



Research article

Rural-urban variation in exclusion from social activities due to menstruation among adolescent girls and young women in Ghana



Angela A. Gyasi-Gyamerah^{a,*}, Joseph Mfum Manukure^a, Lily N.A. Andoh^a,
Nutifafa Eugene Yaw Dey^a, Kenneth Owusu Ansah^a, Pascal Agbadi^b

^a Department of Psychology, College of Humanities, School of Social Sciences, University of Ghana, Legon, Accra, Ghana

^b Department of Sociology and Social Policy, Lingnan University, Tuen Mun, 8 Castle Peak Road, Hong Kong, SAR

ARTICLE INFO

Keywords:

Rural-urban variation
Menstruation
Exclusion
Adolescent girls
Young women
Ghana

ABSTRACT

Menstruation among adolescent girls and young women (AGYW) can be marked by several challenges that often result in exclusion from social activities. Information regarding this subject matter is however sparse in Ghana. This study examined the rural-urban differences in prevalence and correlates of exclusion from social activities due to menstruation among AGYW in Ghana. The study used cross-sectional data drawn from the women dataset of 2017/2018 Ghana Multiple Indicator Cluster Survey Six (GMICS 6). Data of adolescents ($n = 2927$; age 15–19) and young women ($n = 2194$; age 20–24) was analyzed in Stata version 14. About 21.65% of the respondents indicated that they excluded themselves from activities during menstruation with slightly higher rates for rural AGYW (22.2%) compared to their urban counterparts (21.11%). Multivariable Poisson regression models showed that compared with nonattainment of formal education, urban AGYW who attained a primary level education were more likely to exclude themselves from social activities due to menstruation [APR = 2.76, 95% CI:1.11, 6.90]. Also, currently married urban AGYW were less likely to exclude themselves from social activities due to menstruation [APR = 0.63, 95% CI:0.44, 0.91]. AGYW residing in the second-lowest wealth household in rural areas had a higher likelihood of exclusion from social activities due to menstruation [APR = 1.34, 95% CI:1.03, 1.75]. Region of residence was a significant correlate in both rural and urban samples but with an observed rural-urban variation. Given the prevalence of AGYW who exclude themselves from social activities, the government and non-governmental organizations that seek to improve menstrual hygiene and empower young women to participate in social activities regardless of their monthly menstrual flow should take into consideration the urban-rural differentials in the associated factors identified in this study.

1. Introduction

Menstruation, which is a normal body function in females, is a major challenge for many adolescent girls and young women (AGYW). In many parts of the world, mostly in low- and middle-income countries, menstruation is seen as a curse, a dirty thing or impure (Alam et al., 2017; Hennegan et al., 2019; Mahon and Fernandes, 2010; Rajagopal and Mathur, 2017; Sommer et al., 2015b). Studies from Nepal and India have revealed that menstruation-related stigmatization imposed several restrictions on girls' daily routines, movements, and menstrual hygiene management practices (Chandra-Mouli and Patel, 2017; Kabir et al., 2016; Kaur et al., 2018; Mahon and Fernandes, 2010; Rajagopal and Mathur, 2017). Some of these restrictions include ritual bathing, not making physical contact with a male member of the family, plant, tree, or

fruit, not eating dairy products, eating alone, and other mobility limitations inside and outside the home for fear of making others unclean (Chandra-Mouli and Patel, 2017; Crawford et al., 2014; Malhotra et al., 2016; Robinson, 2015; Van Eijk et al., 2016; Kumar and Srivastava, 2011; Thakur et al., 2014).

These menstruation-related stigmatizations can cause adolescent girls and young women to exclude themselves from social activities (Mahon and Fernandes, 2010; Miirio et al., 2018; Vashisht et al., 2018). For school-going adolescent girls, menstruation is associated with school-related absenteeism with reported prevalence rates ranging from 27.5% to 40% in rural Ghana (Kumbeni et al., 2021; Mohammed et al., 2020). Many of these girls are misled to believe that improper disposal of used sanitary materials would lead to infertility (Sommer et al., 2015a). Some, especially young girls in the Northern Region of Ghana are actively

* Corresponding author.

E-mail addresses: aagyasi-gyamerah@ug.edu.gh, aggyamerah@gmail.com (A.A. Gyasi-Gyamerah).

<https://doi.org/10.1016/j.heliyon.2022.e09463>

Received 17 May 2021; Received in revised form 14 September 2021; Accepted 12 May 2022

2405-8440/© 2022 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

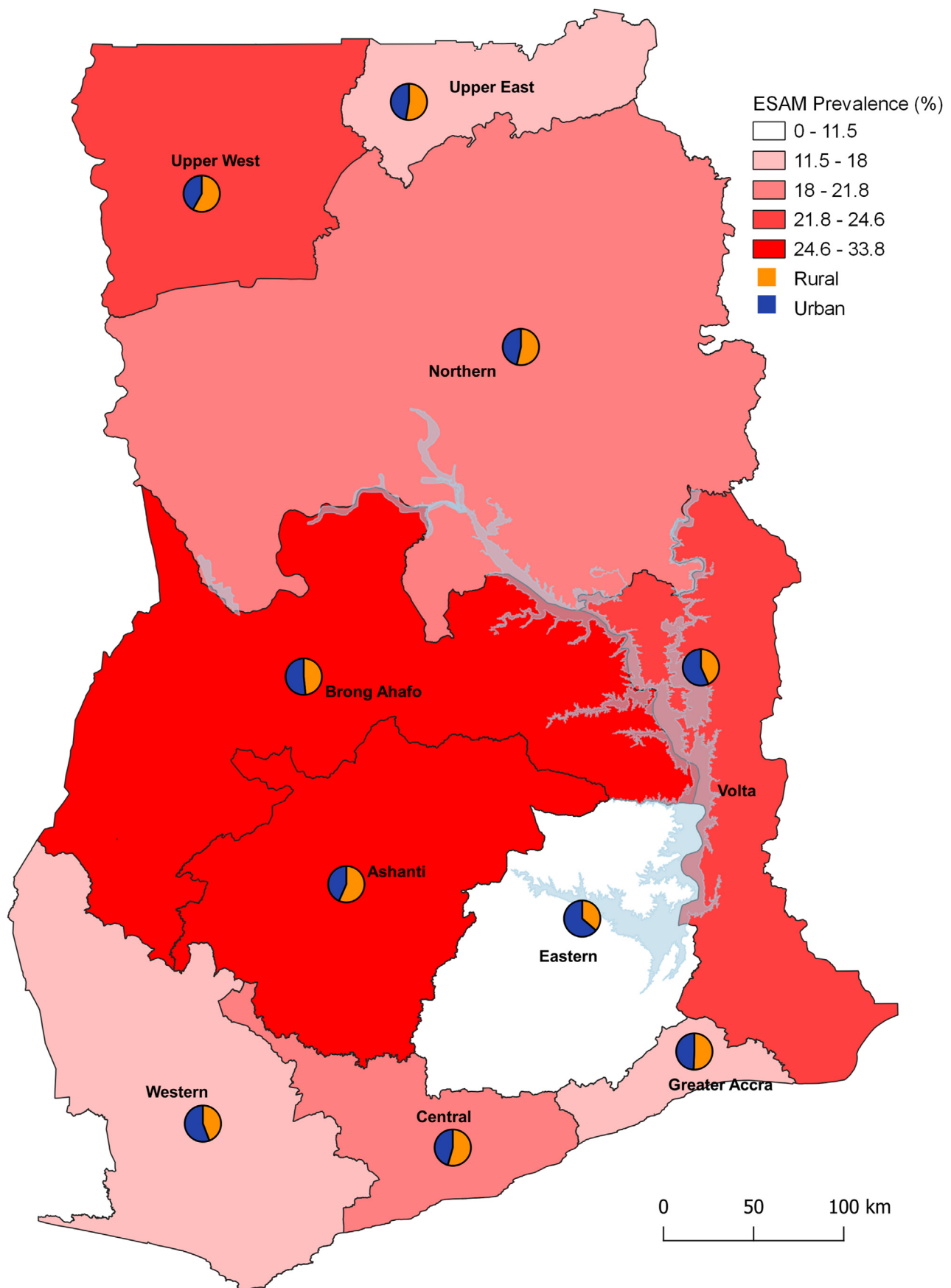


Figure 1. Spatial prevalence mapping of exclusion from social activities due to menstruation (ESAM) by place of residence.

