

## Research Paper

# Understanding potential determinants of menstruation-related school absenteeism in Zimbabwe: a cross-sectional study

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## ABSTRACT

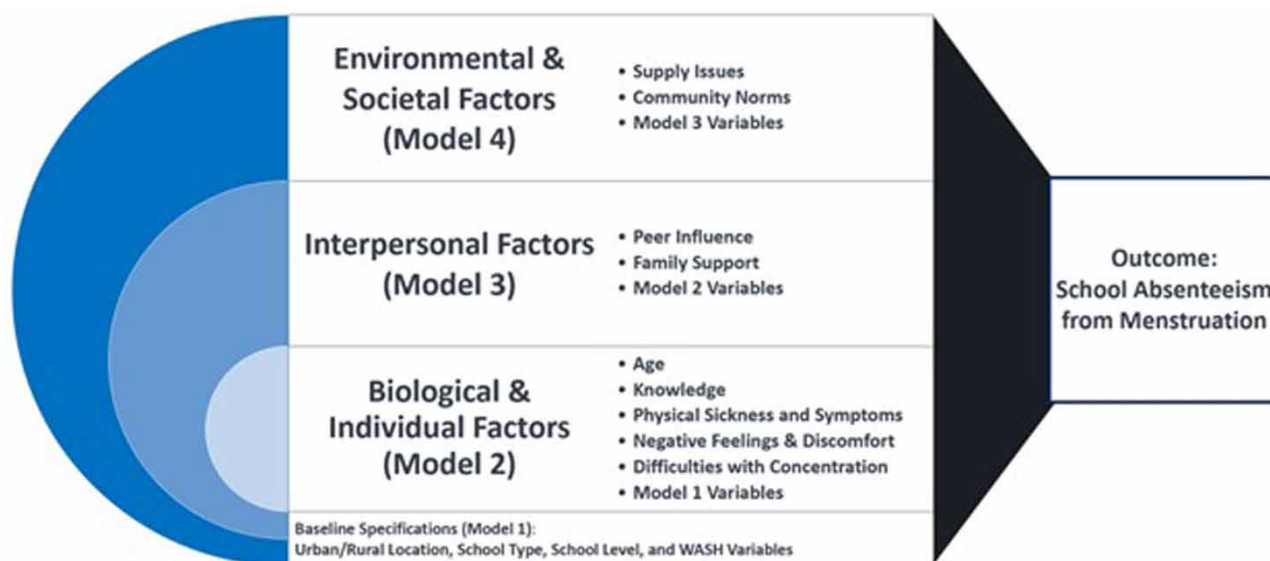
Menstrual health and hygiene (MHH) plays a vital role in protecting the dignity, safety, privacy, and wellbeing of girls and women. In low- and medium-income countries, students often face challenges to manage their menstruation in schools. In 2019, Zimbabwe conducted the first national formative research to inform MHH programming in schools. This study conducted a secondary analysis of cross-sectional data from the national formative research to explore potential determinants of menstruation-related school absenteeism in Zimbabwe. The analysis included 1,393 students from 50 schools, and the main outcome variable measured if students ever missed school due to menstruation. Multivariate analysis employed nested logistic regression models after controlling for the complex survey design. The results revealed that 20.6% of students had ever been absent from school due to menstruation-related issues. Students' age, challenges with concentration, physical sickness, and pain were significantly associated with school absenteeism in this context. Presence of a reliable school water source and availability of adequate handwashing resources at sanitation facilities were protective factors. The evidence-based MHH programming can be further advocated and scaled up to promote students' good health and wellbeing, maximize their educational opportunities, and develop their fullest potential in life.

**Key words:** hygiene, menstruation, MHH, sanitation, school absenteeism, water

## HIGHLIGHTS

- One in five students in Zimbabwe have ever been absent from school due to menstruation-related issues.
- Students' age, challenges with concentration, physical sickness, and pain are risk factors of menstruation-related school absenteeism in Zimbabwe.
- Presence of a reliable water source and availability of adequate handwashing resources at sanitation facilities are protective factors.

## GRAPHICAL ABSTRACT



## INTRODUCTION

Menstruation is a natural monthly occurrence for 1.8 billion girls and women worldwide (UNICEF 2019a). The average age of menarche is between 10 and 16 years (Lacroix *et al.* 2023). Women experience menstruation until they reach menopause at around 50 years (Rohatgi & Dash 2023). Managing menstrual processes without a major barrier is therefore of vital importance to ensure women's overall well-being.

