Epidemiology of menstrual-related absenteeism in 44 low-income and middle-income countries: a cross-sectional analysis of Multiple Indicator Cluster Surveys

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Summary

Background Menstrual-related absenteeism from work, school, or social activities is an important functional indicator of poor menstrual health that disrupts women's and girls' daily lives and exacerbates gender inequality. We sought to estimate the prevalence of and factors contributing to menstrual-related absenteeism across low-income and middle-income countries.

Methods We analysed cross-sectional data from 47 nationally or subnationally representative Multiple Indicator Cluster Surveys from 2017 to 2023, which comprised 3 193 042 individuals from 555 869 households across 44 countries; those with available information on the outcome of interest were included in our analysis. The outcome of interest was menstrual-related absenteeism from work, school, or social activities during the respondent's last menstrual period. Independent factors included age, household wealth index, use (*vs* no use) of menstrual materials (eg, pads, tampons, or cloth), availability of a private place to wash at home during menstruation, and contraceptive use (hormonal and other). Univariable and multivariable associations between each factor and menstrual-related absenteeism were analysed using log-binomial models. Prevalence ratios, estimated from the log-binomial models, represent the relative prevalence of menstrual-related absenteeism across different levels of the independent variables. Prevalences and associations were pooled by geographical region and overall across all surveys using a random-effects meta-analysis. Heterogeneity was assessed using the I^2 statistic, and prediction intervals generated to reflect the variation in associations.

Findings We included 673 380 women and girls aged 15–49 years in this analysis. The overall pooled prevalence of menstrual-related absenteeism was 15·0% (95% CI 12·7–17·3), with prevalence being highest in south Asia (19·7% [11·6–27·8]) and west and central Africa (18·5% [13·5–23·5]). After pooling data across surveys, girls aged 15–19 years were found to have a higher prevalence of menstrual-related absenteeism than those in older age groups, with overall pooled prevalence ratios ranging from 0·75 (0·68–0·82) in those aged 35–39 years to 0·92 (0·87–0·97) in those aged 20–24 years relative to the 15–19 years age group, with adjustment for area type (urban or rural). There was no association between menstrual-related absenteeism and household wealth or the use of menstrual materials. By contrast, having a private place to wash at home was associated with an increased prevalence of menstrual-related absenteeism (overall pooled prevalence ratio 1·25 [1·05–1·48], adjusted for wealth and area type). Menstrual-related absenteeism was less prevalent in women and girls using any contraceptives compared with those not using contraceptives (0·92 [0·87–0·96]), and for those using hormonal contraceptives compared with those using non-hormonal or no contraceptives (0·91 [0·84–0·99]), after adjusting for age, wealth, education level, parity, and area type.

Interpretation Menstrual-related absenteeism is prevalent, especially in Asia and Africa and among adolescent girls. The age-independent protective effect of hormonal contraceptive use suggests that symptoms such as heavy menstrual bleeding or pain contribute to absenteeism. Future studies are urgently needed to better characterise these findings to inform relevant public health interventions.

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Introduction

Menstrual health encompasses the physical, mental, and social impacts of menstruation on a woman's life.[1] This involves the ability to manage menstrual health and hygiene through access to appropriate menstrual materials and water, sanitation, and hygiene (WASH) facilities. Additionally, menstrual health encompasses access to appropriate information and education on menstruation, diagnosis and treatment of menstrual disorders, a respectful environment free from stigma,

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Research in context

Evidence before this study

Menstrual health is a historically understudied topic, with limited knowledge on the epidemiology of menstrual health issues and contributing factors. One consequence of poor menstrual health is menstrual-related absenteeism from school, work, or social activities, which can interfere with women's quality of life and contribute to gender inequality. We searched PubMed, PsycINFO, Embase, and MEDLINE for articles investigating menstrual-related absenteeism across low-income and middle-income countries (LMICs) from database inception to April 18, 2023, without language restrictions, using the terms ("menstrua*" and "absen*") and ("low income" or "middle income" or "LMIC*"). Numerous qualitative studies have investigated women's experiences of menstrual health in LMICs, but there was a scarcity of epidemiological studies which are needed to understand the breadth of this issue. Studies (both quantitative and qualitative) were similarly focused on single countries, and often on particular subpopulations such as adolescents and girls attending school. A global perspective on menstrual health and menstrual-related absenteeism specifically is therefore lacking, requiring studies representative of the entire population of menstruating women. Additionally, many of the quantitative studies available were descriptive only, with no investigation of the associations between menstrual-related absenteeism and contributing factors. Further studies are needed to identify factors important for menstrual health in LMICs in order to inform evidence-based public health interventions.

Added value of this study

In this study, we extracted data from 47 nationally or subnationally representative Multiple Indicator Cluster Surveys (MICS) from 44 different LMICs. Data on menstrual-related absenteeism were available for more than 673 000 women and girls aged 15–49 years, who were included in our study. This study broadens epidemiological knowledge surrounding menstrual health by estimating the prevalence of and investigating the factors relating to menstrual-related absenteeism including age, wealth, use of menstrual materials, availability of private wash facilities at home, and contraceptive use, across a diverse array of countries. Our study was therefore able to compare the importance of these factors and identify possible avenues for future menstrual health research. Additionally, the standardised nature of MICS surveys allowed for comparisons between survey populations, facilitating a more international understanding of menstrual health-related problems.