prevented from participating in household activities (e.g., the preparation of some local dishes such as Wasawasa) and religious activities (e.g., reading the Holy Quran or praying in the mosque) during their menses because they are considered unclean and impure (Mohammed and Larsen-Reindorf, 2020). Sadly, even open discussions about menstruation and its management, which are meant to dispel associated misconceptions, are not encouraged in certain Ghanaian households (Mohammed and Larsen-Reindorf, 2020).

In parts of Asia and Africa, outcomes of numerous studies have led to the abandonment of a lot of traditions, cultures, and taboos that reinforced women's exclusion from several activities during menstruation (Mukherjee et al., 2020). The growing research on the correlation between adolescent girls' menstruation and absenteeism has seen a lot of intervention to improve menstrual hygiene management (MHM) and water, sanitation, and hygiene (WASH) in schools (Kansiime et al., 2020; Miuro et al., 2018). However, many adolescent girls and young women in developing countries, including Ghana, are excluding themselves from social activities due to menstruation, with the following sociodemographic factors identified as significant correlates: age, educational level, health insurance, marital status, household wealth index, and region of residence (Goli et al., 2020; Malhotra et al., 2016; Robinson, 2015; Roy et al., 2021). The gap in the literature is the inadequacy in establishing rural-urban variations in the association between sociodemographic factors and exclusion from social activities among adolescents and young women (Malhotra et al., 2016; Robinson, 2015). In Ghana, studies exploring the prevalence and associated factors of exclusion from social activities among AGYW due to menstruation are lacking. Therefore, the current study seeks to fill the gap in knowledge by examining the rural-urban variations in prevalence and how sociodemographic factors relate with exclusion from social activities due to menstruation.

2. Methods

2.1. Study design and sample size

The current study used cross-sectional data drawn from the women dataset of 2017/2018 Ghana Multiple Indicator Cluster Survey Six (GMICS 6). The MICS 6 was conducted by Ghana Statistical Service (GSS) receiving funding and technical support from the United Nations Children's Fund (UNICEF) and other government agencies and international donors (GSS, 2018). The MICS programme is a well-known survey that collects internationally comparable nationwide household data from children and women on a variety of indicators. The data is aimed to be used by participating countries for their national development plans, policies, and programmes (GSS, 2018).

A multi-stage, stratified cluster sampling procedure was utilized for data collection. At the start of the data collection process, enumeration areas (EAs), based on Ghana's 2010 Population and Housing Census (2010 PHC), were identified and chosen as primary sampling units (PSUs). The second stage involved households listing within each of the selected EAs and sampling using a systematic random sampling procedure. About 13202 households were selected for data collection using this procedure. Data were thus collected from women dwelling in urban and rural areas within the previous 10 administrative regions in Ghana including the Western, Central, Greater Accra, Volta, Eastern, Ashanti, Brong-Ahafo, Northern, Upper East, and Upper West Regions. We analyzed data of 2974 adolescents (aged 15–19 years) and 2862 young women (aged 20–24 years), giving us a total of 5836 respondents.

2.2. Study setting

Ghana is a West African country located on the coast of the Gulf of Guinea, bordered by Togo, to the east, Ivory Coast, to the west, and Burkina Faso, to the north with an estimated total population of about 29.6 million (The World Bank, 2018). The country is said to be experiencing rapid urbanization with a greater number of its population living in urban

areas (GSS, 2014). This is among the principal causes of uneven development between rural and urban areas which has left many rural areas lacking basic social, health, economic and educational amenities (GSS, 2014). There were previously 10 administrative regions in Ghana (see Figure 1): Ashanti, Central, Greater Accra, Eastern, Volta, Northern, Upper East, Upper West, Western, and Brong Ahafo regions. However, with the creation of Northeast, Western North, Bono, Ahafo, Bono East, Oti, and Savannah regions in 2018, there are currently 16 administrative regions.

Ghana is classified as a lower-middle-income country with a Medium Human Development Index ranked 138 (The World Bank, 2021; UNDP, 2020). Poverty in Ghana is reported to be predominant in the Volta, Bono, and Ahafo, Northern, Upper West, and Upper East regions in Ghana (Ghana Statistical Service, 2015). According to UNICEF (2021), adolescents and young people account for about one-third of Ghana's population, with one-quarter of the population aged 10 to 19 and 10% of young adults aged 20–24 years. The transition from girlhood to womanhood is difficult for more than five million Ghanaian adolescent females with most of them experiencing vulnerabilities in their sexual and reproductive health (UNICEF, 2021). In many parts of Ghana, menstruation is considered unclean, such that the majority of the

Table 1. Descriptive results of study variables.

Study variables	Full sample Frequency (%)	Urban sample Frequency (%)	Rural sample Frequency (%)
Exclusion from social activities due to menstruation			
No	4264 (78.35)	2143 (78.89)	2121 (77.80)
Yes	1154 (21.65)	545 (21.11)	609 (22.20)
Age			
15–19	2927 (57.15)	1372 (55.64)	1602 (58.63)
20–24	2862 (42.85)	1437 (44.36)	1425 (41.37)
Education			
Preprimary/None	368 (5.49)	78 (2.51)	290 (8.44)
Primary	866 (14.63)	246 (10.21)	620 (19)
JHS/Middle	2653 (47.77)	1115 (41.56)	1538 (53.90)
SHS/Higher	1949 (32.10)	1370 (45.73)	579 (18.66)
Health Insurance			
Not Insured	2566 (45.14)	1150 (41.81)	1416 (48.96)
Insured	3270 (54.59)	1659 (58.19)	1611 (51.04)
Marital Status			
Never/Formerly married or in-union	4515 (79.67)	2405 (85.60)	2110 (73.82)
Currently married/in-union	1321 (20.33)	404 (14.40)	917 (26.18)
Household Wealth			
Poorest	1386 (17.51)	109 (3.30)	1277 (31.52)
Second	1023 (19.53)	265 (12.01)	758 (26.95)
Middle	1182 (22.15)	620 (21.67)	562 (22.63)
Fourth	1089 (20.77)	829 (30.26)	260 (11.42)
Richest	1156 (20.04)	986 (32.77)	170 (7.49)
Place of residence			
Urban	2809 (49.64)	—	—
Rural	3027 (50.36)	—	—
Region of residence			
Greater Accra	676 (12.17)	618 (21.81)	58 (2.67)
Western	560 (10.12)	266 (7.93)	294 (12.18)
Central	585 (10.58)	273 (9.55)	312 (11.60)
Volta	509 (7.81)	202 (4.51)	307 (11.06)
Eastern	589 (12.18)	270 (11.46)	319 (12.88)
Ashanti	800 (23.12)	509 (26.59)	291 (19.70)
Brong-Ahafo	531 (9.39)	269 (9.80)	262 (8.98)
Northern	550 (8.87)	180 (5.75)	370 (11.95)
Upper East	481 (3.33)	113 (1.48)	368 (5.16)
Upper West	555 (2.43)	109 (1.11)	446 (3.72)

Table 2. Chi-square results of the relationship between correlates and outcome variable.