Early global efforts focused on promoting menstrual hygiene management (MHM) where girls and women use clean and hygienic menstrual management materials, water, sanitation, and hygiene (WASH) services, and physical infrastructure for managing menstruation with dignity, privacy, and comfort (UNICEF 2019a). The notion of MHM evolved over time to menstrual health and hygiene (MHH), which addresses women's menstrual needs and experience more holistically by encompassing MHM and other sociocultural and systemic factors (e.g., social norms, referral to health services) (UNICEF 2019a). These efforts have resulted in the expanded evidence base for MHH in schools, increased evidence-based advocacy to support MHH interventions, and enhanced ownership of MHH in schools by governments globally (Sommer *et al.* 2021).

In low- and middle-income countries, menstruation-related issues and consequences among school-aged girls and adolescents have persisted (Sommer *et al.* 2015, 2016). Previous research suggests that limited knowledge about menstruation, lack of social support, sociocultural norms and taboos around menstruation, inadequate school WASH infrastructure, fear of others noticing menstrual blood, and insufficient sanitary materials prevent students from properly managing their menstruation with dignity, safety, and privacy (Hennegan *et al.* 2019; Sommer *et al.* 2021). These issues have been highlighted as potential determinants of poor school performance and absenteeism (Davis *et al.* 2018; Vashisht *et al.* 2018; Kumbeni *et al.* 2021; Shah *et al.* 2022), which may hinder girls' educational attainment, economic potential, and psychological well-being (Sommer *et al.* 2021).

In Zimbabwe, several studies have been conducted to explore sustainable solutions for MHH (Tamiru *et al.* 2015; Ndlovu & Bhala 2016; Madziyire *et al.* 2018). A multi-country research, including Zimbabwe, provided key insights into MHH materials used in the countries studied, such as cloths, disposable and reusable sanitary pads, toilet paper, and other locally available materials (e.g., ash, cow dung, sand) (Tamiru *et al.* 2015). Another research explored the acceptability of reusable menstrual cups in Harare and highlighted the potential for scaling up the use of the cups (Madziyire *et al.* 2018). A recent mixed-methods study further reported that community-level menstrual health interventions enhanced participants' knowledge, attitudes, and practices (KAP) on reusable pads by providing menstrual health education and support, painkillers, and sanitary materials (Tembo *et al.* 2023). None of the available studies in Zimbabwe, however, was conducted with a nationally representative sample.

In 2019, the first national formative research on MHM and MHH was conducted to expand the evidence base and to inform national efforts to address MHH in schools (UNICEF 2019b). While the formative research addressed a wide

range of topics on MHH, factors affecting menstruation-related school absenteeism have not been elucidated in previous publications. Thus, this study aimed to explore the factors associated with menstruation-related school absenteeism in Zimbabwe.

## METHODS

### Theoretical model

The guiding theoretical model used for the formative research and the present study was a socio-ecological model, which presents how biological, personal, interpersonal, environmental, and societal factors are interconnected with one another to influence MHH practices (UNICEF 2019a). Biological factors include age, heaviness of the blood flow and other physical symptoms of menstruation, such as pain and discomfort. Personal factors address individuals' knowledge, attitudes, and beliefs regarding MHH. Interpersonal factors focus on how family members, peers, and teachers affect MHH practices. Environmental factors include WASH infrastructure, school facilities, and financial resources to support or hinder MHH practices. Societal factors address how policies and cultural norms influence MHH.

### Study approach, design, and sites

The national formative research employed a mixed-method approach to collect both quantitative and qualitative data (Tembo *et al.* 2023). Quantitative data were collected through a cross-sectional survey questionnaire from female students and direct observations of WASH infrastructure in all 10 provinces of Zimbabwe: Harare, Bulawayo, Manicaland, Mashonaland West, Mashonaland Central, Mashonaland East, Matabeleland North, Matabeleland South, Midlands, and Masvingo. Qualitative data were collected through focus group discussions and key informant interviews in four provinces, and the results were described elsewhere (UNICEF 2019b). The present study only analyzed quantitative data from the cross-sectional survey as fully transcribed qualitative data were not available for secondary analysis.

