their menstrual materials at school. In the datasets including the larger number of participants who did not change their menstrual materials at school, remaining school-related items fit poorly with the factor structure and compromised stability of the model.

Validity and internal consistency

Mean, SD, internal consistency and validity tests are presented in table 6 for the respective MPNS-36, MPNS-SF and MPNS-R total scales. Findings for MPNS-SF subscales are presented in online supplemental materials 3. The MPNS-SF total scales displayed adequate internal consistency across datasets, with subscales largely displaying strong reliability particularly when tested using α for ordinal items. Two-item subscales such as 'material reliability concerns' exhibited poorer reliability as expected for the small number of items. The MPNS-R had

Table 3 Rationale for prioritised and selected short form (SF) and rapid (R) items relevant to reusing menstrual materials

Reuse items	SF	R	Priority. Rationale
29. Did you have enough water to soak or wash your menstrual materials?	X	X	High. For shortform, proposed to combine MPNS29 and MPNS32 since the use of soap requires water. Revised item for shortform 'Did you have enough water and soap to wash your menstrual materials?'
30. Did you have access to a basin or bucket to soak or wash your menstrual materials whenever you needed it?			Low. Having enough water and soap accessible often requires having a washing vessel. MPNS29/32 were prioritised over this item.
31. Were you able to wash your menstrual materials whenever you wanted to?	X		High. Rated as a very important item for reusing materials in cognitive interviews that included girls with experience using reusable materials. Captures the accessibility/availability of washing and potential restriction on time.
32. Did you have enough soap to wash your menstrual materials?			High. MPNS29 and MPNS32 combined into a single item for the short form.
33. Were you able to dry your materials when you wanted to?			Moderate. This is the only item that captures satisfaction with the experience of drying, rather than worries/concerns. The availability of drying is often impacted by weather and privacy concerns, which are captured by MPNS35 and MPNS36.
34. Were you worried that someone would see you while you were washing your menstrual materials?			Moderate. While highly relevant, MPNS31 highlights the availability of washing, which is likely to be impacted by privacy. Reuse items are typically highly correlated across samples. MPNS35 and 36 were preferred.
35. Were you worried that your menstrual materials would not be dry when you needed them?	X		High. This item is impacted by both drying practices (eg, drying under other fabric to hide menstrual materials) but also seasonal weather (eg, wet seasons). Impacts material availability and hygiene if wet materials are reused.
36. Were you worried that others would see your menstrual materials while they were drying?	X	X	High. Highly rated by girls in cognitive interviews with experience of reusing materials. Impacts drying hygiene and experience.

MPNS, Menstrual Practice Needs Scale.

acceptable ordinal internal consistency in Bangladesh, but poorer reliability in the Soroti, Uganda sample.

Short and rapid forms of the measure were found to demonstrate hypothesised relationships with school participation, and confidence managing menstruation across datasets. For each reduction of the scale, the strength of these associations was attenuated.

DISCUSSION

Measuring adolescent girls' experiences of managing their menstrual bleeding is essential to capture whether their menstrual health needs are being met, test associations between this experience and broader health and well-being outcomes in research, and to understand the impacts of menstrual health interventions. This study developed short and rapid forms of the MPNS-36, as requested by stakeholders. The MPNS-SF offers an 18-item measure, including 14 items if respondents do not reuse any menstrual materials, with 4 items specific to laundering. Two items specific to disposal are relevant to those who disposed of single-use or reusable materials during their last period. The MPNS-R includes 9 items, 7 for respondents who did not reuse menstrual materials. The MPNS-SF offers consistent subscales to the original measure, with acceptable dimensionality, internal consistency and strong validity. The MPNS-R reduces participant burden further while sacrificing structural validity and attenuating the relationship between the measure and hypothesised correlates. All three forms offer strong face validity, have been well understood by adolescent populations in cognitive interviews, and a high level of interpretability such that both individual items and scale scores offer easily understandable insights into girls' menstrual experiences, needs and relationships with other outcomes.