Study variables	Total Sample		Urban Sample	Rural Sample
	Exclusion from social activities due to menstruation			
	Yes	No	Yes	Yes
Age	$\chi^2 = 0.59, p = 0.57$		$\chi^2 = 1.14, p = 0.38$	$\chi^2 = 0.0, p = 0.99$
15–19	584 (22.02%)	2189 (77.98%)	260 (21.85%)	324 (22.18%)
20–24	570 (21.15%)	2075 (78.85%)	285 (20.16%)	285 (22.22%)
Education	$\chi^2 = 14.20, p = 0.496$		$\chi^2 = 15.12, p = 0.06$	$\chi^2 = 3.33, p = 0.68$
Preprimary/None	56 (16.82%)	263 (83.18%)	11 (8.48%)	45 (19.33%)
Primary	159 (23.15%)	582 (76.85%)	49 (28.3%)	110 (20.4%)
JHS/Middle	529 (21.29%)	1937 (78.71%)	200 (19.79%)	329 (22.45%)
SHS/Higher	410 (22.29%)	1482 (77.71%)	285 (21.47%)	125 (24.26%)
Health Insurance	$\chi^2 = 17.86, p = 0.059$		$\chi^2 = 6.0, p = 0.06$	$\chi^2 = 1.80, p = 0.36$
Not Insured	495 (20.06%)	1915 (79.94%)	211 (18.87%)	284 (21.11%)
Insured	659 (22.99%)	2349 (77.01%)	334 (22.77%)	325 (23.24%)
Marital Status	$\chi^2 = 20.85, p = 0.046$		$\chi^2 = 11.69, p = 0.02$	$\chi^2 = 1.33, p = 0.39$
Never/Formerly married or in-union	936 (22.42%)	3344 (77.58%)	486 (22.15%)	450 (22.73%)
Currently married/in-union	218 (18.40%)	920 (81.60%)	59 (14.14%)	159 (20.62%)
Household Wealth	$\chi^2 = 66.36, p = 0.027$		$\chi^2 = 21.23, p = 0.05$	$\chi^2 = 9.16, p = 0.46$
Poorest	274 (19.18%)	937 (80.82%)	22 (17.49%)	252 (19.35%)
Second	229 (26.68%)	700 (73.32%)	67 (30.53%)	162 (24.91%)
Middle	233 (22.84%)	878 (77.16%)	126 (21.44%)	107 (24.17%)
Fourth	209 (20.34%)	837 (79.66%)	157 (20.16%)	52 (20.83%)
Richest	209 (19.05%)	912 (80.95%)	173 (18.74%)	36 (20.43%)
Place of residence	$\chi^2 = 2.47, p = 0.587$			
Urban	511 (21.11%)	1908 (78.89%)		
Rural	527 (22.20%)	1847 (77.80%)		
Region of residence	$\chi^2 = 607.90, p < 0.001$		$\chi^2 = 94.94, p < 0.001$	$\chi^2 = 158.91, p < 0.001$
Greater Accra	83 (13.78%)	567 (86.22%)	78 (13.75%)	5 (14.12%)
Western	64 (11.60%)	467 (88.40)	33 (13.28%)	31 (10.52%)
Central	101 (18.56%)	443 (81.44%)	44 (16.75%)	57 (20.02%)
Volta	111 (22.69%)	350 (77.31%)	46 (27.25%)	65 (20.82%)
Eastern	58 (11.10%)	480 (88.90%)	32 (14.35%)	26 (8.18%)
Ashanti	235 (32.02%)	545 (67.98%)	140 (28.34%)	95 (36.98%)
Brong-Ahafo	191 (33.79%)	302 (66.21%)	97 (34.76%)	94 (32.68%)
Northern	109 (21.41%)	392 (78.59%)	38 (19.35%)	71 (22.4%)
Upper East	77 (17.07%)	351 (82.93%)	13 (15.67%)	64 (17.51%)
Upper West	125 (22.47%)	367 (77.53%)	24 (17.44%)	101 (24.1%)

population perceive it as ‘messy, revolting and polluting’ (Agyekum, 2002; Mohammed and Larsen-Reindorf, 2020). Consequently, restrictions are placed on menstruating girls to the extent that it is a taboo topic of discussion in some communities (Plan International, 2020).

2.3. Measurements

Exclusion from social activities due to menstruation was considered as the outcome variable. The variable was assessed using a single item module asking adolescents and young women about their menstrual health. The question asked was this: “Due to your last menstruation, were there any social activities, school, or workdays that you did not attend?”. Participants were required to respond to the question using a nominal response scale of “No” (0) and “Yes” (1). A list of categorical variables selected as correlates in this study included age, education, marital status, health insurance status, household wealth index, rural-urban residence, and region of residence. Detailed descriptions of these variables have been explained elsewhere (see GSS, 2018); nonetheless, the categorization of each correlate are presented in Table 1. These correlates were selected based on their availability in the dataset as well as lessons from previous studies (e.g., Goli et al., 2020; Roy et al., 2021).

2.4. Data preparation

The data used in this study was accessed from the MICS database hosted by UNICEF at <https://mics.unicef.org/surveys>. Permission was granted after a simple registration and request procedure was completed by the fourth and last author. Following this, the dataset was downloaded, cleaned, and variables of interest were recorded in Stata version 14 (StataCorp, 2015). Data analysis was limited to only adolescent girls and young women.

2.5. Statistical analysis

The main data analysis proceeded in three phases. Before this, the complex survey command was activated to correct for clusters, stratification, and sample weights. This correction is recommended if data is collected with complex survey designs to account for possible analytical errors and to help draw appropriate inferences (West et al., 2016). The first phase involved performing univariate analysis by computing proportions, percentages, and relevant 95% confidence intervals of the study variables (see Table 1). This analysis was applied to both the full sample and the rural-urban stratified sample. The next phase involved examining

Table 3. Summary of bivariate Poisson regression predicting correlates onto exclusion from social activities due to menstruation.

