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**PERSPECTIVES****Innovation in mother and child care in the hospital and community**

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<https://doi.org/10.31603/ihs.9470>**Abstract**

It is possible for essential measures to enhance the outcomes of maternal and newborn health (MNH) in countries with low and intermediate incomes; however, the implementation of these interventions has proved difficult. The value that innovative MNH techniques provide to existing health systems is still only partially recognised, despite the fact that they have the potential to hasten the pace of improvement and lead to improved health outcomes for pregnant women and newborns. Future implementation and evaluation initiatives will need to determine how innovations affect the outcomes of health care and give evidence regarding the possibility for scale-up, taking into account factors such as cost, feasibility, appropriateness, and acceptability. Measurement of equity is a critical component in locating and focusing on segments of the population who are at increased risk of experiencing service disparities. In order for innovative MNH interventions to be successfully integrated into existing health care systems, there will need to be innovative techniques for their implementation, assessment, and expansion. The Innovations for Maternal, Newborn, and Child Health initiative was a multi-year grant led by Concern Worldwide to find and test ambitious new ideas with the potential to overcome barriers to accessing maternal, newborn, and child health (MNCH) services and significantly improve delivery of these services. The initiative was called the Innovations for Maternal, Newborn, and Child Health (IMNCH) Challenge.

Keywords: Maternity care; health innovation; healthcare; quality of care; maternal safety

Maternal health is a critical aspect of public health that encompasses the physical and mental well-being of mothers before, during, and after pregnancy and childbirth. Ensuring a positive experience for women and their newborns throughout this process is crucial for their overall health and well-being (Noursi, Clayton, Bianchi, & Fink, 2021; Bai, Korfage, Mautner, & Raat, 2019). Despite the significant progress made in the past two decades, it is estimated that in 2026, approximately 287,000 women will die before, during, or after pregnancy and childbirth (Meh et al., 2022; Collier & Molina, 2019). This number is unacceptably high. The most common direct causes of maternal injury and death include excessive bleeding, infection, high blood pressure, unsafe abortion, and obstructed labor (Diana, Wahyuni, & Prasetyo, 2020). These deaths are largely preventable if women have access to timely and appropriate care from qualified health practitioners in a supportive environment. Eliminating avoidable maternal deaths should remain a top priority on the global agenda (Joseph et al., 2021). However, maternal health care should not be evaluated solely based on whether a woman survives pregnancy and childbirth. It is crucial to enhance efforts to reduce maternal injuries and disabilities to improve overall health and well-being (Howell, 2019). Each pregnancy and delivery is unique, and it is essential to address the inequities that affect health outcomes, particularly those related to sexual and reproductive health, rights, and gender, to ensure that all women have access to respectful and high-quality maternity care. Additionally, innovations in maternity healthcare should be optimized to prevent negative outcomes. Maternal health is a multifaceted and complex issue that requires a comprehensive and holistic approach. Promoting equitable access to quality care, and fostering innovation in maternity healthcare, we can work towards ensuring that all women and their newborns have a positive and empowering experience throughout the pregnancy and childbirth continuum.

The stark reality is that a woman loses her life every two minutes due to pregnancy or childbirth-related complications (Nosraty, Rahimi, Kohan, & Beigei, 2016). This unacceptable situation demands urgent action to address the underlying issues and improve maternal health outcomes. A study has demonstrated that systematic

efforts to eliminate delays in accessing healthcare for pregnant women in rural communities can significantly enhance pregnancy and birth outcomes (Awor, Nabiryo, & Manderson, 2020). To scale up these community-based health solutions, it is crucial to identify them, strengthen their capacity, and conduct further research. Moreover, a recent study has proposed several key factors to drive innovation in maternity care, including readiness, recognition and prevention, response, reporting and systems learning, and respectful care (Hameed et al., 2023). Implementing these strategies can help transform the delivery of maternal healthcare and mitigate the risks faced by women during pregnancy and childbirth (**Figure 1**).



Figure 1. Illustration of maternal and childbirth (Courtesy of unsplash.com).