### Sampling process

The minimum sample size required for quantitative data collection was 2,134 by assuming a 95% confidence level, 50% of girls facing MHH challenges, 3% of precision, and a design effect of 2 (Tembo *et al.* 2023). This study employed a multi-stage cluster sampling approach. First, two districts (one urban and one rural) were randomly selected from each province. Secondly, two schools (one primary and one secondary) were randomly selected in each district from three clusters (low-density urban areas, high-density urban areas, and rural areas). This stratification was employed to reach participants from a range of socio-economic levels in urban and rural areas. Thirdly, 54 students were selected in each school through stratified sampling by grade (for primary school level) and form (for secondary school level). In primary schools, at least 10 students were selected from Grade 4 to 6 each, and 20 or 21 students were selected from Grade 7 to ensure more female students from higher age groups were included. In secondary schools, nine students from each form (Form 1–6) were selected from each selected school.

During the fieldwork, data collection teams learned that some rural schools had been misclassified as urban schools. To address this error, an additional 10 schools were sampled through the aforementioned sampling process. Thus, a total of 50 schools (24 urban and 26 rural) were finally sampled, and 2,610 students were reached. Of these, the present study focused on 1,393 students who had experienced the first menstruation and excluded other students who had not started menstruation at the time of data collection. No other exclusion criterion was applied.

### Data collection

Structured questionnaires were developed in English and were translated into three local languages: Shona, Ndebele, and Tonga. For verification purposes, these translated questionnaires were back translated to English, and the validity of the translation was confirmed by survey supervisors. These questionnaires were pilot tested in four schools for further verification.

Data collection was conducted in June 2019 by 25 trained enumerators who collected data by administering the structured questionnaires through face-to-face interviews and direct observation of WASH facilities (i.e., sanitation facilities and hand-washing stations). The survey instrument covered a number of topics including KAP on menstruation, sanitary materials, school absenteeism, and school infrastructure and facilities (UNICEF 2019b). The enumerator training was conducted over 4 days including 2 days of in-class training on interview techniques and survey procedures, 1 day of pilot survey implementation, and 1 day for the debrief and finalization of fieldwork plans. Five teams of five trained enumerators including one supervisor for each team conducted fieldwork for 15 working days to conduct quantitative data collection. Data were

collected with ODK<sup>®</sup>, a Computer-Assisted Personal Interviews (CAPI) software to store data in a secure database. To ensure confidentiality, any personal identifying information was not retained in the dataset.

### Study variables

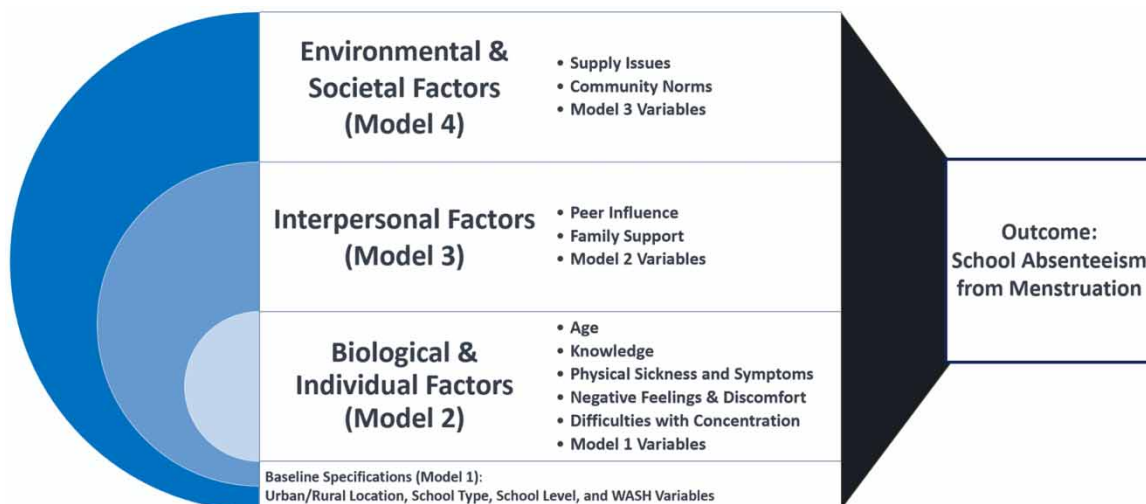
The dependent variable of this study measured if students ever missed school due to menstruation (1. No, 2. Yes). The independent variables include provinces, school locations by urban and rural areas, school type (1. Boarding, 2. Day), school level (1. Primary, 2. Secondary), presence of a reliable water source at school (1. No, 2. Yes), sanitation facilities (1. Flush, 2. Other improved facilities), status of handwashing stations at sanitation facilities (1. No handwashing stations, 2. Handwashing stations with no water and/or soap present, 3. Handwashing stations with water and soap available), students' age, knowledge levels (1. Low, 2. Medium, 3. High), various physical symptoms and feelings during menstruation (1. Not mentioned, 2. Mentioned), interpersonal factors including treatment and support from peers and family (1. Not mentioned, 2. Mentioned), a communal factor (1. Not mentioned, 2. Seen as unclean during menstruation by community members), and challenges with sanitary materials on availability, appropriateness, cost, ease of use, and disposal (0. Not mentioned, 1. Yes, there is a challenge), which were measured individually. The knowledge level of students was determined based on the number of correct responses to true and false questions (i.e., 0–3 = Low, 4–5 = Medium, 6–7 = High).

