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Advocating for an integrated healthcare model for women of reproductive age in low- and middle-income countries

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ABSTRACT

Increasingly, women are presenting in pregnancy with multi-risk and multi-morbidity profiles (combinations of pro-inflammatory diets, trauma, anxiety, depression, infections, metabolic disease, and chronic medication use); together these may independently or interactively impact fetal development. Research indicates that high levels of pro-inflammatory cytokines in the maternal womb, as well as the balance between pro- and anti-inflammatory cytokines, affect the brain development of offspring in a sexually dimorphic way that persists into late adulthood. Despite increased recognition, healthcare systems particularly in low- or middle-income countries remain siloed and have limited resources. This commentary argues for integrated healthcare strategies that transcend traditional maternal and child health frameworks and critiques the traditional disease-centric models that overlook systemic inequities and instead advocates for integrated, equity-driven healthcare solutions tailored to LMIC contexts. It proposes a life course approach, emphasizing the importance of considering temporal dynamics and socio-economic contexts in research on women of reproductive age in poorly resourced contexts.

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Health inequalities; health promotion; model

Background

Over the past decade, growing evidence highlights the need to rethink how we understand the healthcare needs of women of reproductive age, especially in developing contexts. The health of women of reproductive age is increasingly defined by the coexistence of multiple morbidities across different life stages, often going undetected until pregnancy (Brumana et al., 2017; Mendenhall & Weaver, 2014). These complex health challenges are exacerbated in low- and middle-income countries (LMICs), where the prevalence of multi-morbidity among women is notably high and often linked to broader socio-economic and environmental factors (Achoki et al., 2022; Nakanishi et al., 2023) often going undetected until pregnancy (Adam & Rheeder, 2017; Chivese et al., 2019; Macaulay et al., 2018; Redinger et al., 2018).

The prevalence of multimorbidity across 54 countries, 10 Low- and Middle-Income Countries (LMICs) and 44 High Income Countries (HICs), is estimated to be 37.2%, with females accounting for 39.4% (Nakanishi et al., 2023). Multi-morbidity is more acute in populations that bear a disproportionate burden of communicable diseases (CDs), and non-communicable diseases (NCDs) such as diabetes, hypertension, anaemia, obesity, cardiovascular, and mental health conditions (Achoki et al., 2022; Roomaney et al., 2022). Four changeable behavioral risk factors significantly contribute to the development of NCDs: tobacco use, poor diet, lack of physical activity, and excessive alcohol consumption (Achoki et al., 2022; Forouzanfar et al., 2015), contributing to the complexity of multi-morbidity in LMICs.

Women in LMICs face significant health challenges, including being ten times more likely to have obesity or heart health issues than men (Rocha et al., 2022), accounting for 56% of human immunodeficiency virus (HIV) cases in western and central Africa and 59% in eastern and southern Africa (Girum et al., 2018), and experiencing mental health issues, with depression consistently higher among females than males (prevalence ratio 1.1–2.2) (Greene et al., 2021). Additionally, one in two women in LMICs are disproportionately affected by gender-based violence (GBV) (World Health Organization, 2021) which further compounds these health challenges, contributing to long-term physical and mental health consequences. In addition to biological changes, socio-economic factors and environmental exposures, such as shifts from minimally processed to ultra-processed foods, are key drivers of this complex health landscape. The growing prevalence of diet-related conditions like obesity, hypertension, and diabetes among women in LMICs contributes to the double burden of malnutrition and NCDs (Alem et al., 2023; Brumana et al., 2017; Stephenson et al., 2018). Studies conducted in LMICs like South Africa reveal concerning trends that highlight the broader context of these health challenges: 30% of the population is affected by NCDs such

as cardiovascular disease, diabetes, and cancer. Research highlights the troubling intersection of NCDs, physical inactivity, and obesity in women. Despite overall rates of physical inactivity dropping slightly between 2012 and 2020, women remain more likely to be inactive than men (Mlangeni et al., 2018), which contributes to high rates of obesity and associated risks like gestational diabetes and cardiovascular diseases (Lundeen et al., 2016; Macaulay et al., 2018; Neethling et al., 2022).

