

MENSTRUAL HEALTH AND HYGIENE IN MOZAMBIQUE:

**EVIDENCE OF INTERVENTIONS THAT IMPROVE GIRLS'
FULL AND EQUITABLE PARTICIPATION IN SOCIETY**

LEARNING STUDY | JANUARY 2020



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ABOUT BE GIRL

Be Girl is a social enterprise that creates sustainable menstrual products tailored for girls in low- and middle-income countries to ensure that they can manage their period safely and comfortably. Be Girl's period protection products include the PeriodPanty™, a two-in-one product that combines high-performance underwear with reliable period protection through a patented universal pocket that can accommodate either a disposable absorbent or an included, reusable towel.

In addition, Be Girl has designed the SmartCycle® educational tool, a wearable menstrual tracker designed as a necklace to put information about the menstrual cycle in the hands of the user. In addition to distributing products to manage menstrual flow, Be Girl delivers SmartCycle® workshops using this tool to improve adolescents' understanding of the menstrual cycle and their attitudes regarding menstruation as a normal process.

ABOUT THE PARTNERS

United Nations Population Fund (UNFPA) Innovation Fund, established in 2014 with an initial contribution from the Government of Denmark, was conceived “as a tool for generating a cultural shift within UNFPA by providing motivation and a mechanism for staff to generate, fund and implement innovative ideas.” The Innovation Fund helps UNFPA pursue a range of innovations to advance sexual and reproductive health, foster youth empowerment, promote gender equality and use population data for development.



Foundation for Community Development (FDC) is a private, non-profit organization in Mozambique that works to combine efforts of all sectors of society with the purpose of promoting development, democracy, and social justice. Over the last 15 years, FDC has implemented and supported wide-ranging interventions in priority areas such as education, health, food security, and income generation, water and sanitation and HIV / AIDS, with emphasis on the vulnerable groups such as women and children.



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ACRONYMS

DiD	Difference-in-difference
FDC	Foundation for Community Development
MHHM	Menstrual health and hygiene management
UNFPA	United Nations Population Fund

EXECUTIVE SUMMARY

BACKGROUND

Globally, evidence indicates that inadequate menstrual health and hygiene management can have serious consequences for menstruating adolescents' psychosocial well-being and ability to equitably participate in society. However, the majority of existing solutions-oriented research has focused on single-sector relationships, such as the connection between the provision of menstrual products and school attendance. Despite growing recognition of the importance of addressing menstruation as a multi-faceted barrier to achieving gender equity, there have been limited conclusive studies that investigate multiple-sector relationships in fields such as health and social research.

OVERVIEW

With support from the UNFPA Innovation Fund, Be Girl partnered with the Foundation for Community Development in two provinces in Mozambique to implement a learning study that ran from June to September 2019. The objectives of this study were to 1) understand how menstruation is experienced, managed, and viewed by adolescent girls in Mozambique; and 2) assess the impact of an intervention consisting of sustainable menstrual underwear (Be Girl's PeriodPanties™) for girls and menstrual health education (Be Girl's SmartCycle® workshops) for both girls and boys. The study investigated the effect of the intervention on girls' and boys' understanding of and attitudes toward menstruation, reproduction, and family planning; girls' emotional state during menstruation; and girls' mobility and ability to participate in daily activities during menstruation. The study reached 948 girls and 500 boys ages 11-18 in 14 schools and used a mixed-methods design with cluster randomization at the school level. There were three levels of intervention for girls: full treatment (workshop and underwear); partial treatment (workshop only); and non-intervention (comparison group). For boys, there were two levels of intervention: full treatment (workshops) and non-intervention (comparison group). Facilitators surveyed participants at baseline, post-workshop (for those who received workshops), and at a two-month follow-up.

FINDINGS

The evaluation was based on two broad hypotheses. First, increased access to information and reliable menstrual products will help girls better manage their menstrual cycles, increase their self-esteem and confidence, and remove barriers to participating in daily activities. Second, a better understanding of menstruation among both girls and boys will lead to overall improvements in reproductive health and family planning knowledge and attitudes, as well as more positive daily interactions among people of all genders.

This study found that the combined intervention (menstrual underwear and a one-hour menstruation education workshop) had significant positive effects on girls' menstrual cycle knowledge, girls' understanding of reproduction and family planning, girls' attitudes towards family planning, girls' emotional state during menstruation (confidence and feelings of normalcy), and girls' ability to participate in certain daily activities during menstruation, as compared with those in the non-intervention comparison

group. Girls who received sustainable menstrual products had significantly better outcomes than their peers who did not receive products. Menstruating girls who received the full treatment (products and education) were significantly less likely to face restrictions in their overall mobility or ability to participate in activities outside the home like playing sports or with friends, suggesting that high-quality products have a positive effect on girls' participation in social-capital-building opportunities during menstruation. Notably, despite certain improvements in actual restrictions, girls in both treatment groups were more likely to report that they perceived menstruation to interfere in their daily activities after the intervention—these findings were significant for the education-only group—indicating that menstruation education may increase self-awareness of potential barriers.

Further, findings suggest that the provision of a one-hour menstruation education workshop can significantly improve participants' knowledge about menstruation and the fundamentals of reproductive health and family planning. The education workshops had a significant positive effect on girls' menstrual and reproductive knowledge and attitudes and their confidence during menstruation. Additionally, for boys, the education workshop had a significant positive effect on their menstrual and reproductive knowledge and their rejection of menstruation-related stigma. Results therefore suggest that all components of the intervention are important for and effective in removing barriers to girls' ability to manage menstruation safely and comfortably within a supportive environment and equitably participate in society.

This study highlights the importance of applying a gender equity lens when assessing the impacts of menstruation, as its barriers and solutions span multiple sectors (e.g., health, education, hygiene) and impact girls' and women's full and equitable participation in daily life and society. Programs and interventions that seek to achieve improvements in adolescent reproductive health and overall development should consider how their ability to understand and manage menstruation affects girls' program participation and well-being outcomes, and how boys' knowledge about this topic reduces stigmas and taboos and contributes to the well-being of everyone. Though this study uses Be Girl period products and menstrual health education methodology, the analysis provides valuable insights into the current cross-cutting, menstruation-related barriers faced by girls and women in Mozambique, with global implications.

BACKGROUND

Approximately one-fourth of the world's population is of menstruating (or reproductive) age. Menarche (the first menstrual cycle) typically occurs around age 12, and menstruation is an indicator of girls' normal biological development.¹ Preparing for and managing menstruation requires access to sufficient, hygienic menstrual materials (disposable or reusable products to collect or absorb menstrual blood); access to information about the menstrual cycle and good hygienic practices; access to sanitation and hygiene facilities and infrastructure to change materials and wash the body; and a safe and supportive environment in which to menstruate.^{2,3} Globally, inadequate menstrual health and hygiene management (MHMM) often causes girls to face serious restrictions in daily life.⁴ It impacts girls' confidence, limits girls' freedom of movement, and hampers girls' opportunities to fully participate in society.⁵ Without accurate information about their bodies, girls must make important decisions about their health and futures, such as family planning, without foundational knowledge, potentially jeopardizing their opportunities. Boys, for their part, may continue to hold beliefs and carry out behaviors that reinforce barriers and limit opportunities for girls and, ultimately, themselves.⁶

MENSTRUAL PRODUCT ACCESS AND GIRLS' PARTICIPATION IN SOCIETY

Much of the existing evidence to date regarding the impact of menstrual products has focused on the connection between menstrual products and educational attendance/outcomes for users; however, findings have been inconclusive because geographic, economic, and cultural considerations can impact intervention effectiveness. A 2016 systematic review of menstruation-related interventions assessed three trials that provided various sanitary products; the review found moderate but non-significant improvements in school attendance among girls who received menstrual products and noted that the focus on school attendance alone is problematic.⁷ One of the reviewed trials was a 2011 individually randomized control trial in Nepal, which found a very small effect on school attendance among girls who received menstrual cups. In this study, context is important to consider; there was a very high attendance rate baseline and potential difficulties with uptake of menstrual cups for young girls were reported.⁸ Also reviewed was a 2012 non-randomized cluster-control trial in Ghana with 120 schoolgirls that tested the effectiveness of disposable sanitary pads and puberty education versus only receiving puberty education

¹ Zelalem Belayneh and Birhanie Mekuriaw, "Knowledge and menstrual hygiene practice among adolescent school girls in southern Ethiopia: a cross-sectional study," *BMC Public Health* 19, no.1595 (2019).

² Siri Tellier and Maria Hyttel, "Menstrual Health Management in East and Southern Africa," In *Menstrual Health Management Symposium, UNFPA ESARO*, (May 2018).

³ Marni Sommer, "Where the Education System and Women's Bodies Collide," *Journal of Adolescence* 33, no.4 (2010).

⁴ Julie Hennegan and Paul Montgomery, "Do Menstrual Hygiene Management Interventions Improve Education and Psychosocial Outcomes for Women and Girls in Low and Middle Income countries? A Systematic Review," *PLoS ONE* 11, no.2 (February 2016).

⁵ Venkatraman Chandra-Mouli and Sheila Vipul Patel, "Mapping the Knowledge and Understanding of Menarche, Menstrual Hygiene and Menstrual Health Among Adolescent Girls in Low- and Middle-Income Countries," *Reproductive Health* 14, no.30 (March 2017).

⁶ Yu-Ting Chang, Mark Hayter, and Lin Mei Ling, "Pubescent Male Students' Attitudes towards Menstruation in Taiwan: Implications for Reproductive Health Education and School Nursing Practice," *Journal of Clinical Nursing* 21, no.3-4 (February 2011).

⁷ Hennegan and Montgomery, "Do Menstrual Hygiene Management Interventions Improve Education."