Correlates	Full Model PR	Urban PR	Rural PR
Age			
15–19	1	1	1
20–24	0.96 [0.84, 1.10]	0.92 [0.77, 1.11]	1.00 [0.81, 1.23]
Education			
Preprimary/None	1	1	1
Primary	1.38 [0.85, 2.24]	3.34** [1.34, 8.31]	1.06 [0.61, 1.82]
JHS/Middle	1.27 [0.81, 1.97]	2.33 [0.99, 5.48]	1.16 [0.71, 1.89]
SHS/Higher	1.33 [0.86, 2.03]	2.53* [1.08, 5.94]	1.26 [0.79, 2.00]
Health insurance			
Insured	1	1	1
Not insured	0.87 [0.76, 1.01]	0.83 [0.68, 1.01]	0.91 [0.74, 1.12]
Marital status			
Formerly/Never	1	1	1
Currently married	0.82* [0.67, 1.00]	0.64* [0.44, 0.93]	0.91 [0.72, 1.14]
Household Wealth			
Poorest	1	1	1
Second	1.39** [1.09, 1.78]	1.75 [0.87, 3.49]	1.29 [0.99, 1.68]
Middle	1.19 [0.92, 1.54]	1.23 [0.65, 2.32]	1.25 [0.91, 1.72]
Fourth	1.06 [0.82, 1.37]	1.15 [0.61, 2.18]	1.08 [0.74, 1.57]
Richest	0.99 [0.77, 1.29]	1.07 [0.57, 2.01]	1.06 [0.62, 1.79]
Place of residence			
Urban	1		
Rural	1.05 [0.88, 1.26]		
Region of residence			
Greater Accra	1	1	1
Western	0.84 [0.57, 1.25]	0.97 [0.61, 1.53]	0.75 [0.28, 1.96]
Central	1.35 [0.97, 1.87]	1.22 [0.75, 1.98]	1.42 [0.59, 3.44]
Volta	1.65* [1.13, 2.41]	1.98** [1.19, 3.29]	1.48 [0.59, 3.72]
Eastern	0.81 [0.50, 1.29]	1.04 [0.59, 1.85]	0.58 [0.20, 1.66]
Ashanti	2.32*** [1.69, 3.20]	2.06*** [1.40, 3.04]	2.62* [1.07, 6.42]
Brong-Ahafo	2.45*** [1.78, 3.38]	2.53*** [1.70, 3.77]	2.31 [0.95, 5.64]
Northern	1.55* [1.11, 2.17]	1.41 [0.91, 2.17]	1.59 [0.65, 3.90]
Upper East	1.24 [0.85, 1.81]	1.14 [0.55, 2.36]	1.24 [0.50, 3.09]
Upper West	1.63** [1.14, 2.34]	1.27 [0.64, 2.53]	1.71 [0.69, 4.22]

Note. 95% confidence intervals in brackets; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; PR = Prevalence rate; JHS = Junior High School; SHS = Senior High School.

the relationship between the correlates and the outcome variable conducted with a Chi-square test of independence (see Table 2).

In the last phase, bivariate (see Table 3) and multivariable Poisson regression (see Table 4) was conducted regressing the correlates on the outcome variable. The bivariate analyses (unadjusted models) involved separately fitting the models examining the relationship between each correlate and the outcome (PR: prevalence ratio). The multivariable models were fitted with all correlates included together in the model as seen in the adjusted columns (APR: adjusted prevalence ratio). These processes were applied to both the full sample and rural-urban stratified samples. The justification for using Poisson regression instead of logistic regression to estimate prevalence ratios are adequately explained elsewhere (see Ranganathan et al., 2015; Santos et al., 2008; Tamhane et al., 2016). Prevalence ratio against odds ratio is suggested to prevent the overestimation of the calculated estimates when using clustered cross-sectional datasets. Nevertheless, logistic regression models were generated in Table 5 for purposes of comparison. Finally, spatial mapping was generated for the rural-urban prevalence of exclusion from social activities due to menstruation using the Quantum Geographic Information Systems Software version 3.20.2 (QGIS Development Team, 2020).

2.6. Ethics and data availability

Ethics clearance was obtained from the relevant authorities by GSS before starting data collection. Child assent and parental/adult consent were also obtained from participants. No additional ethical clearance was sought by the authors before using the current dataset.

3. Results

3.1. Descriptive characteristics of study variables

Results from Table 1 show a greater number of the respondents had never married/formerly married or in-union whereas slightly above half (50.36%) reside in the rural areas. Many of the respondents were between the ages of 15–19 years (57.15%) and many had obtained a Junior High School (JHS) or Middle school level education (47.77%). A detailed summary is provided in Table 1. Results of the Chi-square test of independence examining the relationship between the correlates and outcome variable revealed some significant associations. Specifically, marital status ($p \leq .05$), household wealth ($p \leq .05$), and region of residence ($p \leq .001$) were significantly associated with exclusion from social activities due to menstruation (see Table 2).

3.2. Prevalence of exclusion from social activities due to menstruation

Overall, about 21.65% [95% CI: 19.76 to 23.66] of the respondents indicated that they excluded themselves from activities when menstruating. Within the urban-rural stratified sample, the rate at which AGYW in the rural areas (22.2% [95% CI: 19.68 to 24.93]) excluded themselves from activities when menstruating is only slightly higher compared to those in the urban areas (21.11% [95% CI: 18.35 to 24.17]). This implies that the prevalence of excluding oneself from activities during menstruation is similar in both urban and rural areas (see Figure 2). Figure 1 and Figure 3 also present the rural-urban variations in prevalence rates of exclusion due to menstruation. From these figures, the experience is greatest in urban Brong-Ahafo (34.76%) and rural Ashanti (36.98%) regions and less occurring in urban Western (13.28%) and rural Eastern (8.18%) regions.

3.3. Association between correlates and exclusion from social activities due to menstruation

Bivariate (prevalence ratio) and multivariable (adjusted prevalence ratio models) analyses are reported for both full and rural-urban stratified in Table 3 and Table 4, respectively. Although our results of interest are the multivariable analyses, some significant associations were found in the bivariate analysis worth highlighting. That is, in the full sample bivariate model, marital status, household wealth, and region of residence were significantly related to exclusion from social activities due to menstruation. However, after controlling for all the correlates in the full sample, only household wealth and region of residence were significantly related to exclusion from social activities due to menstruation. The rural-urban stratified sample analyses revealed that the effects of associated factors on exclusion from social activities due to menstruation differ for urban and rural girls and young women.

Education was a significant correlate of exclusion from social activities due to menstruation. Urban AGYW with primary education were 2.76 times more likely to exclude themselves from activities when menstruating [APR = 2.76, 95% CI: 1.11, 6.90] than those with preprimary or no education. No significant relationship existed between these variables among rural AGYW. Regarding marital status, urban AGYW who are currently married were 0.63 less likely to exclude themselves from activities when menstruating [APR = 0.63, 95% CI: 0.44, 0.91] but this was not the case for rural AGYW. A significant link between

Table 4. Summary of multivariable Poisson regression predicting correlates onto exclusion from social activities due to menstruation.

