# Utilisation of Maternal Health Services and its Impact on Maternal Mortality Rate: A Case for KwaZulu-Natal, South Africa

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## Abstract

Despite several strategies in place in South Africa and globally to prevent maternal mortality and morbidity, maternal deaths remain high, especially in sub-Saharan Africa and lower to middle-income countries. The aim of the study was to identify the challenges that lead to pregnant women’s delays in seeking antenatal care (ANC) early and to find strategies to prevent such delays, contributing to a reduction of maternal deaths in South Africa. The study was conducted in two phases. Phase one analysed data on maternal deaths collected by the District Health Information System (DHIS) of the KwaZulu-Natal Department of Health from all 11 districts over a 10-year period (2009–2019). The data on maternal deaths revealed that there was a very high maternal mortality rate; between 800 and 1 780 per 100 000 live births. This correlated with very low antenatal visits; between 695–895 per 100 000 live births. In phase two, a literature review was conducted using several computer-assisted databases, bibliographies and websites to identify and source current policies. The literature review presents causes of delay in seeking ANC and strategies to prevent maternal deaths. Recommendations were made to consider strengthening education andawareness related to familyplanning; women empowerment through community health programmes and change in healthcare providers’ behaviours and attitudes; ensuring availability of maternal health resources; and developing strategies to ensure that the ANC services delivered are in line with the South African Department of Health Guidelines.

**Keywords:** maternal deaths; maternal mortality; delays; antenatal care (ANC); maternal health

## Introduction

Many health problems of pregnant women are preventable, detectable, and treatable if they receive adequate Antenatal Care (hereafter ANC) (McCauley et al. 2022). Maternal mortality is defined as the death of a woman while she is pregnant, in less than 42 days after delivery, or after the termination of a pregnancy, regardless of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. In other words, maternal mortality does not include deaths that occur as a result of unintentional or incidental causes (Musarandega et al. 2021). According to the World Health Organisation (WHO), the maternal mortality *ratio* is “the number of maternal deaths experienced by every 100 000 live births,” whereas the maternal mortality *rate* is “the number of maternal deaths experienced by every 100 000 women of reproductive age” (WHO 2015). Some 295 000 women lost their lives in 2017 due to complications related to pregnancy, childbirth, or both, despite significant improvements over the past two decades. Considering that the vast majority (94%) of these deaths occurred in low-resource situations where they could have been prevented, this figure is clearly disproportionate. Approximately 86% (254 000) of the predicted global maternal fatalities in 2017 occurred in sub-Saharan Africa (SSA) and Southern Asia. SSA accounted for almost two-thirds (196 000) of all maternal deaths, with Southern Asia accounting for around one-fifth (58 000) (Dol et al. 2022).

In 2009, in response to the crisis of a high number of maternal deaths, the African Union (AU 2020) responded by firmly placing the issues of maternal deaths on its agenda and launching the Campaign for Accelerated Reduction of Maternal Mortality in Africa (CARMMA). South Africa joined in 2012 after the campaign was already underway (Woldearegay, Amevor, and Steeves 2021). South Africa’s re-engineering of Primary Healthcare (PHC) in 2012 coincided with the launch of CARMMA, which included the establishment of District Clinical Specialist Teams (DCSTs) and PHC ward-based outreach teams (KwaZulu-Natal [KZN] Department of Health [DoH] 2018). As a direct consequence of this, advancements in maternal, perinatal, and neonatal healthcare services have been made to a certain degree. The activities provided the framework for mortality surveillance, which enhanced the accuracy of findings and paved the way for targeted therapies based on risks that may be avoided, such as hypertension, haemorrhage, and infections that are not related to pregnancy. Several specialised skills development programmes, such as Essential Steps in the Management of Obstetric Emergencies (ESMOE), Helping Babies Breathe (HBB), and management of sick and small neonates, have been established (Temlett, Bishop, and Moran 2022). These programmes enhanced access to trained birth attendants as well as improved clinical governance procedures with DCSTs and perinatal review meetings.