### Data analysis

Univariate analysis was performed to present descriptive characteristics of all study variables. Bivariate and multivariate analysis assessed the association between menstruation-related school absenteeism and independent variables. Nested multiple logistic regression was conducted with four models. Model 1 included the *base specification* with school locations, school type, school level, and WASH variables. Model 2 included the *base specification* and additionally included *biological* and *personal* factors. Model 3 consisted of the *base specification* along with *individual* and *interpersonal* factors. Model 4 included the *base specification*, *individual*, *interpersonal*, *communal*, and *supply-related* variables as a complete model. Province and perceived supportiveness of boys were not retained in the multivariate analysis due to their lack of bivariate association with the outcome variable. All analyses were adjusted for the complex survey design by using STATA 18. A conceptual model illustrates how these models are linked and nested with each other (Figure 1).

### Ethical review

The national formative research on MHM and MHH obtained ethical clearance from the Medical Research Council of Zimbabwe (MRCZ/A/2482). A written informed consent was sought from parents or caregivers of selected students. Additionally, individual consent and assent were obtained from students after explaining the purpose and scope of the research. To ensure the protection of confidentiality, no personally identifiable information was collected.



**Figure 1** | A conceptual model illustrating potential determinants of menstruation-related school absenteeism.

## RESULTS

Descriptive characteristics of students are summarized in Table 1. The majority of students came from rural areas (63.5%), attended day schools (83.6%), and was enrolled in secondary schools (66.1%). Over 75.9% of students had access to a reliable water source at school while flush toilets were available for 31.5% of them. More than one-third of students did not have access to handwashing stations at school sanitation facilities. The average age of students at the time of data collection was 14.6 years while their average age at menarche was 13.0 years. Approximately 70.4% of students perceived that boys laugh at menstruating girls. The most common challenges with sanitary materials were cost (39.7%) and availability issues (26.1%).

Table 2 presents the frequency and weighted prevalence of menstruation-related school absenteeism by independent variables and test statistics on bivariate associations. Approximately 20.6% of students had ever been absent from school due to menstruation-related issues. The prevalence varied among provinces, ranging from 16.5% in Mashonaland West to 25.3% in Masvingo. It was lower in urban (17.6%), boarding (16.4%), and primary schools (18.0%) than rural (22.4%), day (21.5%), and secondary schools (22.0%). Students with access to a reliable school water source, flush toilets, and handwashing stations with water and soap in sanitation facilities had a prevalence of 19.0, 17.4, and 12.7%, respectively. The average age of students who had experienced school absenteeism from menstruation was 15 years. The prevalence was higher among students with a low knowledge level (23.5%) than those students with a high knowledge level (16.1%). Over 30% of students experienced school absenteeism when they faced challenges with concentration, physical sickness, pain, and frustrations during menstrual periods. Students with a perception that boys laugh at menstruating girls and communities regard them as unclean had a prevalence of 21.9 and 18.7%, respectively. School absenteeism was more prevalent among students who faced supply issues on availability (30.2%), appropriateness (31.2%), and ease of use (31.4%).