Implications of all the available evidence

Our work identified menstrual-related absenteeism as a common health concern for women and girls in LMICs, particularly in south Asia and west and central Africa. In general, adolescents were at the highest risk of menstrual-related absenteeism, thereby identifying this population as a key priority for future menstrual health programmes and research. Our results show that menstrual-related absenteeism is more common in women and girls with private sanitation facilities at home. However, more research is needed to ascertain what improvements are required to better facilitate menstrual health and hygiene. Additionally, our results identified hormonal contraceptive use to be associated with reduced menstrual-related absenteeism when compared with the use of non-hormonal or no contraceptives, which could be due to improved menstrual symptoms. Future work is needed to better understand the importance of menstrual symptoms for quality of life, and the direct or indirect roles of access to contraception, including hormonal contraception, on menstrual health and absences.

and the freedom to choose what activities to participate in while menstruating.[1]

Many women and girls in low-income and middle-income countries (LMICs) have poor menstrual health.[2] One consequence of this is menstrual-related absenteeism from work, school, or social activities, which substantially disrupts women's and girls' lives. Menstrual-related absenteeism from school is common, with Performance Monitoring and Accountability 2020 surveys—collected between November, 2017 and August, 2018—estimating that 17%, 15%, and 23% of school-going women and girls aged 15–24 years missed school due to menstruation in the previous year in Burkina Faso, Niger, and Nigeria, respectively.[3] Other studies have identified much higher rates of absenteeism, with a national survey in Bangladesh between March and June, 2013, reporting that 41% of menstruating girls aged 11–17 years missed school due to menstruation during their last three menstrual cycles.[4] Menstrual-related absenteeism from school and work impedes gender equality and empowerment, hindering the ability of women and girls to participate fully in education and the workforce,[5] and posing a barrier to achieving Sustainable Development Goal 5 to achieve gender equality and empower all women and girls.[6]

While previous reports have descriptively analysed the global distribution of menstrual health indicators from national health surveys, investigation of factors contributing to menstrual health outcomes, along with exploration of region-specific trends, would help inform future menstrual health research and interventions.[7] We reasoned that menstrual-related absences could serve as an indicator of poor menstrual health. In this study, we leveraged data from UNICEF's Multiple Indicator Cluster Surveys (MICS) to estimate the prevalence of menstrual-related absenteeism from work, school, or social activities across LMICs, and to explore potential risk factors for this outcome.

Methods

Study design

We did a multinational analysis of cross-sectional MICS data.[8] MICS measure indicators of women's and children's health, and have been conducted in more than 120 countries since the mid-1990s. MICS follow a standardised study design, incorporating multistage sampling to select a national or subnational representative sample of households. Members of selected households are then interviewed using questionnaires directed at the household overall, and questionnaires addressing specific household members (men and boys aged 15–49 years, women and girls aged 15–49 years, children aged <5 years, and children aged 5–17 years). Our study's outcome data were derived from the women's questionnaire delivered to consenting women and girls aged 15–49 years in the sampled households. The household dataset was also used to capture area type (urban or rural) and religion of the household head. Information on sex was self-reported and no data were collected on gender. All countries reported only "male" or "female". In what follows, we report on self-reported females only.

STROBE guidelines were used in preparing this report and the GATHER checklist is presented in the appendix (p 2).[9,10] All MICS data used in this study had undergone ethical review before fieldwork. Consent was obtained for each respondent participating per MICS study design. Approval from UNICEF for data access was received. A waiver of ethics approval was received from the Walter and Eliza Hall Institute of Medical Research (Melbourne, VIC, Australia).

Procedures

The outcome of interest for this study was MICS indicator WS.13, in which women and girls aged 15–49 years who menstruated in the last 12 months were asked, "Due to your last menstruation, were there any social activities, school or workdays that you did not attend?" Possible responses included "yes", "no", and "don't know/not sure/no such activity". This indicator has been included since the sixth round of MICS (since 2017) and, as of September, 2023, data were available for 48 surveys across 44 countries, which were eligible for inclusion (with four surveys conducted in separate provinces of Pakistan). After excluding the North Korean survey, which had restricted access to data, we include 47 eligible surveys for analysis.

We first developed hypotheses for associations with menstrual-related absenteeism. We expected menstrual-related absenteeism to be more common in young women and girls who might have poor menstrual education and more severe menstrual symptoms.[11,12] Women and girls in lower wealth quintiles were hypothesised to have reduced access to menstrual-related resources, and hence to be more susceptible to absenteeism, along with women and girls who did not use menstrual materials.[13] We hypothesised that women and girls with private facilities to wash and change menstrual materials at home would have more absenteeism as they could better meet their menstrual health needs at home compared with outside the home.[2] Lastly, women and girls who used hormonal contraceptives were expected to have less severe menstrual symptoms and less absenteeism.[14,15]

Based on our prespecified hypotheses, we selected independent variables: women's age (5-year age groups from 15–49 years), household wealth (quintile 1 [poorest] to quintile 5 [richest]), use (*vs* no use) of menstrual materials (such as pads, tampons, or cloth), availability of a private place to wash and change menstrual materials at home during menstruation, contraceptive use, area type (urban or rural) and use of reusable menstrual materials (among those who used any menstrual materials; appendix pp 3–4). Marital status and educational attainment were also included as covariates (appendix p 35) but were not analysed as independent variables. Due to the substantial variation in the definition of ethnicity between surveys, no analyses adjusted for or explored effect modification by ethnicity.

Household wealth quintiles were developed by MICS for each survey using a wealth index based on principal component analyses of household characteristics such as dwelling characteristics, water and sanitation, and ownership of consumer goods. As such, the quintiles represent the relative wealth within the survey population. Contraceptive use was categorised in two different ways: current use of any contraceptive, and current use of hormonal contraceptives defined as the use of at least one of injectables, implants, or the pill. Women and girls aged 15–49 years using an intrauterine device (IUD) were excluded from hormonal contraceptive analyses as questionnaire items did not differentiate between the use of copper or progesterone-releasing IUDs, which could have divergent effects on menstrual symptoms.

See Online for appendix

Statistical analysis

No power calculation was done; instead, the sample size was defined by available data. The distribution of demographic factors and independent variables was described for each survey cohort (appendix pp 6–25, 27–31). The prevalence of menstrual-related absenteeism in each survey population was calculated for the entire survey sample and stratified by the independent variables of interest (appendix pp 26, 32–34, 46–57). Using log-binomial regression, the univariable association between each independent variable and menstrual-related absenteeism was estimated as prevalence ratios with associated 95% CI. Prevalence ratios represent the relative prevalence of menstrual-related absenteeism across different levels of the independent variable, with a ratio of 1 indicating no difference, below 1 indicating lower prevalence, and above 1 indicating higher prevalence compared with the reference group. If any convergence issues arose, a logistic regression model was fitted followed by the marginal standardisation