In Soweto, a large urban township in South Africa, a sizeable proportion of women are overweight or obese by age 22 and during pregnancy (Lundeen et al., 2016; Prioreshi et al., 2021), increasing the risk of gestational diabetes and cardiovascular diseases (Macaulay et al., 2018; Wrottesley et al., 2021). Also, in South Africa, the estimated HIV prevalence among adults aged 15 to 49 years is 26.3% for women and 14.8% for men (Palanee-Phillips et al., 2022). Additionally, in Soweto, antenatal depression rates were found to be between 30% and 40% (Brittain et al., 2015; Rochat et al., 2011; Rotheram-Borus et al., 2011; Tomlinson et al., 2014). Maternal health issues, particularly mental health disorders, have far-reaching implications. Depression, for instance, is not only more prevalent in women but can also persist through the reproductive years, affecting not just the mother's well-being but also the developmental outcomes of her offspring (Redinger et al., 2020). The presence of maternal mental health disorders, compounded by conditions such as obesity and infection, exacerbates the low-grade inflammatory state of pregnancy, characterized by elevated circulating pro-inflammatory cytokines. This inflammatory state, intensified by maternal mental stress, has been linked to fetal metabolic programming and an imbalance in pro- to anti-inflammatory cytokines, resulting in adverse long-term effects on fetal brain development in a sexually dimorphic manner (Akoto et al., 2021; Prioreshi et al., 2021). Evidence suggests that for women of reproductive age choosing to become pregnant, antenatal care often begins too late to mitigate these detrimental health risks to the developing fetus (Dean et al., 2013).

These maternal health challenges in LMICs like South Africa are further exacerbated by the widespread occurrence of disrespect and abuse (D&A) during childbirth, which highlights significant gaps in the quality of care provided to women (Mira-Catalá et al., 2024). Such mistreatment, which includes verbal abuse and denial of essential care, compounds the already complex healthcare needs of women, placing additional strain on the public health system (Malatji & Madiba, 2020). In these contexts, adverse health outcomes continue to manifest in younger women, and healthcare systems are often unable to meet their diverse needs (Basto-Abreu et al., 2022; Hajat & Stein, 2018; Kowal et al., 2015). The co-existence of multiple health disorders at different life stages challenges the traditional separation of chronic, acute, communicable, and non-communicable diseases. In LMICs like South Africa, this complex health burden is costly to the public health system, making it essential to reduce the cost of public health interventions (Shandu et al., 2024). Given these challenges, it is crucial to reform healthcare systems in LMICs to address the complex, multi-faceted healthcare needs of women. This includes developing targeted diagnostic tools, interventions, and support systems that go beyond maternal and child healthcare and tackle the broader spectrum of health for women of reproductive age in a holistic way (Basto-Abreu et al., 2022).

A conceptual model for the integrated healthcare of women of reproductive age

Using Bronfenbrenner's bio-ecological process-person-context-time (PPCT) model, this conceptual model (see Figure 1) illustrates the complex relationship between multimorbidity, risk behaviours, and social determinants across life stages in LMICs with constrained healthcare services. This model shifts away from traditional disease-centred approaches by emphasizing the dynamic interactions between individual health behaviours, environmental determinants, and temporal factors, such as critical health periods, often overlooked in previous ecological models. The model connects micro-level influences, such as individual behaviours and health literacy, with macro-level determinants, including systemic healthcare inadequacies and socio-economic disparities. This holistic approach provides a comprehensive understanding of health outcomes, particularly in resource-limited settings.