According to the data provided by the South African National Department of Health (NdoH 2021) and the KwaZulu-Natal Provincial Government (2021), the rate of maternal mortality has decreased from 320 per 100 000 live births in 2012 to 120 per 100 000 live births in 2019/2020, and the rate of neonatal mortality has decreased from 14 per 1 000 live births in 2014 to 12 per 1 000 live births in 2019/2020. Unfortunately, around 810 women lose their lives every day because of difficulties related to pregnancy and childbirth (WHO 2015). Most of these deaths are caused by factors that may be avoided or treated, including infections and complications (WHO 2015). The most common direct causes of maternal injury and death are obstetric haemorrhage, infections and pregnancy-related sepsis, hypertensive disorders, unsafe abortions, and obstructed labour. Indirect causes of maternal injury and death include anaemia, malaria, heart disease, and other medical and surgical conditions. According to the South African NDoH (2021), most maternal deaths are preventable if proper interventions are carried out by trained health professionals working in appropriate maternity care environments.

It is essential for both the mother and the child’s life and well-being to have access to maternal healthcare services during pregnancy, labour, and the postpartum period after delivery. In addition to this, it is important to remember that one of the foundations of safe motherhood in South Africa is the provision of maternal healthcare services during pregnancy (KZN DoH 2021). As a result, enhancing mother and child health continues to be a priority in terms of population health in South Africa and around the world. Many African countries are still facing significant obstacles in the form of poor maternal and reproductive health outcomes. According to the research that has been conducted, low-income nations are responsible for most incidences of maternal and child mortality. This is in part because of the low or non-existent utilisation of maternity and reproductive health services in these countries (WHO 2019).

According to the findings of a new report that was published by Statistics South Africa (in KZN DoH 2021), there has been improvement regarding the Maternal Mortality in Facility Ratio (MMFR). At the national level, the ratio went from 105.9 deaths per 100 000 live births in 2019 to 88.0 deaths per 100 000 live births in 2020, demonstrating that South Africa is going through a period of declining MMFR. The province with the lowest maternal mortality rate in 2020 was the Western Cape, with 43.6 deaths for every 100 000 live births, followed by Mpumalanga (67.1 deaths per 100 000 live births). Between 2019 and 2020, there was a rise in the MMFR in the provinces of Eastern Cape and Northern Cape. Musarandega et al. (2021) found that all the other provinces showed diminishing patterns, and this finding was also reflected in the national pattern (Chatterjee, Czajka, and Gethin 2022). There have been several studies that investigated the role that ANC plays in lowering the rate of maternal mortality (Kachoria et al. 2022; KZN Provincial Government 2021; Ransohoff et al. 2022); however, none of these studies concentrated on the statistical data produced by the DoH in KZN to determine whether or not a delay in seeking care is a factor in the state’s high maternal mortality rate. Hence, this study sought to determine whether ANC plays a critical role in reducing the risk of maternal death among pregnant women in the province of KwaZulu-Natal, South Africa.

## Current Maternal Mortality Prevention Strategies

Maternal health and healthcare indicators are key goals of the Sustainable Development Goals (SDGs), which build on the Millennium Development Goals (MDGs) to promote global sustainable development by 2030 (Batalini de Macedo et al. 2022). The WHO (2021b) reports that the world is off-track to reach SDG 3.1 for reducing maternal deaths, requiring urgent measures to improve women’s and babies’ health. In 2017, 3 600 Human Immunodeficiency Virus (HIV)-related indirect maternal fatalities occurred, with the global HIV-related indirect MMR estimated at 3 per 100 000 live births (Millogo et al. 2021). Thus, significant and persistent measures are required to address healthcare access and use barriers, particularly in low- and middle-income countries. The Global Strategy for Women’s, Children’s, and Adolescents’ Health (2016–2030) was launched by former UN Secretary-General Ban Ki-moon at the UN General Assembly in New York. The strategy is a road map for the post-2015 agenda as stated by the SDGs, and it strives to eliminate all preventable deaths of women, children, and adolescents and build an environment in which these groups not only survive but flourish and see their environments, health, and well-being (WHO 2022).