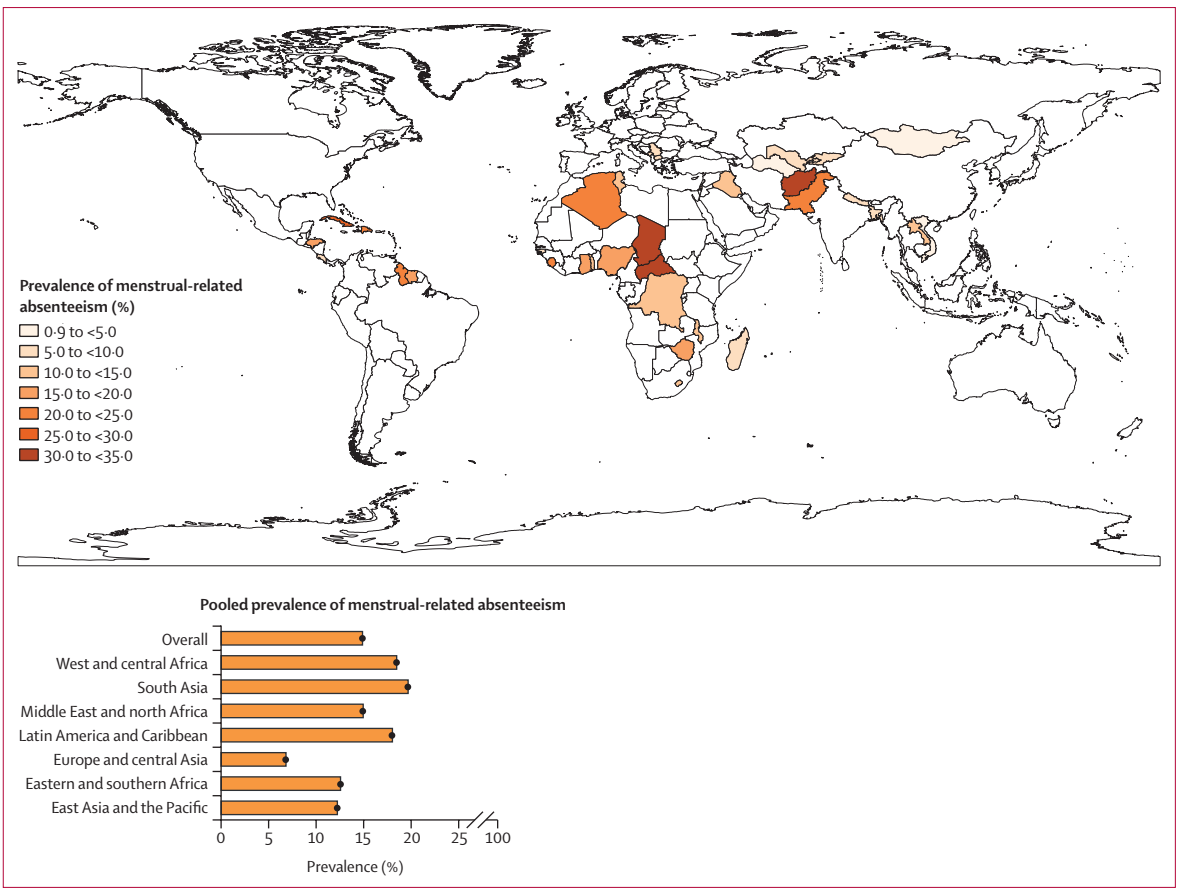

Figure 1: **Prevalence of menstrual-related absenteeism by survey population**
Each MICS survey country is coloured to represent the prevalence of menstrual-related absenteeism in surveyed women and girls aged 15–49 years. Countries shown in white have no available MICS6 survey. The bar graph represents the prevalence of menstrual-related absenteeism pooled by region, and an overall pooled estimate across all surveys. Some countries and territories are not shown but include Kiribati (prevalence of menstrual-related absenteeism 16·1%), Samoa (9·0%), Tonga (15·6%), Tuvalu (15·6%), São Tomé and Príncipe (11·0%), Turks and Caicos Islands (12·7%), and Kosovo (10·5%). Pakistan had four region-specific surveys from which results were pooled to generate a country-specific estimate (22·6%). MICS=Multiple Indicator Cluster Surveys.

technique to estimate the prevalence ratio and the delta method for the SE and CI.[16]

Multivariable associations with menstrual-related absenteeism were also obtained for each independent variable of interest using the same methods, with adjustment for relevant confounders informed by directed acyclic graphs (DAGs) created using the R package dagitty (appendix p 35).[17] For household wealth, included confounders were women's age and marital status (currently, formerly, or never married or in union); for use of menstrual materials, confounders were household wealth, women's and girls' highest level of education (preschool or none, primary, secondary, higher or vocational), and area type; for a private place to wash and change at home, confounders were household wealth and area type; and for use of contraceptives (any method or hormonal methods), confounders were household wealth, area, women's age, parity, and educational attainment. Our DAGs identified no confounders for the association between age and menstrual-related absenteeism. However, area type was included as a confounder for age due to its potential to determine life expectancy and contribute to menstrual-related absenteeism.[18,19]

A two-step random-effects meta-analysis with the Sidik–Jonkman method was used to generate pooled prevalence estimates and prevalence ratios, and associated 95% CIs, with results pooled across MICS-defined geographical regions and across all surveys.[20] Our study included four surveys conducted in separate Pakistan provinces, which were treated as independent in all meta-analyses. We assessed heterogeneity using the I^2 statistic[21] and 95% prediction intervals to reflect the variation in associations.

The population used for demographic analyses and prevalence estimates included all women and girls without missing data for the outcome variable (ie, those who responded "yes", "no", "don't know/no such activity", or "no response") and relevant independent variables. When undertaking univariable and multivariable analyses, the analysis set was reduced to only women and girls who answered "yes" or "no" to the outcome variable and relevant independent variables.

