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OPEN A perspective on economic barriers and disparities in access to hormone replacement therapy in LMICs (MARIE-WP2b)

Gayathri Delanerolle^{1,4,29}, Snehal Ghosh^{1,29}, Paula Briggs^{2,3,29}, Peter Phiri^{4,5}, Julie Taylor¹, Vindya Pathiraja⁶✉, Tharanga Mudalige⁶, Yassine Bouchareb⁷, Heitor Cavalini^{4,29}, Sharron Hinchliff⁸, Carol Atkinson⁹, Kristina Potocnik¹⁰, Lucky Saraswat¹¹, Fred Tweneboah-Koduah¹², Nana Afful-Mintah¹³, Helen Felicity Kemp¹⁴, George Uchenna Eleje¹⁵, Divinefavour Echezona Malachy¹⁵, Bernard Mbwele¹⁶, Teck-Hock Toh¹⁷, Jude Siong Yip-King¹⁷, Daniela Angerame Yela¹⁸, Gabriela Pravatta Rezende¹⁸, Renan Massao Nakamura¹⁸, Cristina Laguna Benetti-Pinto¹⁸, Muhammad Irfan¹⁹, Rabia Kareem¹⁹, Jeremy van Vlymen⁴, Ashish Shetty^{20,21,22}, Ganesh Dungal²³, Suman Pant²⁴, Kathleen Riach²⁵, Nirmala Rathnayake^{6,30}, Lanka Dasanayake⁶, Jian Qing Shi^{26,30}, Om Kurmi^{24,27,30}, Saval Khanal^{28,30} & Sohier Elneil^{21,30}

Women globally spend a significant portion of their lives experiencing perimenopausal and menopausal symptoms, which can severely affect their quality of life. Hormone Replacement Therapy (HRT) has proven effective in alleviating symptoms such as hot flushes, sleep disturbances, and mood disorders. However, disparities in access to HRT exist, especially in low- and middle-income countries (LMICs), where socioeconomic factors and healthcare availability may limit treatment access. We aimed to explore economic barriers and disparities to access to HRT across Brazil, Ghana, Malaysia, Nepal, Nigeria and Sri Lanka. A cross-sectional exploratory study was conducted using publicly available data from national healthcare databases, pharmacies, and hospital formularies from Brazil, Ghana, Malaysia, Nepal, Nigeria, and Sri Lanka. The availability and cost of common HRT medicines, including oral and transdermal therapies, were analysed alongside of surgical procedures. Affordability was assessed by comparing the cost of a two-month HRT supply to the number of days of minimum wage work required to cover the cost. Additionally, Gross National income per capita was also collected to contextualise these findings. The availability of HRT medicines varied widely across six countries, with Brazil and Nigeria offering a broader range of options compared to Ghana and Nepal. Pricing disparities were significant, with the cost of medicines such as the Mirena Coil requiring over 21 days of minimum wage work in Brazil and more than 260 days in Nigeria for Angeliq. Affordability remained a critical issue across LMICs, with high out-of-pocket costs restricting access to essential menopausal treatments. This study reveals substantial economic barriers to accessing HRT in LMICs, driven by high costs and limited availability. Healthcare policy reforms to improve access and affordability of HRT in these regions are urgently needed. These findings can inform strategies to reduce healthcare inequalities and enhance women's health outcomes globally.

¹University of Birmingham, Birmingham, UK. ²University of Liverpool, Liverpool, UK. ³Liverpool Women's Hospital Foundation NHS Trust, Liverpool, UK. ⁴Hampshire and Isle of Wight Healthcare NHS Foundation Trust, Southampton, UK. ⁵University of Southampton, Southampton, UK. ⁶University of Ruhuna, Matara, Sri Lanka. ⁷Sultan Qaboos University, Muscat, Oman. ⁸University of Sheffield, Sheffield, UK. ⁹Manchester Metropolitan University, Manchester, UK. ¹⁰University of Edinburgh, Edinburgh, UK. ¹¹University of Aberdeen, Scotland, UK. ¹²Narh-Bita Hospital, Tema, Ghana. ¹³Ethos Clinic, Milton Keynes, UK. ¹⁴Trauma Healing Together, Perth, UK. ¹⁵Nnamdi Azikiwe University, Nnewi, Nigeria. ¹⁶University of Dar es Salaam, Mbeya College of Health and Allied Sciences, Dar es Salaam, Tanzania. ¹⁷Sibu Hospital, Ministry of Health, Sarawak, Malaysia. ¹⁸University of Campinas, UNICAMP, Campinas, Brazil. ¹⁹Peshawar Medical College, Riphah International University, Islamabad, Pakistan. ²⁰University College London Hospitals NHS Foundation Trust, London, UK. ²¹University College London,

London, UK. ²²Cleveland Clinic London, London, UK. ²³Kathmandu Model Hospital, Kathmandu, Nepal. ²⁴Coventry University, Coventry, UK. ²⁵University of Glasgow, Glasgow, UK. ²⁶Southern University of Science and Technology, Shenzhen, China. ²⁷McMaster University, Hamilton, ON, Canada. ²⁸Kings College London, London, UK. ²⁹These authors contributed equally: Gayathri Delanerolle, Snehal Ghosh, Paula Briggs and Heitor Cavalini. ³⁰These authors jointly supervised this work: Nirmala Rathnayake, Jian Qing Shi, Om Kurmi, Saval Khanal and Sohier Elneil. ✉email: vindyapathiraja@ahs.ruh.ac.lk

Menopause marks the end of the reproductive life cycle in individuals with female reproductive biology¹. While many experience natural menopause over time, others may undergo it due to medical conditions or treatments like radical hysterectomy or long-term medications². Natural menopause progresses gradually with perimenopause, whereas surgical or medical menopause is sudden and often presents severe symptoms immediately^{3,4}.