Correlates	Full Model		Urban Model		Rural Model	
	B	APR	B	APR	B	APR
Age						
15–19		1		1		1
20–24	0.02	1.02 [0.86, 1.20]	0.04	1.04 [0.85, 1.27]	0.02	1.02 [0.78, 1.33]
Education						
Preprimary/None		1		1		1
Primary	0.34	1.40 [0.88, 2.25]	1.02	2.76* [1.11, 6.90]	0.22	1.24 [0.73, 2.12]
JHS/Middle	0.22	1.24 [0.79, 1.96]	0.65	1.92 [0.81, 4.55]	0.23	1.26 [0.75, 2.14]
SHS/Higher	0.30	1.35 [0.86, 2.12]	0.77	2.16 [0.91, 5.13]	0.25	1.29 [0.76, 2.18]
Health insurance						
Insured		1		1		1
Not insured	-0.11	0.90 [0.77, 1.04]	-0.19	0.83 [0.66, 1.04]	-0.03	0.97 [0.80, 1.17]
Marital status						
Formerly/Never		1		1		1
Currently married	-0.18	0.83 [0.66, 1.05]	-0.46	0.63* [0.44, 0.91]	-0.03	0.97 [0.72, 1.31]
Household Wealth						
Poorest		1		1		1
Second	0.31	1.37* [1.07, 1.75]	0.46	1.58 [0.81, 3.08]	0.29	1.34* [1.03, 1.75]
Middle	0.18	1.20 [0.91, 1.57]	0.16	1.17 [0.63, 2.18]	0.23	1.27 [0.91, 1.75]
Fourth	0.07	1.07 [0.81, 1.43]	0.10	1.11 [0.58, 2.11]	0.13	1.14 [0.79, 1.64]
Richest	-0.04	0.97 [0.71, 1.31]	-0.01	1.00 [0.53, 1.87]	-0.01	0.99 [0.60, 1.62]
Place of residence						
Urban		1				
Rural	0.07	1.07 [0.88, 1.30]				
Region of residence						
Greater Accra		1		1		1
Western	-0.24	0.79 [0.52, 1.19]	-0.02	0.99 [0.62, 1.57]	-0.33	0.72 [0.27, 1.91]
Central	0.23	1.25 [0.88, 1.79]	0.17	1.19 [0.73, 1.93]	0.31	1.36 [0.55, 3.34]
Volta	0.39	1.48 [0.99, 2.19]	0.58	1.79* [1.08, 2.96]	0.37	1.45 [0.57, 3.68]
Eastern	-0.29	0.75 [0.46, 1.22]	-0.02	0.99 [0.56, 1.75]	-0.55	0.58 [0.20, 1.67]
Ashanti	0.79	2.20*** [1.60, 3.04]	0.67	1.95*** [1.35, 2.84]	0.96	2.61* [1.06, 6.43]
Brong-Ahafo	0.80	2.22*** [1.59, 3.12]	0.84	2.32*** [1.57, 3.44]	0.82	2.27 [0.92, 5.65]
Northern	0.42	1.52* [1.07, 2.18]	0.30	1.35 [0.87, 2.10]	0.56	1.75 [0.70, 4.35]
Upper East	0.20	1.22 [0.81, 1.83]	0.03	1.03 [0.50, 2.16]	0.33	1.39 [0.55, 3.50]
Upper West	0.45	1.57* [1.06, 2.32]	0.23	1.26 [0.63, 2.49]	0.61	1.83 [0.73, 4.61]
More details						
Population size	4792		2418		2374	
Observations	5418		2688		2730	
Strata	20		10		11	
PSU	660		319		421	
Design df =	640		309		410	
F statistics	F (20, 621) = 5.49, $p < 0.001$		F (19, 291) = 3.69, $p < 0.001$		F (19, 392) = 3.34, $p < 0.001$	

Note. B = unstandardized beta value; 95% confidence intervals in brackets; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; APR = Adjusted Prevalence ratio; JHS = Junior High School; SHS = Senior High School.

household wealth index and exclusion from social activities due to menstruation was recorded. About 34% of rural AGYW in the second-lowest quintile had a higher chance of excluding themselves from activities when menstruating [APR = 1.34, 95% CI: 1.03, 1.75]. Additionally, urban AGYW who resided in Volta, Ashanti, and Brong-Ahafo regions were 1.79, 1.95, and 2.32 times respectively more likely to exclude themselves from activities when menstruating than their counterparts in Greater Accra. However, only rural AGYW residing in the Ashanti region excluded themselves from social activities due to menstruation. Precisely, these women were 2.61 times more likely to exclude themselves from activities when menstruating [APR = 2.61, 95% CI: 1.06, 6.43].

4. Discussion

This study estimated the prevalence and examined the rural-urban variations in the association between sociodemographic factors and exclusion from social activities due to menstruation among AGYW in Ghana. Generally, and consistent with the literature (Kumbeni et al., 2021; Mohammed et al., 2020), AGYW in rural areas excluded themselves from activities more frequently than urban AGYW. Education, marital status, and region of residence were associated with exclusion from social activities due to menstruation among urban AGYW whereas household wealth and region of residence were associated with exclusion from social activities due to menstruation among those in rural areas.

Table 5. Summary of Multivariable logistic regression predicting correlates onto exclusion from social activities due to menstruation.

Correlates	Full Model			Urban Model			Rural Model		
	B	AOR	p	B	AOR	p	B	AOR	p
Age									
15–19		1			1			1	
20–24	0.02	1.02 [0.82, 1.27]	0.838	0.05	1.05 [0.80, 1.38]	0.714	0.03	1.03 [0.72, 1.48]	0.876
Education									
Preprimary/None		1			1			1	
Primary	0.44	1.55 [0.85, 2.84]	0.152	1.26	3.52 [1.20, 10.36]	0.022	0.29	1.34 [0.66, 2.71]	0.418
JHS/Middle	0.28	1.32 [0.74, 2.34]	0.341	0.75	2.12 [0.80, 5.61]	0.128	0.31	1.37 [0.68, 2.73]	0.375
SHS/Higher	0.39	1.48 [0.84, 2.61]	0.179	0.91	2.48 [0.93, 6.57]	0.069	0.34	1.40 [0.70, 2.81]	0.345
Health insurance									
Insured		1			1			1	
Not insured	-0.15	0.86 [0.71, 1.06]	0.152	-0.25	0.78 [0.58, 1.06]	0.106	-0.05	0.96 [0.74, 1.24]	0.739
Marital status									
Formerly/Never		1			1			1	
Currently married	-0.24	0.79 [0.58, 1.06]	0.116	-0.59	0.55 [0.35, 0.87]	0.011	-0.05	0.95 [0.63, 1.44]	0.824
Household Wealth									
Poorest		1			1			1	
Second	0.43	1.53 [1.10, 2.13]	0.011	0.64	1.89 [0.78, 4.60]	0.157	0.40	1.49 [1.04, 2.14]	0.030
Middle	0.24	1.27 [0.89, 1.82]	0.190	0.22	1.24 [0.56, 2.74]	0.593	0.32	1.37 [0.88, 2.15]	0.162
Fourth	0.09	1.10 [0.75, 1.60]	0.636	0.14	1.15 [0.50, 2.63]	0.741	0.17	1.18 [0.72, 1.95]	0.503
Richest	-0.05	0.95 [0.64, 1.42]	0.810	-0.00	1.00 [0.45, 2.23]	0.997	-0.03	0.97 [0.50, 1.90]	0.939
Place of residence									
Urban		1							
Rural	0.09	1.10 [0.84, 1.43]	0.498						
Region of residence									
Greater Accra		1			1			1	
Western	-0.29	0.75 [0.46, 1.21]	0.234	-0.02	0.98 [0.59, 1.70]	0.948	-0.38	0.72 [0.22, 2.12]	0.506
Central	0.26	1.30 [0.85, 1.99]	0.233	0.20	1.22 [0.68, 2.20]	0.500	0.36	1.36 [0.50, 4.14]	0.500
Volta	0.46	1.59 [0.97, 2.60]	0.067	0.73	2.08 [1.06, 4.07]	0.033	0.45	1.45 [0.52, 4.71]	0.428
Eastern	-0.35	0.71 [0.40, 1.24]	0.244	-0.03	0.97 [0.49, 1.92]	0.935	-0.62	0.58 [0.16, 1.83]	0.317
Ashanti	1.01	2.76 [1.84, 4.14]	<0.001	0.85	2.33 [1.45, 3.75]	0.001	1.28	2.61 [1.21, 10.60]	0.021
Brong-Ahafo	1.04	2.83 [1.83, 4.36]	<0.001	1.12	3.06 [1.80, 5.23]	<0.001	1.06	2.27 [0.98, 8.60]	0.055
Northern	0.51	1.66 [1.07, 2.57]	0.024	0.35	1.42 [0.83, 2.45]	0.203	0.70	1.75 [0.68, 5.92]	0.204
Upper East	0.23	1.26 [0.77, 2.06]	0.355	0.02	1.02 [0.42, 2.47]	0.965	0.41	1.39 [0.51, 4.49]	0.456
Upper West	0.54	1.72 [1.06, 2.80]	0.028	0.27	1.31 [0.57, 3.01]	0.527	0.76	1.83 [0.71, 6.39]	0.177
More details									
Population size	4792			2418			2374		
Observations	5418			2688			2730		
Strata	20			10			11		
PSU	660			319			421		
Design df =	640			309			410		
F statistics	F (20, 621) = 5.49, $p < 0.001$			F (19, 291) = 3.69, $p < 0.001$			F (19, 392) = 3.34, $p < 0.001$		

Note. B = unstandardized beta value; 95% confidence intervals in brackets; AOR = Adjusted odds ratio; JHS = Junior High School; SHS = Senior High School.