Analyses were undertaken in Stata 17 using the SVY commands to account for complex survey design using women's survey weights, with stratification by area type and district, region, or province depending on the survey. META commands were used for pooling results. Strata with single sampling units were centred at the grand mean to allow the calculation of SEs.[22] No finite population correction was applied due to the unknown

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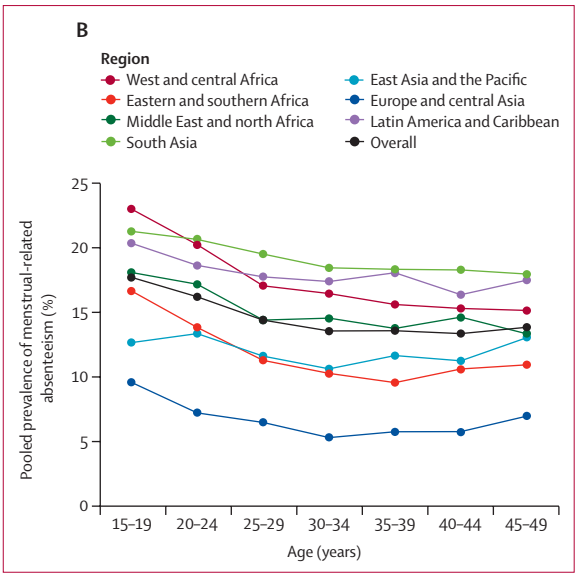

Figure 2: **Association between age and menstrual-related absenteeism**
(A) Dot plot with survey-specific prevalence ratios comparing the prevalence of menstrual-related absenteeism across different age groups with the reference group (age 15–19 years). All prevalence ratios are based on multivariable analysis (appendix pp 39–41) and adjusted for area type (urban or rural). Error bars are 95% CIs for pooled prevalence ratios. (B) Line graph showing the prevalence of menstrual-related absenteeism pooled by region and age group. The pooled prevalence across all surveys is shown by the black line.

population size of women and girls aged 15–49 years in each survey population. The sampling variability might therefore be overestimated in some surveys, particularly in countries with a small population size. Some figures were additionally produced using R statistical software (version 4.3.1) or QGIS 2.10 Pisa software.

Role of the funding source

The funder had no role in the study design, data collection, data analysis, data interpretation, or writing of the report.

Results

Surveys and their sample demographics are summarised in the appendix (pp 5–25). 47 MICS surveys across 44 LMICs, from May, 2017 to February, 2023, were included. There were ten surveys in west and central Africa, four in eastern and southern Africa, four in the Middle East and north Africa, seven in south Asia, eight in east Asia and the Pacific, seven in Europe and central Asia, and seven in Latin America and the Caribbean (figure 1). In total, these surveys comprised 3 193 042 individuals from 555 869 households, of which 673 380 women and girls from 479 424 households had information for the outcome variable and were included in this study. The total survey-weighted sample size was 677 035 women and girls, with survey-weighted populations ranging from 728 in Tuvalu to 58 198 in Bangladesh (appendix p 5).

Across all surveys, the pooled prevalence of menstrual-related absenteeism was 15·0% (95% CI 12·7–17·3; appendix p 26). The regional pooled prevalence of menstrual-related absenteeism was highest in south Asia (19·7% [11·6–27·8]), followed by west and central Africa (18·5% [13·5–23·5]), Latin America and the Caribbean (18·0% [13·1–22·9]), Middle East and north Africa (14·9% [8·7–21·1]), eastern and southern Africa (12·6% [9·4–15·8]), east Asia and the Pacific (12·2% [7·6–16·9]), and Europe and central Asia (6·8% [4·6–9·1]; figure 1; appendix p 26). The prevalence of menstrual-related absenteeism by country ranged from 43 (0·9%) of 4946 in Turkmenistan to 10 404 (38·0%) of 27 398 in the Sindh province of Pakistan. The prevalence of menstrual-related absenteeism across each independent variable is described in detail in the appendix (pp 32–34, 46–57).

We first investigated the association between women's age and menstrual-related absenteeism. The mean age of women and girls across all surveys was 30·0 years (95% CI 29·4–30·6; appendix p 27). In 35 of 47 surveys, menstrual-related absenteeism was highest in women and girls aged 15–19 years or 20–24 years (appendix pp 32–33). In these age groups, the overall pooled prevalence of menstrual-related absenteeism was 17·7% (15·1–20·3) in those aged 15–19 years and 16·2% (13·8–18·6) in those aged 20–24 years. After adjusting for area type, the overall pooled prevalence ratios indicated that those aged 15–19 years (the reference group) had the highest prevalence of menstrual-related absenteeism when compared with all other age groups, with pooled prevalence ratios ranging from 0·75 (0·68–0·82) in those aged 35–39 years to 0·92 (0·87–0·97) in those aged 20–24 years (figure 2; appendix pp 39–41).

Next, we compared the prevalence of menstrual-related absenteeism across household wealth quintiles, with the reference being the third (median) quintile (figure 3). After adjusting for age and marital status, there was no definite evidence of an association between wealth index and menstrual-related absenteeism (adjusted prevalence ratio 1·09 [1·00–1·19] in quintile 1 [poorest]; 1·01 [0·96–1·06] in quintile 2; 0·94 [0·89–1·00] in quintile 4; 0·91 [0·83–0·99] in quintile 5 [richest]; appendix pp 44–45).

Likewise, we observed no consistent association between the use (*vs* no use) of menstrual materials and menstrual-related absenteeism within or across regions, with an overall pooled prevalence ratio of 0·97 (0·85–1·11) after adjusting for wealth, education, and area type (figure 4A; appendix pp 48–49). However, country-specific associations were observed: the use of menstrual materials was associated with lower absenteeism in countries such as Nepal (adjusted prevalence ratio 0·46 [0·37–0·57]) but higher absenteeism in countries such as Chad (2·01 [1·64–2·46]).