Each year, about 25 million women enter menopause, a number expected to rise as the global population ages⁵. Global estimates indicate that by 2030 approximately 1.2 billion individuals will be perimenopausal or menopausal, reflecting demographic ageing across both high- and low- and middle-income settings. Although life expectancy remains variable across regions, it has increased substantially in many LMICs over recent decades, resulting in a growing proportion of women reaching midlife⁶. This demographic shift highlights the need to address the health and well-being of menopausal women, particularly in low- and middle-income countries (LMICs), where menopause often occurs earlier—between ages 45 and 50—compared to high-income countries (HICs), where the average onset is around 51. In LMICs, factors like malnutrition and infectious diseases contribute to this earlier transition, leading to significant health and socioeconomic impacts⁷. Access to healthcare for managing menopausal symptoms in these regions is limited, often exacerbated by underreporting of the issue. Hormone replacement therapy (HRT) is the most effective treatment for managing menopausal symptoms, including vasomotor symptoms, sleep disturbances, and mood changes, and plays a key role in improving quality of life and long-term health outcomes. Despite its clinical effectiveness, access to HRT remains highly variable across settings. Conversely, women in HICs benefit from better healthcare access and treatment options, though disparities including economic disparities, reflected in the relationship between the cost of HRT and income; geographical disparities, reflected in differences in the availability of medicines and services across regions; and health system disparities, including variation in infrastructure, workforce capacity, and access pathways still exist within specific populations⁸. In LMICs, access to HRT is often constrained by financial barriers, limited availability, weak health system integration, and reliance on out-of-pocket expenditure. These constraints may result in unmet healthcare needs and contribute to broader health and economic inequalities.

HRT may lower the risk of cardiovascular issues and osteoporosis. HRT is also beneficial after surgical menopause to restore hormone levels⁹. A recent network meta-analysis comparing various HRT regimens confirmed the effectiveness of different formulations in symptom management and long-term health benefits, reinforcing the importance of ensuring equitable access to these therapies across diverse healthcare settings¹⁰. Testosterone can enhance libido, energy, mood, and overall well-being by addressing declines in androgen production¹¹. However, awareness of menopause-related cardiovascular risks is low, with only 56% of women informed. Menopause changes hormones, body fat distribution, lipids, and vascular health, increasing cardiovascular risk, particularly after bilateral oophorectomy¹².

HRT is offered in two main forms: oestrogen alone or in combination with progesterone, and it is available in oral and transdermal formulations¹³. However, access to HRT and gynaecological services can vary significantly, even within individual countries¹⁴. For example, a study in the UK revealed an 18% lower rate of HRT prescribing in the most deprived areas, showing a preference for oral HRT over transdermal options despite the latter having a reduced cardiovascular risk¹⁵. These disparities underscore the difficulty in generalising findings to LMICs, where healthcare access is often limited. Economic evaluations in LMICs need more comprehensive data on treatment preferences, health outcomes, and associated costs¹⁶. Funding limitations for women's health equally pose significant challenges. Despite the widespread impact of menopause, research in women's health remains chronically underfunded compared to other areas of medicine. A recent analysis highlights that funding gaps in women's health contribute to the slower pace of innovation, limiting advancements in treatment accessibility, including HRT¹⁷.

In summary, menopause is a global health issue, yet significant disparities persist in access to HRT, particularly in LMICs, where economic constraints often limit treatment affordability. To address these challenges, we initiated the MARIE project, a multi-country research project designed to study menopause from a global public health perspective, incorporating a multi-step health economics workstream to assess the economic impact of menopause across consortium countries. Despite the growing global burden of menopause, there is limited comparative evidence on the affordability and accessibility of HRT across LMICs.

We used a cross-sectional exploratory design in the first instance to gain initial insights as part of a pilot study to understand the economic barriers and impact, disparities related to accessing HRT and the implications to the female workforce, and affordability costs of menopause. Women are a significant part of the informal economy, facing physically demanding labour and lacking health support. Unmanaged menopausal symptoms can lead to productivity loss, affecting individuals, families, and national economies. This study aims to address complex issues related to HRT and menopause in LMICs, where comprehensive data is scarce, by gathering baseline insights and uncovering trends.

The primary aim of this pilot, cross-sectional study is to explore and understand economic barriers and disparities related to accessing HRT by examining their availability, cost, and impact on women in the workforce.

Methods

Data sources and collection

Data on female workforce participation were sourced from Our World in Data (OWiD)¹⁸, focusing on trends in participation, gender differences, and unemployment. Female labour force participation was included as a contextual variable to assess the broader economic implications of menopause and affordability of treatment, particularly in relation to productivity and workforce engagement. We developed a dashboard to visualise female workforce participation by country, providing context for the economic implications of HRT affordability. Data were extracted directly from underlying datasets obtained through national databases, pharmacy records, and institutional sources. Graphical outputs were not used for analysis. In settings where centralised databases were unavailable, data were triangulated using multiple verified sources, including pharmacist consultation and local formularies.

MARIE project, local investigators and pharmacists collected data on the availability and pricing of HRTs from Brazil, Ghana, Malaysia, Nepal, Nigeria, and Sri Lanka through structured verification processes to ensure accuracy and comparability across settings. Countries included in this study were part of the MARIE Consortium, a structured multi-country research collaboration. Participation was determined through formal governance processes, including institutional agreements, regulatory alignment, and operational capacity to implement the study protocol, rather than through sampling strategies. As such, the selection reflects the current composition of the consortium and should be interpreted as the first phase of an ongoing international research programme. They used local pharmacy price lists, collaborated with pharmacists, and accessed national healthcare databases. This included information on HRT medicines, formulations (oral, transdermal, gels), and surgical procedures related to menopause. We have confirmed use for menopausal care, as verified by local clinicians and pharmacists before including to the study. To ensure methodological integrity and cross-country comparability, we have not included medicines solely used for contraception unless their menopausal application was clearly documented. In countries where price variation exists across regions, representative prices were obtained from commonly accessed urban and institutional sources to ensure comparability across settings. The selection of the country was based on the convenience of researchers and the planned future study aims to include more countries than the currently selected ones.

This study utilised exclusively secondary, non-identifiable, and publicly available data sources, including national healthcare databases, pharmacy price lists, and institutional formularies. In accordance with UK Health Research Authority (HRA) guidance and international standards for health economics and policy research, ethical approval was not required. Where access to institutional or pharmacy-level data was necessary, permissions were obtained in line with local governance and regulatory procedures.

National healthcare databases and institutional repositories were used where available. In settings without centralised databases, data were triangulated using multiple sources, including pharmacy records, clinician input, and validated local datasets particularly in LMIC settings where centralised pricing databases are often unavailable.

Pharmacy price lists were used as a primary data source as they represent the most consistent and accessible point of medicine pricing across countries. While acknowledging that prices may vary across regions and providers, these sources provide a standardised and verifiable basis for cross-country comparison in the absence of unified national pricing systems.