⁸ Emily Oster and Rebecca Thornton, "Menstruation, Sanitary Products, and School Attendance: Evidence from a Randomized Evaluation," *American Economic Journal: Applied Economics* 3, no.1 (January 2011).

(no products) after five months. The researchers measured a 9% increase in attendance for those receiving pads and education and also found that puberty education alone resulted in similar attendance improvement.⁹ However, a 2016 follow-up in Uganda by the same research group used a four-armed cluster quasi-randomized control trial (puberty education; reusable sanitary pads; puberty education and reusable sanitary pads; and a control) and found that at follow-up, school attendance had worsened across all conditions, though the control group had 17% greater drop in attendance than participants in the other treatments.¹⁰ Even when girls are able to attend school during menstruation, studies have gathered reports from teachers and students that voiced concerns about girls' difficulty concentrating or performing well in school due to menstruation.^{11,12,13,14,15,16}

Though inadequate MHHM is recognized as a barrier to gender equity affecting economic to psychosocial outcomes, there is little research on how access to effective menstrual management products affects girls' mobility and ability to participate in a variety of opportunities outside the home. While education is one important well-being outcome for girls, their development throughout adolescence requires building a range of health, social, economic, and cognitive assets.¹⁷ Participation in community activities such as church, sports, and social clubs is also crucial for positive development. Such opportunities give girls the chance to build social capital, which has far-reaching implications for a broad range of well-being outcomes for girls. Social capital—the aggregate of a person's social resources, including friends and networks, participation in groups, and access to social institutions—is broadly recognized as an important driver of resilience, particularly for women.^{18,19} Research has shown that increased social capital is correlated to greater access to health information,²⁰ fewer sexual partners, a greater likelihood of having

⁹ Paul Montgomery et al., "Sanitary Pad Interventions for Girls' Education in Ghana: A Pilot Study," *PLoS ONE* 7, no.10 (October 2012).

¹⁰ Paul Montgomery et al., "Menstruation and the Cycle of Poverty: A Cluster Quasi-Randomised Control Trial of Sanitary Pad and Puberty Education Provision in Uganda," *PloS ONE* 11, no.12 (December 2016).

¹¹ Shannon A. McMahon, et al., "'The Girl with Her Period is the One to Hang Her Head' Reflections on Menstrual Management Among Schoolgirls in Rural Kenya," *BMC International Health and Human Rights* 11, no.7 (June 2011).

¹² Robyn Boosey, Georgina Prestwich, and Toity Deave, "Menstrual Hygiene Management Amongst Schoolgirls in the Rukungiri District of Uganda and the Impact on their Education: A Cross Sectional Study," *Pan African Medical Journal* 19, (November 2014): 253.

¹³ Li Ping Wong, "Attitudes Toward Menstruation, Menstrual-Related Symptoms, and Premenstrual Syndrome Among Adolescent Girls: A Rural School-Based Survey," *Women & Health* 51, no.4 (June 2011).

¹⁴ Li Ping Wong and Ee Ming Khoo, "Menstrual-Related Attitudes and Symptoms Among Multi-Racial Asian Adolescent Females," *International Journal of Behavioral Medicine* 18, no.3 (September 2011).

¹⁵ Aditi Chaudhari and Amarjeet Singh, "How Do School Girls Deal With Dysmmenorrhoea?" *Journal of the Indian Medical Association* 110 no.5 (May 2012).

¹⁶ Deepa Joshi, Gerlinde Buit, and Diana Gonzolaz-Botero, "Menstrual Hygiene Management: Education and Empowerment for Girls?" *Waterlines* 34, no.1 (February 2015).

¹⁷ Karen Austrian and Althea D. Anderson, "Barriers and Facilitators to Health Behaviour Change and Economic Activity among Slum-Dwelling Adolescent Girls and Young Women in Nairobi, Kenya: The Role of Social, Health and Economic Assets," *Sex Education* 15, no.1 (2015).

¹⁸ Tim Frankenberger, et al., "Community Resilience: Conceptual Framework and Measurement Feed the Future Learning Agenda," *USAID*, (October 2013).

¹⁹ "Rethinking Resilience: Prioritizing Gender Integration to Enhance Household and Community Resilience to Food Insecurity in the Sahel," *Mercy Corps*, (2014).

²⁰ Ayano Yamaguchi, "Effects of Social Capital on General Health Status," *Global Journal of Health Science* 6, no.3 (May 2014).

had a HIV test,²¹ greater economic opportunity for both the individual and her broader community,²² and even greater educational attainment.²³

MHHM INFORMATION, REPRODUCTIVE HEALTH, AND SOCIAL STIGMA

Family planning and contraceptive use are important components of reproductive health, enabling healthy child spacing, intentional decisions about family size, delayed age of first pregnancy (which greatly reduces risk of adolescent maternal mortality), and reduced risk of HIV and other sexually transmitted diseases.²⁴ Historically, family planning interventions have focused on married women to the detriment of adolescents.²⁵ A 2004 study in four Sub-Saharan African countries found that both male and female 12-14-year-olds did not have a detailed understanding of pregnancy prevention.²⁶ Similarly, a 2013 study in Kenya found that 51% of 12-14 year old girls were aware of the existence of a fertile period, but of those in this group, only 14% understood that the highest risk of pregnancy occurred halfway through menstruation cycles.²⁷

Researchers have recognized the importance of early adolescence as a “pivotal moment” in girls’ and boys’ lives and a “period of rapid development where important health and social knowledge is gained, lifelong behaviors are established, beliefs and attitudes are shaped, and the foundation is built for adulthood.”²⁸ Understanding the menstrual cycle is foundational to understanding reproductive health—an important precursor for healthy family planning practices—and studies suggest that menstruation can be an effective starting point for reproductive health education and could help girls avoid preventable reproductive health problems later in life.^{29,30,31} Although comprehensive programs that address puberty education and MHHM are implemented around the world, few organizations have carried out a rigorous evaluation of MHHM educational interventions, especially those that emphasize the relationship between menstruation and reproductive health or include boys. Thus, evidence about the impact of MHHM education on reproductive health outcomes is scant and largely inconclusive.³²

²¹ Kelly Hallman et al., “Social Capital, Socioeconomic Aspirations, and HIV Risk Behaviors among Poor South African Youth,” Paper presented at Third South African AIDS Conference, Durban, (June 6, 2007.)

²² Matthew J. Hanka and Trent Aaron Engbers, “Social Capital and Economic Development: A Neighborhood Perspective,” *Journal of Public and Nonprofit Affairs* 3 no. 3 (2017).

²³ Glenn D. Israel, Lionel J. Beaulieu, and Glen Hartless, “The Influence of Family and Community Social Capital on Educational Achievement,” *Rural Sociology* 66 no.1 (March 2001).

²⁴ “Family Planning/Contraception Fact Sheet,” *World Health Organization*, last modified February 8, 2018.

²⁵ Marni Sommer, Carla Ann Sutherland, and Venkatraman Chandra-Mouli, “Putting Menarche and Girls into the Global Population Health Agenda,” *Reproductive Health* 12 no. 1 (March 2015).

²⁶ Vanessa Woog and Anna Kagesten, “The Sexual and Reproductive Health Needs of Very Young Adolescents Aged 10–14 in Developing Countries: What Does the Evidence Show?” *Guttmacher Institute*, (May 2017).

²⁷ *Ibid.*

²⁸ Katharine McCarthy, Martha Brady, and Kelly Hallman, “Investing When It Counts: Reviewing the Evidence and Charting a Course of Research and Action for Very Young Adolescents,” *Population Council*, (2016).

²⁹ William K.A. Agyei and Elsbeth J. Epema, “Sexual Behavior and Contraceptive Use Among 15-24-Year-Olds in Uganda,” *International Perspectives on Sexual and Reproductive Health* 18, no. 1 (March 1992): 13-17.

³⁰ Thomas T. Kane, et al., “Sexual Activity, Family Life Education, and Contraceptive Practice Among Young Adults in Banjul, The Gambia,” *Studies in Family Planning* 24, no.1 (Jan-Feb 1993).

³¹ Sommer, Sutherland, and Chandra-Mouli, “Putting Menarche and Girls Into the Global Population Health Agenda.”

³² Alexandra Geertz, et al., “An Opportunity to Address Menstrual Health and Gender Equity,” *FSG*, last modified May 2016.

MHHM cannot be discussed without considering the impact of taboos and social stigma surrounding menstruation that persist in nearly every culture around the world. Such stigma both perpetuates and is perpetuated by lack of access to information. Studies suggest that this combination of stigma and lack of access to information affects girls' confidence and psychosocial well-being,³³ which, in the formative years of early adolescence can have far-reaching consequences on girls' lives. Moreover, evidence suggests that better MHHM is associated with better psychosocial health, including lower risk of depression, substance misuse, and antisocial behaviors.³⁴ Researcher Chris Bobel reviewed dozens of MHHM studies and, in her 2019 book *The Managed Body: Developing Girls and Menstrual Health in the Global South*, concluded that stigma is the foremost challenge that must be addressed by the field of MHHM, as it is the central driver of the physical, psychological, and social barriers faced by menstruating girls.³⁵

In multiple countries around the world, girls find their daily routines restricted by menstruation-related taboos. In India, Brazil, and Egypt, girls are prevented from entering certain rooms in the house during menstruation.³⁶ In India, Kenya, and Nepal, menstruating girls are not allowed to participate in household work.³⁷ In India, menstruating girls are not allowed to have body contact with certain people.³⁸ Within many religious traditions, menstruating girls are considered ritually impure (Judaism) or must abstain from praying (Hinduism and Islam).³⁹ In Nigeria, over 40% of girls reported abstaining from religious activities during their periods.^{40,41}

Finally, boys and men have an important role in the MHHM discussion, as they are frequently gatekeepers (or "powerholders") in society, and thus play a part in upholding and perpetuating negative menstruation stereotypes and taboos. In exploring male students' attitudes toward menstrual hygiene practices in Taiwan, researchers found that boys viewed menstruation as "a silent topic" or "an unimportant issue."⁴² Many of the young boys in the study had misguided information about menstruation. Similarly, another study aimed to explore adolescent boys' perceptions of menstruation in India. Researchers found that few boys openly shared negative attitudes about menstruation, but some referred to it as a 'disease'.⁴³ On the other hand, both studies noted the boys desire to learn more about menstruation but face barriers both at home and school.