We next investigated the association between menstrual-related absenteeism and having a private place to wash and change at home during menstruation. The pooled prevalence of women and girls with a private place to wash and change at home during menstruation

ranged from 78·9% (63·5–94·3) in the Middle East and north Africa to 97·3% (95·9–98·8) in Europe and central Asia, with an overall pooled prevalence of 91·6% (89·2–93·9; appendix p 30). Having a private place to wash and change at home (*vs* having no such place) was associated with a higher prevalence of menstrual-related absenteeism, with an overall pooled prevalence ratio of 1·25 (1·05–1·48) after adjusting for wealth and area type

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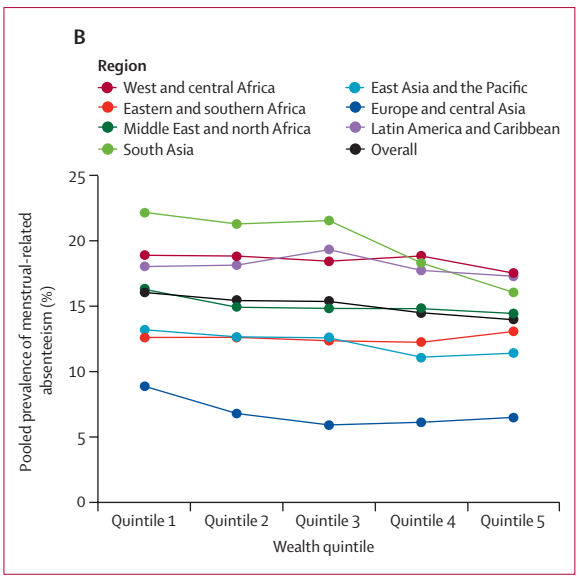


Figure 3: **Association between household wealth quintile and menstrual-related absenteeism**

(A) Dot plot with survey-specific prevalence ratios comparing the prevalence of menstrual-related absenteeism across different household wealth quintiles with the reference group (third [median] quintile). All prevalence ratios are based on multivariable analysis (appendix pp 44–45) and adjusted for age and marital status. Error bars are 95% CIs for pooled prevalence ratios. (B) Line graph showing the prevalence of menstrual-related absenteeism pooled by region and wealth quintile. The pooled prevalence across all surveys is shown by the black line. Wealth quintiles represent the relative wealth within a country and are derived from household wealth scores calculated based on housing characteristics and household and personal assets. Quintile 1 represents the poorest households, while quintile 5 represents the richest.

(figure 4B; appendix pp 52–53). This trend was observed in regional pooled estimates in west and central Africa, eastern and southern Africa, and Latin America and the Caribbean, although an association in the opposite direction was observed in Europe and central Asia (adjusted prevalence ratio 0·48 [0·32–0·73]).

Additionally, we explored the association between contraceptive use and menstrual-related absenteeism. The regional pooled proportion of women and girls using any method of contraceptive varied from 24·1% (18·3–29·8) in west and central Africa to 60·2% (54·6–65·7) in the Middle East and north Africa, with an overall pooled prevalence of 38·6% (33·8–43·5; appendix p 31). Contraceptive use was associated with lower menstrual-related absenteeism, with an overall pooled prevalence ratio of 0·92 (0·87–0·96) after adjusting for age, wealth, education level, parity, and area type (figure 5A; appendix pp 54–55). Contraceptive use was associated with a reduced prevalence of menstrual-related absenteeism in 11 of 47 surveys, with no surveys showing increased menstrual-related absenteeism in those using contraceptives.

Among women and girls who reported being on contraceptives, the regional pooled proportion of those using a hormonal method ranged from 11·4% (5·3–17·5) in Europe and central Asia to 78·0% (66·4–89·7) in eastern and southern Africa, with an overall pooled prevalence of 52·2% (44·9–59·5; appendix p 31). After adjusting for age, wealth, education level, parity, and area type, the use of hormonal contraceptives was associated with lower menstrual-related absenteeism when compared with the use of only non-hormonal or no contraceptives (overall pooled prevalence ratio 0·91 [0·84–0·99]; figure 5B; appendix pp 56–57). Hormonal contraceptive use was associated with a reduced prevalence of menstrual-related absenteeism in ten of 47 surveys, with no surveys observing an increase in menstrual-related absenteeism in hormonal contraceptive users.

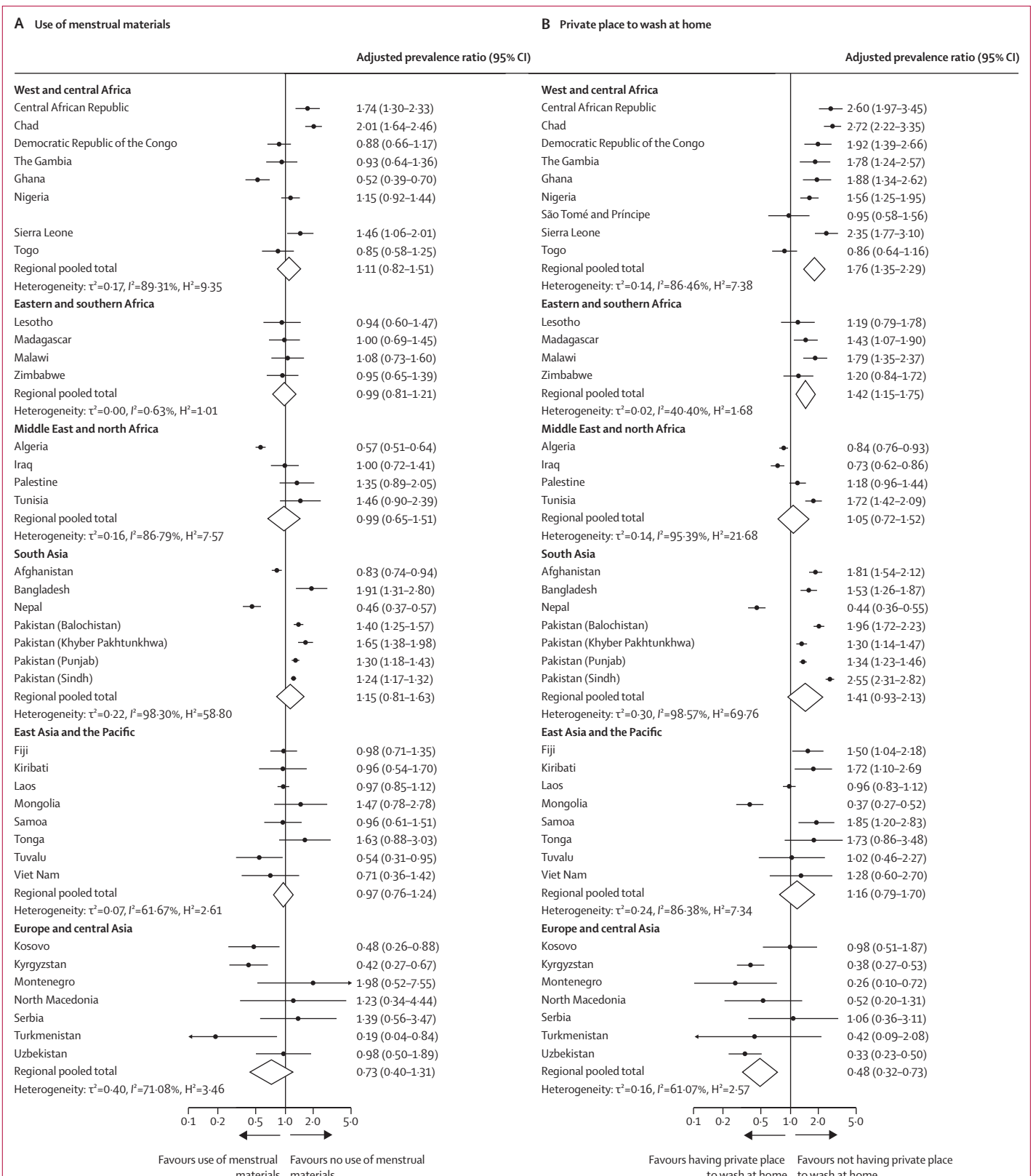
The regional pooled proportion of women and girls living in a rural area ranged from 27·7% (95% CI 18·6–36·7) in the Middle East and north Africa to 65·9% (53·2–78·5) in eastern and southern Africa, with an overall pooled prevalence of 49·1% (43·4–54·7; appendix p 28). After adjusting for age and marital status, there was no evidence of a difference in menstrual-related absenteeism when living in a rural compared with an urban area (overall adjusted prevalence ratio 1·00 [0·94–1·07]; appendix pp 46–47).