Data on HRT pricing and availability were obtained through country-specific, validated source pathways identified by MARIE investigators in each participating setting. Where formal national healthcare or pricing databases existed, these were used. In countries without a single centralised pricing repository, data were collected from locally appropriate and verified sources, including institutional formularies and pharmacy price records routinely used within clinical practice. Given the heterogeneity in regulatory structures, levels of digitisation, and data governance across participating countries, a uniform data source was neither available nor methodologically appropriate. Where multiple sources existed within a country, the most representative and consistently accessible source was selected by the local research team to ensure comparability across settings.

Cost analysis and affordability measure

Affordability was assessed using the number of days of minimum wage required to purchase a defined supply of HRT, a standard proxy used in access-to-medicines research to enable cross-country comparison of financial burden. This measure reflects population-level economic accessibility rather than individual affordability and does not account for variations in employment status, insurance coverage, or informal income structures.

The affordability of HRT medicines is crucial for understanding economic disparities. It was measured by the number of days of minimum wage required to buy a two-month supply of HRT, providing a clear, comparable metric for assessing financial burden, a widely used proxy in health economics for evaluating financial accessibility in settings with high out-of-pocket expenditure. Many women in LMICs pay out-of-pocket for healthcare, making direct cost comparisons insufficient. By framing affordability in terms of workdays needed, we offer a tangible measure of financial strain.

Additionally, we collected Gross National Income (GNI) per capita data from World Bank reports to contextualize these affordability findings. GNI per capita serves as a macroeconomic indicator of a country's wealth, and when combined with minimum wage data, it clarifies how income levels impact healthcare accessibility. Among the studied countries, Brazil and Malaysia are Upper-Middle-Income countries, while the others are LMICs. This dual measure enables a standardized comparison across countries with varying economic conditions. Furthermore, menopausal women in these settings often balance paid work with unpaid caregiving responsibilities, amplifying both financial and physical burdens. GNI per capita¹⁹ and minimum wage per day²⁰ for each country are provided in Supplementary Table S1.

Availability in this study was defined as the documented presence of HRT medicines and menopause-related services within the health system sources assessed by each country team, including formularies, pharmacy records, and service listings. This reflects system-level availability within the data sources used and does not imply universal or consistent access across all regions or facilities within a country.

Outcome measures

The primary outcome of interest was the female workforce availability, cost, and affordability of HRT medicines alongside several secondary outcomes, as described below;

- Female labour force participation in the selected countries
- Availability of HRT medicines and menopause-related gynaecological and surgical services by assessing the number and type of HRT medicines and services available in each country. The list of medicines and services was initially developed by consultation among the MARIE project members.
- The cost of HRTs and menopause-related gynaecological and surgical services were calculated as the price of individual medicines and services, which were collected in local currencies and converted to USD for standardisation.
- The affordability of HRTs and menopause-related gynaecological and surgical services is calculated by dividing each prescription's price (usually for two months) by the daily minimum wage in each country and the annual supply of medicines GNI per capita income.

Some of the items reported in the study may not be directly classified as the HRT treatment, for example, Mirena, primarily used for contraception and treatment of heavy menstrual bleeding, was included in our analysis due to its off-label use in managing menopausal symptoms. Similarly, surgical procedures included in the analysis were selected based on their potential association with menopause-related health conditions, such as gynaecological visit, hysterectomy, ovarian surgeries and other services named in the services list.

Data analysis

Data were analysed descriptively, measuring affordability as the minimum wage days needed to buy a two-month HRT prescription. A comparison of six countries highlighted availability, pricing, and affordability variations. Higher-income countries like Brazil and Malaysia were contrasted with lower-income countries such as Ghana and Nepal to assess the financial accessibility of HRT in different economic contexts. The data facilitated a comparison of available medicines and costs in each country.

Ethical considerations

This study did not involve human subjects or personal health data, so no ethical approval was needed. All data used were from publicly available sources or established local databases.

Results

This section presents findings on the availability, cost, and affordability of HRT across the studied countries, alongside its potential economic impact. We examined disparities in availability, variations in pricing, and affordability measures in relation to income levels and the number of minimum wage workdays required for treatment. Additionally, we assess female workforce participation across the studied countries, providing context for understanding how HRT availability, cost, and affordability may influence women's continued employment and contribute to the broader workforce economy.

Female labour force participation

Supplementary Figure S1 highlights female labour force participation and gender equality worldwide. The top left map shows countries where women have equal job access without spousal permission. In the 2015 bubble chart, older women (45–54) generally participate more in the workforce than younger women^{25–34}, with Nepal having the highest rate for both age groups. The 2022 bar chart shows Ghana leading female participation at 65% and Nepal at 28%, with Brazil and Nigeria at 54% and 52%. The line graph (1991–2022) reveals stable participation in Brazil and Ghana but a decline in Sri Lanka. The 2022 unemployment map shows Brazil's low rate (4%) amid higher rates elsewhere.

Availability of HRT medicines and related services across selected countries

Table 1 summarises the availability of HRT medicines and menopause-related gynaecological services across Brazil, Ghana, Malaysia, Nepal, Nigeria, and Sri Lanka. Brazil offers 18 out of 20 HRT options, closely followed by Nigeria with 17. Ghana and Nepal have the most limited access, with six and three medicines available, respectively. Sri Lanka provides a moderate selection of nine medicines.

In gynaecological services, Sri Lanka stands out with the broadest range of basic and advanced procedures, including laparoscopic cystectomy and sacral colpopexy. Nepal, despite limited medicines, offers essential surgeries like abdominal and radical hysterectomies. Brazil, Ghana, Malaysia, and Nigeria show significant gaps in both medicines and procedures, reflecting potential limitations in healthcare for menopause-related needs. Brazil and Nigeria excel in HRT availability, while Sri Lanka leads in comprehensive gynaecological services.

Cost of HRT medicines and related services across selected countries

The data shows significant cost disparities between HRT medicines and menopause-related gynaecological services across Brazil, Ghana, Malaysia, Nepal, Nigeria, and Sri Lanka. Brazil offers a broad range of HRT options at moderate prices, like Angeliq at \$36.7 (£28.23), while Nigeria, despite wide availability, shows high prices, with

Angeliq at \$598.5 (£460.85). The Mirena Coil ranges from \$51.1 (£39.37) in Nepal to \$201.9 (£155.48) in Sri Lanka. Malaysia and Ghana offer lower prices for some medicines, such as Progynova at \$0.2 (£0.12) in Malaysia compared to \$29.2 (£22.46) in Nigeria.