Rather than focusing solely on individual diseases in pregnant women, typically identified during the first antenatal visit, we advocate for a temporally informed life course perspective on women's health (Aagaard-Hansen et al., 2019; Lynch & Smith, 2005). This approach departs from other health models (Hanson et al., 2017) and recognises the importance of integrating preconception care into healthcare systems (Barker et al., 2018; Fleming et al., 2018; Public Health England, 2018). We argue that preconception, pregnancy, and postnatal periods are critical life stages, with healthcare system shortcomings, such as understaffing, poor infrastructure, and management gaps, exacerbating the challenges faced during these periods.

Healthcare system challenges intersect with social determinants like poverty, health literacy, social support, trauma exposure, food insecurity, and housing instability, which collectively influence maternal health and wellbeing, fetal development, and long-term child health outcomes (Kruk et al., 2018). These social determinants operate at multiple ecological levels: the microsystem (e.g. individual behaviours and health literacy), mesosystem (family and social support), and exosystem (broader socioeconomic and healthcare structures). They mediate or moderate the risks affecting maternal health and long-term child development.

The model illustrates how interconnected ecological layers, in combination with modifiable risk behaviours, contribute to the development of CD and NCD multimorbidity across the life course. It thus offers a framework for context-sensitive interventions that address these complexities at multiple levels.

A focus on lifestyle interventions across life stages

A core component of this framework is the promotion of lifestyle interventions at various life stages. Intervening at the individual level through behaviour change, such as promoting healthier diets, regular physical activity, cessation of substance use,

