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Menstrual health and endometriosis: costs incurred by women, health systems and society



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Sexual and reproductive health and rights (SRHR) are central to overall health and well-being. Advancing women's gynaecological health is an aspect of SRHR that has been inadequately prioritized. We highlight the costs incurred by women, health systems and societies associated with menstrual health and endometriosis to underscore critical unmet women's health needs and call for interventions to mitigate society-wide economic repercussions of poor gynaecological health in women.

Comprehensive sexual and reproductive health and rights (SRHR) are central to realizing overall health and well-being for all individuals and are integral to national efforts to achieve universal health coverage¹. The realization of comprehensive SRHR for women is compromised by the way in which many elements of SRHR have been underprioritized, insufficiently researched or inadequately financed, including women's gynaecological health². In many settings, including high-income countries, women lack access to the full range of gynaecological health services, including education regarding the physiologic process of menstruation³ as well as timely diagnosis of conditions like endometriosis or vulvodynia.

Failures to support women's gynaecological health can incur a steep, if often invisible, toll on women's health since it is directly associated with quality of life and impacts other aspects of health, including mental health⁴. Poor gynaecological health may also limit women's autonomy, hinder social relationships or curtail their economic participation in some settings. Conversely, since health is an important determinant of school attendance and labour force participation, efforts to support the comprehensive realization of SRHR could promote economic prosperity. However, existing data on the costs associated with either implementing SRHR programmes or failing to address SRHR have tended to focus on contraception and maternal health interventions, with less attention to women's gynaecological health^{2,5–7}. Thus, the economic case for greater prioritization of women's gynaecological health beyond reproductive functions and sexually transmitted infections has not yet been sufficiently well made, and the associated costs and cost-effectiveness of services and products are understudied.

This article highlights available evidence regarding the costs entailed in realizing women's gynaecological health², by focusing on two critical components: menstrual health and endometriosis^{8,9}. We take a broad approach to defining these costs and include out-of-pocket costs incurred by women (e.g., costs of purchasing menstrual products), costs incurred by health systems (e.g., the direct costs of providing treatment for endometriosis), as well as the greater opportunity costs accruing to society (e.g., reductions in women's productivity as a result of absenteeism). We specify which type of costs we refer to throughout the article. We adopt the Terminology Action Group of the Global Menstrual Collective's definition of menstrual health: "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity, in relation to the menstrual cycle."¹⁰ By sharing existing evidence on the costs associated with menstrual health and endometriosis, we aim to draw the attention of policymakers and health system administrators to under-recognized SRHR needs and priorities of women and to support the allocation of greater financial resources for quality sexual and reproductive health service provision.

In this article, the term 'women' is used inclusively to refer to all women, girls, and gender-diverse individuals who identify as women across their life course and the diversity of lived experiences, including but not limited to women with disabilities, experiencing homelessness, undergoing incarceration and/or institutionalization, displaced due to conflicts, climate change or other humanitarian crises, living with human immunodeficiency virus (HIV), belonging to minority, racial or ethnic groups, and Indigenous women.

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Gender inequality and intersecting determinants shape women's economic status and gynaecological health

Gender inequality and patriarchal gender norms shape and limit women's economic agency and preclude women from making autonomous decisions on critical aspects of their own health. At a structural level, gender inequality interacts with economic status and other social, political, and commercial determinants of health – such as housing, access to clean water and sanitation, food (in)security, educational attainment, and environmental exposures – to broadly give rise to the exposures and conditions that shape women's health¹¹. For instance, various structural, social, and commercial determinants may compel women to make decisions regarding their gynaecological health that have detrimental downstream impacts on their overall health or quality of life¹². This is happening in India, for example, where young women working in sugar cane fields are choosing to undergo hysterectomies to stop menstruating in order to maintain paid employment and improve their ability to survive, at times experiencing subsequent chronic pain¹³. This situation is a marker of gender inequality and reflects the lack of appropriate and acceptable services for women's gynaecological health common to many settings, particularly affecting women with low economic power. While women in some settings have greater access to health services than men by virtue of seeking perinatal health care, services to address women's SRHR needs beyond reproduction are frequently unaffordable, unavailable, inaccessible, or unacceptable.