Menopause-related service costs also vary widely: an abdominal hysterectomy is \$474.5 (£365.40) in Nepal and \$1,235.8 (£951.55) in Sri Lanka, with basic consultations cheaper in Ghana (\$16.1 / £12.38) and Nepal (\$3.6 / £2.75) than in Brazil (\$82.5 / £63.52). Advanced procedures like Sri Lanka's laparoscopic cystectomy cost \$955.7 (£735.87), highlighting limited access and high costs for complex care in low-resource areas. Further details are provided in Table 2. Missing cost data for certain procedures reflect limitations in data availability rather than absence of services, and this has been explicitly indicated in the tables.

Affordability of HRT across different countries

Figure 1 highlights the major disparities in the affordability of HRT medicines and menopause-related procedures across LMICs, measured in days of minimum-wage work. For medicines (Fig. 1a), costs vary widely: Brazil's Mirena Coil requires 21.31 days of wages, while Malaysia's Progynova costs only 0.01 day, though the Mirena Coil is 12.69 days. In Nepal, Depo Provera is affordable at 1.34 days' wages, whereas Nigeria faces severe affordability issues, with Angeliq priced at 260.07 days' wages and Sri Lanka's Mirena Coil at 153.54 days. HRT affordability was calculated using a two-month supply.

Medicines	Brazil	Ghana	Malaysia	Nepal	Nigeria	Sri Lanka
Angeliq	✓	x	x	x	✓	x
Combipatch	✓	x	x	x	✓	x
Depo Provera	x	x	x	✓	x	✓
Duavee	✓	x	x	x	✓	x
Estradot	✓	x	x	x	✓	x
Evorel	✓	✓	x	x	✓	x
Femosten Conti Patches	✓	x	x	x	✓	✓
Femoston mono	x	x	x	x	x	✓
Femhrt	✓	x	x	x	✓	x
Lenzetto	✓	x	x	x	✓	x
Mirena Coil	✓	✓	✓	✓	✓	✓
Oestrogen Only Spray	✓	x	x	x	✓	x
Primerin vaginal cream	x	x	x	✓	x	✓
Progynova	✓	✓	✓	x	✓	✓
Prometrium	✓	x	✓	x	✓	x
Provera	✓	✓	✓	x	✓	x
Sandrena	✓	x	x	x	✓	x
Testosterone	✓	✓	✓	x	✓	x
Tibolone	✓	x	✓	x	✓	✓
Vaginal Oestrogen	✓	✓	✓	x	✓	x
Procedures						
Abdominal Hysterectomy	✓	✓	✓	✓	✓	✓
Bartholian Cyst	x	x	x	x	x	✓
Consultation with a Gynaecologist	✓	✓	✓	✓	✓	✓
Dilation and Curettage (D&C)	✓	✓	✓	✓	✓	✓
Endoscopic Retrograde Cholangio- Pancreatography	✓	✓	✓	✓	✓	✓
Examination under Anaesthesia	✓	✓	✓	✓	✓	✓
Hysterectomy	✓	✓	✓	x	✓	✓
Lap. Cystectomy / Ovarian Cyst	✓	✓	✓	✓	✓	✓
Lap. & Dye Test	x	x	x	x	x	✓
Laparoscopic Radical Trachelectomy	x	x	x	x	x	✓
Laprosopic Sacral Colpopexy (LSCS)	x	x	x	x	x	✓
Mayomectomy	x	x	x	x	x	✓
Normal Vaginal Delivery	✓	✓	✓	✓	✓	✓
Oophorectomy	✓	✓	✓	✓	✓	✓
Radical Hysterectomy	✓	✓	✓	✓	✓	✓
Salpingectomy	✓	✓	✓	✓	✓	✓
Total Abdominal Hysterectomy (TAH)	✓	✓	✓	✓	✓	✓
Ventral Hernia Repair (VHR)	✓	✓	✓	✓	✓	✓

Table 1. Availability of HRT medicines and related services across selected countries.

For procedures (Fig. 1b), Sri Lanka generally requires fewer workdays. Basic gynaecologist consultations take less than two days of work in all countries, with Nepal at just 0.8 days. Complex surgeries, such as laparoscopic trachelectomy in Sri Lanka, cost up to 48 days' wages, while abdominal hysterectomies in Nepal range from 20 to 40 days. Brazil, Ghana, and Nigeria face higher wage burdens for surgeries like hysterectomies, requiring 34–40 days.

Affordability by income also varies between the countries (Table 3). Brazil's Mirena Coil consumes 9.84% of annual income, Ghana's reaches 51.72%, and Malaysia offers low-cost options like Progynova at 0.01%. Nigeria struggles with extreme costs, where Angeliq is 221.52% of annual income. Basic consultations are affordable across all countries for procedures, while major surgeries cost up to 2% of income in Brazil and Nepal, posing significant financial challenges. Sri Lanka offers the lowest costs for basic and advanced surgical care, while higher costs in Brazil, Ghana, and Nigeria indicate considerable financial barriers to complex care.

Discussion

This study provides novel multi-country evidence on economic barriers and disparities in access to hormone replacement therapy across LMICs. The findings demonstrate substantial variation in availability, pricing, and affordability, highlighting significant inequities in access to essential menopause care. These findings highlight substantial inequities in access to menopause care, particularly in LMICs where high out-of-pocket costs, limited availability, and fragmented health systems restrict access to essential therapies. The observed disparities align with broader evidence on inequitable access to medicines and health services in resource-constrained settings.