The United Nations' research, "Trends in maternal mortality 2000 to 2020," paints a sobering picture. It projects that the lives of one million women could be at risk by 2030 if significant progress is not made in reducing maternal mortality (United Nations, 2022). The analysis estimates that there were 287,000 maternal deaths in 2020 alone, equating to 800 deaths per day or one every two minutes. The vast majority of these deaths could have been prevented with timely and appropriate interventions. In response to this crisis, UNICEF and its partners have reaffirmed their commitment to identifying, co-creating, and scaling up life-saving solutions that will contribute to improving maternal health outcomes (UNICEF, 2023). This collaborative effort is crucial in addressing the systemic challenges and ensuring that every woman has access to quality, respectful, and equitable maternal healthcare. By addressing the barriers to healthcare access, driving innovation in maternity care, and scaling up proven community-based solutions, we can work towards a future where no woman loses her life due to pregnancy or childbirth-related complications. This is a moral imperative and a critical step towards achieving the Sustainable Development Goals (SDGs) and ensuring the health and well-being of women and their families worldwide. The SDGs set forth by the United Nations provide a comprehensive framework for addressing the pressing global challenges that impact the health and well-being of women and their families worldwide. At the heart of this agenda is a commitment to ensuring universal access to quality maternal and reproductive healthcare, empowering women and girls, and promoting gender equality. By aligning efforts to achieve the SDGs, the global community can work

towards eliminating preventable maternal and child mortality, eradicating harmful practices such as child marriage and female genital mutilation, and fostering an environment where women and girls can thrive, free from discrimination and violence. Realizing these goals will require a multi-faceted approach that encompasses policy reforms, investment in healthcare infrastructure, community-based interventions, and the mobilization of resources and partnerships. Ultimately, the pursuit of the SDGs represents a transformative vision for a world where the health, rights, and dignity of women and their families are upheld as fundamental human rights, paving the way for sustainable development, prosperity, and a more equitable future for all.

Innovations in the social and digital spheres for pregnant women

Pregnancy among adolescents is a grave public health concern, as it is the leading cause of death in young women aged 15 to 19 years (Hameed et al., 2023). This alarming statistic underscores the urgent need to address the unique challenges and vulnerabilities faced by this population. Beyond the tragic loss of young lives, the consequences of adolescent pregnancy extend to the newborns as well. Babies born to teenage mothers are at a significantly higher risk of low birth weight, premature delivery, and severe neonatal complications (Hameed et al., 2023). These adverse outcomes can have long-lasting impacts on the health and development of the child, perpetuating a cycle of vulnerability that must be broken. Tragically, many pregnant adolescents and young parents struggle to access the essential information and resources they need to ensure their own health and that of their child during pregnancy, childbirth, and the postpartum period (Hameed et al., 2023). This lack of access to maternal healthcare knowledge and services further compounds the challenges faced by this vulnerable population, contributing to the disproportionately high rates of maternal and neonatal mortality and morbidity. We can empower young women and their families with the knowledge and support they need to make informed decisions, access appropriate care, and ultimately improve health outcomes for both the mother and child. This holistic approach, grounded in a deep understanding of the unique needs and circumstances of adolescent mothers, is essential for reversing the alarming trends and ensuring a brighter, healthier future for young women and their children worldwide.

Digital free counselling on sexual health and rights

Adolescent boys and girls can use telemedicine to ask questions through their mobile phones and receive real-time responses from youth peer counsellors on a variety of topics, including sexual and reproductive health and rights, HIV, the prevention of violence, and pregnancy-related difficulties and questions (Craighead et al., 2022). There have already been more than 350,000 teens using the platform. This innovation will be scaled to three other countries in the Eastern and Southern Africa area in 2023, with the pilot project taking place in Mozambique.

The provision of digital free counselling on sexual health and rights represents a crucial intervention in empowering individuals, particularly women and girls, to make informed decisions about their bodies, relationships, and overall well-being. In an era where access to accurate and non-judgmental information on sensitive topics can be limited, especially for marginalized communities, digital platforms offer a discreet and accessible avenue for people to seek guidance, ask questions, and explore their sexual and reproductive health concerns. By offering free, confidential counselling services through digital channels such as mobile applications, websites, and messaging platforms, individuals can overcome barriers related to geographic isolation, cultural stigma, and financial constraints that may otherwise prevent them from accessing essential sexual health resources. These services can provide a safe space for users to discuss a wide range of issues, including contraception, sexually transmitted infections, gender identity, sexual violence, and family planning, among others. Importantly, digital counselling on sexual health and rights must be designed and delivered in a manner that is inclusive, culturally sensitive, and responsive to the diverse needs and lived experiences of the target population. This may involve the integration of multilingual support, the incorporation of peer-to-peer learning models, and the provision of referrals to in-person healthcare services as needed. The impact of such digital interventions can be far-reaching, empowering individuals to make autonomous choices about their sexual and reproductive health, while also contributing to the broader goals of gender equality, universal health coverage, and the realization of sexual and reproductive rights. By scaling up these innovative digital solutions, the global community can work towards ensuring that everyone, regardless of their background or circumstances, has access to the information, resources, and support they need to lead healthy, fulfilling, and self-determined lives.