The regional pooled proportion of women and girls using reusable menstrual materials ranged from 2·4% (1·8–3·0) in Latin America and the Caribbean to 63·2 (52·7–73·7) in south Asia, with an overall pooled prevalence of 28·8% (20·0–37·7; appendix p 29). After adjusting for wealth, education, and area type, there was no evidence of a difference in menstrual-related absenteeism when using reusable menstrual materials compared with using only non-reusable materials (overall adjusted prevalence ratio 1·08 [0·99–1·17]; appendix pp 50–51).

I^2 values from the meta-analyses indicated a moderate to high proportion of variance, reflecting variance of true effects rather than sampling error. The wide 95% prediction intervals indicated uncertainty in the true effect sizes, likely due to observed heterogeneity (appendix pp 36–57).

Discussion

Our analysis of multinational data from 44 LMICs summarises the prevalence of and factors associated with menstrual-related absenteeism from work, school, or social activities. Menstrual-related absenteeism was found to occur in 15% of women and girls in LMICs, being most common in south Asia and west and central Africa. Menstrual-related absenteeism prevalence is highest among younger women aged 15–19 years, emphasising the vulnerability of this group and the urgent need for adolescent girls to be prioritised in future research and programmes. Women and girls who use hormonal contraceptives reported less menstrual-related absenteeism, independent of age, wealth, education, area type, and parity, suggesting that menstrual symptoms might contribute to this outcome. Our analyses provide new evidence to inform future



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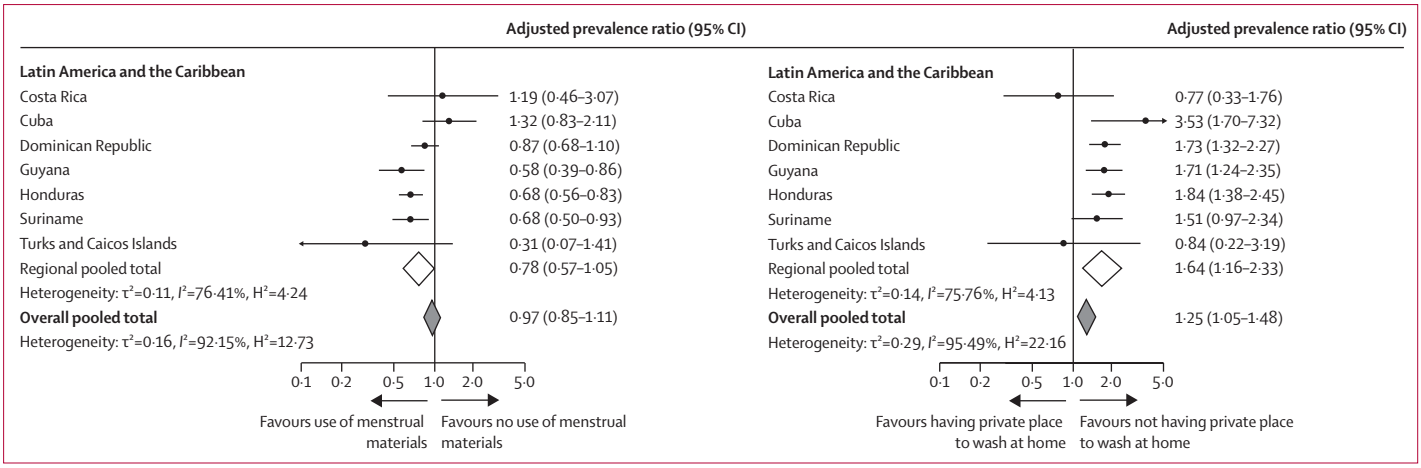


Figure 4: **Association between menstrual-related absenteeism and use of menstrual materials or availability of a private place to wash at home during menstruation**
(A) Forest plot showing prevalence ratios comparing menstrual-related absenteeism in women and girls using menstrual materials compared with those using no menstrual materials (reference). Analyses are adjusted for wealth, education, and area type. (B) Forest plot showing prevalence ratios comparing the prevalence of menstrual-related absenteeism in women and girls who have a private place to wash at home during menstruation to those who do not (reference). Analyses are adjusted for wealth and area. Measures of heterogeneity within regions and across all surveys are shown by τ^2, I^2, and H^2 for each pooled estimate.