Existing economic evidence: the costs of women's gynaecological health

We conducted a rapid, semi-systematic review of existing evidence on the costs associated with menstrual health and endometriosis, as well as the cost-effectiveness of related services in order to build a narrative understanding of costs. We restricted our search to peer-reviewed articles published in English and indexed in PubMed between 1 January 2000 and 13 November 2023. We used a variety of search terms based on published systematic reviews in these areas and used economic search terms to capture a broad definition of costs. We did not employ any geographical restrictions to the search. Retrieved articles were reviewed for and sorted by relevance and full text availability by one author, comprising most of the evidence described here. The reference lists of relevant articles were also reviewed to identify peer-reviewed manuscripts and grey literature not yet retrieved. Finally, where relevant, additional references were included from authors' personal libraries. We report currency as United States dollars (US\$) with the year of reporting, when provided in referenced sources.

Menstrual health

Across the world, more than 2 billion women menstruate each month¹⁴, and dysmenorrhoea, or pain associated with menstruation, is the most common menstrual symptom among adolescent girls and young women, with prevalence rates ranging from 50% to 90%^{15,16}. Even when experienced as an uncomplicated physiologic process, menstruation incurs regular costs to women and girls. These include out-of-pocket costs for over-the-counter analgesics or products to reduce discomfort; out-of-pocket costs for manufactured menstrual products such as pads, tampons, hormone-containing medications, absorbent underwear, sponges, or menstrual cups; and indirect costs related to the time and energy spent procuring these products or washing materials such as cloth or rags to manage menses¹⁷.

Costs of menstrual products. Period poverty, or the lack of access to menstrual products due to financial constraints, disproportionately affects women and girls in low-income, conflict-affected and humanitarian settings^{18,19}. A non-peer-reviewed study investigating the monthly costs of a set package of 20 tampons, 25 panty-liners and 24 200 mg tablets of ibuprofen based on online prices listed for local pharmacies and supermarkets in 107 countries of all income levels found that costs ranged in 2023 from US\$ 1.09 in El Salvador to US\$ 34.05 in Algeria²⁰. Affordability was lowest in Algeria, Zambia and Nigeria, where women would have to spend between 10–15% of their average monthly income on

menstruation products²⁰. A cost-effectiveness and cost-benefit analysis of an open cluster randomized controlled pilot study providing either menstrual cups or one year's worth of sanitary pads to girls aged 14 to 16 year in rural Kenya found that providing menstrual cups and sanitary pads would cost annually US\$ (2019) 3.27 and 24 per girl reached, respectively, where the gross living wage is approximately US\$ 200 per month²¹.

Women in many settings may be subject to the “rural premium,” whereby menstrual products often cost more in rural areas than in urban centres due to supply chain inefficiencies, transportation costs, and limited market competition²². A systematic review and meta-analysis published in 2021 suggests that reusable menstrual pads are likely less costly over time²³, but single use/disposable menstrual products may be less expensive initially^{9,21}. Further, many countries of all income levels impose standard value added tax (VAT) on menstrual products²⁴. Higher prices in rural areas and the economic burden of taxation on sanitary products disproportionately affect economically vulnerable populations, exacerbating period poverty²². Community-based financing and/or subsidy models could improve the affordability of menstrual products. Programmes like AFRI-pads and Huru International provide cost-effective reusable pads through local distribution networks, making menstrual health products more financially accessible to low-income women and girls^{25,26}. Exempting menstrual products from VAT – or applying a reduced tax rate – may also improve their affordability and could have broader positive externalities for education and health. However, research suggests that VAT exemptions alone are insufficient to make menstrual products more affordable, as price controls and distribution policies must also be in place to ensure consumer prices are reduced²⁷. Digital and community-driven innovations may additionally reduce economic barriers and improve access to menstrual hygiene products in low-resource settings, although evidence is more limited. For example, apps could map and share locations where menstrual products are cheaper or freely available while geographic information systems could be used to improve distribution and avoid stockouts²⁸.