Bivariate analysis revealed the following as significant individual factors: students' age ( $p = 0.037$ ), difficulty to concentrate ( $p < 0.001$ ), physical sickness ( $p < 0.001$ ), physical discomfort ( $p = 0.002$ ), pain ( $p < 0.001$ ), perceptions of not being ashamed of menstruation ( $p = 0.012$ ), and feeling uncomfortable with menstruation ( $p = 0.001$ ). Challenges with sanitary materials on availability ( $p = 0.001$ ) and appropriateness ( $p = 0.002$ ) were also significantly associated with school absenteeism from menstruation. Interpersonal and communal factors with school absenteeism were not statistically significant.

Table 3 presents the results of nested multiple logistic regression on school absenteeism. In Model 1, none of the variables was significantly associated with school absenteeism from menstruation. Only a marginally significant protective effect was found for the presence of a reliable water source at school (adjusted odds ratio (AOR) = 0.672,  $p = 0.082$ ).

In Model 2, age, inability to concentrate, physical sickness, and pain were significantly associated with menstruation-related school absenteeism. By holding other variables constant, an increase of student's age by 1 year was associated with 11.4% higher odds of school absenteeism ( $p = 0.031$ ). The significant association between age and school absenteeism was maintained in all subsequent models. Menstruating students who experienced difficulties with concentration (AOR = 1.578,  $p = 0.005$ ), physical sickness (AOR = 1.546,  $p = 0.023$ ), and pain (AOR = 1.875,  $p = 0.009$ ) were also associated with higher odds of school absenteeism than those students who did not experience these issues during menstruation, respectively. The odds of school absenteeism were 55.3% lower among students who had access to handwashing stations with water and soap at school sanitation facilities than that of students who did not have such handwashing resources ( $p = 0.032$ ). The significant protective effect of handwashing stations with water and soap was consistent across all models.

In Model 3 and Model 4, the same variables from Model 2 maintained significant associations with school absenteeism. Interpersonal factors and school absenteeism were not significantly associated in these models. Water and communal factors were found to be significant in Model 4. Those students who reported the presence of a reliable water source at school had 32.1% lower odds of school absenteeism than other students who did not have a reliable school water source ( $p = 0.026$ ). After controlling for other variables, the odds of school absenteeism among students who perceived that communities see menstruating students as unclean was 63.2% lower than that of other students who did not have this perception ( $p = 0.005$ ). Due to the small design degrees of freedom, model fit statistics were not estimated to identify the most parsimonious model.

## DISCUSSION

This study revealed potential determinants of school absenteeism from menstruation-related issues in Zimbabwe. The results suggested that students' age, challenges with concentration, physical sickness, and pain are positively associated with school



**Table 1** | Descriptive characteristics of students,  $n = 1,393$ 

Characteristics	Weighted %
Province	
Bulawayo	6.05
Harare	3.90
Manicaland	11.31
Mashonaland Central	21.95
Mashonaland East	8.24
Mashonaland West	7.07
Masvingo	6.82
Matabeleland North	13.70
Matabeleland South	9.51
Midlands	11.46
Location	
Urban	36.53
Rural	63.47
School type	
Boarding	16.42
Day	83.58
School level	
Primary	33.87
Secondary	66.13
Reliable water source at school	
Yes	75.95
Sanitation facility type ( $n = 1,344$ )	
Flush	31.49
Other improved facilities	68.51
Handwashing stations at sanitation facilities ( $n = 1,344$ )	
No handwashing station	33.60
Limited availability of water or soap	61.85
Handwashing stations with water and soap	4.55
Age at the time of data collection	14.63
Age at menarche	13.01
Knowledge level	
Low	9.78
Medium	53.25
High	36.97
Problems and feelings during monthly periods	
Not able to concentrate	17.44
Physically sick	20.01
Feeling negative	13.00
Physical discomfort	26.30
Pain	22.73
Frustrated	3.75

(Continued.)

**Table 1** | Continued

Characteristics	Weighted %
Not ashamed of menstruation	7.32
Uncomfortable with menstruation	55.79
Interpersonal factors	
Boys are supportive	14.19
Boys laugh at girls	70.43
Family is supportive	49.70
Communal factor	
Seen as unclean by community	7.28
Challenges with sanitary materials	
Availability	26.11
Appropriateness	17.03
Cost	39.73
Ease of use	9.55
Disposal	5.89

Note 1: Age variables show the weighted mean.

absenteeism in this context. Older students were more likely to be absent from school due to menstruation than younger students. The presence of a reliable water source at school and availability of handwashing stations with water and soap at sanitation facilities were also identified as protective factors of school absenteeism. These findings are in accordance with similar studies in Sub-Saharan Africa (Tegegne & Sisay 2014; Miiro *et al.* 2018; Mohammed *et al.* 2020).