³³ Sommer, Sutherland, and Chandra-Mouli, "Putting Menarche and Girls into the Global Population Health Agenda."

³⁴ George Christopher Patton and Russell Viner, "Pubertal Transitions in Health," *The Lancet*, 369 no.9567 (March 2007).

³⁵ Chris Bobel, *The Managed Body: Developing Girls and Menstrual Health in the Global South*. Basingstoke, Hampshire: Palgrave MacMillan (2019): 9-12.

³⁶ Chandra-Mouli and Patel, "Mapping the Knowledge and Understanding of Menarche."

³⁷ Ibid.

³⁸ K.A. Narayan, et al., "Puberty Rituals, Reproductive Knowledge and Health of Adolescent Schoolgirls in South India," *Asia-Pacific Population Journal / United Nations* 16 no.2 (June 2001).

³⁹ Sowmyaa Bharadwaj and Archana Patkar, "Menstrual hygiene and management in developing countries: Taking stock." Mumbai, India: Junction Social (2004).

⁴⁰ Zubairu Iliyasu, et al., "Sexual and Reproductive Health Communication Between Mothers and Their Adolescent Daughters in Northern Nigeria," *Health Care Women International* 33 no.2 (February 2012).

⁴¹ Mo Oche, et al., "Menstrual Health: The Unmet Needs of Adolescent Girls' in Sokoto Nigeria," *Scientific Research and Essays* 7, no.3 (January 2012).

⁴² Chang, Hayter, and Lin, "Pubescent Male Students' Attitudes towards Menstruation in Taiwan."

⁴³ Linda Mason, et al., "'We Do Not Know': a Qualitative Study Exploring Boys Perceptions of Menstruation in India," *Reproductive Health* 14, no.1 (December 2017): 174.

MOZAMBIQUE CONTEXT

The intervention took place in Mozambique’s Maputo and Zambezia provinces at schools in which Be Girl’s partner organization, Foundation for Community Development (FDC), implements child education and anti-poverty programs. Zambezia was selected to ensure participant diversity in the form of multiple cultures and geographic locations.

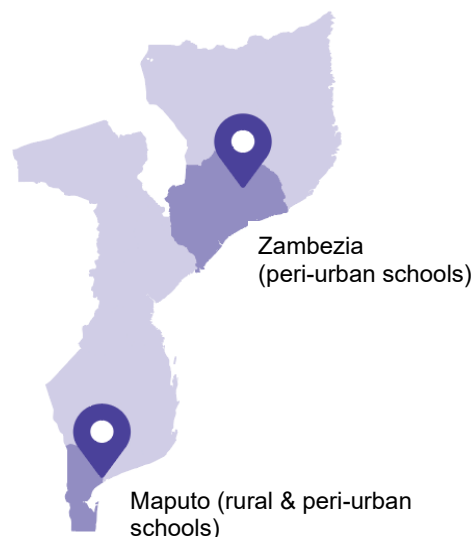
Maputo Province, where the capital city is located, is approximately 70% urban. However, the study took place at schools in the predominantly rural Boane and peri-urban Matola. Note that all references throughout this study to the target location of Maputo refer to the province and not Maputo City.

Zambezia Province, located in central Mozambique, is over 80% rural and is culturally and geographically different from Maputo. However, the study took place in schools in Quelimane City, the province’s capital and largest city.

Seen through multiple indicators, Mozambique has much to achieve in the way of human development. In 2018, Mozambique ranked 180 out of 189 countries in the Human Development Index.⁴⁴ The country’s transition rate from primary to secondary school is approximately 76%. Despite this rate, the adult literacy rate hovers around 50%. The country has one of the highest child marriage rates in the world, with almost half of girls marrying before 18, and 1 in 10 before their fifteenth birthday.⁴⁵ About 40% of girls become pregnant before age 20.⁴⁶

The context of adolescent reproductive health and development is quite different between Maputo and Zambezia provinces. Child marriage rates are noticeably higher in Zambezia, which has the second-highest instance of absolute numbers of child marriages in Mozambique.⁴⁷ Overall prevalence of HIV among men and women is higher in Maputo but is approximately the same across the two provinces among young women (age 15-24). Early age of sexual debut (before age 15) is much more prevalent among girls in Zambezia (25.1%) compared to Maputo (11.8%), but relatively equal for boys (24.4% in Zambezia and 24.8% in Maputo).⁴⁸ Contraceptive use is far higher in Maputo compared to Zambezia.⁴⁹

Figure 1. Map of Zambezia and Maputo Provinces in Mozambique



⁴⁴ “Inequalities in Human Development in the 21st Century: Briefing Notes for Countries on the 2019 Human Development Report,” United Nations Development Programme, (2019).

⁴⁵ “Child Marriage in Mozambique,” *UNICEF*, (n.d.).

⁴⁶ “Ending child marriage in Mozambique: Gaps and opportunities in legal and regulatory frameworks.” Policy Brief 1, *Plan International*, (2016).

⁴⁷ “Mozambique: Standard DHS, 2011,” The DHS Program - Mozambique: Standard DHS, *USAID*, (November 2011).

⁴⁸ “Mozambique: National Survey on Prevalence, Behavioral Risks and Information about HIV and AIDS,” *Instituto Nacional de Saúde*, (2009).

⁴⁹ “Total Market Assessment for Family Planning in Mozambique,” *Population Services International*, (July 2016).

There is also a huge disparity in education performance between Maputo and Zambezia provinces. Overall primary school completion rates are far higher in Maputo province compared to Zambezia. About 85% of girls complete primary school in Maputo (slightly higher than the boys' rate of 73%), compared to just 27% of girls in Zambezia (much lower than the boys' rate of 41%).⁵⁰

OBJECTIVES

This learning study aimed to assess the impacts of providing high-quality, reusable all-in-one menstrual underwear to girls and a one-hour interactive, age-appropriate menstruation education workshop to both girls and boys. Impacts assessed included girls' involvement in daily activities during menstruation, girls' and boys' knowledge and attitudes related to menstruation, and their attitudes and openness to family planning methods.

These three learning objectives were based on two broad hypotheses. First, increased access to information and reliable menstrual products will help girls better manage their menstrual cycles, increase their self-esteem and confidence, and remove barriers to participating in daily activities. Second, a better understanding of menstruation among both girls and boys will lead to overall improvements in reproductive health and family planning knowledge and attitudes, as well as more positive daily interactions among people of all genders.

METHODS

The MHHM intervention consisted of two components:

1. Distribution of two Be Girl PeriodPanty™ menstrual underwear products to each participant (girls only): The PeriodPanty™ is a single product that combines underwear with menstrual protection using a mesh pocket that holds a washable towel to absorb menstrual flow.
2. Provision of Be Girl SmartCycle® workshops to girls and boys in gender-segregated groups: The SmartCycle® workshop is a one-hour educational approach that teaches the basic biology of the menstrual cycle, connects menstruation to reproduction, and addresses myths and taboos surrounding menstruation. During the workshops, participants receive their own SmartCycle® tool, a kinesthetic learning device that enables users to track three phases of the menstrual cycle (menstruation, ovulation, and preparation) for a typical 28-day cycle. The full curriculum is open access and available for download.⁵¹

The target sample size for the study (n = 1,500 students in 228 clusters) was calculated to detect a medium effect size (0.5) in the behavioral outcomes, based on standard assumptions to achieve 80%

⁵⁰ "Study on Basic Education Sector in Africa: Mozambique," Basic Education Sector Analysis Report, *Japan International Cooperation Agency*, (April 2015).

⁵¹ Be Girl. *SmartCycle® Training Manual and Curriculum*. Washington, DC: Be Girl, Inc. 2019.

power. To account for an anticipated dropout rate of 28%, the program initially included 2,000 students (1,200 girls and 800 boys); 1,448 completed the evaluation study (30% attrition).

The study used a mixed-methods design with cluster randomization at the school-level with three levels of intervention for girls and two levels of intervention for boys. Budget limitations prohibited the inclusion of a treatment condition for girls that provided only the menstrual products without the menstruation education workshop. The clustered design prevented contamination bias and implementation challenges as well as ethical issues that could result from perceived intentional unequal menstrual product or education distribution among participating classmates.

Table 1. Intervention Groups: Girls

Treatment Levels
Full treatment (girls): SmartCycle® workshop + educational tool + PeriodPanty™
Partial treatment: SmartCycle® workshop + educational tool
Comparison group

Table 2. Intervention Groups: Boys

Treatment Levels
Full treatment (boys): SmartCycle® workshop + educational tool
Comparison group

The mixed-methods design included both quantitative and qualitative data. It required that the quantitative data be obtained at three distinct measurement points: a baseline survey, an “exit survey” immediately following the workshop intervention for students in the treatment groups only, and a follow-up survey two months later to compare the intervention groups with the comparison groups. The qualitative approach consisted of focus group discussions with a subset of girls who had received the full treatment, i.e., the period products and menstrual health education. The qualitative data were collected at the two-month follow-up with the aim of obtaining a more in-depth understanding of the outcomes and usefulness of the intervention. This captured more nuanced reactions to the products and workshops. All participants received the full treatment appropriate for their gender after the conclusion of the study.