Pregnancy test technology

Women who receive prenatal care from the beginning of their pregnancies until the beginning of labour have the best chance of being healthy throughout their pregnancies and of delivering healthy babies (**Figure 2**). Prenatal care begins before a woman becomes pregnant and continues until labour begins (Kennedy, Yeh, Gholbzouri & Narasimhan, 2022). The innovative pregnancy tests that were developed in collaboration by the Rhodes University Biotechnology Innovation Centre (RUBIC) and UNICEF use nucleic acid strands (RNA/DNA) rather than the traditional antibodies. This results in a significant reduction in the cost of the tests while maintaining their accuracy and increasing their stability across a wider range of temperatures and humidity levels (Wise et al., 2020).



Figure 2. Illustration of technology in maternal care (*Courtesy of unsplash.com*)

Pregnancy test technology has evolved significantly in recent decades, offering women and their partners increasingly accurate, accessible, and user-friendly tools to detect and monitor pregnancy. These advancements have had a profound impact on the way individuals manage their reproductive health and make informed decisions about their family planning. At the core of modern pregnancy test technology are highly sensitive and specific biomarkers that can detect the presence of human chorionic gonadotropin (hCG), a hormone produced during pregnancy. The development of rapid, at-home pregnancy tests has revolutionized the way people can monitor their reproductive health, providing them with the ability to discreetly and conveniently test for pregnancy in the privacy of their own homes. These tests have become increasingly accurate, with some claiming to detect pregnancy as early as six days after conception, empowering individuals to take proactive steps in managing their reproductive choices. Moreover, the integration of digital technologies, such as smartphone-connected pregnancy tests, has further enhanced the user experience, offering real-time data tracking, personalized guidance, and seamless integration with healthcare providers. Beyond the initial detection of pregnancy, advancements in pregnancy test technology have also enabled more nuanced monitoring of pregnancy progression and potential complications. Quantitative hCG tests, which measure the exact levels of the pregnancy hormone, can provide valuable insights into the health

and development of the fetus, allowing for early identification of potential issues and timely medical intervention. Additionally, the emergence of non-invasive prenatal testing (NIPT) has revolutionized the field of prenatal diagnostics, enabling the detection of genetic abnormalities and other fetal health conditions through a simple blood draw, without the need for more invasive procedures. These technological advancements have empowered women and their families to make informed decisions about their pregnancies, while also contributing to improved maternal and fetal health outcomes. As pregnancy test technology continues to evolve, it is essential that these innovations are designed and deployed in a manner that prioritizes user privacy, informed consent, and equitable access. By ensuring that these tools are available and accessible to all, regardless of socioeconomic status or geographic location, the global community can work towards a future where every pregnancy is met with the necessary information, support, and resources to ensure the health and well-being of both the mother and the child.

Technology on life saving

In all regions of the world, severe bleeding after childbirth is the leading direct cause of maternal mortality. Interventions that could save lives are frequently out of reach in a great number of countries (Mlambo, Sibanda, Ntshangase & Mvuyana, 2022; August et al., 2016). The Postpartum Haemorrhage (PPH) Prevention and Treatment Devices provided by the UNICEF Product Innovation Centre are readily available, affordable, and easy to use.

The integration of life-saving technologies has been a critical driver in improving healthcare outcomes and reducing preventable deaths worldwide. From innovative medical devices to advanced digital solutions, the rapid advancements in technology have transformed the way healthcare is delivered, empowering healthcare providers, patients, and communities to address some of the most pressing health challenges. One of the most significant areas where technology has had a profound impact is in the field of emergency and critical care. The development of portable, user-friendly medical devices, such as automated external defibrillators (AEDs), has enabled bystanders to provide immediate, life-saving interventions in the event of cardiac emergencies. These devices, which can be found in public spaces and workplaces, have been instrumental in increasing survival rates for individuals experiencing sudden cardiac arrest. Similarly, the advancement of telemedicine and remote monitoring technologies has revolutionized the delivery of emergency care, allowing healthcare providers to assess, diagnose, and initiate treatment for patients in remote or underserved areas, often in real-time. This has been particularly crucial in addressing the disparities in access to quality healthcare, especially in low-resource settings, where the timely provision of life-saving interventions can mean the difference between life and death.

Technological innovations have also transformed the way healthcare is delivered across the continuum of care. The rise of digital health solutions, such as mobile health applications, wearable devices, and patient portals, has empowered individuals to take a more active role in managing their own health, enabling them to monitor their vital signs, track their medication adherence, and communicate more effectively with their healthcare providers. These technologies not only improve patient engagement and self-care but also provide healthcare professionals with valuable data that can inform clinical decision-making and facilitate earlier interventions, ultimately enhancing the overall quality of care and reducing the risk of adverse health outcomes. As these technologies continue to evolve and become more widely adopted, they hold the promise of further improving healthcare access, quality, and equity, ultimately contributing to the saving of countless lives around the world.