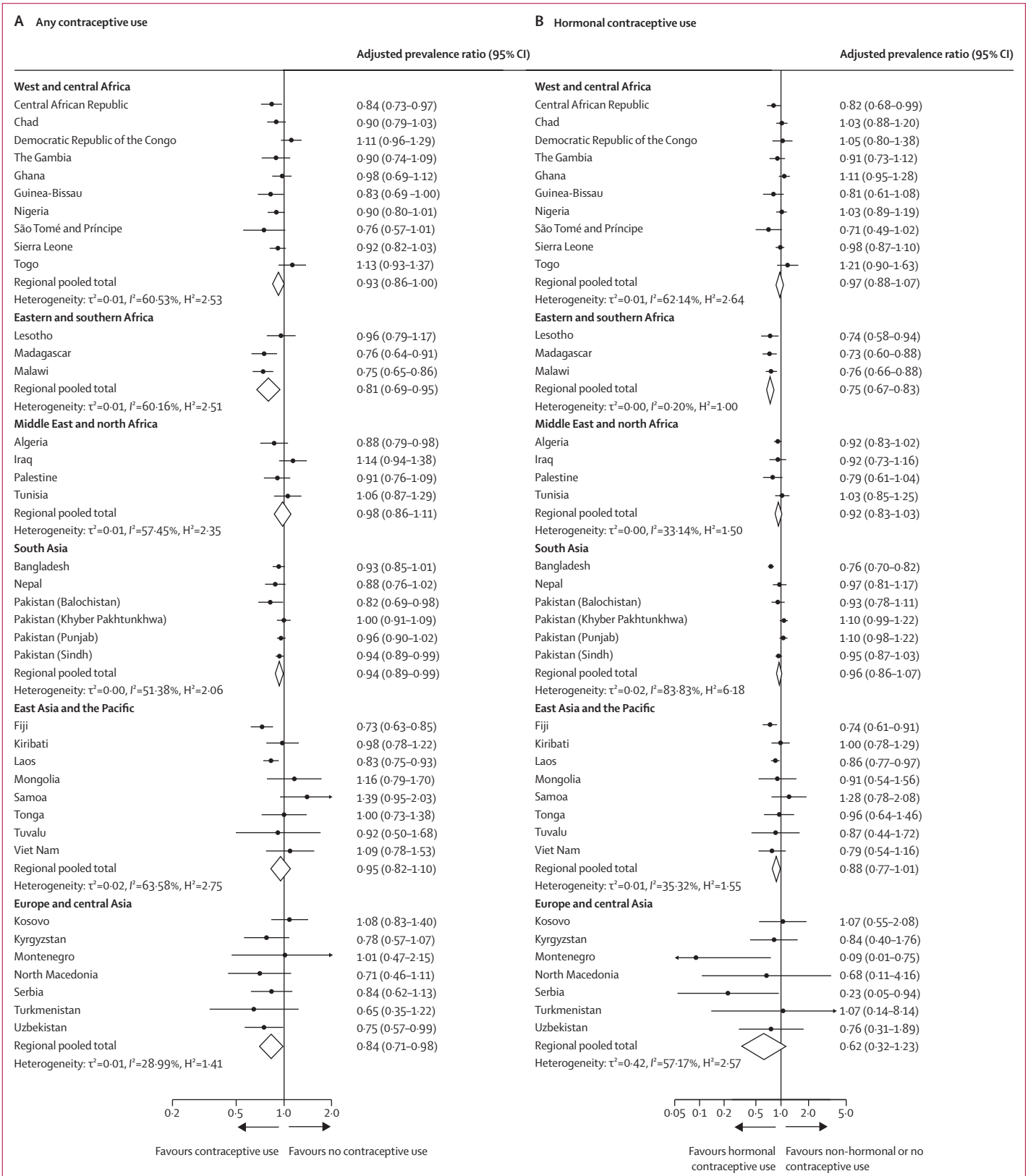
menstrual health research and public health interventions.

Both any contraceptive use and hormonal contraceptive use specifically were associated with reduced menstrual-related absenteeism in this study. However, hormonal contraceptive use was found to be protective when compared to both non-hormonal or no contraceptive use, suggesting an effect specific to this group of contraceptives. Hormonal contraception improves many menstrual symptoms, including heavy menstrual bleeding and menstrual pain.[14,15] Both symptoms have been shown to contribute to menstrual-related absenteeism in adolescents in countries such as Malawi (47·9% absent due to heavy bleeding, 19·5% absent due to cramps, headache, or pain), India (31·8% absent due to excessive bleeding, 76·3% absent due to pain or discomfort), and Ghana (40·0% absent due to heavy bleeding, 57·3% absent due to pain).[23–25] The association between hormonal contraceptive use and reduced menstrual-related absenteeism might, therefore, be mediated by symptom control, indicating the potential value of hormonal treatments as a possible menstrual health intervention independent from the benefits to family planning. Such benefits could also provide a less stigmatised route for improving the uptake of contraceptives in adolescents and unmarried women and girls. Other medical treatments, such as non-steroidal anti-inflammatory drugs and tranexamic acid, could also be offered. Medical interventions must also be accompanied by programmes for health-care workers and community members raising awareness of the problems of menstrual pain and heavy bleeding to destigmatise these conditions and improve health-seeking behaviour.

Our study did not find clear associations between relative household wealth and menstrual-related absenteeism. One possible explanation might be that wealth quintiles measure a household's relative wealth within a population; if the population is largely poor or wealth is similar across a large proportion of the population, then the composition of quintiles across the population might be similar, limiting the utility of comparison between quintiles. Another explanation might be that wealth does not guarantee improved access to menstrual materials and WASH facilities, such as in rural areas with limited resources or in contexts where there is high menstrual stigma. We found that the overall prevalence of menstrual-related absenteeism was similar in rural and urban areas, despite lower coverage of WASH facilities—including safely managed sanitation and basic hygiene services—in rural areas compared with urban areas.[7] Additionally, women and girls might not have access to their household's wealth or the agency to spend such money on menstrual materials. It is also possible that wealth acts as an effect modifier, which could interfere with the magnitude and direction of any observed effect. Further work is needed to explore these possibilities.

We found no clear association between the use of any menstrual materials or the use of reusable menstrual materials and menstrual-related absenteeism. Future work should explore other factors related to the use of menstrual materials, including product type, quality, and sufficiency, availability of disposal facilities, and private areas for changing and washing outside the home.[26–28] These factors are often neglected in programmes and are not well captured in large-scale health surveys.