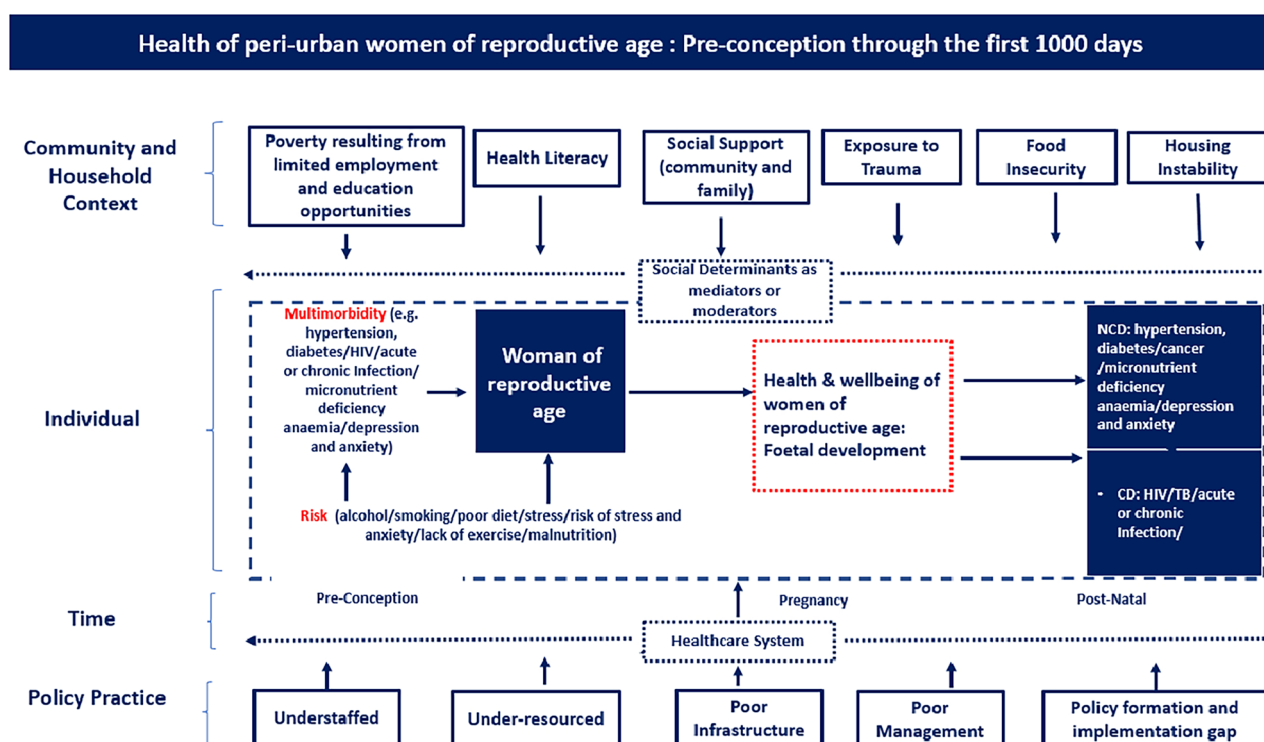


Figure 1. A conceptual model for the health and wellbeing of women of reproductive age.

Figure 1 represents the relationship between the health and wellbeing of women of reproductive age, influenced by multi morbidity, risk behaviours and social determinants across different life stages: pre-conception, pregnancy, and post-natal.

and enhanced health literacy, can mitigate health risks, facilitate early detection of chronic diseases or infections, and ensure timely linkage to care (Hanson et al., 2017).

The integration of delivery mechanisms like telemedicine, community health education programs, and services administered by community health workers (Diab & Flack, 2013; Norris et al., 2022; Taneja et al., 2022) is emphasized for their cost-effectiveness and contextual relevance. These approaches are more likely to gain community uptake, thereby enhancing their sustainability. For example, a study in Soweto, part of the HeLTI initiative (see Norris et al., 2022), demonstrated that a text-messaging intervention significantly improved adherence to micronutrient supplementation, resulting in better haemoglobin status (Soepnel et al., 2022). Similarly, the Bukhali trial, also part of HeLTI, showed that additional nutrition support provided by dietitians empowered women in Soweto to prioritize health and nutrition, even in the face of significant contextual challenges (Mogashoa et al., 2024).

Culturally relevant approaches and ecological integration

Culturally relevant interventions, such as promoting indigenous physical activities (Shandu et al., 2024) and anti-inflammatory traditional diets (Ngidi, 2023), can also be integrated into this model at multiple ecological levels. At the microsystem level, these interventions target individual behaviours like diet and exercise, addressing food insecurity and improving the health of women of reproductive age maternal health during critical stages such as pregnancy (Ngidi, 2023; Wrottesley et al., 2017; 2022). At the mesosystem and exosystem levels, they strengthen community-based support and inform healthcare policies, ensuring that interventions are not only contextually appropriate but also sustainable.

A holistic approach to the health of women of reproductive age across the life course

This integrated framework broadens the healthcare perspective beyond reproductive outcomes, expanding it to include overall health and well-being across the life course. By emphasizing preconception care as a pivotal stage for intervention, the model acknowledges its critical role in addressing multimorbidity and mitigating downstream effects on maternal and child health. This life course approach moves away from the traditional focus on disease-specific outcomes, instead addressing the broader determinants of health that shape women's well-being from preconception through to postnatal periods.

Promoting health equity through policy and action

Improving the health of women of reproductive age in LMICs offers significant benefits for global health, advancing gender equality, reducing poverty, and achieving the sustainable development goals (SDGs) (United Nations Statistics Division, 2022).

Figure 2: Case Study of the Women and Infants Integrated Interventions for Growth Study (WINGS)

The WINGS study was a randomized factorial trial implemented in low and middle-income communities of Delhi, India. It assessed the effects of integrated health, nutrition, WaSH (nutrition, water, sanitation and hygiene), and psychosocial care interventions on birth outcomes and linear growth at 24 months. The study included 13,500 women, with 6,722 receiving preconception interventions and 6,778 receiving routine care. In the intervention group, community health workers visited homes weekly to reinforce interventions, replenish supplies, and help manage health conditions. This community-based intervention accounts for key social determinants while addressing health conditions and unhealthy behaviours. It significantly reduced low birth weight and stunting at 24 months when delivered during preconception, pregnancy, and early childhood. Preconception interventions alone improved birth outcomes but did not affect 24-month stunting. Pregnancy and early childhood interventions on their own positively impacted birth outcomes and reduced stunting at 24 months. However, the combined intervention approach was the most effective, improving both birth outcomes and long-term child growth.