Our findings highlight that adolescent girls' experiences of managing menstrual bleeding are multidimensional, driven by the diverse practices required and environments in which menstruation is managed. Despite halving the number of items for the short form, the four and two factor structure remained the best fit for the data across all three available datasets. Consistent with past studies in Uganda,[3 6] experiences at home and at school differed substantially in the samples in Bangladesh. However also consistent with past application of the measure among adolescents, girls' insecurities, that

Table 4 Dimensionality of the MPNS-SF in all three datasets, with factor loadings presented by subscale

No.	Item	Khulna pilot, complete cases* (n=79)	Khulna pilot, excluding school† (n=218)	Khulna cohort, complete cases* (n=92)	Khulna cohort excluding school† (n=603)	Soroti, Uganda (n=525)
Material and home environment needs						
1	Were your menstrual materials comfortable?	0.539	0.455	0.379	0.375	0.543
2	Did you have enough of your menstrual materials to change them as often as you wanted to?	0.579	0.553	0.556	0.690	0.399
13	Were you able to dispose of your used materials in the way that you wanted to?	0.486	0.490	0.620	0.533	0.673
16	Home—Were you able to change your menstrual materials when you wanted to?	0.626	0.481	0.788	0.661	0.66
17	Home—Were you satisfied with the place you used to change your menstrual materials?	0.630	0.682	0.628	0.621	0.518
Material reliability concerns						
5	Were you worried that your menstrual materials would allow blood to pass through to your outer garments?	0.370	0.532	0.549	0.445	0.563
7	Were you worried about how you would get more of your menstrual material if you ran out?	0.687	0.635	0.802	0.745	0.571
Change and disposal insecurity						
15	Were you concerned that others would see your used menstrual materials in the place you disposed of them?	0.685	0.706	0.625	0.690	0.566
20	Home—Were you worried that someone would see you while you were changing your menstrual materials?	0.809	0.861	0.902	0.832	0.543
21	Home—Were you worried that someone would harm you while I you were changing your menstrual materials?	0.911	0.872	0.770	0.842	0.714
27	School—Were you worried that someone would see you while you were changing your menstrual materials?	0.971		0.979		0.56
28	School—Were you worried that someone would harm you while you were changing your menstrual materials?	0.823		0.816		0.587
School environment needs						
23	School—Were you able to change your menstrual materials when you wanted to?	0.647	0.736	0.850	0.439	0.625
24	School (Khulna studies)—Were you satisfied with the places available at your school for changing your menstrual materials (eg, it was clean, safe and had what you needed)? School (Uganda)—Were you satisfied with the place you used to change your menstrual materials?	0.401	0.806	0.768	1.157	0.649
	CFI	0.956	0.943	0.936	0.960	0.950
	TLI	0.943	0.921	0.918	0.945	0.936
	RMSEA (90%CI)	0.076 (0.039 to 0.106)	0.064 (0.043 to 0.084)	0.080 (0.050 to 0.107)	0.050 (0.039 to 0.062)	0.039 (0.028 to 0.050)

	Items for those reusing materials	Khulna Pilot (n=67)	Khulna Cohort (n=364)	Soroti, Uganda (n=286)
Reuse needs				
29	(Khulna cohort): Did you have enough water and soap to soak or wash your menstrual materials? (Khulna pilot and Uganda) Did you have enough water to soak or wash your menstrual materials?	0.766	0.678	0.874

Continued

Table 4 Continued

	Items for those reusing materials	Khulna Pilot (n=67)	Khulna Cohort (n=364)		Soroti, Uganda (n=286)
Reuse insecurity					
35	Were you worried that your menstrual materials would not be dry when you needed them?	1.182‡	0.815	49	0.868
36	Were you worried that others would see your menstrual materials while they were drying?	0.619	0.688	50	0.261
	CFI	0.988	0.997		>0.999
	TLI	0.971	0.981		>0.999
	RMSEA (90%CI)	0.122 (0.00 to 0.247)‡	0.065 (0.00 to 0.170)		<0.001 (0.00 to 0.054)