A global multi-partner project known as Ending Preventable Maternal Mortality (EPMM) outlined a comprehensive set of plans for maternal health programmes in 2015. These strategies were implemented in 2015 (Kinney et al. 2015). The overarching goal of EPMM was to realise the SDG target for Maternal Mortality Reduction (MMR). EPMM has set coverage targets and milestones to track progress towards the SDGs and to expedite progress towards the SDG targets and goals. These coverage targets and milestones were defined in conjunction with relevant stakeholders and partners at national, regional, and global levels, and alignment with those targets and milestones is being guaranteed through the Every New-born Action Plan (ENAP), which was launched in September 2020 (WHO 2021a). Furthermore, five crucial targets were introduced by WHO and the United Nations Population Fund (UNFPA) to aid nations in getting back on track in decreasing avoidable maternal deaths and monitoring progress toward the SDGs. New coverage milestones and targets have been created by the EPMM programme, which involve a large coalition of partners working in maternal and newborn health by 2025. Globally, these are for:

1. A total of 90% of pregnant women to attend four or more ANC visits towards increasing to eight visits by 2030.
2. A total of 90% of births to be attended by skilled health personnel.
3. A total of 80% of women who have just given birth to access postnatal care within two days of delivery.
4. A total of 60% of the population to have access to emergency obstetric care within two hours of travel time.
5. A total of 65% of women to be able to make informed and empowered decisions regarding sexual relations, contraceptive use, and their reproductive health.

Moreover, to assist nations in achieving better fairness and coverage at the national and sub-national levels, specific targets are also provided (Moran and Requejo 2021).

## Methodology

The KZN Province, which is situated in the south-eastern part of South Africa (Municipalities of South Africa 2020), was the setting for the study that informed this paper. This province has one metropolitan district municipality, eThekwini, 10 district municipalities and 43 sub-district municipalities (Municipalities of South Africa 2020).

An ecological study design was employed to analyse aggregated secondary data at the KZN provincial level, which are housed on the electronic routine health information system called the web District Health Information System (webDHIS) Version 2.30. WebDHIS is a web-based health information management tool that is used to collect, validate, analyse, and present aggregate data for routine reporting purposes. Data are collected for each health facility using a selected list of health-related indicators that are prescribed by the National and Provincial DoH (KZN DoH 2018). Routinely, data are collected on paper within the health facilities and electronically captured by information officers. The health facility data are reported to the district monthly, which are then aggregated at the provincial level. The web-based system allows captured information at the facility level to be collated at the district, provincial and national levels within 24 hours (KZN DoH 2018). The collection of indicators that was developed by the NDoH for purposes of monitoring the performance of the healthcare system on the DHIS is called the National Indicator Dataset (NIDS).

The Provincial Indicator Dataset (PIDS) is a specific set of indicators that is province-specific. Data collection tools at public health facilities have been aligned in accordance with the NIDS (2017), while the PIDS has been compiled in consultation with Programme Managers (KZN DoH 2018). WebDHIS was rolled out in December 2016 in hospitals and CHCs. Since aggregated data were used, all public sector health facilities in KZN were included in this study, and there was no sampling employed. Figure 1 below presents the sequence of data collection in the DHIS.

**Figure 1:** Sequence of data collection in the DHIS

**Source**: KZN DOH (2021).

Data were mined from the webDHIS database for the following indicators: the Maternal Mortality in Facility Ratio (MMFR) and the ANC visits before 20 weeks. The source of the indicators was registers from health facilities (KZN DoH 2021). The indicator, “Maternal Mortality in Facility Ratio,” was used to calculate the rate per 100 000 population for the province and for each district within the province. MMFR is the number of maternal deaths among 100 000 deliveries in health facilities/institutions, where the numerator is the number of maternal deaths in institutions and the denominator is the total number of deliveries in institutions.