The findings are consistent with broader evidence on inequities in access to essential medicines in LMICs, where high out-of-pocket expenditure and limited health system financing constrain access to care. Addressing these barriers will require policy interventions, including improved financing mechanisms, integration of menopause care into primary healthcare, and strengthening of supply chains. Women in LMICs face high costs for HRT and essential gynaecological procedures, such as screenings for menopause-related risks like osteoporosis and cardiovascular disease. Williams et al. (2008) indicate that HRT is often unavailable or unaffordable, resulting in untreated symptoms. In contrast, high-income countries offer better access through subsidies and insurance, enabling consistent care^{21,22}. Limited healthcare infrastructure in LMICs further restricts access to quality menopausal care, as highlighted by the UN Population Fund and HelpAge International (2012), which note a shortage of facilities, trained providers, and medical supplies⁹. The high cost of HRT limits access for many women in LMICs, widening health disparities compared to HICs. While Brazil and Nigeria offer a greater variety of HRT options, prices remain unaffordable; in Nigeria, Angeliq costs \$598.51 (£460.58), equating to over 221.52% of income, while in Brazil, the Mirena coil costs \$164.65 (£123.60), or 9.84% of income. Surgical procedures such as hysterectomies are often out of reach financially, especially in rural areas. Ghana has only six available HRT options, while Nepal offers just three. Some medicines, like Depo-Provera in Nepal, are more affordable at \$1.76 (0.28% of income), but overall choices remain limited. Malaysia and Sri Lanka have mid-range pricing, yet the high cost of treatments like the Mirena coil—7.33% of income in Malaysia and 31.65% in Sri Lanka—makes access to advanced procedures, such as laparoscopic surgeries, difficult.

The significant proportion of healthcare costs relative to income highlights broader economic challenges, including GDP, health spending, and productivity. Countries with higher GDP, such as Brazil, tend to invest more in public healthcare, which helps lower out-of-pocket expenses. In contrast, Nigeria and Brazil struggle with high HRT costs due to limited health funding. Nigeria allocates only 3.6% of its GDP to healthcare, compared to Brazil's 9.2%, leading to potentially an affordability challenges. When treatment costs exceed 200% of monthly income in Nigeria, it severely limits women's access to care and impacts workforce participation.

Most HRT and procedural costs in LMICs are paid out-of-pocket due to limited insurance coverage and government subsidies, disproportionately affecting lower-income families²³. High costs force many women to forgo treatment for symptoms like hot flashes and fatigue, impacting their productivity. For example, in Brazil, the Mirena Coil costs nearly 10% of a woman's income, with regional disparities further limiting access. In Sri Lanka, even more affordable procedures may still be hard for low-income women to access. Increasing local production of affordable generic HRT and improving distribution in underserved areas could enhance accessibility. Additionally, rural women face travel costs and lost work hours to access care, worsening economic disparities. Strengthening rural healthcare in LMICs could reduce treatment access time and support workforce stability, boosting national productivity.

Comparison to high-income countries

This study represents a first structured, multi-country economic assessment of access to hormone replacement therapy across low- and middle-income settings using a standardised comparative framework. As such, there is limited directly comparable literature against which these findings can be benchmarked. The discussion therefore focuses on interpreting the patterns observed in availability, cost, and affordability within the context of broader evidence on access to medicines, health system constraints, and economic barriers to care. Where relevant, comparisons are drawn with adjacent literature; however, the findings presented here should be understood as contributing novel evidence to an underexplored area rather than confirming existing multi-country analyses.

Our findings highlight that the current HRT guidelines from HICs, such as those of the British Menopause Society (BMS), do not adequately address the realities faced by immigrant populations from LMICs. The BMS guidelines are tailored to resource-rich environments although it is often referred to by LMIC healthcare professionals, and catered primarily for Caucasian women, with healthcare infrastructure that supports regular consultations and personalised dosage adjustments²⁴. In the UK, HRT packaging varies significantly, with prescriptions often determined case-by-case by the physician based on patient needs and responses to treatment although NICE guidelines illustrate recommendations to maintain good practices²⁵. Patients also have options for private HRT treatments, such as testosterone therapy, that are not typically available through the NHS at

Medicine	Brazil	Ghana	Malaysia	Nepal	Nigeria	Sri Lanka
Angeliq	\$36.7 / £28.23	-	-	-	\$598.5 / £460.85	-
Combipatch	\$29.3 / £22.58	-	-	-	\$37.0 / £28.50	-
Depo Provera	-	-	-	\$1.8 / £1.36	-	\$1.8 / £1.36
Duavee	\$50.4 / £38.82	-	-	-	\$217.1 / £167.14	-
Estradot	\$24.8 / £19.06	-	-	-	\$8.3 / £6.38	-
Evorel	\$26.6 / £20.47	\$3.6 / £2.77	-	-	\$15.4 / £11.88	-
Femosten Conti Patches	\$32.1 / £24.70	-	-	-	\$38.0 / £29.28	\$17.8 / £13.67
Femoston mono	-	-	-	-	-	\$7.4 / £5.71
Femhrt	\$21.1 / £16.23	-	-	-	\$54.1 / £41.64	-
Lenzetto	\$48.6 / £37.41	-	-	-	\$23.0 / £17.73	-
Mirena Coil	\$164.7 / £126.78	\$192.9 / £148.56	\$142.3 / £109.54	\$51.1 / £39.37	\$57.0 / £43.91	\$201.9 / £155.48
Oestrogen Only Spray	\$41.3 / £31.76	-	-	-	\$25.0 / £19.27	-
Primerin vaginal cream	-	-	-	\$6.2 / £4.77	-	\$11.9 / £9.19
Progynova	\$13.8 / £10.59	\$5.4 / £4.16	\$0.2 / £0.12	-	\$29.2 / £22.46	\$7.4 / £5.71
Prometrium	\$18.3 / £14.11	-	\$0.6 / £0.42	-	\$14.1 / £10.87	-
Provera	\$11.9 / £9.17	\$15.2 / £11.73	\$0.1 / £0.07	-	\$4.1 / £3.14	-
Sandrena	\$15.6 / £12.00	-	-	-	\$9.4 / £7.25	-
Testosterone	\$32.1 / £24.70	\$73.0 / £56.17	\$1.1 / £0.84	-	\$14.6 / £11.21	-
Tibolone	\$24.8 / £19.06	-	\$0.4 / £0.29	-	\$37.6 / £28.98	\$9.0 / £6.91
Vaginal Oestrogen	\$15.6 / £12.00	\$14.2 / £10.90	\$13.6 / £10.43	-	\$18.8 / £14.49	-
Services						
Abdominal Hysterectomy	-	-	-	\$474.5 / £365.40	-	-
Bartholian Cyst	-	-	-	-	-	\$200.0 / £154.00
Consultation with a Gynaecologist	\$82.5 / £63.52	\$16.1 / £12.38	\$44.7 / £34.42	\$3.6 / £2.75	\$2.5 / £1.89	-
Dilation and Curettage (D&C)	-	-	-	-	-	\$510.8 / £393.31
Endoscopic Retrograde Cholangio-Pancreatography	-	-	-	-	-	\$510.8 / £393.31
Examination under Anaesthesia	-	-	-	-	-	\$100.0 / £77.00
Hysterectomy	\$3,666.0 / £2,822.84	\$578.8 / £445.66	\$3,129.2 / £2,409.48	-	\$94.1 / £72.46	\$1,235.8 / £951.55
Lap. Cystectomy / Ovarian Cyst	-	-	-	-	-	\$955.7 / £735.87
Lap. & Dye Test	-	-	-	-	-	\$823.9 / £634.36
Laparoscopic Radical Trachelectomy	-	-	-	-	-	\$823.9 / £634.36
Laposcopic Sacral Colpopexy (LSCS)	-	-	-	-	-	\$1,120.3 / £862.59
Mayomectomy	-	-	-	-	-	\$1,071.0 / £824.68
Normal Vaginal Delivery	-	-	-	-	-	\$790.9 / £608.99
Oophorectomy	\$2,749.8 / £2,117.36	\$450.2 / £346.62	\$2,235.1 / £1,721.06	\$346.2 / £266.60	\$94.1 / £72.46	-
Radical Hysterectomy	-	-	-	\$467.1 / £359.66	-	-
Salpingectomy	-	-	-	-	-	\$823.9 / £634.36
Total Abdominal Hysterectomy	-	-	-	-	-	\$1,235.8 / £951.55
Ventral Hernia Repair (VHR)	-	-	-	-	-	\$905.5 / £697.24