In urban areas, education was significantly correlated with exclusion from social activities due to menstruation. The findings suggest that urban AGYW with primary education are more likely to exclude themselves from activities during menstruation than those with preprimary or no education. Knowledge about menstruation empowers girls to properly cater for themselves thereby encouraging engagement in activities during menstruation (Malhotra et al., 2016). Therefore, it is unexpected that urban AGYW with primary education excluded themselves from activities. This cohort of girls may have an inadequate source of information on menstruation. Hence, menstruation could come as a shock to urban girls which would probably compel them to exclude themselves from activities regardless of their education. The finding is, however, inconsistent with previous studies which reported that some formal education equips girls with adequate knowledge on menstruation (Jewitt and Ryley, 2014; Mohamed et al., 2018).

Moreover, in urban settings, marital status is significantly correlated with exclusion from social activities due to menstruation. Married urban AGYW were less likely to exclude themselves from activities during menstruation as compared to those who are not married. Economically, marriage becomes an advantage to the parties involved. Urban married women are also more likely to be in more advantageous positions than their unmarried counterparts. That is, women benefit more financially from marriage (Gomez et al., 2016) hence, they have the economic advantage in purchasing materials such as menstrual items which are used in improving their menstrual hygiene, therefore, married urban women are less likely to exclude themselves from activities during menstruation. Marriage in Ghana allows older women to transmit customary rites and knowledge to guide the young bride on the best ways to adequately care for themselves, their partner, and their household (Osei-Tutu et al., 2020). It is therefore possible that urban AGYW may

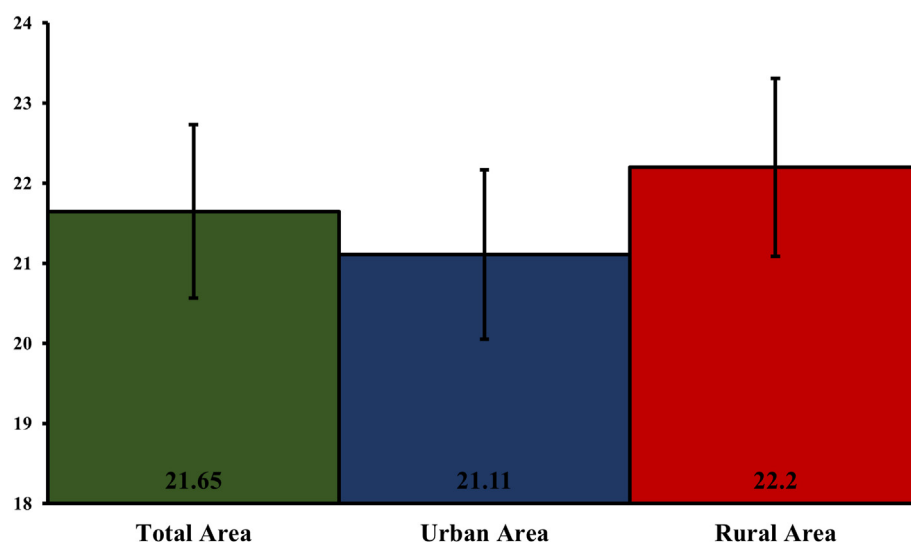


Figure 2. Bar chart comparing the prevalence rates of exclusion from social activities due to menstruation amongst AGYW for total, urban and rural areas.

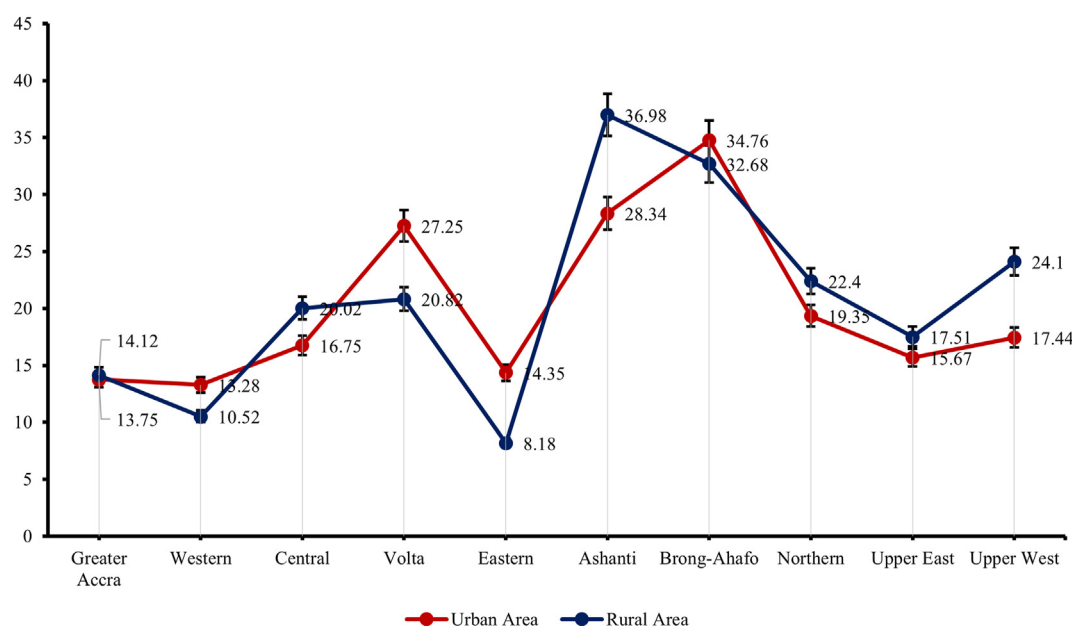


Figure 3. Line graph showing regional by place of residence prevalence of exclusion from social activities due to menstruation.

have gained sufficient knowledge about how to manage their menstruation and avoid excluding themselves from social activities while menstruating.

In rural areas, household wealth was significantly related to exclusion from social activities due to menstruation. Rural AGYW from the poorest households were more likely to exclude themselves from activities. The role of economic status in managing menstruation experiences among AGYW could perhaps explain the differences observed among the rural sample (e.g., Crichton et al., 2013; Hennegan et al., 2019). Many rural girls and young women struggle to afford their preferred sanitary material such that commercial sanitary pads become a luxury for them. The inability to purchase menstrual hygiene items or pain relief due to the lack of funds constrain women's menstrual experience hence their exclusion from activities during menstruation (Hennegan et al., 2019). Thus, the high rate of poverty experienced in rural areas renders many AGYW incapable of purchasing menstrual materials such as commercial sanitary pads hence their exclusion from social activities due to menstruation. This is the case within our Ghanaian sample as well.