Having a private place to wash and change at home during menstruation was associated with an increased prevalence of menstrual-related absenteeism in many regions. This might suggest suboptimal out-of-home sanitation facilities, causing women and girls to stay at home while menstruating to better manage their



(Figure 5 continues on next page)

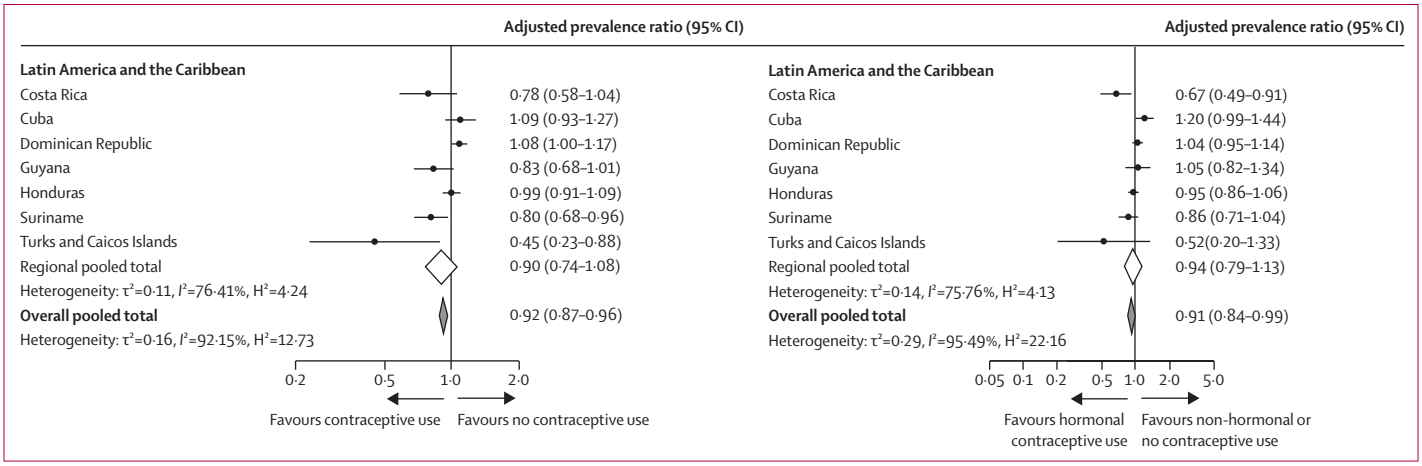


Figure 5: **Association between contraceptive use and menstrual-related absenteeism**
(A) Forest plot showing prevalence ratios comparing menstrual-related absenteeism in women and girls using contraceptives compared with those not using contraceptives. (B) Forest plot showing prevalence ratios comparing menstrual-related absenteeism in women and girls using hormonal contraceptives compared with those using only non-hormonal or no contraceptives. All analyses are adjusted for women's age, wealth, education, parity, and area. Measures of heterogeneity within regions and across all surveys are shown by τ^2, I^2, and H^2 for each pooled estimate.

menstrual health. Implementation of female-friendly toilets (ie, those that are clean, safe, accessible, private, and affordable) could reduce menstrual absences for women and girls, especially for those who have heavy menstrual bleeding who need to wash and change materials frequently.[29] Further studies are needed to better understand the complex relationship between water and sanitation facilities and menstrual health in order to prioritise implementation of highly efficacious interventions.

Our study has several limitations. By design, this study leveraged data from the MICS, thus limiting the available variables relating to women's menstrual health. Likewise, the inability to distinguish between absenteeism from work, school, and social activities limited our ability to identify the relative prevalence of each event and the settings to prioritise for public health interventions. In addition, the surveys asked only about attendance, which might not reflect participation.[30] Girls commonly reach menarche before 15 years of age, and younger individuals are not evaluated by the MICS women's questionnaire, preventing us from investigating the potentially distinct menstrual health challenges in menstruating girls younger than 15 years. The wide 95% prediction intervals indicate that the magnitude of effect between settings might vary due to unexplained causes of heterogeneity. Residual confounding from unmeasured covariates, such as women's menstrual education, stigma, working status, and other social or cultural determinants, might have influenced our findings. Future prospective studies should carefully measure all potential covariates to develop a more complete picture of factors contributing to poor menstrual health. The cross-sectional design of MICS impedes causal inference, and drivers of poor menstrual health would be best evaluated through prospective targeted studies. Although MICS apply a consistent methodology, differences in survey implementation across countries might have also contributed to the observed heterogeneity. Recall errors relating to women's previous menstrual periods (eg, menstrual-related absenteeism, use of menstrual materials) might also have biased our findings. Despite these limitations, using MICS also offered strengths, including providing large-scale data from standardised methodologies to allow between-country comparisons of results.

Menstrual-related absenteeism is a common health and social issue for women and girls in LMICs. Our hypothesis-generating findings call attention to the burden of this understudied problem and inform important avenues for future prospective research. Future work should aim to confirm our findings with prospective study designs, and prioritise identification of efficacious, culturally safe interventions for reducing menstrual-related absenteeism and improving menstrual health in LMICs.

For more on the **MICS datasets** see https://mics.unicef.org/surveys

Contributors

S-RP and MS conceptualised and designed the study. S-RP secured funding for the study. The UNICEF-verified MICS dataset was accessed by MS and RH. RH and MS undertook the analysis with code created by RH and MS. RH, MS, and SB interpreted the data. RA and MS visualised the data. NVD and SB validated the data. MS, S-RP, and RH prepared the initial draft of the manuscript, and all authors reviewed and edited the manuscript. All authors had full access to the data and accept responsibility to submit for publication.

Declaration of interests

S-RP reports advisory boards and consultancy for CSL-Vifor, consultancies for ITL Biomedical and Givewell, and non-compensated roles as Director of the WHO Collaborating Centre for Anaemia Detection and Control. All other authors declare no competing interests.

Data sharing

MICS data are the property of the UNICEF MICS programme, and the data use agreement precludes redistribution. However, MICS study datasets are available upon request to the MICS programme for legitimate research purposes.

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Editorial note: The Lancet Group takes a neutral position with respect to territorial claims in published maps and figures.

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