Kangaroo mother care

There are a lot of things that we can do now to improve the chances of newborns living long and healthy lives (Cai et al., 2022). Kangaroo mother care, also known as skin-to-skin contact between the infant and the mother immediately after birth, has been proven in studies to increase nursing as well as heat regulation in newborns, both of which are essential for a newborn's ability to survive in environments with limited resources (WHO Immediate KMC Study Group et al., 2021).

Kangaroo Mother Care (KMC) is a revolutionary approach to caring for preterm and low-birth-weight infants that has the potential to significantly improve neonatal outcomes and save countless lives. This innovative method, which involves the continuous skin-to-skin contact between the infant and the caregiver, typically the mother, has been hailed as a transformative intervention in the field of neonatal care. At the heart of KMC is the recognition that the warmth, security, and nurturing touch provided by the caregiver can have a profound impact on the physiological and developmental well-being of the infant. By placing the newborn, often wrapped in a cloth or garment, directly against the caregiver's bare chest, KMC mimics the natural environment of the womb, providing the infant with a

sense of comfort, stability, and optimal temperature regulation. This close physical contact has been shown to have a myriad of benefits, including improved respiratory function, better regulation of body temperature, enhanced breastfeeding outcomes, and reduced risk of infection and mortality. Importantly, KMC can be initiated and maintained even in resource-limited settings, making it a highly accessible and cost-effective intervention that can be implemented in a wide range of healthcare settings. The widespread adoption of KMC has the potential to revolutionize neonatal care, particularly in regions where access to advanced medical technologies and specialized neonatal intensive care units is limited. By empowering caregivers, often mothers, to take an active role in the care of their preterm or low-birth-weight infants, KMC fosters a deeper bond between the infant and the caregiver, while also reducing the burden on healthcare systems. Furthermore, the simplicity and scalability of KMC make it an ideal intervention for addressing the global challenge of neonatal mortality, which disproportionately affects low- and middle-income countries. As the global community continues to prioritize the health and well-being of newborns, the widespread implementation of Kangaroo Mother Care stands as a shining example of how innovative, low-cost, and evidence-based solutions can save lives and transform the trajectory of neonatal care worldwide (**Figure 3**).



Figure 3. Illustration of neonatal care (Courtesy of unsplash.com).

Improving mother and neonatal survival rates requires strong leadership from the government. Donor funding is substantial in low- and middle-income nations, where various parties contribute to the complexity of the situation. A coherent description of project components and their intended results, based on a common theory of change, can be a useful tool for policymakers and others interested in harmonising various efforts to improve maternal and newborn health. We offer a method for constructing such a tool in order to characterise the work that is being done as well as the effect that is intended to come from a portfolio of nine large-scale maternal and newborn health programmes in north-east Nigeria, Ethiopia, and Uttar Pradesh in India. These projects are located in those regions. The 'characterisation framework' was established by the teams who worked on these projects. It is based on a general theory of transformation. They were able to describe their ideas and the consequences they had envisioned with the help of this framework. After that, the individual project characterisations from each geography

were collated in order to determine what innovations were implemented where, when, and at what size, as well as the anticipated health impact of the combined efforts of all projects.

Our research has a few caveats and restrictions. It would have been improved by a more extensive description and analysis of the context, and by framing our work in terms of discrete inventions, we may have overlooked some synergistic elements of the combination of those innovations. It would have been enhanced by a more detailed description and analysis of the context. Our method can be useful for constructing a plan in accordance with a theory of change that is generally accepted, and it can also be helpful for researchers who are investigating the efficiency of the combined efforts of a number of different actors. The exercise enables policymakers and funders, both within countries and between countries, to better coordination of efforts and to inform decision-making about what to support, when to fund it, and where to fund it. Finally, the way in which individuals look for information and make decisions regarding their health has been significantly altered by information and communication technologies, particularly the internet. Communication tools, such as smartphones, patient monitoring tools, and other wireless devices, are examples of the information and communication technologies that fall under the umbrella of eHealth and encompass the mHealth component. These technologies provide support for health practices.

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Author's perspective

Key points

- Improving mother and neonatal survival rates requires strong leadership from the government
- Technological innovations have also transformed the way healthcare is delivered across the continuum of care
- Pregnancy among adolescents is a grave public health concern

Potential areas of interest

- How can the government be involved in developing technologies in maternal care?
- How can healthcare providers foster a strong, supportive therapeutic alliance with their patients?
- When the healthcare providers involve patients in shared decision-making regarding their care plan?

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