(Taneja et al., 2022)

Figure 2. Case study of the women and infants integrated interventions for growth study (WINGS).

Meeting these goals requires a fundamental shift in healthcare policies: moving beyond viewing pre-conception, pregnancy, and post-natal health solely through a reproductive lens, and instead recognizing the intrinsic value of women's overall health and well-being, regardless of their decision to become pregnant or not. This necessitates a departure from established healthcare policies and an awareness of how past and current narratives may restrict women's autonomy by emphasizing maternal and child health outcomes over women's comprehensive health needs. Current policies often focus narrowly on maternal and child health, with care beginning only once a woman is pregnant. This approach overlooks the importance of preconception care and fails to address broader health issues, such as mental well-being, nutrition, and chronic conditions, which are vital for improving long-term health outcomes (Lassi et al., 2019).

To address these gaps, the WINGS study (see [Figure 2](#)) and early findings from the Bukhali trial provide actionable evidence for policy changes and interventions. These studies highlight the importance of integrating preconception and pregnancy care, with a focus on health literacy, micronutrient supplementation, and psychosocial support. Integrating community health worker-led approaches that incorporate health literacy materials and micronutrient supplementation can empower women to improve nutrition, physical health, and mental well-being before and during pregnancy (Norris et al., 2022). The concurrent delivery of interventions, including WaSH and psychosocial support during preconception and pregnancy, as demonstrated in the WINGS study, could enhance birth outcomes and reduce stunting (Taneja et al., 2022). Culturally relevant initiatives, such as promoting indigenous diets and physical activities, play a crucial role in addressing food insecurity and preventing adverse pregnancy outcomes (Shandu et al., 2024; Wrottesley et al., 2017, 2022). These approaches are vital because they align with local practices and values, making them more likely to be accepted and effective in improving maternal and child health outcomes.

Policymakers must recognize the need for integrated, responsive, person-centred approaches that prioritize the unique health needs of women across their lifespan to foster sustainable health (World Health Organization, 2015). By considering the health of women of reproductive age within their social and cultural contexts, these policies can ensure women are listened to, informed, respected, and empowered in their healthcare decisions (Epstein & Street, 2011). The intergenerational transmission of risk increases in the presence of social, economic, and gender inequities (Pérez-Escamilla & Bermúdez, 2012), and such approaches must also consider the broader social determinants of health. A contextually appropriate health care approach also acknowledges the critical role that social determinants play in health outcomes. Social determinants, including socioeconomic status, gender, ethnicity, and disability, are the root causes of health disparities. These inequities are perpetuated by unequal access to resources and opportunities, further compounded by gender and social norms, which limit women's ability to make informed health decisions and access quality care (Marmot & Bell, 2019).

Conclusion

The proposed integrated healthcare model offers a clear, actionable path towards more equitable and effective healthcare systems. By prioritizing the health of women of reproductive age across the lifespan and within socio-economic contexts, this model not only improves individual well-being but also contributes to broader societal stability and economic growth in LMICs. Implementing these strategies is an investment in the health of women of reproductive age and is a necessary step towards achieving global health goals, reducing disparities, and promoting health and human rights for all.

Author contributions

All authors were involved in conceptualisation of the commentary. Stuart, Hart and Desai performed the literature search. Stuart wrote the first draft and revised the second and final version. Norris conceived the idea for the paper, critically revised the first and second draft. Hart, Desai and Norris jointly revised and improved the final draft with Stuart. All authors provide approval for the final manuscript to be published and agree to be accountable for all aspects of the work.

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AI assistance

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Data availability statement

No new data was used for the purpose of this article.

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