Additionally, the unavailability of sanitation facilities and other infrastructure in rural households to a large extent affects AGYW's menstrual experience such that they are compelled to stay indoors (Hennegan et al., 2019).

Region of residence is significant in both urban and rural areas but with a twist. Urban AGYW residing in Volta, Ashanti, and Brong-Ahafo regions while rural AGYW residing in the Ashanti region appeared to be more likely to exclude themselves from activities relative to AGYW in the Greater Region. It is worth noting that many traditional activities are still held in high esteem in these regions. From a sociocultural perspective, menstruation is stigmatized across cultures such that it is deemed as dirty and impure and therefore not openly discussed (Hennegan et al., 2019). AGYW are prevented from visiting places of worship, have food-related restrictions, sleep or sit separately from other household members, are prevented from cooking, and prevented from exercising and moving outside or attending social functions. Thus, sociocultural beliefs about menstruation are based on the concept that menstruation is a form of pollution, therefore girls are restricted from participating in

activities (Pandey, 2014). Additionally, mother-daughter communication about menstruation is sometimes considered culturally inappropriate (Dolan et al., 2014). Perhaps similar beliefs and consequent restrictions on menstruation are stronger in the Volta, Brong-Ahafo, and Ashanti regions than in Greater Accra because of their strong adherence to traditions.

4.1. Strengths and limitations

A notable strength of this study lies in its use of a complex survey for data analysis, guaranteeing that the results are generalizable to the wider population of AGYW in Ghana. Another strength worth mentioning is the stratification of the data by rural and urban areas, allowing a more nuanced examination of the prevalence and correlates of exclusion from social activities due to menstruation. Lastly, the study uses a nationally representative dataset that lessens the effects of potential errors induced by self-reporting. Nevertheless, the findings must be interpreted cautiously due to limitations. Firstly, the cross-sectional nature of the data limits the ability to assess the trends as well as establish cause-and-effect evidence between the various factors and exclusion from social activities due to menstruation. Given that we used existing data for this study, we had little control over the selection and inclusion of variables. More research in this area using other research designs (e.g., longitudinal designs) and using primary datasets (to increase control over variable selection) on this subject matter is therefore recommended.

5. Conclusion

The findings of this study indicate that exclusion from social activities due to menstruation on the rural and urban levels are influenced by social factors such as wealth index and educational level. Communities, rural and urban, should be equipped with functional water, sanitation, and hygiene facilities to ensure that menstruating adolescents and young women can hygienically manage their menses outside their homes. Regardless of educational level, inadequate sources of information influence AGYW's menstrual experiences, hence, factual and accurate information on menstruation should be integrated into school curricula as well as regular health promotion and educational programmes in the communities to help educate AGYW and build awareness about menstruation and its hygienic management. These interventions should be distributed equitably in both rural and urban areas to reduce instances of exclusion from activities during menstruation amongst AGYW. The findings further encourage stakeholders to bolster policies and enforce interventions geared towards improving sexual and reproductive health issues in Ghana from a rural-urban lens.

Declarations

Author contribution statement

Angela A. Gyasi-Gyamerah: Conceived and designed the experiments; Performed the experiments; Wrote the paper.

Joseph Mfum Manukure and Lily N. A. Andoh: Performed the experiments; Wrote the paper.

Nutifafa Eugene Yaw Dey and Pascal Agbadi: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Kenneth Owusu Ansah: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Data availability statement

The authors do not have permission to share data.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

Acknowledgements

Thanks to all the stakeholders involved in conducting the GMICS. We would also like to thank UNICEF for granting permission to use this data for publication. Lastly, we appreciate the free training in data management provided by Research Empowerment Network (REN).

References

- Alam, M.U., Luby, S.P., Halder, A.K., Islam, K., Opel, A., Shoab, A.K., Ghosh, P.K., Rahman, M., Mahon, T., Unicomb, L., 2017. Menstrual hygiene management among Bangladeshi adolescent schoolgirls and risk factors affecting school absence: results from a cross-sectional survey. *BMJ Open* 7 (7).
- Agyekum, K., 2002. Menstruation as a verbal taboo among the Akan of Ghana. *J. Anthropol. Res.* 53 (3), 367–387 (2018, January 11). Menstruating girls banned from crossing Ghana river. <https://www.bbc.com/news/world-africa-4265314>.
- Chandra-Mouli, V., Patel, S., 2017. Mapping the knowledge and understanding of menarche, menstrual hygiene and menstrual health among adolescent girls in low- and middle-income countries. *Reprod. Health* 14 (30).
- Crawford, M., Menger, L.M., Kaufman, M.R., 2014. 'This is a natural process': managing menstrual stigma in Nepal. *Cult. Health Sex.* 16 (4), 426–439.
- Crichton, J., Okal, J., Kabiru, C.W., Zulu, E.M., 2013. Emotional and psychosocial aspects of menstrual poverty in resource-poor settings: a qualitative study of the experiences of adolescent girls in an informal settlement in Nairobi. *Health Care Women Int.* 34 (10), 891–916.
- Dolan, C.S., Ryus, C.R., Dopson, S., Montgomery, P., Scott, L., 2014. A blind spot in girls' education: menarche and its webs of exclusion in Ghana. *J. Int. Dev.* 26 (5), 643–657.
- Ghana Statistical Service, 2014. The 2010 Population and Housing Census Report: Urbanisation. <https://statsghana.gov.gh/gssmain/fileUpload/pressrelease/Urbanisation%20in%20Ghana.pdf>.
- Ghana Statistical Service, 2015. *Ghana Poverty Report Mapping Report*. Ghana Statistical Service. <https://www2.statsghana.gov.gh/docfiles/publications/POVERTY%20MAP%20FOR%20GHANA-05102015.pdf>.
- Ghana Statistical Service, 2018. *Multiple Indicator Cluster Survey (MICS2017/18): Survey Findings Report*. GSS, Accra, Ghana.
- Goli, S., Sharif, N., Paul, S., Salve, P.S., 2020. Geographical disparity and socio-demographic correlates of menstrual absorbent use in India: a cross-sectional study of girls aged 15–24 years. *Child. Youth Serv. Rev.* 117, 105283.
- Gomez, S.L., Hurley, S., Canchola, A.J., Keegan, T.H., Cheng, L., Murphy, J.D., Clarke, C.A., Glaser, S.L., Martínez, M.E., 2016. Effects of marital status and economic resources on survival after cancer: a population-based study. *Cancer* 122 (10), 1618–1625.
- Hennehan, J., Shannon, A.K., Rubli, J., Schwab, K.J., Melendez-Torres, G.J., 2019. Women's and girls' experiences of menstruation in low- and middle-income countries: a systematic review and qualitative meta-synthesis. *PLoS Med.* 16 (5), e1002803.
- Jewitt, S., Ryley, H., 2014. It's a girl thing: menstruation, school attendance, spatial mobility and wider gender inequalities in Kenya. *Geoforum* 56, 137–147.
- Kabir, Y., Chandrasekar, R., Tahiliani, B., 2016. A reason to smile: the five 'A's approach to promote menstrual hygiene management in adolescent girls. *Waterlines* 35 (3), 324–333.
- Kansime, C., Hytti, L., Nalugya, R., Nakuya, K., Namirembe, P., Nakalema, S., Weiss, H.A., 2020. Menstrual health intervention and school attendance in Uganda (MENISCUS-2): a pilot intervention study. *BMJ Open* 10 (2), e031182.
- Kaur, R., Kaur, K., Kaur, K., 2018. Menstrual hygiene, management, and waste disposal: practices and challenges faced by girls/women of developing countries. *J. Environ. Publ. Health* 2018 (5), 1–9.
- Kumar, A., Srivastava, K., 2011. Cultural and social practices regarding menstruation among adolescent girls. *Soc. Work. Publ. Health* 26 (6), 594–604.
- Kumbeni, M.T., Ziba, F.A., Apenkwa, J., Otupiri, E., 2021. Prevalence and factors associated with menstruation-related school absenteeism among adolescent girls in rural northern Ghana. *BMC Wom. Health* 21 (1), 1–6.
- Mahon, T., Fernandes, M., 2010. Menstrual hygiene in South Asia: a neglected issue for WASH (water, sanitation and hygiene) programmes. *Gend. Dev.* 18 (1), 99–113.
- Malhotra, A., Coli, S., Coates, S., Mosquera-Vasquez, M., 2016. Factors associated with knowledge, attitudes, and hygiene practices during menstruation among adolescent girls in Uttar Pradesh. *Waterlines* 35 (3), 277–305.
- Miir, G., Rutakumwa, R., Nakiyingi-Miir, J., Nakuya, K., Musoke, S., Namakula, J., Francis, S., Torondel, B., Gibson, L.J., Ross, D.A., Weiss, H.A., 2018. Menstrual health