The study period under review was according to the Mid Term Expenditure Framework (MTEF) years between 1 April 2009 and 31 March 2019. Data for the province and the 11 health districts were extracted from webDHIS. Data were then exported to a Microsoft Excel workbook for descriptive analysis and time trend analysis. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), Version number 26. The mean and standard deviation for the dataset were calculated. Analytical data analysis was limited to district-level data and excluded provincial-level data due to small variations in the dataset.

Ethical approval for the study was granted by the Durban University of Technology Ethics Committee, BREC (BCA056/13). Patient consent was not required since this study used aggregated data without any patient identifiers. The aggregate data consist of counts for data elements across health facilities in the province.

## Results

The study that informed this paper was conducted in two phases. In the first phase, we reviewed secondary in-facility MMR data to establish trends and explore how far the public health sector is from the national and global targets for the reduction of maternal mortality. In the second phase, a literature review was conducted to identify the risk factors associated with a delay in seeking ANC. A discussion was presented on the strategies to prevent and end the high maternal mortality rates. In this manuscript, we present the findings of the first phase of the study. The results present the MMR in-facility rates (MMFR) from the DHIS, followed by a discussion based on the literature review regarding national and global targets. These data were compared to national and international benchmarks, programmes and strategies set out by various organisations and frameworks to prevent maternal deaths in KZN.

Data were used from the District Health Information System (DHIS) (2009–2019). As per the mandate of the DoH, the various centres in the provinces are required to report data for evaluation of the services provided (Jinabhai et al. 2021). The DHIS, which facilitates the disease surveillance process, is a continuous process of data collection, analysis, interpretation and dissemination of information that is essential for immediate public health action (Dureab et al. 2020). The DHIS is tasked with the storage of primary data collected by allocated information officers and healthcare workers from each district. Submitted data are formatted within specific data collection fields, as prescribed by the provincial DoH.

This review involved the analysis of data collected by the DHIS on maternal mortality rates from all 11 health districts in KZN between 2009 and 2019. The rural population in South Africa was reported at 32.65% in 2020. KZN is home to a large number of townships and larger rural settlements. Rural areas generally lag on economic performance indicators, such as economic growth, labour force participation rates, unemployment, education attainment, and life expectancy at birth. Challenges include insufficient skills and educational performance, socio-spatial inequalities, infrastructure deficits, housing backlogs, environmental issues, an ageing population, and health disparities (KZN Province 2021).

**Figure 2:** ANC visits and maternal mortality trends by 11 districts in KZN

**Source:** DoH KZN (2020)

The maternal deaths and ANC visits for all 11 districts were analysed. Statistics collected over a 10-year period (2009–2019) by the DoH in KZN indicate that maternal deaths remain high. Between 2009 and 2019, maternal deaths averaged between 865 to 1 782 per 100 000 live births. This is way above the SDG target of less than 70 per 100 000 live births. ANC visits remain low at less than 600 per 100 000 live births per district (figure 2).

Working towards SDG goal 3.1 of reducing maternal mortality to below 70 per 100 000 live births and neonatal mortality to 12 deaths per 1 000 live births, South Africa aims to reduce the institutional Maternal Mortality Rate (iMMR), neonatal mortality and stillbirths by 50% by 2030 (South African NDOH 2021). Unfortunately, we were unable to identify whether the maternal deaths were related to the number of ANC visits. However, we found it important to highlight and present the data to give emphasis to the abnormally high maternal mortality rate in KZN and South Africa as a whole.

**Figure 3:** Maternal deaths in KwaZulu-Natal (2009–2019)

**Source:** DoH KZN (2020)

The WHO (2015) reported a significant decline in maternal mortality in developing countries. The statistics presented above confirm this decline in South Africa. Maternal deaths have steadily declined in KZN since 2009; from a high of 1 782.1 deaths to a low of 865.9 deaths per 100 000 live births in 2019 (see figure 3). Results are shown for the number of maternal deaths and the number of ANC visits per 100 000 population at the provincial and district level over the 10-year review period (2009–2019).