Efforts focused on reducing consumer prices and improving accessibility of menstrual products may not adequately address the additional resource requirements associated with menstruation, including waste disposal options as well as access to spaces to change menstrual materials and water to wash or dry menstrual products and clean hands and bodies^{9,17}. In regions with limited access to clean water, women spend additional time collecting and managing water for hygiene during menstruation, equating to indirect costs when monetized against local wages¹⁹.

School attendance and labour force participation. The costs of menstrual health are not limited to menstrual products and practices. Inadequate access to sustainable, acceptable menstrual products and lack of cleanliness, privacy and safety in the physical environment may obligate women and girls to engage in menstrual practices that interfere with their participation in school or the labour force, often leading to long-term economic disadvantages for individuals and society^{9,29}. For example, a 2016 systematic review and meta-analysis of 97,070 girls across 138 studies in India found that one in four girls missed one or more days of school during their menses³⁰. Similarly, in a 2013 cross-sectional study of 2332 girls aged 11 to 17 years from 700 schools in Bangladesh, 931 girls (41%) reported missing school during menses, and 82% of girls deemed school facilities to be inappropriate for menstrual hygiene³¹. A pilot study in Ghana involving 120 girls aged 12 to 18 years from 2008–2009 found that providing puberty education – with or without menstrual pads – improved school attendance compared to girls who had not received either, possibly reflecting the value of destigmatizing menstrual health information for improving school attendance during menstruation in some settings³². Evidence on the overall effectiveness of menstrual health interventions for improving school attendance is scarce and limited by the challenges of implementing and evaluating these interventions in low and middle income countries (LMICs), including low comparability of educational outcomes across contexts³³. Overall,

current evidence suggests that menstruation has variable consequences on education, related to multiple aspects of menstrual experience including fear and stigma, unavailable or unreliable products, inadequate knowledge among girls and unsupportive infrastructure⁹.

The growing body of evidence suggests that when menstruation is experienced negatively, it influences the economic empowerment of women, leading to absenteeism from school and the workplace³⁴ or reductions in labour productivity. For example, in Japan, a 2011 cross-sectional, survey-based study involving a nationally representative sample of 19,254 women ages 15 to 49 years found that increasing severity of menstrual symptoms and self-reported heavy bleeding were found to be associated with greater work productivity losses in the order of US\$ (2022) 11.4 billion per year³⁵. There is less data on the impact of supplying menstrual products to women on their participation in the workforce and very little available evidence on the impacts of menstruation in adult women overall^{33,36}. The economic costs of menstruation-related workplace absenteeism and future productivity losses are likely greater in some settings and for some women than others. For example, unlike women in formal employment, many informal workers, including those in the Africa region, lack paid sick leave or workplace accommodations, exacerbating economic insecurity³⁷.

Costs of unmet needs for health care. In addition to recurring out-of-pocket costs related to buying menstrual products, women with menstrual health issues or concerns who lack access to health and social protection schemes must either pay high out-of-pocket fees for health services or forego menstrual health care altogether, having no choice but to endure the health consequences that arise from their unmet needs for care³⁸. Affordability is an integral aspect of access and encompasses direct payment(s) for health services, medicines and other commodities as well as transportation costs, payments to cover childcare or other care-taking responsibilities, and wages lost while seeking care. For example, women attending a sexual and reproductive health care facility in urban South Africa seeking care for menstrual problems had to spend US\$ (2022) 45 out of pocket over the course of two visits in addition to foregoing income of US\$ (2022) 20, on average³⁹. Costs also accrue to health systems when women with longstanding unmet needs for care or who previously received poor-quality health care present to secondary, urgent or emergent care services.