*Complete cases refer to the subset of participants who were eligible to answer all questions. That is, participants who disposed of menstrual materials and attended and changed menstrual materials at school at least once during their last menstrual period.
†Excluding school refers to the subset of participants who answered all questions about their experience except those related to changing their menstrual materials at school, as they did not change materials at school.
‡Heywood case and lower model fit in this instance are assumed to be the result of the very small sample size (n=67).
CFI, Comparative Fit Index; MPNS, Menstrual Practice Needs Scale; RMSEA, root mean square error of approximation; TLI, Tucker-Lewis Index.

is worries about availability, privacy and safety, regarding spaces for menstrual management loaded on a single factor across locations. These concerns may have more unifying drivers across locations such as girls' internalised stigma regarding menstruation or trait anxiety.

In selecting short-form items, we prioritised maintaining content validity and the breadth of practices captured. However, we note that items capturing experiences of transporting and storing menstrual materials were lost in moving from the original 36-item to short and rapid measures. Experiences of transporting items have consistently presented issues in cross-loading given they bridge multiple environments (eg, transporting materials from home to school).[3 6] In data collected in the Khulna pilot survey, we note that almost half of girls reported they never felt comfortable carrying spare menstrual materials outside their home. Future research must remain sensitive to this important, but often neglected, challenge. Slight updates to MPNS items, such as item 24, to apply to all participants, not only those changing menstrual materials in school reduce the quantity of missing data and better capture the availability of facilities for menstrual self-care. We suggest such changes to be incorporated into MPNS-36 items for consistency.

MPNS items specific to reusing menstrual materials are focused on the experiences of those using improvised reusables such as cloth and commercial reusable pads. As such, items may not be as well suited to capturing the experiences of those using menstrual cups. For example, items regarding drying are unlikely to be relevant and needs such as boiling the cup are not captured. Items regarding changing menstrual materials may need modification to incorporate emptying a menstrual cup. Alternative items have been used in one past study using the MPNS among menstrual cups users, but have not yet been validated.[7]

We found that capturing experiences across the breadth of menstrual practice offers the strongest correlation with hypothesised related constructs and impacts of menstrual experience. This was observed across the original, short and rapid forms of the measure wherein total scores exhibited stronger relationships with hypothesised correlates than subscales capturing only one dimension of blood management experience. The finding supports our hypothesis that capturing menstrual experience requires the use of multiple-item measures, and aligns with qualitative research which has consistently highlighted the diversity of menstrual management challenges that impact on women's and girls' lives.[16 34 35]

Strengths and limitations

We triangulated insights from implementation of the MPNS, the perspectives of adolescent girls in Bangladesh, and advances in menstrual health research guidance on monitoring[19] to develop the MPNS short and rapid forms. A data-driven approach to shortening the scale would likely have yielded greater model fit of subscales but would reduce the breadth of practices and thus validity of the measure. A strength of the MPNS remains its development drawing on synthesis of qualitative research of women's and girls' experiences of menstruation across LMIC settings.[3 16] The variety in menstrual practices that adolescent girls employ means not all MPNS items are relevant to all respondents. Non-applicable items reduce the sample sizes available for undertaking tests of dimensionality with complete data. In our Bangladesh samples where many girls do not change their materials at school meant restricted samples were available to test dimensionality for all items. We were unable to test the performance of the MPNS-R alone in a new sample. The performance of this rapid version may have been biased by the full set

Table 5 Dimensionality of the MPNS-R across datasets, with factor loadings presented by subscale