The baseline was carried out in June 2019 (Maputo) and July 2019 (Zambezia), and the follow-up took place in September 2019 and early October 2019 in Maputo and Zambezia, respectively. Despite having reached 1,242 girls and 849 boys at baseline, the study experienced a 30% attrition rate—slightly higher than the 28% in the protocol power calculation—making the final sample size 948 girls and 500 boys. In addition to typical school absenteeism, study drop-out was due in part to scheduling difficulties; many workshops were conducted around school year holidays and a national election, and in some schools, students were not informed by school staff that the workshops would be taking place.

PARTICIPANT SELECTION PROCESS AND TRAITS

FDC, the partner organization, provided a list of potential schools available to participate in the study. From this list, Be Girl and FDC staff recruited 14 schools. Selection was determined based on several considerations. Since FDC predominately reaches primary schools, priority was given to schools that had higher numbers of students aged 13 and 14 in order to reach the target sample of adolescents. Location was also a determining factor. Due to budgetary constraints, the research team needed to reach schools within a few hours' driving distance from Maputo City (staff headquarters) and Quelimane City (the capital of Zambezia province), which is a two-hour flight away from Maputo.

Treatment conditions were assigned at the school level so that within a school, all clusters received the same treatment. FDC requested that in three schools of the 14 total, female participants receive the full treatment (menstrual products and education workshop), based on FDC's internal programming schedule. Then, Be Girl staff arbitrarily assigned schools to the remaining two levels of treatment (comparison and workshop only groups).

The average age of all participants was 13.5, with an age range from 11-18. The group of female respondents included girls who had already started menstruating and girls who were premenarchal. Reaching the correct number of adolescent students was a key logistical challenge. Because FDC principally works with primary school students, all schools with the exception of one were complete primary schools (*escola primaria completa*), i.e., primary schools that extend to 7th grade instead of just 5th grade. Thus, the students in the sample are the eldest in their primary schools and may be educationally behind many of their peers (who have already moved onto secondary school). In order to meet a representative sample size of young adolescents (ages 13 and older), the research team had to target more schools than otherwise would have been needed if secondary schools were included in the study. Table 3 below provides demographic details for the schools and participants.

Table 3. Demographics by Treatment Group and Gender

Demographic Data	Menstrual underwear & education workshop (girls only)		Education workshop (boys & girls)		Comparison (boys & girls)		
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up	
Total N - 1448	399	289	815	577	877	582	
Gender:	Female	399	289	403	325	440	334
	Male			412	252	437	248
% in Zambezia	49.87%	49.48%	50.31%	45.93%	46.18%	56.53%	
% in Maputo	50.13%	50.52%	49.69%	54.07%	53.82%	43.47%	
Mean Grade (range)	6.95 (4-9)		6.55 (1-7) F 6.35 (4-8) M		7.54(4-10) F 7.62 (4-10) M		

Mean Age (range)	13.41 (12-15)	13.29 (12-14) F 13.27 (12-14) M	13.63 (12-18) F 13.67 (12-18) M
Attrition Rates Overall: 30.7% F: 23.6% M: 41.1%	27.50%	29.20%	33.60%

IMPLEMENTATION

Measures

The study sought to answer the following three research questions:⁵²

1. How does female participants' involvement in daily activities during menstruation change after completing the intervention?
2. How do participants' knowledge and attitudes related to menstruation change after completing the intervention?
3. How do participants' knowledge of family planning and intentions to use family planning change after completing the intervention?

Research Question 1 was measured using mobility indicators both at home and in the community. For instance, survey questions asked how often girls felt unable to be around certain people, go to certain places, or carry out certain activities during their periods. Analyses for this research question only considered girls who had already started menstruating and excluded responses from those who were premenarchal. The questions were designed to be impartial and target the underlying restrictions girls face during their periods.

Research Question 2 was investigated using multiple strategies. Five multiple-choice questions assessed change in knowledge. Each respondent received a score of correct answers (from 0 to 5) and the change from baseline to follow-up was measured. Questions that were not answered were marked incorrect.

To assess changes in attitudes, value systems, and prevailing stigma against girls and menstruation, respondents were asked if menstruation was positive or negative, how comfortable they felt discussing menstruation and, for girls specifically, how they felt being around boys during their periods. The response options available were intentionally varied (ex. scared, confident, ashamed) to ensure girls could express their feelings accurately. For questions in this section that asked girls to recall experiences when they are on their periods, respondents were restricted to those who had experienced menarche. In addition, boys' attitudes toward menstruation were reached through a series of questions that asked if it was normal to interact with girls while on their periods, how they felt around menstruating girls, and if boys and men should or should not learn about menstruation.

⁵² Surveys and Variable Codebook available upon request.

Research Question 3 was measured using four multiple-choice reproductive health and family planning knowledge questions. Each of these survey questions was analyzed individually and only had one correct answer. For example, one of the questions asked, “Is there a connection between the menstrual cycle and where babies come from?” The only correct answer was “yes.” Each survey question was coded to be binary (1 = correct, 0 = incorrect). Questions were analyzed to see how girls’ and boys’ a) understanding of the basic link between the menstrual cycle and where babies come from, b) comprehension that people can make a conscious decision when to have a baby (the basic concept of family planning), and c) comfort level discussing family planning changed after the intervention.

Data Collection and Management

Experienced and highly trained local Be Girl staff conducted the workshops and administered paper surveys as a group, walking participants through the survey question by question to answer queries and ensure responses. The paper surveys did not include student names or other easily identifiable information. At baseline, Be Girl staff developed a master roster that contained each participant’s name based on classroom attendance sheets and a unique participant ID for each participant.

Participant privacy and data protection were maintained throughout the project. The master roster, the only document containing personal information, was stored in a separate file from the survey data and analysis files. All electronic data files used for cleaning, organization and validation, and analyses, were completely anonymized. All study-related paper documents, attendance sheets, were used only by Be Girl staff and were not shared. All electronic files were saved in a permission-only, password-protected folder on a secure cloud storage service. All physical documents were stored at Be Girl’s Mozambique office in a secure cabinet.

Cleaning and analyses were conducted on Stata 15.1.⁵³ To maintain statistical rigor, not all the individual responses to the surveys were included in the analysis that followed. For instance, responses with no data were dropped. Also, mutually exclusive questions that received more than one answer were dropped from the analysis of that question, and if every answer was marked, that observation was dropped from the analysis.

Data Analysis

The study used difference-in-difference (DiD) analyses to assess differences in change over time between each intervention group and the comparison groups, and between the different levels of intervention. DiD regressions were run to assess the difference in changes over time between treatment and comparison groups. Each survey question was analyzed multiple times using the baseline and follow-up survey results; the treatment groups were independently compared with the comparison groups and the different levels of treatment for girls were also compared with each other. In analyses with only female participants, the regressions included controls for whether or not girls have reached menarche and whether or not the girls self-reported having any knowledge about menstruation prior to their first period.

⁵³ StataCorp. Stata Statistical Software: Release 15. College Station, TX: StataCorp LP. 2018.

RESULTS

RESEARCH QUESTION 1: GIRLS' MOBILITY DURING MENSTRUATION

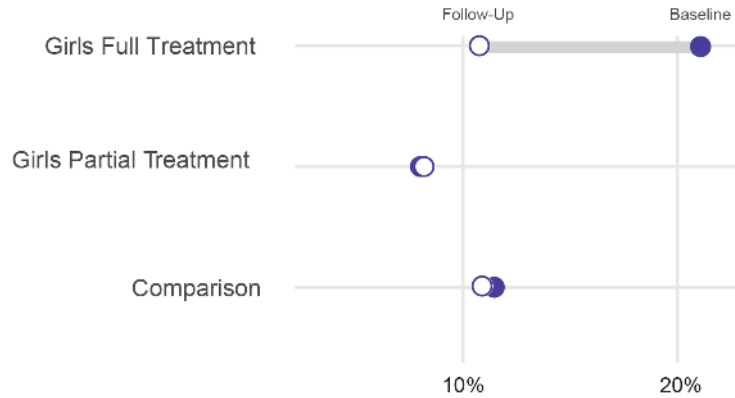
According to baseline survey results, menstruation stands in the way of girls' full participation in daily life in Mozambique. The effect of menstruation in a girl's life goes beyond attending school. While 13% of girls at baseline reported that they missed school sometime in the last year due to their periods (with 20% of those missing at least one day every cycle), the impact is far greater on girls' ability to concentrate in school (with 44% reporting difficulties), the ease with which they can participate in sports or play with friends (with 58% reporting difficulties), or overall mobility (with 48% reporting that they face limited mobility or often stay home). See Table 4 for the full results of the analysis and Tables 5 and 6 for the underlying, raw response rates to each question pre- and post-treatment.

After treatment, girls in the partial, education-only treatment group were about twice as likely to respond affirmatively that their period interferes with their daily life, compared to those in the comparison group; this result was statistically significant. Girls in the full treatment group were also (approximately 50%) more likely than the comparison group to respond affirmatively post treatment—though this result was not statistically significant. Of note, the difference between the education-only group and the other groups was large at baseline—with girls in the education-only group less likely to say their period interfered with their daily life by over 20 percentage points relative to both other groups. See Table 5 for the precise figures. This may partially explain the larger effect observed for the education-only treatment.