Endometriosis

Endometriosis is the growth of endometrial tissue outside of the uterus, often giving rise to heavy menstrual bleeding, dysmenorrhoea or even severe chronic pelvic pain, and a range of other symptoms such as dyspareunia and fatigue⁴⁰. Approximately 10% of women of reproductive age are estimated to be affected by endometriosis globally⁴¹. Women with endometriosis have double the risk of infertility compared to women without endometriosis⁴². Diagnosis of endometriosis currently requires laparoscopic surgery, which is costly, where available. Sensitive, non-surgical diagnostic modalities have the potential to increase rates of diagnosis and reduce the costs associated with endometriosis, but an inexpensive, widely accessible diagnostic test is currently lacking (a saliva-based diagnostic test is in clinical trials)^{43,44}. At present, the diagnostic delay for women with endometriosis is 6 to 7 years on average⁴⁵, and in some settings may be as long as 11 to 20 years⁴⁶. In many African countries, the diagnosis of endometriosis is often delayed due to a lack of specialized healthcare services, limited awareness among both healthcare providers and patients, as well as limited access to gynaecological specialists and diagnostic tools such as laparoscopy⁴⁷. Delays may also result from pervasive normalization of pain related to menstruation, stigmatization, or dismissal of women's reported symptoms. Women with endometriosis often visit multiple healthcare providers before receiving a correct diagnosis, incurring significant out-of-pocket expenses for consultations, medications, and ineffective treatments^{48,49}.

Direct and indirect costs. There is some evidence - mostly from high-income countries and which varies widely in terms of study type, data

sources and participants - on the direct health care costs related to endometriosis, or the costs incurred via medical management of symptoms. Until recently, little data on indirect costs had been reported^{50,51}, as indirect costs for endometriosis are difficult to quantify comprehensively and studies have defined these costs inconsistently. For example, an industry-funded systematic review of studies published in English between 2000 and 2013 included 12 primary studies that reported direct or indirect costs associated with endometriosis⁵¹. Across the 5 studies in this systematic review reporting indirect costs, they were defined and calculated as: sick leave and unemployment due to endometriosis per patient per year; productivity loss per patient per unit time; lost productivity and leisure per patient per year; absenteeism-related cost per employed woman per week; and presenteeism-related cost (reduced productivity at work due to symptoms) per woman per week⁵¹.

In this systematic review, ten studies were conducted in or included data exclusively from high-income countries in North America and Europe, one was conducted in Brazil, and another study reported data from Argentina, Belgium, Brazil, China, England, Ireland, Italy, Nigeria, Spain and the US. Estimates of total direct costs including inpatient and outpatient costs, medicines and other services ranged from US\$ (2013 dollars) 1,109 in Canada to 12,118 in the United States (US). The estimated indirect costs were higher and ranged from US\$ (2013 dollars) 3,314 per patient per year in Austria and 3854 in Canada up to 15,737 in the US⁵¹. For reference, the annual combined (direct and indirect) cost per woman with endometriosis in the US is estimated to be 11–70% higher than the annual cost per patient with diabetes in the US⁵².

In contrast, absent quality, available, accessible, and acceptable diagnosis and treatment services, direct costs for endometriosis among women in low-income settings - measured by proxy variables such as heavy menstrual bleeding or dysmenorrhoea - may appear falsely low as unmet needs persist^{39,47} while indirect costs, namely lifelong productivity losses, are likely substantial⁴⁹. Evidence from LMIC regarding the economic costs of endometriosis and health-related quality of life is limited⁴⁵. One cross-sectional study of 410 women in Northern Cyprus reports lower direct costs to individuals and society but that productivity losses comprise the biggest proportion of the overall annual cost⁵³.

Professional outcomes. Endometriosis and endometriosis-related symptoms have been associated with negative professional outcomes in women before and after formal diagnosis and treatment, including increased sick leave and work impairment, in addition to productivity losses at work^{49,54,55}. For example, a multi-centre study assessing the impact of endometriosis on quality of life and work productivity via questionnaires administered to women with and without endometriosis in Argentina, Belgium, Brazil, China, England, Ireland, Italy, Nigeria, Spain and the US between 2008–2010 found that women with endometriosis lost on average 10.8 hours of work per week and were absent nearly 3 hours more than women without endometriosis⁴⁸. Further, increased absenteeism may result in longer-term reduced earning potential. One industry-funded retrospective cohort study assessing insurance claims from 1999–2017 for 42 companies covering 4.4 million beneficiaries in the US compared work loss events and salary/growth in women ages 18 to 49 with endometriosis to women without endometriosis (6851 matched pairs) for five years following endometriosis diagnosis. Women with endometriosis had average annual salaries that were lower by US\$ (2020) 3697–6600 in years 2 to 5 and experienced less year-on-year salary growth than women without endometriosis⁵⁶.