Many of these deaths are preventable. In South Africa, unlike in many other developing countries, women mostly give birth in healthcare facilities and visit ANC clinics before they give birth. So, why are the maternal mortality rates so high? The statistics for 2009–2019 from DoH KZN show a very low ANC attendance in comparison to the maternal death rate (figure 4).

**Figure 4:** ANC visits and maternal deaths (2009–2019)

**Source:** DoH KZN (2020)

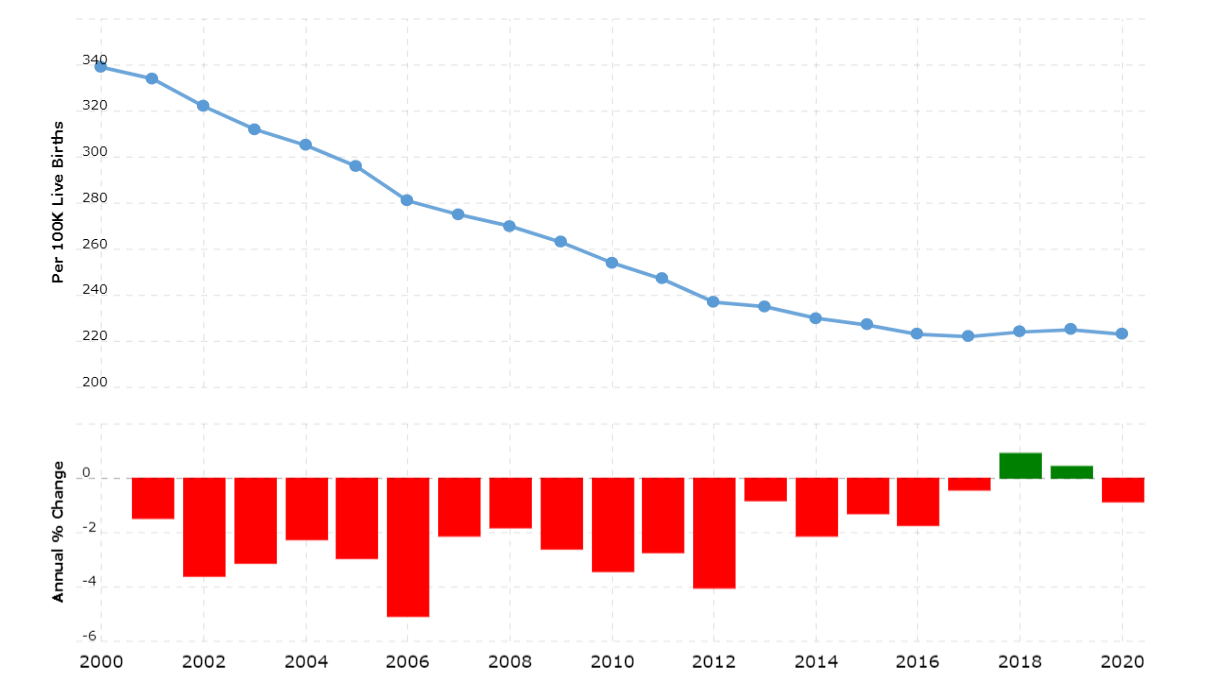
Figure 4 above shows the relationship between ANC visits and maternal deaths. ANC attendance showed an increase from 627.1 in 2013, to 810.6 in 2019. This made a difference in reducing maternal deaths, though not significantly. Despite significant efforts with limited resources, maternal morbidity and mortality remain high in KZN and other developing countries. As a lower-middle-income country (LMIC), South Africa bears the burden of maternal and neonatal mortality like other sub-Saharan African countries. According to the Saving Mothers Report 2017/19, there has been a progressive and sustained reduction in iMMR in the past three triennia (2010–2019), from 320 per 100 000 live births to 120 per 100 000 live births (South African NDoH 2021).

In table 1 below, the maternal mortality rate among clients correlates negatively with the total number of antenatal visits per 100 000 population (r = -0.431; *p* < 0.01) and the maternal mortality rate (r = -1.000; *p* < 0.01). Hence, the lower the number of ANC visits per 100 000 population, the higher the maternal death rate. This means that an increase in ANC visit rates among clients results in a decrease in maternal mortality rates, and a decrease in ANC visits results in an increase in maternal mortality rates.