No.	Item	Khulna pilot, complete cases* (n=79)	Khulna pilot, excluding school† (n=218)	Khulna cohort, complete cases* (n=92)	Khulna cohort excluding school† (n=603)	Soroti, Uganda (n=525)
Needs						
2	Did you have enough of your menstrual materials to change them as often as you wanted to?	0.629	0.540	0.485	0.611	0.251
13	Were you able to dispose of your used materials in the way that you wanted to?	0.553	0.462	0.620	0.464	0.523
17	Home—Were you satisfied with the place you used to change your menstrual materials (eg, it was clean, safe and had what you needed)?	0.536	0.617	0.482	0.551	0.583
23	School—Were you able to change your menstrual materials when you wanted to?	0.356	–0.171	0.611	0.087	0.491
29	Reuse needs Did you have enough water and soap to soak or wash your menstrual materials?	‡				
Insecurity						
5	Were you worried that your menstrual materials would allow blood to pass through to your outer garments?	0.310	0.351	0.446	0.311	0.365
20	Home—Were you worried that someone would see you while you were changing your menstrual materials?	0.833	1.038	0.757	0.979	0.564
27	School—Were you worried that someone would see you while you were changing your menstrual materials?	0.710		0.876	–	0.613
36	Reuse insecurity Were you worried that others would see your menstrual materials while they were drying?	‡				
	CFI	0.931	0.980	0.936	1.000	0.972
	TLI	0.888	0.962	0.897	1.000	0.955
	RMSEA (95% CI)	0.092 (0.000 to 0.158)	0.038 (0.000 to 0.093)	0.091 (0.016 to 0.152)	0.003 (0.00 to 0.048)	0.030 (0.00 to 0.057)

*Complete cases refer to the subset of participants who were eligible to answer all questions. That is, participants who disposed of menstrual materials and attended and changed menstrual materials at school at least once during their last menstrual period.
†Excluding school refers to the subset of participants who answered all questions about their experience except those related to changing their menstrual materials at school, as they did not change materials at school.
‡Reuse insecurity and reuse needs apply only to a subset of the sample and were not included in CFA. CFA included the seven other items.
CFI, Comparative Fit Index; MPNS, Menstrual Practice Needs Scale; RMSEA, root mean square error of approximation; TLI, Tucker-Lewis Index.

Table 6 MPNS-36, MPNS-SF and MPNS-R total scale scores, internal consistency and associations with hypothesised correlates

	Mean (SD)	$\alpha_{ordinal}$ (α)	DASS r (p-value)*	Did not miss school due to last period OR (95% CI)	Did not experience difficulty participating in class due to last period OR (95% CI)	Very confident managing menstruation at home OR (95% CI)	Confident managing menstruation at school OR (95% CI)
Khulna pilot							
MPNS-36 total	2.16 (0.37)	0.92 (0.86)	−0.34 (p<0.001)	1.22 (0.66 to 2.26)	2.72 (1.37 to 2.39)	1.13 (0.58 to 2.16)	3.94 (2.01 to 7.73)
MPNS-SF total	2.21 (0.39)	0.88 (0.78)	−0.28 (p<0.001)	1.07 (0.60 to 1.90)	2.56 (1.35 to 4.86)	1.40 (0.75 to 2.60)	2.91 (1.57 to 5.39)
MPNS-R total	2.14 (0.45)	0.74 (0.59)	−0.32 (p<0.001)	1.09 (0.66 to 1.83)	2.36 (1.33 to 4.19)	1.26 (0.73 to 2.16)	2.32 (1.35 to 3.98)
Khulna cohort							
MPNS-SF total	2.08 (0.44)	0.87 (0.78)	−0.36 (p<0.001)	1.88 (1.37 to 2.57)	4.80 (3.36 to 6.86)	2.40 (1.66 to 3.47)	1.58 (1.17 to 2.14)
MPNS-R total	1.99 (0.49)	0.72 (0.60)	−0.32 (p<0.001)	1.77 (1.33 to 2.36)	3.65 (2.65 to 5.01)	2.36 (1.68 to 3.30)	1.54 (1.17 to 2.03)