With regards to attending or concentrating in school during their period, there was no significant change in either the full- or partial-intervention groups relative to the comparison group. After full treatment, a higher percentage of girls reported that they “never” faced difficulty going to school during menstruation, but this was not statistically significant. This finding can be explained in part by the short, two-month timeframe from baseline to follow-up. It is possible that a longer timeline could see more robust results—this is an area for further study.

In terms of mobility during their period, girls in both treatment groups reported statistically significant improvements relative to the comparison group, and improvement for girls in the full treatment group was nearly twice as great in magnitude compared to those in the partial treatment (workshop only, no products) group. Additionally, at follow-up, girls who received the full treatment reported a statistically significant improvement in the ease of playing sports or with friends during menstruation compared to the partial treatment group. There was no statistically significant difference found between the partial treatment and comparison groups. Figure 2 illustrates these results at baseline and follow-up (on a 1-3 scale, change of 0.25 points).

Figure 2. Raw Percentages of those who answered “Always” to “When I am on my period, it is hard to play sports or with friends.”



Overall, the results suggest that girls in both treatment groups became more aware of limitations or interference with their daily lives while they have their periods. This is primarily highlighted by both treatments groups responding that their period more frequently “interferes with [their] daily life” after the intervention, compared to the comparison group—twice as likely for the workshop-only group and approximately 50% more likely for the full treatment group (only the coefficient for the workshop-only group was statistically significant). However, girls in both treatment groups reported experiencing fewer actual restrictions on their mobility and daily activities post-treatment compared to the comparison group (e.g., they were less likely to stay home, less likely to experience difficulties playing sports or with friends). Some of the effects were small in magnitude and not all observed changes were statistically significant—but all were positive in terms of girls’ mobility. Finally, the statistically significant difference in the results between those who received the full treatment and those who received only menstruation education workshop indicates that the provision of a high quality, washable menstrual product played a key role in the observed mobility improvements.

Table 4. Logistic and Linear Regressions Predicting Change over Time for Research Question 1

Variable	Girls Partial Treatment vs. Comparison	Girls Full Treatment vs. Comparison	Girls Full Treatment vs. Partial Treatment	Boys Full Treatment vs. Comparison
Logistic Regression Results, Odds Ratios				
Do you think girls MUST be restricted to certain daily activities during menstruation? 1 = yes	1.53	0.97	-	1.61*
Did you miss school during your LAST period? 1 = yes	0.97	0.61	0.55	-
When you have your period, do you think that it interferes with your daily life? 1 = yes	3.04**	1.57	0.60	-
Linear Regression Results, β				
When I'm on my period, I have limited mobility and stay at home.	0.23**	0.39**	0.09	-
When I'm on my period, it is not acceptable to be close to some family members.	0.28**	0.14	-0.09	-
When I'm on my period, it is hard to play sports or with friends.	0.08	0.30**	0.24*	-
When I'm on my period, it is hard to go to school.	0.06	0.08	0.07	-
When I'm on my period, it is hard to concentrate on the lessons.	0.10	0.09	0.06	-

**p<0.01, *p<0.05

All the linear regression questions are coded 1 = always, 2 =sometimes, 3 = never. n = 1448. Note, n includes all respondents who have both baseline and follow-up data. The n for each survey question varies slightly based on response rates and skip patterns.

Table 5. Research Question 1 Girls Raw Percentages at Baseline and Follow-up

Variable		Comparison			Full Treatment			Partial Treatment		
		Baseline	Follow-up	Change	Baseline	Follow-up	Change	Baseline	Follow-up	Change
Do you think girls MUST be restricted to certain daily activities during menstruation?	1 = yes	26.33	17.65	-8.68	36.15	23.16	-12.99	16.88	14.92	-1.96
Did you miss school during your LAST period?	1 = yes	14.77	21.10	6.33	14.49	14.23	-0.26	9.87	12.5	2.63
When you have your period, do you think that it interferes with your daily life?	1 = yes	29.08	21.72	-7.36	27.92	30	2.08	6.58*	15.23	8.65
When I'm on my period, I have limited mobility and stay home.	1 = always	5.24	8.70	3.46	17.72*	4.95	-12.77	8.25	6.81	-1.44
	2 = sometimes	47.55	49.13	1.58	35.13*	33.33	-1.8	30.93	17.87	-13.06
	3 = never	47.20	42.17	-5.03	47.15*	61.71	14.56	60.82	75.32	14.5
When I'm on my period, it is not acceptable to be close to some family members.	1 = always	7.58	12.15	4.57	10	4.55	-5.45	8.08	5.65	-2.43
	2 = sometimes	20.58	21.03	0.45	15.31	20	4.69	16.84	10.87	-5.97
	3 = never	71.84	66.82	-5.02	74.69	75.45	0.76	75.08	83.48	8.40
When I'm on my period, it is hard to play sports or with friends.	1 = always	15.03	15.07	0.04	21.34*	12	-9.34	8.68	9.79	1.11
	2 = sometimes	47.90	49.32	1.42	47.87*	39.11	-8.76	31.94	31.91	-0.03
	3 = never	37.06	35.62	-1.44	30.79*	48.89	18.10	59.38	58.3	-1.08
When I'm on my period, it is hard to go to school.	1 = always	5.86	6.51	0.65	6.29	2.31	-3.98	5.72	5.29	-0.43
	2 = sometimes	33.33	30.23	-3.10	22.33	17.59	-4.74	11.45	11.89	0.44
	3 = never	60.81	63.26	2.45	71.38	80.09	8.71	82.83	82.82	-0.01
When I'm on my period, it is hard to concentrate on the lessons.	1 = always	12.50	9.22	-3.28	11.95	5.66	-6.29	5.90	7.96	2.06
	2 = sometimes	42.14	49.31	7.17	35.22	37.74	2.52	25.35	27.43	2.08
	3 = never	45.36	41.47	-3.89	52.83	56.6	3.77	68.75	64.60	-4.15

Baseline n = 2091. Follow-Up n = 1448. The n for each survey question varies slightly based on response rates and skip patterns.

Table 6. Research Question 1 Boys Raw Percentages at Baseline and Follow-up

Variable		Comparison			Full Treatment		
		Baseline	Follow-up	Change	Baseline	Follow-up	Change
Do you think girls MUST be restricted to certain daily activities during menstruation?	1 = yes	51.76	50.63	-1.13	46.68	58.06	11.38

Baseline n = 2091. Follow-Up n = 1448. The n for each survey question varies slightly based on response rates and skip patterns.

Turning to the results for boys as they relate to Research Question 1, Table 4 illustrates that boys in the treatment group were approximately 1.6 times more likely to respond at follow-up that girls must be limited to certain activities during their periods than boys in the comparison group—a result that was statistically significant. This result runs counter to the goals of the intervention to reduce menstruation-related stigma and prejudice among adolescent boys. See Table 6 for more detail and the Conclusion section for a full discussion of the study’s results for boys and their implications.

RESEARCH QUESTION 2: KNOWLEDGE AND ATTITUDES RELATED TO MENSTRUATION

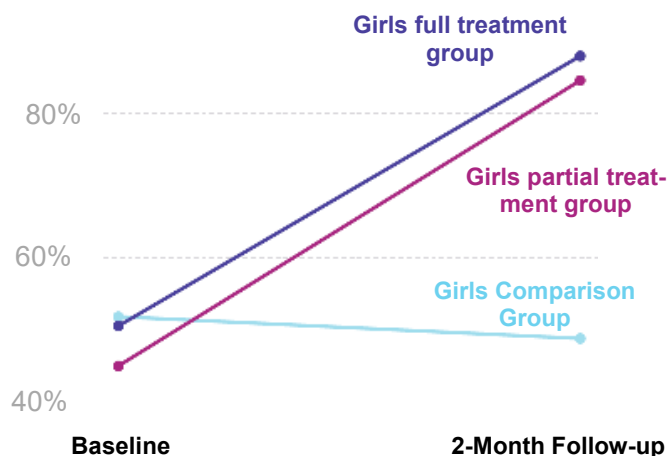
According to baseline survey responses, pervasive stigma around menstruation persists in both rural and urban areas. 32% of girls reported being ashamed to be around boys while menstruating. 26% of girls and 49% of boys reported that girls *should* be restricted to certain activities while menstruating, and 32% of boys believed that it was not normal to interact with a girl who was menstruating. 26% of girls said that they were “always” or “sometimes” restricted from being around certain family members while menstruating.

Stigma around menstruation was greater in Maputo compared with Zambezia in nearly every category, revealing that stigma is decidedly not limited to rural areas. For example, in Maputo, 38% of boys responded that it was not normal to interact with a girl on her period, compared to 26% in Zambezia.

Eleven survey questions were analyzed to explore Research Question 2 using baseline survey and follow-up survey results. Ten questions were used to analyze attitudes towards menstruation, while four questions assessed knowledge.

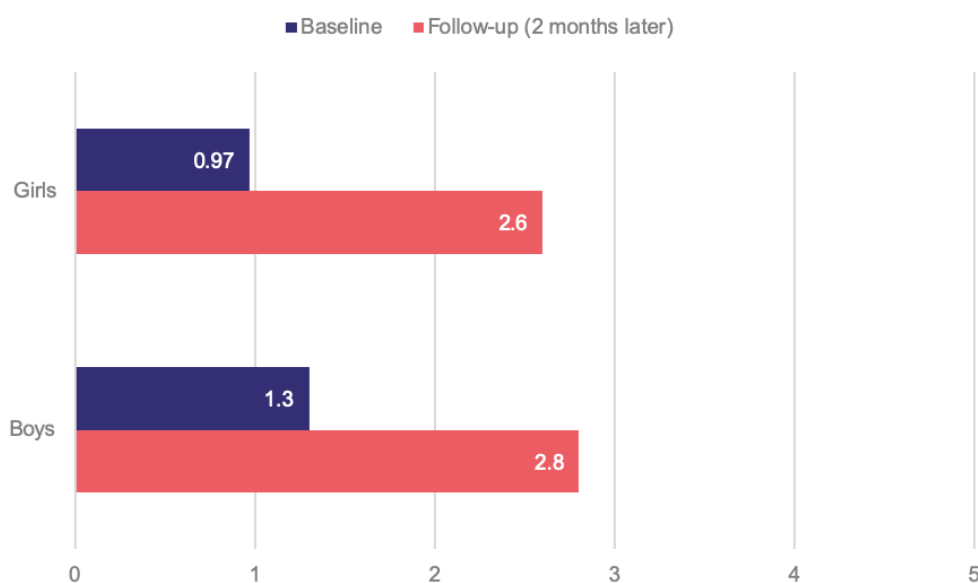
Menstruation Knowledge

Figure 3. Percentage of affirmative responses to the statement “I know how my menstrual cycle works.”