**Table 1:** Correlation between maternal mortality rate and ANC visits in KZN

|  |  |  |  |
| --- | --- | --- | --- |
| Correlations | | | |
|  | | Mortality | Antenatal |
| Pearson Correlation | Mortality | 1.000 | -.431 |
| Antenatal | -.431 | 1.000 |
| Sig. (1-tailed) | Mortality | . | <.001 |
| Antenatal | .000 | . |
| Antenatal | 110 | 110 |

**Source:** DoH KZN (2020)



**Figure 5:** Global maternal deaths from 2000–2020

**Source:** United Nations (2023)

The MMR in KZN was compared to the global MMR. As indicated in figure 5, between 2000 and 2020, the global MMR declined by 34·8% (from 342 deaths per 100 000 live births to 223 deaths per 100 000 live births) (United Nations 2023). Rates fell significantly between 2000 and 2015 but largely stagnated between 2016 and 2020, and in some regions have even reversed (United Nations 2023). For the period under review in the above sections, 2009–2019, there was a steady decline in maternal death rates. From 2009 to 2017, there was a negative downward trend in the MMR. However, from 2018 to 2019, the world saw a slight increase in MMR, a growth of 0.9%. The MMR in figure 3 correlates with the global MMR, where a decline was noted. However, in the periods 2018 and 2019, KZN continued with a downward trend and maternal deaths decreased significantly in 2019.

## Discussion

Despite extensive advancement over the past few decades, ending preventable maternal deaths is still an unmet goal and one of the world’s most critical issues (Bekele, Seifu, and Roga 2023). Notwithstanding robust international efforts to expand the global coverage of basic primary health services for women, pregnancy and childbirth remain a high-risk period for mother and child, especially in low-income and middle-income countries (WHO 2023). Decreases in maternal and early child mortality linger high on the global development policy agenda and are included in SDG 3 (Kuhnt and Vollmer 2017). However, more than 800 women die each day from pregnancy and maternal-related conditions in low-income and middle-income countries. Many of these deaths and morbidities are due to easily preventable causes (WHO 2023).

ANC is an indicator to evaluate the effectiveness of maternal care use. It assists in reducing and preventing undesirable pregnancy outcomes when provided early in the pregnancy and continued through delivery (Gebeheyu et al. 2023). Women who present with problems in pregnancy will be identified early and will be referred timeously for treatment. Access to quality ANC is crucial to achieve these goals and improve the lives of both mothers and babies (Hlongwane et al. 2021). Therefore, it is necessary to improve ANC services and to update indicators that track ANC performance. Hence, this phase of the study focused on the relationship between ANC visits and the number of maternal deaths in KZN.

The present review and analysis revealed that ANC visits were significantly associated with lower rates of maternal deaths. The finding is supported by other studies done in different countries (Bekele et al. 2023; Pattinson, Hlongwane, and Vannevel 2019; Tesfay, Hailu, and Woldeyohannes 2023) that showed a positive association between ANC visits and a reduction in maternal deaths.

There were a few limitations that we experienced with the data available. Unfortunately, we could not ascertain disaggregated information on the providers for each ANC visit, the maternal and demographic characteristics of the pregnant women, or any data related to their pregnancy terms, medical conditions and other related information. Additionally, we could not further assess the quality of care received by the women.

Hlongwane et al. (2021) found that within the last decades, the provision of ANC services has increased worldwide. During 2010–2015, the ANC coverage (defined as the percentage of women aged 15–49 years who attended at least one ANC visit with a skilled provider) was around 85% globally, and approximately 77% in the least developed countries. Similarly, the ANC attendance in the current study improved steadily from 2013, with a consequent result in the reduction of maternal deaths (figure 4). According to our results, having favourable ANC has a positive effect on both maternal health and reduces maternal deaths. Therefore, policies and actions aimed towards improving the coverage and quality of ANC services should be a top priority to maximise the benefit of the care.