Table 2. Cost of HRT medicines and related services across the selected countries. Exchange rates: 1 unit of local currency to GBP and USD: Sri Lanka: 1 LKR = 0.0025 GBP, 0.0033 USD; Brazil: 1 BRL = 0.14 GBP, 0.18 USD; Nepal: 1 NPR = 0.0058 GBP, 0.0075 USD; Malaysia: 1 MYR = 0.18 GBP, 0.22 USD; Ghana: 1 GHS = 0.051 GBP, 0.064 USD; Nigeria: 1 NGN = 0.00049 GBP, 0.00063 USD; We included Depo-Provera only in countries where its off-label use for menopausal management was confirmed by local clinicians and pharmacists

present. In contrast, LMICs face significant resource limitations and cost barriers. Additionally, options like private testosterone therapy in the UK are not readily available in LMICs.

Beyond healthcare policies, differences in employment structures also shape access to HRT across LMICs and HICs. In LMICs, a substantial proportion of women work in labour-intensive, informal, or unregulated sectors, where employment often lacks job security, social protections, and employer-provided health benefits. As a result, out-of-pocket healthcare costs—including HRT—can impose a significant financial burden, potentially forcing women to forgo treatment altogether. Moreover, the physically demanding nature of informal sector jobs may amplify the effects of untreated menopausal symptoms, further limiting women's ability to sustain employment.

In contrast, women in HICs are more likely to work in formal employment sectors where legal protections, employer-sponsored healthcare schemes, and state-funded prescriptions reduce—but do not eliminate—financial barriers to HRT. However, disparities persist, particularly among lower-income workers in HICs who

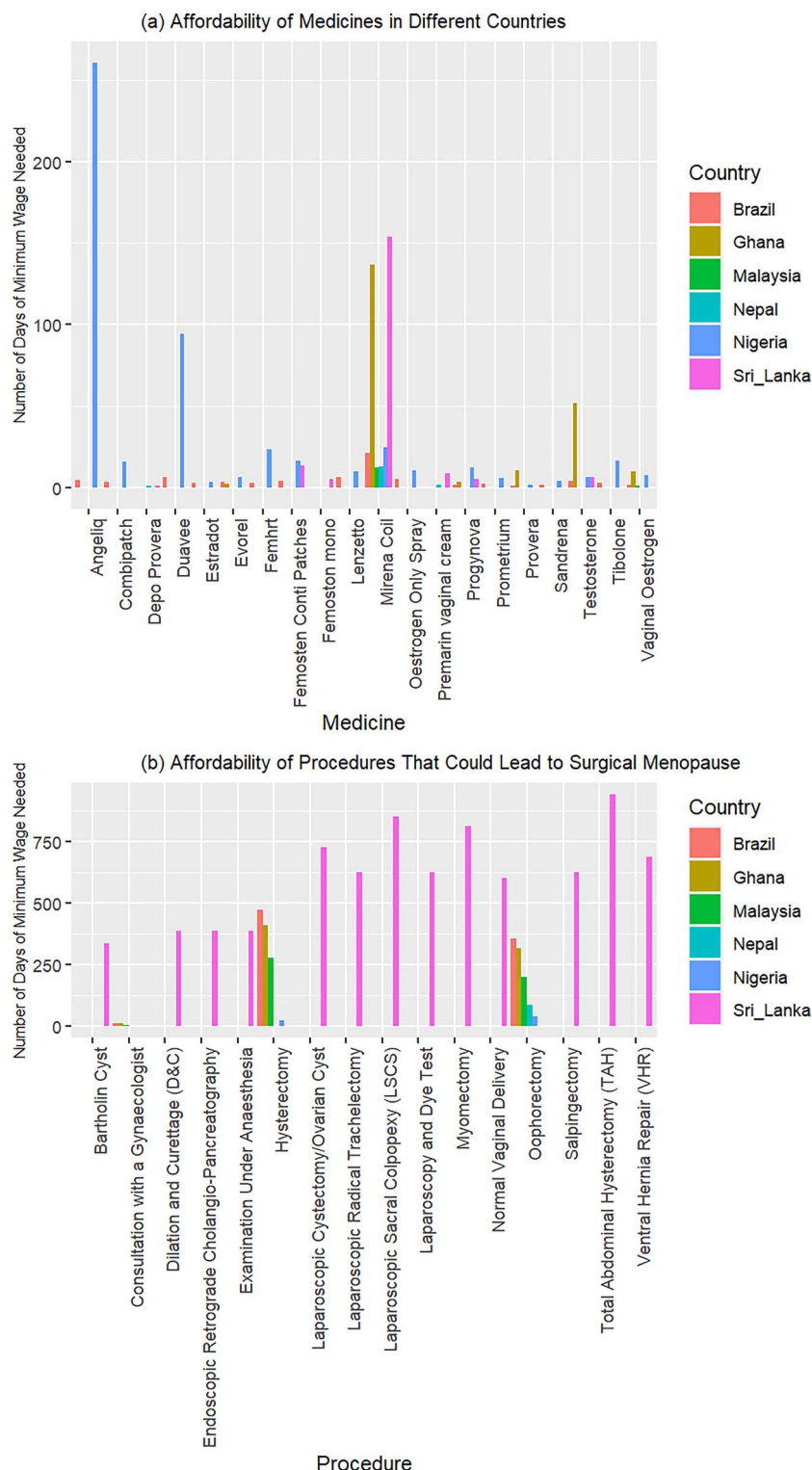


Fig. 1. (a) Affordability of medicines in different countries (b) Affordability of procedures that could lead to surgical menopause.