The percentage of girls who reported knowing how their menstrual cycle works increased from 47% at baseline to 86% at the two-month follow-up on average for both groups who received the workshop. Note, this is a self-report measure of knowledge, and it is not included in the knowledge score analyzed below. Nevertheless, this is an important indicator of confidence on the subject matter. See Figure 3.

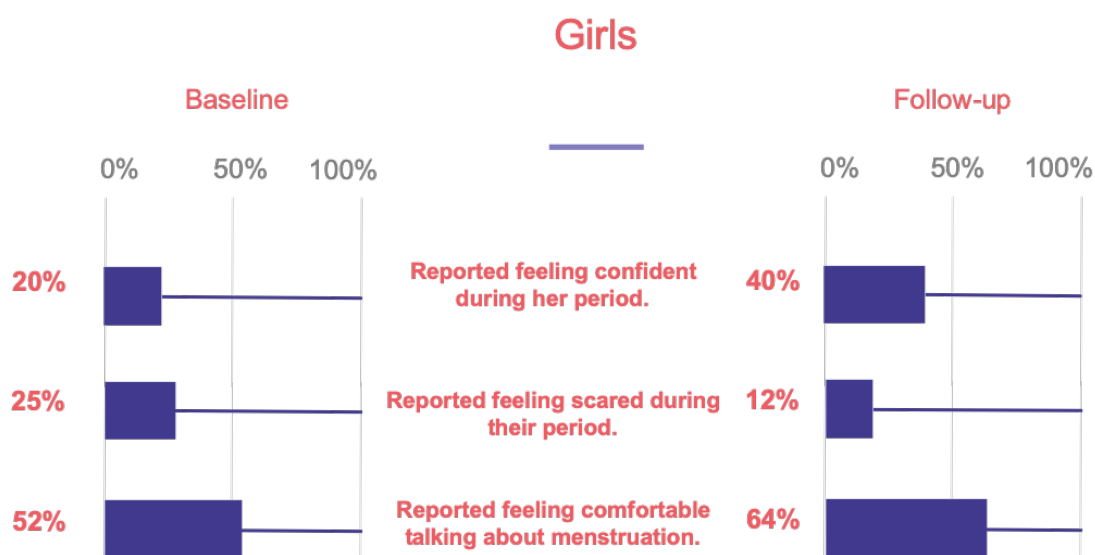
Figure 4. Average knowledge score on the 5-question menstruation knowledge "quiz" for all treatment groups



All groups answered, on average, one knowledge question correctly at baseline (consistent with guessing). At follow-up, girls in both treatment groups improved their knowledge scores relative to those in the comparison group, answering, on average, 1.5 more questions correctly—a difference which was statistically significant. Girls from both treatment groups who had received the workshop averaged 2.6 correct answers (184% increase), and boys averaged 2.8 correct questions (115% increase), which was also statistically significant. The comparison groups saw essentially no change See Figure 4 and Tables 7,8,9.

Attitudes

Figure 5. Menstruation-Related Attitude Changes Before and After Treatment



There was evidence of significant attitude changes for girls. At baseline, 20% of girls in both treatment groups reported feeling confident while on their periods, and after treatment, 40% reported feeling confident. The results also show that those in the full treatment group were 250% more likely to say they were confident than those in the comparison group, and those in the education-only group were slightly over 100% more likely to say they were confident than those in the comparison group—with both results being statistically significant. Note, the change in confidence between the girls who had received the educational workshop and those who had received the workshop and menstrual products was not statistically significant. With this result, the additional effect of the products on confidence is inconclusive. Additionally, as one would expect given this increased confidence, there was a statistically significant effect on reports of feeling scared, with girls in the education only treatment group 72% less likely to report feeling scared during their periods post-treatment versus the comparison group. See Figure 5 and Table 7.

Compared to girls who only got the partial, education-only treatment, those that had received the full treatment (workshop and menstrual products) were 1.8 times more likely to say they felt “normal” when

they were on their period, which was statistically significant. Note, for this survey question, there was a statistically significant difference at baseline between the treatment groups; at baseline, those in the full treatment group were more likely to say they felt normal than those in the education-only group.

The results for boys for Research Question 2 were uniformly positive. After treatment, boys in the treatment group were 1.3 times more likely to say it is normal to interact with a girl on her period relative to the comparison group. Similarly, they were approximately 3.5 times more likely to respond that boys and men should learn about menstruation, approximately 100% more likely to respond that menstruation was something positive, and nearly 100% more likely to respond that menstruation is a natural process relative to the comparison group. All the above observed changes were statistically significant.

Overall, the intervention produced substantial improvements in knowledge and attitudes about menstruation for both girls and boys. Both genders demonstrated markedly more knowledge about menstruation. Both genders also demonstrated more comfort with menstruation in terms of talking about the concept and being around members of the opposite sex during girls' periods. Finally, and perhaps most encouragingly, the intervention resulted in girls feeling noticeably more confident during their periods post-treatment than at baseline. See the Conclusion for a discussion of how these positive results for boys compare to the unexpected negative result for boys from Research Question 1.

Table 7. Logistic and Linear Regressions Predicting Change over Time for Research Question 2

Variable		Girls Partial Treatment vs. Comparison	Girls Full Treatment vs. Comparison	Girls Full Treatment vs. Partial Treatment	Boys Full Treatment vs. Comparison
Logistic Regression Results, Odds Ratios					
For me, menstruation is something...	1 = positive	0.88	1.19	-	2.02*
How do you feel about boys when you're on your period?	1 = scared	0.28**	0.57	2.05	-
	1 = normal	0.39**	1.24	2.81*	-
	1 = ashamed	0.62	0.57	0.95	-
	1 = confident	3.51**	2.14*	0.63	-
Why do women and girls menstruate?	1 = natural process	-	-	-	1.93**
When a girl is on her period...	1 = normal to interact	-	-	-	2.32**
I think that boys/men...	1 = should learn about menstruation	-	-	-	4.55**
Linear Regression Results, β					
How do you feel talking about menstruation?		-0.27 **	-0.30**	-	-
Menstrual Knowledge Score		1.51**	1.71**	-	1.50**
Imagine you learn a female classmate is menstruating. How would you feel around her?		-	-	-	-0.28**

**p<0.01, *p<0.05

All linear regressions except the Menstrual Knowledge Score are coded 1 = comfortable, 2 = moderately comfortable, 3 = uncomfortable. n = 1448. Note, n includes all respondents who have both baseline and follow-up data. The n for each survey question varies slightly based on response rates and skip patterns.

Table 8. Research Question 2 Girls Raw Percentages at Baseline and Follow-up

Variable		Comparison			Full Treatment			Partial Treatment		
		Baseline	Follow-up	Change	Baseline	Follow-up	Change	Baseline	Follow-up	Change
For me, menstruation is something...	1 = positive	83.86	88.07	4.21	88.24	92.28	4.04	87.69	91.69	4
How do you feel talking about menstruation?	1 = comfortable	49.15	43.75	-5.40	32.64*	52.36	19.72	52.20	63.87	11.67
	2 = moderately comfortable	36.08	41.88	5.80	47.15*	35.64	-11.51	35.40	20.97	-14.43
	3 = uncomfortable	14.77	14.37	-0.40	20.21*	12	-8.21	12.40	15.16	2.76
How do you feel about boys when you're on your period?	1 = scared	22.96	15.04	-7.92	30.97	13.62	-17.35	26.71	11.02	-15.69
	1 = normal	52.20	56.60	4.40	40.06**	49.03	8.97	44.95	34.69	-10.26
	1 = ashamed	27.36	17.89	-9.47	41.76**	19.07	-22.69	24.76	13.47	-11.29
	1 = confident	16.98	18.70	1.72	15.34**	27.24	11.90	23.78	44.49	20.71
Menstrual Knowledge Score	0	40.91	37.13	-3.78	46.12*	10.38	-35.74	39.21	8.92	-30.29
	1	23.86	23.65	-0.21	27.02*	13.15	-13.87	32.26	16.92	-15.34
	2	19.32	18.86	-0.46	15.54*	19.03	3.49	20.60	24.92	4.32
	3	11.36	14.67	3.31	10.53*	27.34	16.81	4.96	27.38	22.42
	4	4.32	4.79	0.47	0.75*	20.07	19.32	2.48	13.85	11.37
	5	0.23	0.90	0.67	0*	10.03	10.03	0.50	8	7.50

*Indicates that the baseline difference between treatment and comparison groups was statistically significant at p<0.05

**Indicates that the baseline difference between 1A and 2A groups was statistically significant at p<0.05

Baseline n = 2091. Follow-Up n = 1448. The n for each survey question varies slightly based on response rates and skip patterns.