### Insights from descriptive analysis

Descriptive analysis provided insights into what MHH-related issues were prevalent among primary and secondary school students in Zimbabwe. The national prevalence of menstruation-related school absenteeism was estimated to be over 20%, suggesting that MHH-related issues have prevented students from fully focusing on their learning and development. While the large majority of students reported the presence of a reliable water source at school and had basic knowledge on menstrual processes, handwashing resources at school sanitation facilities were not adequate. Another prevalent issue was a negative attitude of boys toward menstruating students where over 70% of students perceived that boys laugh at girls. Availability and cost of sanitary materials were also common issues in this context.

### Protective effect of water and handwashing stations

Multivariate analysis highlighted the protective independent effect of water availability and handwashing resources on menstruation-related school absenteeism. However, the results did not confirm a significant link of sanitation facilities with school absenteeism. These findings are in accordance with other studies that highlighted the mixed results of WASH service availability on school absenteeism (Grant *et al.* 2013; Alam *et al.* 2017; Davis *et al.* 2018; McMichael 2019; Shah *et al.* 2022). While a study in Gambia found protective effects of clean toilets and soap availability on menstruation-related school absenteeism, evidence from Malawi suggests that school level WASH facilities did not influence it (Grant *et al.* 2013; Shah *et al.* 2022). A cross-sectional study in Indonesia also reported that lack of handwashing facilities was associated with lower odds of school absenteeism (Davis *et al.* 2018). This association could have been influenced by spurious relationships and unmeasured confounders (Davis *et al.* 2018), which may be present in this study. Accordingly, the independent effects of WASH services and resources on menstruation-related school absenteeism may be context-specific, and rigorous study designs are needed to assess causal relationships among WASH, MHH, and school absenteeism. Nonetheless, promoting WASH service availability in schools remains vital to create a supportive environment for MHH.

### Physical and psychological factors

As with previous studies (Miiro *et al.* 2018; Mohammed *et al.* 2020; Shah *et al.* 2022), this study also confirmed the strong influence of physical and psychological factors on school absenteeism. Difficulties with concentration, physical sickness, and

**Table 2** | Bivariate analysis of student characteristics and menstruation-related school absenteeism,  $n = 1,393$ 

Independent variables	Ever absent from school due to menstruation <i>n</i> (weighted row proportions)		<i>F</i> statistic	<i>p</i> -value
	No	Yes		
Province	No 1,095 (79.37)	Yes 298 (20.63)	0.257	0.927
Bulawayo	96 (80.86)	22 (19.14)		
Harare	90 (83.38)	25 (16.62)		
Manicaland	128 (79.31)	40 (20.69)		
Mashonaland Central	153 (78.49)	37 (21.51)		
Mashonaland East	97 (80.18)	28 (19.82)		
Mashonaland West	110 (83.46)	27 (16.54)		
Masvingo	74 (74.71)	30 (25.29)		
Matabeleland North	112 (81.31)	24 (18.69)		
Matabeleland South	131 (79.81)	31 (20.19)		
Midlands	104 (75.95)	34 (24.05)		
Location			4.107	0.070
Urban	556 (82.45)	144 (17.55)		
Rural	539 (77.60)	154 (22.40)		
School type			2.840	0.123
Boarding	195 (83.63)	39 (16.37)		
Day	900 (78.53)	259 (21.47)		
School level			0.886	0.369
Primary	184 (82.01)	33 (17.99)		
Secondary	911 (78.02)	265 (21.98)		
Reliable water source at school			3.230	0.103
Yes	865 (81.03)	217 (18.97)		
No	230 (74.14)	81 (25.86)		
Sanitation facility type ( $n = 1,344$ )			4.142	0.069
Flush	457 (82.60)	118 (17.40)		
Other improved facilities	597 (77.69)	172 (22.31)		
Handwashing stations at sanitation facilities ( $n = 1,344$ )			2.639	0.111
No handwashing station	322 (75.70)	100 (24.30)		
Limited availability of water or soap	703 (80.57)	186 (19.43)		
Handwashing stations with water and soap	29 (87.27)	4 (12.73)		
Age	1,095 (14.52)	298 (15.03)	5.770	<b>0.037</b>
Knowledge level			1.414	0.268
Low	88 (76.54)	33 (23.46)		
Medium	553 (76.77)	165 (23.23)		
High	454 (83.87)	100 (16.13)		
Problems and feelings during monthly periods				
Not able to concentrate	151 (63.52)	96 (36.48)	55.286	< <b>0.001</b>
Physically sick	184 (66.55)	96 (33.45)	39.068	< <b>0.001</b>
Feeling negative	148 (74.78)	59 (25.22)	3.041	0.112
Physical discomfort	263 (72.83)	102 (27.17)	16.988	<b>0.002</b>