Costs of longer-term sequelae. Few - if any - studies that attempt to estimate the costs of endometriosis have included the costs of medium-to-long term sequelae, such as endometriosis-related infertility^{42,51}, either as direct costs (medical care of infertility and assisted-reproductive technologies) or as indirect costs (loss of productivity, absenteeism and presenteeism associated with seeking and undergoing infertility care).

Discussion

The costs of women's gynaecological health, as exemplified by menstrual health and endometriosis, can be substantial for women, health systems and society. The true economic burden associated with menstrual health and endometriosis is likely underestimated, and existing data is not comprehensive for several reasons. First, existing economic evidence regarding the costs of women's gynaecological health includes almost entirely non-disabled, cis-gender, heterosexual women. Research targeting specific subpopulations would likely reveal higher costs. Second, most data come from high-income countries where the average ability of women to afford out-of-pocket costs is greater, averting further financial or health consequences. Available data, particularly for endometriosis, is somewhat homogenous and not representative of the diverse experiences for most women across the world. Third, most of the literature regarding menstrual health, its impacts on education and employment, and the associated economic costs considers the average experience of uncomplicated menstruation. These studies do not explicitly include or account for the costs (to the individual or the health system) of challenges associated with menstruation, such as dysmenorrhoea, heavy menstrual bleeding resulting in iron-deficiency anaemia, or abnormal menstrual bleeding.

Fourth, while some economic studies of both menstrual health and endometriosis include indirect costs such as loss of productivity, many closely related, short- and long-term health and well-being outcomes (and their relevant additional costs) are not considered in existing evaluations. For example, when women do not have access to needed health services, they must often accept negative, multi-dimensional consequences such as pain and poor individual health, social exclusion or isolation and lower economic power^{57,58} that result in poor mental health outcomes and/or negative impacts on family and community relationships. The consequential costs of these outcomes (including out-of-pocket expenditures borne by women and health system costs) are not systematically captured. Economic evaluations pertaining to gynaecological health needs must therefore also consider the pain and losses in well-being and opportunity that result from an inability to access services due to individual or national financial constraints. In addition, and as is the case in many health areas, evaluations tend to remain siloed across sectors. Investments in water, sanitation and hygiene (WASH) could lead to large improvements in menstrual health⁵⁹. Not only are studies quantifying the economic benefits of WASH interventions lacking, but studies to date have tended to measure few health outcomes, potentially missing positive externalities within health that could imply even greater cost-effectiveness of interventions. This includes, for example, accounting for the impact of improved menstrual health on the incidence of bacterial vaginosis and sexually transmitted infections (STIs)^{60,61}.

Further, some gynaecological events have a cumulative effect over time. Evaluation of these long-term and complex impacts is crucial⁶², but they are rarely taken into account in economic evaluations. For instance, dropping out of school due to lack of access to appropriate toilets and other menstruation-related challenges in school can result in diminished economic opportunities for girls compared to boys, as well as reduced knowledge about SRHR. They may, consequently, be at increased risk of unintended pregnancies, STIs, early marriage and gender-based violence, further compromising their health and well-being⁶³. Life course approaches have been used to better capture the complexities of cumulative health needs over time, particularly as life expectancy increases³, and could be used more explicitly to guide or structure economic evaluations. A life course approach might additionally facilitate greater attention to women's gynaecological health beyond reproduction, including peri-menopause and menopause, for which services are often lacking⁶⁴. To inform a more efficient, equitable, people-centred allocation of health resources, further research on both the breadth and magnitude of economic costs related to women's SRHR is needed.