Table 9. Research Question 2 Boys Raw Percentages at Baseline and Follow-up

Variable		Comparison			Full Treatment		
		Baseline	Follow-up	Change	Baseline	Follow-up	Change
For me, menstruation is something...	1 = positive	80.56	85.43	4.87	75.68	88.94	13.26
Menstrual Knowledge Score	0	21.28	16.53	-4.75	27.91	2.78	-25.13
	1	23.57	27.82	4.25	30.58	15.48	-15.10
	2	25.63	22.98	-2.65	24.76	22.62	-2.14
	3	18.76	21.37	2.61	13.11	28.17	15.06
	4	8.47	8.87	0.40	3.64	19.84	16.20
	5	2.29	2.42	0.13	0	11.11	11.11
Why do women and girls menstruate?	1 = natural process	77.11	81.89	4.78	70.31	83.47	13.16
When a girl is on her period...	1 = normal to interact	62.29	69.67	7.38	73.07	89.16	16.09
Imagine you learn a female classmate is menstruating. How would you feel around her?	1 = comfortable	43.78	44.98	1.20	50.38	73.79	23.41
	2 = moderately comfortable	36.79	38.43	1.64	35.95	19.35	-16.60
	3 = uncomfortable	19.43	16.59	-2.84	13.67	6.85	-6.82
I think that boys/men...	1 = should learn about menstruation	84.02	87.70	3.68	80.05	95.95	15.90

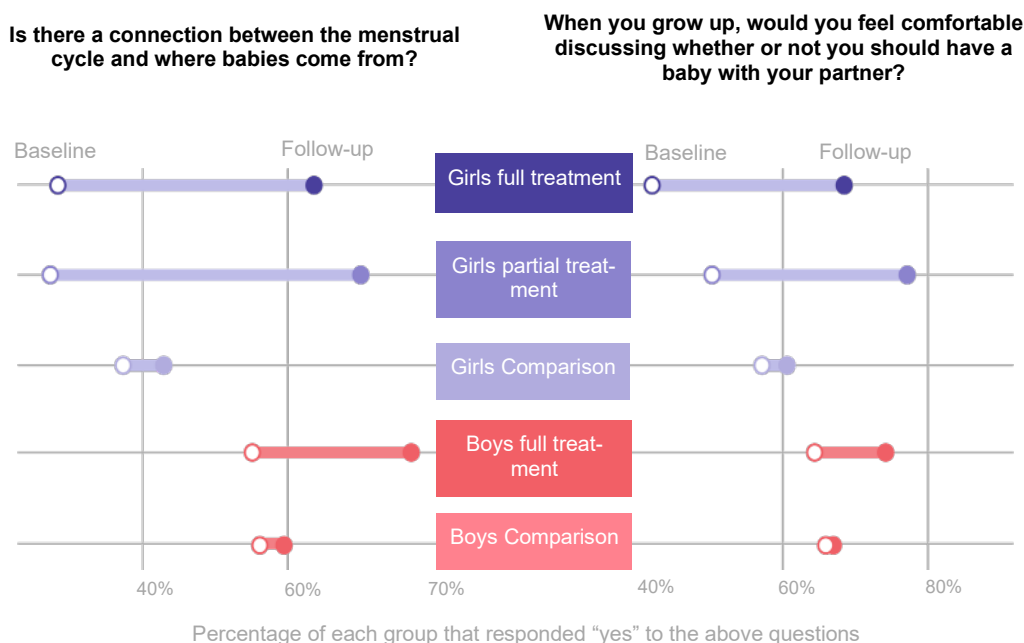
Baseline n = 2091. Follow-Up n = 1448. The n for each survey question varies slightly based on response rates and skip patterns.

RESEARCH QUESTION 3: KNOWLEDGE AND ATTITUDES RELATED TO FAMILY PLANNING

According to baseline survey results, both girls and boys have limited knowledge about the menstrual cycle and its connection to reproductive health, and both have limited access to accurate, age-appropriate information about menstruation. Overall, 83% of all girls reported to have had little to no knowledge about menstruation prior to their first period (significantly higher at 89% in Zambezia vs. 70% in Maputo). When asked five multiple-choice questions about the menstrual cycle (e.g., “What is menstrual blood?”), 42% of girls and 25% of boys answered all questions incorrectly. Half of boys reported that they did not know what menstruation is, and 70% of girls and 45% of boys did not know that there is a connection between the menstrual cycle and reproduction.

Four survey questions were analyzed using baseline and follow-up survey results to explore Research Question 3. The survey questions were selected to measure indicators of reproductive knowledge and connections between reproduction and the menstrual cycle.

Figure 6. Sexual and Reproductive Health Knowledge and Intentions Responses



After treatment, girls in the education-only treatment group were 11.6 times more likely to choose “yes, there is a connection between the menstrual cycle and where babies come from” relative to those in the comparison group. Similarly, girls who received the full treatment (products and education) were 2.6 times more likely to answer affirmatively at follow-up than the comparison group. Both results were statistically significant. After treatment, boys who received the program were approximately 2.4 times more likely to say “yes, there is a connection between the menstrual cycle and where babies come from” than those in the comparison group, which was statistically significant. See Figure 6 and Table 10 for more details.

After treatment, girls in the education-only group were 5.5 times more likely to choose “yes, it’s possible for adults to decide when they have a baby” compared to the comparison group, and girls in the full treatment group were 1.4 times more likely to say “yes.” Meanwhile, boys in the treatment group were approximately 90% more likely to select “yes” in agreement with this statement. All results were statistically significant.

After treatment, girls in the education-only treatment group were 6.2 times more likely than comparison to say that they are comfortable discussing child planning with a future partner, while girls in the full treatment group were approximately 1.4 times more likely. Both results were statistically significant. Note, for this survey question, there was a statistically significant difference at baseline between the treatment

and comparison groups; at baseline, the comparison group reported feeling comfortable at a significantly higher rate than those in the treatment group. The boys’ treatment group showed an improvement from baseline to follow-up, but it was not a statistically significant change.

Overall, the results demonstrate that the intervention produced unequivocally positive changes in reproductive knowledge for both girls and boys that were large in magnitude and statistically significant across both knowledge questions. With regards to attitudes, girls showed a statistically significant improvement in their comfort level discussing family planning with a future planning; however, boys (whose baseline values were much higher than girls’) did not show a statistically significant change for this question. One question did not show a statistically significant improvement post-treatment for either group: “At home, who should decide whether or not to have a baby?” This question started from a very high baseline with the response “both parents” at a prevalence of at least 87% across each treatment group and gender pre-intervention—thus making it more difficult to demonstrate a statistically significant change in a positive direction. Nevertheless, the response-rate for “both parents” increased in each group post-treatment. See Tables 11 and 12.

Table 10. Linear Regressions Predicting Change over Time for Research Question 3

Variable		Girls Partial Treatment vs. Comparison	Girls Full Treatment vs. Comparison	Boys Full Treatment vs. Comparison
Linear Regression Results, β				
Is there a connection between the menstrual cycle and where babies come from?	1= yes	12.62**	3.63**	3.40**
Do you think it’s possible for adults to decide and control when they have a baby? 1= yes	1 = yes	6.51**	2.43**	1.92*
At home, who should decide whether or not to have a baby?	1 = both parents	1.60	1.51	1.55
When you grow up, do you think you would feel comfortable discussing with your partner whether or not you should have a baby?	1 = yes	7.24**	2.36**	1.34

**p<0.01, *p<0.05

n = 1448. Note, n includes all respondents who have both baseline and follow-up data. The n for each survey question varies slightly based on response rates and skip patterns.

Table 11. Research Question 3 Girls Raw Percentages at Baseline and Follow-up

Variable		Comparison			Full Treatment			Partial Treatment		
		Baseline	Follow-up	Change	Baseline	Follow-up	Change	Baseline	Follow-up	Change
Is there a connection between the menstrual cycle and where babies come from?	1 = yes	37.77	42.9	5.13	28.91*	63.25	34.34	27.79	69.84	42.05
Do you think it's possible for adults to decide and control when they have a baby?	1 = yes	56.29	54.43	-1.86	51.94	73.38	21.44	42.56	71.43	28.87
At home, who should decide whether or not to have a baby?	1 = both parents	87.47	94.94	7.47	89.37	96.13	6.76	94.29	96.52	2.23
When you grow up, do you think you would feel comfortable discussing with your partner whether or not you should have a baby?	1 = yes	57.52	60.88	3.36	42.68*	68.10	25.42	50.64	76.66	26.02

*Indicates that the baseline difference between treatment and comparison groups was statistically significant at $p < 0.05$

Baseline $n = 2091$. Follow-Up $n = 1448$. The n for each survey question varies slightly based on response rates and skip patterns.

Table 12. Research Question 3 Boys Raw Percentages at Baseline and Follow-up

Variable		Comparison			Full Treatment		
		Baseline	Follow-up	Change	Baseline	Follow-up	Change
Is there a connection between the menstrual cycle and where babies come from?	1 = yes	59.14	56.2	-2.94	55.64	76.4	20.76
Do you think it's possible for adults to decide and control when they have a baby?	1 = yes	68.95	75.31	6.36	65.25	81.93	16.68
At home, who should decide whether or not to have a baby?	1 = both parents	84.80	85.25	0.45	79	84.96	5.96
When you grow up, do you think you would feel comfortable discussing with your partner whether or not you should have a baby?	1 = yes	67.06	66.26	-0.80	64.36	74.04	9.68

Baseline n = 2091. Follow-Up n = 1448. The n for each survey question varies slightly based on response rates and skip patterns.