*(Continued.)*



Table 2 | Continued

	Ever absent from school due to menstruation <i>n</i> (weighted row proportions)			
Pain	207 (65.86)	121 (34.14)	33.105	< 0.001
Frustrated	32 (69.02)	18 (30.98)	2.669	0.133
Not ashamed of menstruation	99 (91.33)	8 (8.67)	9.478	<b>0.012</b>
Uncomfortable with menstruation	561 (73.50)	209 (26.50)	20.940	<b>0.001</b>
Interpersonal factors				
Boys are supportive	176 (79.28)	49 (20.72)	0.001	0.974
Boys laugh at girls	755 (78.09)	222 (21.91)	4.612	0.057
Family is supportive	528 (80.43)	145 (19.57)	0.336	0.575
Communal factor				
Seen as unclean by community	70 (81.29)	16 (18.71)	0.168	0.691
Challenges with sanitary materials				
Availability	238 (69.83)	103 (30.17)	19.552	<b>0.001</b>
Appropriateness	157 (67.89)	67 (32.11)	17.201	<b>0.002</b>
Cost	425 (76.20)	142 (23.80)	2.456	0.148
Ease of use	82 (68.60)	34 (31.40)	3.358	0.097
Disposal	60 (76.98)	17 (23.02)	0.212	0.655

Note 1: The weighted mean of student's age is presented in parentheses.

Note 2: Test statistics are based on the adjusted Wald test for age and likelihood ratio test for other variables.

Bold values signifies  $p < 0.05$ .

pain had substantial effects on school absenteeism and may require a set of interventions, such as provision of pain killers and review sessions for some students who could not concentrate in classes during their monthly periods. A process evaluation of MHH interventions in Uganda suggested that MHH training encouraged students to manage their pain through multiple ways, such as using hot water bottles to warm abdomen, stretching, and exercising (Nalugya *et al.* 2020). However, painkillers were not fully accepted by students due to their myths and misconceptions (e.g., painkiller as a carcinogen). Future studies may further explore what menstrual pain management approaches can be affordable, accessible, and acceptable by students and how they can be implemented in schools.

### Interpersonal and communal factors

The results further highlighted the complex relationships of interpersonal and communal factors on school absenteeism. This study revealed that students' perception of communities seeing menstruating students as unclean may lead to less school absence. A plausible explanation is that menstruating students come to school to avoid mistreatment or discrimination in communities. However, such students may face negative attitudes and behaviors of their peers if their menstruation status is recognized. Exploring how menstruating students weigh the potential risk of mistreatment in communities and schools is beyond the scope of this study. Additional studies are needed to examine the relationship between risk perceptions and menstruation-related school absenteeism.

### Supply

Challenges with sanitary materials were also found to influence school absenteeism in bivariate analysis. Although this study did not confirm the association of cost, ease of use, and disposal with school absenteeism, ensuring the availability of sanitary materials with which students feel comfortable remains vital for MHH efforts. While most students prefer to use disposable pads in Zimbabwe (Tembo *et al.* 2023), alternative options, such as menstrual cups and reusable pads, may receive traction from students if they can be widely available in the country. A recent study in Zimbabwe suggested that participants preferred reusable pads to menstrual cups, and key barriers to the menstrual cup uptake included fears of compromising their virginity (Tembo *et al.* 2020). Additional research would be needed to inform what sanitary materials can be culturally accepted, scaled up, and distributed widely for use by students.