may not have comprehensive insurance coverage or who face indirect costs such as consultation fees. Even within the UK, where HRT is free in Scotland, Wales, and Northern Ireland and available in England for £19.30 per year under a Prescription Prepayment Certificate, additional treatments may still require separate payment²⁶. Migration from LMICs to HICs presents both opportunities and challenges for accessing HRT. While migrants generally find more treatment options in HICs, they often encounter healthcare systems that may not fully meet their needs. Factors such as employment type, financial constraints, and cultural beliefs can influence whether

Medicines	Brazil	Ghana	Malaysia	Nepal	Nigeria	Sri Lanka
Angeliq	2.19%	-	-	-	221.52%	-
Combipatch	1.75%	-	-	-	13.70%	-
Depo Provera	-	-	-	0.28%	-	0.28%
Duavee	3.01%	-	-	-	80.34%	-
Estradot	1.48%	-	-	-	3.06%	-
Evorel	1.59%	0.97%	-	-	5.71%	-
Femosten Conti Patches	1.92%	-	-	-	14.07%	2.78%
Femoston mono	-	-	-	-	-	1.16%
Femhrt	1.26%	-	-	-	20.02%	-
Lenzetto	2.90%	-	-	-	8.52%	-
Mirena Coil	9.84%	51.72%	7.33%	23.17%	21.11%	31.65%
Oestrogen Only Spray	2.46%	-	-	-	9.26%	-
Premarin vaginal cream	-	-	-	2.81%	-	1.87%
Progynova	1.38%	3.82%	0.01%	-	12.68%	5.63%
Prometrium	1.10%	-	0.03%	-	5.23%	-
Provera	0.71%	4.09%	0.01%	-	1.51%	-
Sandrena	0.93%	-	-	-	3.48%	-
Testosterone	1.92%	19.56%	0.06%	-	5.39%	-
Tibolone	1.48%	-	0.02%	-	13.93%	1.41%
Vaginal Oestrogen	0.93%	3.79%	0.70%	-	6.97%	-
Procedures						
Bartholin Cyst	-	-	-	-	-	4.40%
Consultation with a Gynaecologist	0.80%	0.70%	0.40%	0.30%	0.20%	-
Dilation and Curettage (D&C)	-	-	-	-	-	5.10%
Endoscopic Retrograde Cholangio-Pancreatography	-	-	-	-	-	5.10%
Examination Under Anaesthesia	-	-	-	-	-	5.10%
Hysterectomy	36.50%	25.90%	31.20%	-	5.80%	-
Laparoscopic Cystectomy/Ovarian Cyst	-	-	-	-	-	9.50%
Laparoscopic Radical Trachelectomy	-	-	-	-	-	8.20%
Laparoscopy and Dye Test	-	-	-	-	-	8.20%
Laparoscopic Sacral Colpopexy (LSCS)	-	-	-	-	-	11.20%
Myomectomy	-	-	-	-	-	10.70%
Normal Vaginal Delivery	-	-	-	-	-	7.90%
Oophorectomy	27.40%	20.10%	22.30%	26.20%	5.80%	-
Salpingectomy	-	-	-	-	-	8.20%
Total Abdominal Hysterectomy (TAH)	-	-	-	-	-	12.30%
Ventral Hernia Repair (VHR)	-	-	-	-	-	9.00%

Table 3. Affordability of HRT medicines and procedures based on the percentage of Gross National Income (GNI) per capita required to buy annual supply of HRT medicines or a single procedure.

migrant women seek and adhere to HRT treatment. Culturally competent healthcare in HICs can play a key role in providing tailored education to help migrants navigate the system and make informed decisions, potentially reducing care discontinuation due to misunderstandings.

Significant variation in HRT access exists within the UK, particularly among deprived and ethnic minority populations, a challenge even more pronounced in LMICs. Funders often reduce deprivation to economic issues, but our findings show that barriers to HRT in these regions extend beyond income level²⁷. Despite many educated women in LMICs, HRT use remains low due to limited availability, high costs, and varied pricing, highlighting the need for a nuanced understanding of HRT accessibility.

Socioeconomic and cultural implications

Labour force participation among women is higher in HICs like Australia and Scandinavia, thanks to better access to education, economic opportunities, and supportive policies such as paid family leave and childcare²⁸. These measures help women remain in the workforce and boost national economic productivity. In contrast, LMICs face barriers such as limited education, cultural constraints, and fewer economic resources, which result in lower female participation in the workforce^{29,30}. In HICs, women typically retire around 65 due to supportive retirement policies, while in LMICs, they often retire earlier due to economic necessity and job demands^{29,30}. Untreated menopausal symptoms—such as hot flashes, depression, and anxiety—can lead to social isolation and reduced productivity, negatively affecting family and community involvement^{29,30}.

Untreated menopause raises the risk of long-term health issues like cardiovascular disease and osteoporosis, straining healthcare systems. Additionally, menopause-related symptoms extend beyond physical health, significantly affecting mental well-being, including increased risks of depression, anxiety, and cognitive difficulties³¹. The economic impact includes high absenteeism, decreased efficiency, and early retirement, leading to significant losses. Investing in menopausal care, such as HRT and gynaecological services, offers a strong return on investment, enhancing workforce productivity, reducing absenteeism, and supporting gender equality in leadership roles^{29,30}.

Australia's dedicated funding for women's health, particularly in menopause research, illustrates how targeted investments can improve health outcomes and workforce participation³². Similar funding models in LMICs through subsidies, local HRT production, and awareness campaigns could enhance health outcomes and economic resilience²⁹. Investing in menopausal care in LMICs may yield even greater returns by preventing economic losses from untreated symptoms, thus improving workforce productivity and reducing long-term healthcare costs. Investing in this area is a beneficial economic strategy that supports individual health and national growth^{29,30}.