QUALITATIVE RESULTS

Finally, valuable findings emerged from the focus groups that complement and help explain the quantitative results. The post-intervention focus groups were conducted with 38 female students from the three full-treatment schools at follow-up. Many girls reported feeling afraid to go to the market, school, or church out of fear of staining their clothing with menstrual fluids. Girls in all three focus groups expressed frustration because they have trouble concentrating in class and worry about staining their clothes while menstruating. Many girls felt uncomfortable going to friends’ and family members’ homes because they did not feel comfortable asking for period products while visiting. The girls also reported abstaining from going to parties during their periods because they worried their unsecured pad may fall while dancing. These comments are consistent with data on attitudes collected from the quantitative baseline surveys.

When asked about the intervention, girls reported that they enjoyed learning about their menstrual cycles in the menstruation education workshop. The girls appreciated the SmartCycle® tool and were able to use it to track their cycles. One girl noted that she learned how the menstrual cycle connects to getting pregnant, which made her more confident about preventing pregnancy. Unfortunately, a few girls could not remember how to use the SmartCycle® tool. Overall, girls reported that they shared what they had learned with their mothers, aunts, cousins, and friends.

After receiving the menstrual underwear, girls were excited to wear it regardless of whether or not they had their periods—they liked the look and feel of the product. In fact, many expressed excitement to get their periods in comparison to the times they dreaded their periods because of lack of hygiene materials. Some girls used the menstrual underwear while they were sleeping and reported leaks during the night.

However, none reported they had leaked onto their blankets. Overall, results from the focus group indicate a preference for Be Girl's PeriodPanty™ products as compared with other period products and enthusiasm for understanding the menstrual cycle.

CONCLUSION

BASELINE DATA

Survey data collected at baseline revealed that adolescents have a limited understanding of menstruation and its connection to health. Accounts collected from the focus groups reinforced these findings. At baseline, girls and boys who participated in this study had limited knowledge about the menstrual cycle and the connection to reproductive health, and their access to accurate, age-appropriate information about menstruation was limited. Girls reported that menstruation limits their participation in regular daily activities such as attending school, which has been evidenced by several prior studies. Significantly, even higher percentages of girls reported other limitations, such as the inability to concentrate in school, difficulty playing sports or playing with friends, and challenges with overall mobility while on their periods.

Across both rural and urban regions in Mozambique, stigma surrounding menstruation exists widely. Many participants of both genders reported misconceptions about menstruation and beliefs that stigmatize those who are menstruating. Girls reported feeling ashamed around boys, and boys reported that it was not normal to interact with girls who were menstruating.

RESEARCH QUESTION RESULTS

Research Question 1: Girls' Mobility During Menstruation

Overall, the results from Research Question 1 were illuminating, showing the treatments' varied impact on girls' mobility during menstruation. Relative to the comparison group, girls in both treatment groups reported feeling limited in their daily activities at higher rates post-treatment. This could be explained by the fact that the educational workshops made girls more self-aware of the challenges they face during their periods and of menstruation's impact on their daily lives.

Despite this increase, at follow-up, girls in both treatment groups also reported fewer actual impediments to their mobility during their periods, which resulted in their being less likely to stay home or avoid playing sports or playing with friends relative to the comparison group. This effect was most pronounced (with improvements of larger magnitude) for the full treatment group that received menstrual underwear in addition to the educational workshops, suggesting that the provision of a high-quality washable menstrual product was key to girls' improvements in mobility.

One interpretation of the seeming contradiction of these two takeaways is that providing more information about menstruation made girls more aware of its impact on their lives (and more likely to notice any difficulties it causes) but also better equipped them to effectively manage their periods to limit those difficulties (an effect that appears markedly greater for the treatment group that also received menstrual underwear). This interpretation suggests the intervention had a generally positive effect on girls' mobility.

Notably, there was no significant change in either treatment group regarding difficulty attending or concentrating in school, which can be explained in part by the short, two-month timeframe from baseline to follow-up and is an area for further study.

Going forward, additional research will be required to further disentangle the effects of menstrual health education and the provision of high-quality, dependable menstrual hygiene products on girls' mobility. These study results indicate that the latter may be the more important factor for mobility. However, the combination of both education and products may likely produce a larger effect on mobility than the provision of products alone, a hypothesis that extends beyond the scope of this study.

Research Question 2: Knowledge and Attitudes Related to Menstruation

The one-hour workshop intervention had a positive impact on participants' knowledge about menstruation, as compared to participants in the comparison group. Both boys and girls significantly increased their knowledge scores two months after participating in the workshop. Girls in both treatment groups increased their knowledge scores by approximately the same amount, suggesting that the workshop provides a positive impact on menstruation-related knowledge. Although this evaluation does not explore the data from the exit surveys in detail, it should be noted that knowledge scores were higher on the surveys immediately following the one-hour workshop than those at follow-up two months later.

The intervention had also a positive impact on participants' attitudes toward menstruation. After the program, girls in both treatment groups were more than twice as likely as the comparison group to report feeling confident during menstruation and half as likely to say they felt scared at that time. The raw data revealed a 20 percentage point increase in the number of girls who felt comfortable talking about menstruation after the full treatment.

Overall, the results validate the efficacy of using the SmartCycle® methodology in menstrual health education workshops designed to increase knowledge and reduce prejudices and taboos.

Research Question 3: Knowledge and Attitudes Related to Family Planning

The workshop intervention had a positive impact on participants' understanding of family planning. Both boys and girls who participated in the program significantly increased their correct responses to all knowledge questions related to family planning post-program. After the workshops, students' understanding in the treatment groups more than doubled. Of note, while both the girls' partial and full treatment groups significantly increased their understanding of the basic connection between the menstrual cycle and reproduction, the improvement was noticeably greater for the education-only treatment group. One possible explanation for this difference is that providing the full treatment group with menstrual underwear may have distracted them from the workshop content, both during the workshop itself (as the discussion may have been cut short to allow time to learn how to use the menstrual products) and after it. By contrast, the education-only group had a single focus and therefore were more likely to retain reproductive health and family planning information than those who also received the menstrual underwear.

The intervention had a positive impact on girls' reported comfort discussing family planning with a partner. However, there was no significant change in boys' reported comfort discussing family planning with a partner. Overall, results from the study suggest that the workshop significantly increases girls' and boys' understanding of the concept of family planning (i.e., that people can make a conscious decision when to have a baby), their understanding of the basic connection between the menstrual cycle and reproduction (i.e., "where babies come from"), and their comfort level discussing family planning.

These results, taken as a whole, suggest menstrual health education is an effective, age-appropriate way to broach reproductive health discussions with adolescent girls and boys (including very young adolescents, 10 to 14 years old) and prepare them for more comprehensive reproductive health interventions later in life.

Specific Results for Boys

The study found somewhat unexpected results for boys. The workshop intervention for boys appears to be partially successful. For Research Question 2, the intervention produced uniformly positive results across all survey questions measuring attitudes about menstruation in terms of reducing some stigmas and encouraging normal interactions, with significant improvements at follow-up. However, the same group was significantly more likely to respond that girls must be limited to certain activities during their periods relative to the comparison group post-treatment. These contrasting results highlight the challenge of reducing stigmas and prejudices about menstruation among adolescent boys. Overall, the results show the need for repeated exposure to the topic (e.g., in the form of comprehensive sexuality education); a one-hour workshop can be a good starting point to begin to dismantle stigma and taboos, but additional education is necessary to fully change knowledge and attitudes.

IMPLICATIONS

This study highlights the importance of applying a gender equity lens to the issue of menstruation, as its barriers and solutions span multiple sectors (e.g., health, education, hygiene) and impact girls' and women's full and equitable participation in daily life and society. Programs and interventions that seek to achieve improvements in adolescent reproductive health and overall development should consider how the ability to understand and manage menstruation affects girls' program participation and well-being outcomes.

The combined intervention (menstrual underwear and a one-hour menstruation education workshop) had significant positive effects on girls' and boys' menstrual cycle knowledge, girls' and boys' understanding of reproduction and family planning, girls' attitudes towards family planning, girls' emotional state during menstruation (confidence and feelings of normalcy), and girls' ability to participate in certain daily activities during menstruation. For girls, there was a significant difference between the full intervention group (products and education) and the partial intervention group (education only) with results suggesting that products have an effect on girls' participation in social-capital-building opportunities (playing sports or playing with friends) and feelings of normalcy during menstruation. The education workshops had a significant positive effect on girls' menstrual and reproductive knowledge/attitudes and their confidence during menstruation. Additionally, education for boys had a significant positive effect on their menstrual

and reproductive knowledge and their rejection of menstruation-related stigma. Results therefore suggest that all components of the intervention (menstrual products for girls, menstruation education for girls, and menstruation education for boys) are important for and effective in removing barriers to girls' ability to manage menstruation safely and comfortably within a supportive environment and equitably participate in society.

Implications for future research include considering the effects of these specific interventions across different contexts (socioeconomic statuses, ethnicities, geographic locations) and cultures, not only for adolescents but for adults as well. Future studies should consider any potential unintended consequences of intervention, particularly for an issue that faces widespread stigma. Intervention access for persons with disabilities should be considered as well. It would also be useful to consider additional treatment groups to explore the extent of impact of products alone (i.e., one treatment group that receives products only without education) as well as the effect of the SmartCycle® kinesthetic learning tool on knowledge retention and attitude change over time (i.e., one treatment group that receives workshops with the SmartCycle® tool and one group that receives the workshop only without the tool).

In summary, the study provided valuable insights into the current cross-cutting, menstruation-related barriers faced by girls and women in Mozambique, with global implications. Moreover, this analysis delivered quantitative and qualitative evidence to support the hypothesis that the provision of high-quality, dependable menstrual products for girls and age-appropriate menstruation education workshops for girls and boys function as effective solutions for beginning to address these barriers and advancing progress toward gender equity.

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