- and school absenteeism among adolescent girls in Uganda (MENISCUS): a feasibility study. *BMC Wom. Health* 18 (1), 1–13.
- Mohamed, Y., Durrant, K., Huggett, C., Davis, J., Macintyre, A., Menu, S., Wilson, J.N., Ramosaea, M., Sami, M., Barrington, D.J., McSkimming, D., Natoli, L., 2018. A qualitative exploration of menstruation-related restrictive practices in Fiji, Solomon Islands and Papua New Guinea. *PLoS One* 13 (12), e0208224.
- Mohammed, S., Larsen-Reindorf, R.E., 2020. Menstrual knowledge, sociocultural restrictions, and barriers to menstrual hygiene management in Ghana: evidence from a multi-method survey among adolescent schoolgirls and schoolboys. *PLoS One* 15 (10), e0241106.
- Mohammed, S., Larsen-Reindorf, R.E., Awal, I., 2020. Menstrual hygiene management and school absenteeism among adolescents in Ghana: results from a school-based cross-sectional study in a rural community. *Int. J. Reprod. Med.*
- Mukherjee, A., Lama, M., Khakurel, U., Jha, A.N., Ajose, F., Acharya, S., Tymes-Wilbekin, K., Sommer, M., Jolly, P.E., Lhaki, P., Shrestha, S., 2020. Perception and practices of menstruation restrictions among urban adolescent girls and women in Nepal: a cross-sectional survey. *Reprod. Health* 17, 81.
- Osei-Tutu, A., Oti-Boadi, M., Affram, A., Dzokoto, V.A., Asante, P.Y., Agyei, F., Kenin, A., 2020. Premarital counseling practices among Christian and Muslim lay counselors in Ghana. *J. Pastor. Care Counsel.* 74 (3), 203–211.
- Pandey, A., 2014. Challenges experienced by adolescent girls while menstruation in Kathmandu, Valley: a qualitative study. *J. Community Med. Health Educ.* 4 (285), 2161, 0711.
- Plan International, 2020. Ghana: Let's Talk about Periods- Tackling Taboos in Ghana. AllAfrica. <https://allafrica.com/stories/202006280095.html>.
- QGIS Development Team, 2020. QGIS Geographic Information System. Open-Source Geospatial Foundation Project. <http://qgis.osgeo.org>.
- Rajagopal, S., Mathur, K., 2017. 'Breaking the silence around menstruation': experiences of adolescent girls in an urban setting in India. *Gend. Dev.* 25 (2), 303–317.
- Ranganathan, P., Aggarwal, R., Pramesh, C.S., 2015. Common pitfalls in statistical analysis: odds versus risk. *Perspect. Clin. Res.* 6 (4), 222.
- Robinson, H., 2015. Chaupadi: the affliction of menses in Nepal. *Int. J. Wom. Dermatol.* 1 (4), 193–194.
- Roy, A., Paul, P., Saha, J., Barman, B., Kapasia, N., Chouhan, P., 2021. Prevalence and correlates of menstrual hygiene practices among young currently married women aged 15–24 years: an analysis from a nationally representative survey of India. *Eur. J. Contracept. Reprod. Health Care* 26 (1), 1–10.
- Santos, C.A.S., Fiaccone, R.L., Oliveira, N.F., Cunha, S., Barreto, M.L., do Carmo, M.B.B., Amorim, L.D., 2008. Estimating adjusted prevalence ratio in clustered cross-sectional epidemiological data. *BMC Med. Res. Methodol.* 8 (1), 1–10.
- Sommer, M., Ackatia-Armah, N., Connolly, S., Smiles, D., 2015a. A comparison of the menstruation and education experiences of girls in Tanzania, Ghana, Cambodia and Ethiopia. *Compare* 45 (4), 589–609.
- Sommer, M., Sutherland, C., Chandra-Mouli, V., 2015b. Putting menarche and girls into the global population health agenda. *Reprod. Health* 12 (24).
- StataCorp, 2015. Stata Statistical Software: Release 14. StataCorp LLC, College Station, TX.
- Tamhane, A.R., Westfall, A.O., Burkholder, G.A., Cutter, G.R., 2016. Prevalence odds ratio versus prevalence ratio: choice comes with consequences. *Stat. Med.* 35 (30), 5730–5735.
- Thakur, H., Aronsson, A., Bansode, S., Lundborg, C.S., Dalvie, S., Faxelid, E., 2014. Knowledge, practices, and restrictions related to menstruation among young women from low socioeconomic community in Mumbai, India. *Front. Public Health* 2 (72).
- The World Bank, 2018. The World Bank in Ghana. <https://www.worldbank.org/en/country/ghana/overview>.
- The World Bank, 2021. Data for Lower Middle Income, Ghana. <https://data.worldbank.org/?locations=XN-GH>.
- UNDP, 2020. The Next Frontier: Human Development and the Anthropocene Briefing Note for Countries on the 2020. *Human Development Report- Ghana*. Human Development Report 2020. http://hdr.undp.org/sites/all/themes/hdr_theme/country-notes/GHA.pdf.
- UNICEF, 2021. Adolescent Health and Nutrition. <https://www.unicef.org/ghana/adolescent-health-and-nutrition>.
- Van Eijk, A.M., Sivakami, M., Thakkar, M.B., Bauman, A., Laserson, K.F., Coates, S., Phillips-Howard, P.A., 2016. Menstrual hygiene management among adolescent girls in India: a systematic review and meta-analysis. *BMJ Open* 6 (3), e010290.
- Vashisht, A., Pathak, R., Agarwalla, R., Patavegar, B.N., Panda, M., 2018. School absenteeism during menstruation amongst adolescent girls in Delhi, India. *J. Fam. Commun. Med.* 25 (3), 163–168.
- West, B.T., Sakshaug, J.W., Aurelien, G.A.S., 2016. How big of a problem is analytic error in secondary analyses of survey data? *PLoS One* 11 (6), 1–29.