						Confident managing menstruation at home OR (95% CI)	
Soroti							
MPNS-36 total †	1.82 (0.37)	0.82 (0.77)	−0.11 (p=0.013)	2.62 (1.52 to 4.50)	–	4.09 (2.52 to 7.06)	4.22 (2.52 to 7.06)
MPNS-SF total	1.79 (0.40)	0.72 (0.72)	−0.12 (p=0.005)	2.42 (1.48 to 3.97)	–	3.09 (1.75 to 5.45)	4.02 (2.50 to 6.46)
MPNS-R total	1.79 (0.47)	0.48 (0.43)	−0.04 (p=0.310)	1.48 (0.98 to 2.22)	–	2.27 (1.41 to 3.65)	3.46 (2.31 to 5.19)

*Khulna pilot: only half of the sample was administered the DASS, associations presented here are for this half of the sample (n=164 of 313 menstruating girls) | Khulna Cohort and Soroti data.
†Findings from the original study report,[3] provided here for ease of comparison.
DASS, Depression Anxiety Stress Scale; MPNS, Menstrual Practice Needs Scale.

of MPNS-SF items in the cohort and MPNS-36 items in the pilot and Soroti samples. While measures are emerging for capturing menstrual experiences in different populations,[36 37] we did not have other measures of adolescent menstrual experiences against which to test convergent or divergent validity.

Implications for research and practice

Caring for the body during menstruation in a way that meets individual needs for hygiene, comfort, privacy and safety is a requirement for menstrual health, and objective of many menstrual health policies and programmes.[13 38] The MPNS-SF and MPNS-R offer concise measures to capture this construct. Based on the findings of measure development, the MPNS-36 still offers the greatest nuance in describing population needs and explanatory power in investigating hypothesised correlates. The MPNS-36 may be best suited for needs assessment in a new population. The MPNS-SF offers a reliable and valid measure, with subscales matching the original, associations with hypothesised correlates, and good internal consistency. The measure maintains a balance in practices and captures both having needs satisfactorily met and insecurities related to menstrual management. It also offers minor modifications to improve the applicability of some items in the school environment. We recommend that the MPNS-SF be used when a shorter measure is needed such as in research and intervention evaluation where survey length is restricted, or multiple constructs must be accommodated. Finally, the MPNS-R provides a restricted set of questions with brief survey duration. In shortening the measure further, the MPNS-R no longer offers reliable subscales, with multiple original subscales represented by a single item. However, the tool retains breadth in capturing experiences of menstrual practices and environments and is preferable to selecting subscales of the original measure or ad-hoc item selection which results in incomparable data across studies. We recommend the rapid form is used where menstrual health is not the primary area of focus but included as part of studies of broader water, sanitation and hygiene or sexual and reproductive health . The MPNS-R may also be considered in routine monitoring within NGO programmes where very brief measures are needed.

Future longitudinal research using the MPNS measures will test their predictive validity and the impact of menstrual experiences on individuals' lives. Subsequent waves of the AMEHC Bangladesh study will offer these opportunities,[23] and more cohort studies will be needed across contexts. Trials using the MPNS measures as primary or secondary outcomes will provide insights into the sensitivity of the measure to change and use for evaluation.[8 12] Future research should investigate the validity of the shorter MPNS forms in new cultural contexts, languages and age groups. Tests of reliability and validity using the MPNS-R alone are needed, and future studies should explore measurement invariance to assess the comparability of scores across contexts. As found previously,[6] the dimensionality of the MPNS-36 differs for adult women, and we would hypothesise similar differences for the short form. The MPNS-36 was designed to capture the experiences of adolescent school-going girls, and subsequently adult women who attend paid work. While most items in the scale are applicable to out-of-school girls and women outside of paid employment (excluding those items specific to school/work environments), the dimensionality of the tool is likely to differ for these populations and validity and reliability have not been assessed. Improved availability of high-quality measures for menstrual health research and practice will strengthen the evidence base and aid comparability across studies.[1 39 40]

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