In order to better understand the hidden costs related to poor gynaecological health that many women face globally, a programme of future research needs to include: (a) a thorough mapping of sexual and

reproductive health and well-being issues that women face across their life course; (b) the development of a more fulsome framework for evaluating the economic impacts related to women's SRHR that captures women in all their diversity as well as downstream health impacts; (c) a greater exploration of out-of-pocket costs borne by women in accessing these services and in their ability to self-care; (d) systematic surveying of women's sexual and reproductive health services included in, and excluded from, health benefit packages and social insurance programmes across countries; and (e) a broader and more inclusive approach to measuring disease burden of women's health, in addition to greater quantification of consequences beyond the health sector. Future research should also explore integrated interventions that address menstrual health as both a public health priority and an economic development issue, recognizing its multidimensional impact on education, labour, and gender equity. Health system and financing policies that include explicit protection for and link benefits to women's needs, including financial incentives for health and care workers to promote gender-responsive care, could help progress women's SRHR.

There are some limitations to our analysis. First, we did not conduct a full systematic review. We limited our search to manuscripts written in English in only one database, PubMed, and prioritized manuscripts for which the full text was readily available. However, PubMed is the largest database of its kind, we reviewed a large proportion of relevant articles retrieved in the search, and there was a great deal of coherence across studies included in the review, allowing us to characterize the likely economic burden of menstrual health and endometriosis on women, health systems and society (as well as associated gaps). Second, we draw on this subset of available evidence of the costs associated with menstrual health and endometriosis to highlight under-recognized SRHR needs and priorities of women and to call for further research. It is possible that studies of other aspects of women's gynaecological health have more comprehensively described the associated costs. Third, while we attempted to include data from a wide range of settings and did not restrict our search by geography or country income level, most published studies come from high-income countries. Economic costs may be higher in these settings because of greater earning potential and heightened costs of medical care, but the absolute health and well-being impacts may be most acute in lower-income settings, including for women who go without quality health care that is financially unattainable. Finally, while economic analyses help to draw attention to women's health issues, economics is not the sole lens through which these issues should be evaluated. The notion that a physiological process requires medical management amounts to medicalization, and raising concerns regarding productivity losses to help justify greater attention to women's empowerment and well-being is a capitalistic argument^{65,66}. Women deserve autonomy, time to rest and the freedom to prioritize their health and well-being without being reduced to the sum of their economic contributions. Policies should strive to balance economic arguments with holistic health perspectives^{67,68}.

Conclusion

Menstrual health and endometriosis incur substantial costs to individual women, health systems and society that are underestimated. Further, the financial, physical and emotional burden of poor gynaecological health on women is not well understood or quantified. Menstrual health is an aspect of health that can significantly impact the overall health and well-being of women, but which has received insufficient attention in public health responses⁶⁹. Addressing the multifaceted and substantive costs associated with menstrual health, endometriosis, and other sexual and reproductive health issues that accrue to women, their families, communities, and societies requires comprehensive healthcare strategies, including prevention, early intervention, and support for affected women to mitigate the overall economic burden.

We intentionally situated women's gynaecological health outcomes within the context and complexities of the structural and social determinants of health, reinforcing the linkages between women's economic status and their ability to realize the highest attainable state of SRHR. As such,

future research and priority-setting regarding women's SRHR and well-being must prioritize equity and centre the communities rendered vulnerable in their specific social, cultural, and political context(s). There is a need for researchers to engage in - and for donors to fund - research that advances the economic case for realizing SRHR with explicit attention to populations who have been excluded from economic evaluations to date and where evidence of impact is currently lacking. Such a programme of research could influence intervention targeting and resource prioritization on the road towards improving health and well-being of women and universal health coverage.

Data availability

No datasets were generated or analysed during the current study.

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Author contributions

S.T.R. performed the initial searches for published evidence regarding the economic costs of women's gynaecological health. M.N., J.J.K.R. and S.T.R. were major contributors in writing the manuscript. M.R., C.K., M.B.Q., P.A. and G.O. provided critical review. All authors reviewed and contributed to the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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