Lack of ANC and failure to give birth in a health facility are likely to delay early detection of pregnancy-related complications during pregnancy and delivery, which in turn are likely to increase the risk of maternal mortality (Ahinkorah et al. 2021; Doctor, Nkhana-Salimu, and Abdulsalam-Anibolowo 2018). The implication is that the generally low ANC utilisation in KZN might have contributed to the high maternal mortality, as shown in the reports above.

The South African government has made commendable efforts to prioritise the need to reduce maternal deaths in recent years through key health policies. These policies recognise the importance of early and continued ANC. The government’s stated target is for more than 60% of pregnant women and girls to access ANC before 20 weeks of pregnancy by 2016. ANC is free in South Africa’s public health system, and nearly all pregnant women and girls attend an antenatal clinic at least once during their pregnancy (South African National Department of Health 2021). However, most pregnant women do not access ANC until the latter stage of pregnancy. Such delays have been linked to nearly a quarter of avoidable maternal deaths in South Africa. There is a widespread desire to improve maternity care services and make optimum use of women’s contact with health services. If considerable resources are to be devoted to providing ANC, then it is important to identify which interventions are effective and how best to deliver them (Esopo, Derby, and Hauhofer 2020).

Many pregnant women in low-income and middle-income countries have no access to or do not attend ANC services regularly enough (more than four visits), and many do not see a skilled provider (United Nations 2023). According to this study’s results, improving the coverage and uptake of ANC services could be an important tool to improve outcomes in the short-term and even long-term.

The association between an increase in maternal mortality and a decrease in ANC utilisation is a well-documented concern in public health research. This research has provided evidence that ANC plays a crucial role in monitoring the health of pregnant women and ensuring safe pregnancies and deliveries. It has also shown that one of the primary reasons for such an association is that ANC provides an opportunity to identify and manage pregnancy-related complications early. Findings have also shown that when women receive regular check-ups during pregnancy, healthcare providers can detect and address issues, thereby reducing the risk of maternal mortality.

## Recommendations for Healthcare Professionals and Health Policymakers

Collaborative efforts from policymakers, healthcare professionals and researchers are needed in the important arena of women’s reproductive health issues. The first step towards these efforts is ensuring the availability of continuous, reliable and comparable measures of maternal mortality. Thereafter, several targeted interventions, depending on different community needs, can prevent deaths related to pregnancy. Importantly, family planning and skilled care before, during, and after childbirth are essential steps towards saving mothers’ lives.

Inadequate resources contribute to poor quality of ANC, and many routine ANC services seem to be neglected. Nevertheless, coverage of routine services alone is not sufficient for the provision of quality ANC services, and there should be increased attention to the importance of basic assessments and response-based services. Current quality indicators and ANC guidelines do not provide sufficient guidance for achieving quality ANC adapted to the individual woman’s needs. Flexible quality assessment criteria adapted to the local setting should be considered to strive for realistic quality improvement of ANC.

Comprehensive health education programmes can be developed targeting communities and healthcare providers. In this way, it will raise awareness about the benefits of ANC for both mothers and babies, emphasising the link between ANC and reduced maternal mortality. ANC services should be readily available and easily accessible, particularly in rural and underserved areas. Equally important is for the local government to increase the number of healthcare facilities offering ANC services.

## Conclusions

In summary, our study provides evidence of the potential importance of ANC for improving maternal and child health and vital outcomes in low-income and middle-income countries and might be an important tool to reach the third SDG by 2030. Data in this research have also shown that converse effects, such as a lack of ANC or lack of monitoring for both the health of the mother and the foetus, can mean that potentially life-threatening conditions may go unnoticed until they reach a critical stage, making it difficult to intervene effectively. Therefore, it becomes essential to tailor recommendations as outlined above to the specific context and challenges faced by certain regions, populations or communities. These recommendations aim to improve maternal health outcomes while simultaneously encouraging pregnant women to seek and utilise ANC services aided by the collaboration between governments, healthcare providers, NGOs, and communities.

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