Practical implication

Disparities in the affordability of HRT medications hinder access to menopausal care and impact female labour force participation (FLFP) and socioeconomic outcomes. The U-shaped curve of FLFP in relation to economic development, as noted by Goldin (1995)³³ and Jayachandran (2022)³⁴, shows that initial economic advancement can reduce FLFP due to limited formal job opportunities and societal barriers, before stabilizing with increased employment and educational opportunities for women.

In LMICs, women's labour participation is mainly driven by economic necessity, compounded by restricted access to affordable healthcare. While menopausal symptoms can impact work performance, the direct link between HRT access and workforce participation remains understudied and requires further research. Additionally, unmanaged menopausal symptoms may contribute to productivity loss, but comparative analyses with other health burdens, such as untreated iron deficiency anaemia, are necessary to establish priorities in resource-limited settings. Sub-Saharan Africa shows high female labour force participation as a survival strategy, while HICs like Norway and Sweden offer policies that support career advancement and family life. Hence, such studies are important.

In LMICs, insufficient policy support, high costs, and limited HRT availability exacerbate health and social inequalities. Untreated menopausal symptoms can negatively affect productivity and economic growth. While younger women increasingly participate in the workforce due to recent reforms, older women face higher dropout rates driven by societal expectations and restricted healthcare access. To address these challenges, governments should implement healthcare reforms that lower the cost of essential HRT treatments and menopause-related procedures through direct subsidies and price regulations in public healthcare. Improving access to HRT and menopause care may increase utilisation, helping to reduce health and social inequalities, enhance workforce participation among older women, and contribute to overall economic growth. Public health campaigns can help raise awareness about menopause and normalise discussions on HRT, reducing stigma and encouraging women to seek care³⁵. Training healthcare providers in underserved areas to manage menopausal symptoms and provide accurate HRT information is crucial^{36–38}. Pharmaceutical companies should focus on producing affordable generic HRT options. Policy interventions should prioritise affordable HRT access, educational programs on its benefits, and gender-equitable employment policies. Enhancing healthcare access could support women's well-being and economic development. Future research should explore the long-term health impacts of limited HRT access and the influence of cultural factors on menopause-related care.

Addressing knowledge gaps in menopausal healthcare in LMICs requires dedicated funding and focused research. Menopause significantly impacts women's health, yet research remains underfunded. Investing in affordable HRT R&D is essential for ethical reasons and potential economic gains, as improved health can enhance productivity and reduce healthcare costs. Future funding should prioritize local HRT production, healthcare financing policy analyses, and evaluations of the economic benefits of menopausal care. Expanding HRT access would promote healthier ageing, support workforce continuity, and drive economic growth, highlighting the need to invest in women's health.

To address the economic and structural barriers identified in this study, we propose several actionable strategies that align with global health priorities set by the WHO and UNFPA. First, promoting local production of affordable generic HRT can reduce dependence on costly imports and improve price stability. Second, strengthening supply chains is essential to minimise stockouts and ensure consistent availability, particularly in rural and underserved regions. Finally, implementing targeted subsidies for vulnerable populations can reduce out-of-pocket expenditure and improve equitable access to care. These recommendations support the WHO's Universal Health Coverage (UHC) framework and UNFPA's focus on reproductive health equity, providing a roadmap for policymakers to reduce disparities in menopausal care and enhance women's health outcomes globally (Table 4).

Strengths and limitations

This study's broad geographical scope enables comparisons across six LMICs, shedding light on global disparities in HRT access. By assessing affordability in terms of minimum wage days for purchasing HRT or covering procedural costs, it reveals the financial burden on poorer households. Additionally, measuring affordability against GNI per capita provides insight into average household access, highlighting economic barriers to essential services in LMICs.

This study has several limitations. Data were collected through a combination of publicly available sources and locally validated data pathways identified by MARIE investigators across participating countries which took

Priority area	Recommended action	Expected impact	Alignment with WHO/UNFPA goals
Local production of generic HRT	Incentivise domestic manufacturing of affordable HRT formulations	Lower medicine costs, improved price stability, sustainable access	Supports UHC and essential medicines security
Strengthening supply chains	Improve forecasting, distribution systems, and rural coverage	Reduced stockouts, consistent availability across regions	Aligns with WHO essential medicines framework
Targeted subsidies for underserved populations	Introduce subsidies or voucher systems for low-income women	Lower out-of-pocket costs, improved equity in access to care	Promotes reproductive health equity under SDGs

Table 4. Priority areas and recommendations.

a considerable amount of time. While this approach reflects real-world data practices and strengthens contextual relevance, differences in how data are recorded, accessed, and maintained across settings may affect comparability. The study presents system-level estimates and pricing within countries. The analysis focuses on economic access to HRT and does not directly evaluate associated clinical outcomes which reflects the defined scope of the study and highlights an important area for future research linking access to health and socioeconomic outcomes.

The use of secondary data sources may introduce variability in data completeness and comparability across countries. And, reliance on pharmacy and institutional pricing may not fully capture regional price variation within countries. The absence of standardised national pricing databases in some settings required triangulation of data sources. Finally, the findings reflect system-level patterns and may not fully capture individual-level access experiences.

Conclusions

This study emphasises the need for equitable access to HRT medicines and services in LMICs, highlighting significant gaps in availability and affordability. Women in certain regions face barriers to necessary care, which can hinder their career advancement and long-term employment. These challenges impact the female workforce and limit economic potential, as their participation is crucial for GDP growth. Enhancing access to affordable HRT can reduce the health burden of menopause, leading to improved well-being and productivity. Policy changes and efforts from manufacturers to lower costs are essential, along with more research to fully understand and address these disparities.

Data availability

The data shared within this manuscript is available within government organisations’ and their ministries or department’s of health and in public reports.

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Author contributions

GD conceptualised the MARIE project as part of the ELEMI program. GD conceptualised the economic analysis with SK. First draft was written by SG and furthered by SK and GD. Data collection was completed by SG, TM, VP, TTH, CLBP, IA, GUE and FK. SG conducted the analysis. All authors critically appraised, reviewed and commented on all versions of the manuscript. All authors read and approved the final manuscript. VP formatted and submitted all the versions of the manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics approval

Not applicable as the study utilised exclusively secondary, non-identifiable, and publicly available data sources.

Consent for publication

All authors consented to publish this manuscript.

Additional information

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Correspondence and requests for materials should be addressed to V.P.

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