**Table 3** | Nested logistic regressions of individual, interpersonal, communal, and environmental factors on menstruation-related school absenteeism,  $n = 1,344$ 

	Model 1	Model 2	Model 3	Model 4
Location (Ref: Urban)				
Rural	0.907	0.726	0.723	0.681
School type (Ref: Boarding)				
Day	1.61	1.35	1.283	1.174
School level (Ref: Primary)				
Secondary	1.412	0.959	0.941	0.867
Reliable water at school (Ref: No)				
Yes	0.672	0.679	0.675	0.679*
School sanitation facilities (Ref: Flush)				
Other improved facilities	1.253	1.277	1.299	1.304
Handwashing (HW) stations at sanitation facilities (Ref: No HW stations)				
Limited availability of water or soap	0.872	0.843	0.848	0.879
Handwashing stations with water and soap	0.556	0.447*	0.453*	0.345**
Age		1.114*	1.115*	1.124*
Knowledge level (Ref: Low)				
Medium		0.943	0.944	1.073
High		0.592	0.593	0.674
Problems and feelings during monthly periods (Ref: Not mentioned)				
Not able to concentrate		1.578**	1.621**	1.507*
Physically sick		1.546*	1.532*	1.692*
Feeling negative		1.048	1.054	1.071
Physical discomfort		1.083	1.099	1.043
Pain		1.875**	1.891**	1.836**
Frustrated		1.645	1.599	1.564
Not ashamed of menstruation		0.543	0.545	0.504
Uncomfortable with menstruation		1.546	1.51	1.531
Interpersonal factors (Ref: Not mentioned)				
Boys laugh at girls			1.297	1.233
Family is supportive			0.918	0.926
Communal factor (Ref: Not mentioned)				
Seen as unclean by community				0.368**
Challenges with sanitary materials (Ref: Not mentioned)				
Availability				1.527
Appropriateness				1.595
Cost				1.060
Ease of use				1.202
Disposal				0.699
Constant	0.185**	0.042***	0.038**	0.030***

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Note: Model fit statistics were not available due to small degrees of freedom from the survey design.

## Limitations

Several limitations were noted in this study. First, this study focused on analyzing self-reported data except for the sanitation and handwashing infrastructure variables. As self-reported measures may be prone to recall, reporting, and social desirability biases, the reported results in this study need to be interpreted with caution. Second, the cross-sectional study cannot establish the temporality of independent and dependent variables or reject the possibility of reverse causation. Third, this study did not analyze qualitative data, which could have provided more insights into how menstruating girls decide to be absent from school and why they experienced school absenteeism from menstruation-related issues. Although the national formative research on MHH conducted qualitative data collection only in four provinces of Zimbabwe (UNICEF 2019b), future studies may additionally examine qualitative data from all provinces to present more holistic perspectives. Fourth, this study used a binary outcome variable to assess the overall relationship between MHH-related factors and school absenteeism. Yet, the number of school days missed from menstruation could have been explored to assess the magnitude of school absenteeism in Zimbabwe. A follow-up study may collect this information with a specific recall period to minimize a recall bias. Lastly, this study only included students who had experienced the first menstruation for analysis. The knowledge, attitude, and behaviors of other students who have not started menstrual periods were not controlled for. Future studies may examine how knowledge and attitudes on MHH are formed in this age group of students to inform the implementation of MHH programs.

## CONCLUSIONS

This study highlighted the notable effects of individual, communal, and environmental factors as potential determinants of menstruation-related school absenteeism in Zimbabwe. Some of the immediate MHH interventions in Zimbabwe may focus on alleviating difficulties with concentration, physical sickness, and menstrual pain by ensuring the availability of basic medical supplies, sanitary materials, and referral services to local health facilities, conducting MHH education to all students and communities to minimize myths and mistreatment against menstruating girls, and strengthening school WASH infrastructure to ensure students can manage their menstruation with psychological and physical safety, dignity, and privacy. Additional evidence is needed to inform how MHH interventions can be best implemented and what amount of financial resources would be needed to implement MHH interventions at the national scale. The evidence-based MHH programming can be further advocated and scaled up to promote students' good health and well-being, maximize their educational opportunities, and develop their fullest potential in life.

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## DISCLAIMER

The contents and perspectives presented in this research are solely the responsibility of the authors and do not necessarily reflect the official view and position of the United Nations Children's Fund (UNICEF) or the Government of Zimbabwe.

## DATA AVAILABILITY STATEMENT

Data cannot be made publicly available; readers should contact the corresponding author for details.

## CONFLICT OF INTEREST

The authors declare there is no conflict.

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