arima study

Onambele, L.; Guillen-Aguinaga, S.; Guillen-Aguinaga, L.; Ortega-Leon, W.; Montejo, R.; Alas-Brun, R.; Aguinaga-Ontoso, E.; Aguinaga-Ontoso, I.; Guillen-Grima, F. Trends, Projections, and Regional Disparities of Maternal Mortality in Africa (1990–2030): An ARIMA Forecasting Approach. Epidemiologia 2023, 4, 322–351. https://doi.org/ 10.3390/epidemiologia4030032

* Institutional delivery is vital, as childbirth facilitated by trained healthcare professionals can significantly reduce maternal mortality. However, systemic issues like staffing shortages, accessibility, and service quality seriously challenge many African regions
* The Millennium Development Goals (MDGs) aimed to achieve a 75% reduction in the maternal mortality rate (MMR) between 1990 and 2015 [14–17]. However, at a meeting in Luanda, Angola 2014, the Health Ministers of Africa acknowledged that only four African countries—Cape Verde, Equatorial Guinea, Eritrea, and Rwanda—had achieved this target
* Previous studies have several limitations that this study aims to address. For instance, data quality and completeness have been issues in several previous studies, primarily due to the limited resources for comprehensive and regular data collection and validation in many parts of Africa [27,28]. This data deficiency leads to potential biases and uncertainties in the estimated MMRs and trends
* Additionally, there is a dearth of research examining the variations in MMR across the various African regions and their underlying causes [28,30]. The diversity of healthcare systems, socioeconomic contexts, and policy environments across Africa is considerable [30], yet many studies have treated Africa as a homogenous entity. This may lead to conclusions and recommendations that are not sufficiently tailored to the unique circumstances of each region
* Furthermore, most studies have focused more on the impact of direct health interventions, often neglecting the broader socioeconomic factors that play a crucial role in maternal health outcomes. Factors such as literacy rates, income level, women’s status, and other social determinants of health are under-studied.
* Africa is the region with the highest maternal mortality rate in the world, but the region lacks accurate data. Researchers have employed various methods to estimate maternal mortality in Africa [49]. However, the heterogeneity of these methods affects the results and makes it difficult to compare them.
* Reproductive age mortality survey (RAMOS) studies combining data from institutional records and communities produced the most reliable national maternal mortality estimates. Many Sub-Saharan African countries rely on various surveys and census methods, such as Multiple Indicator Cluster Surveys, Demographic and Health Surveys, and population censuses, to estimate their MMR
* Primarily, this study relied exclusively on data from the World Bank database, which, though extensively used and recognized for its reliability, may not wholly encapsulate the intricacies and nuances of MMRs across the diverse African continent. The reliability and completeness of the World Bank’s MMR data could potentially vary across countries and regions within Africa due to the disparities in data collection, reporting standards, and healthcare infrastructure. Consequently, our analysis might be subject to some degree of imprecision.
  + The following is what I did
  + Future research could enhance the robustness and comprehensiveness of such analysis by incorporating data from multiple sources. The World Health Organization, for instance, maintains comprehensive health-related data sets that could be integrated into future analyses. Similarly, national health surveys often provide detailed and locally specific data that could capture certain nuances missed by more extensive international databases. Furthermore, data from health-focused non-governmental organizations (NGOs) operating in Africa could offer unique insights into grassroots realities and fill potential gaps in national reporting. By integrating these diverse sources, future studies could offer a more holistic and nuanced understanding of African MMRs. Such multi-source analysis might also help mitigate potential regional or national biases in the data and help to build a more comprehensive and accurate understanding of MMR trends and projections across Africa
  + The overall decline in maternal mortality across Africa from 1990 to 2015 is a positive outcome, reflecting global and regional efforts to address maternal health issues. However, the current MMR rates remain alarmingly high, and regional disparities persist. The annual decline of maternal mortality in Africa by 2.6% over the study period is promising. However, the change is less than the 5.5% annual decrease necessary to achieve the SDG target. This outcome underscores the need for accelerated efforts and innovative interventions in maternal healthcare.
  + Study attributing differences in MMR to non-directly biological factors (me saying this)
    - For North Africa, which has consistently lower MMR, factors contributing to this trend could include better healthcare infrastructure, the availability of skilled healthcare providers, and higher rates of female education and economic participation [78–80]. Access to antenatal care and emergency obstetric services is likely more prevalent in this region than in Sub-Saharan Africa [81]. The MMR remains relatively high compared to global standards, indicating room for improvements in socioeconomic conditions and healthcare services [82–84].
    - Over the past twenty years, no other region has experienced as many significant military confrontations as Sub-Saharan Africa (SSA), which underwent 13 wars from 1990 to 2015 [85]. This heightened state of conflict has detrimentally impacted the region’s healthcare infrastructure.
  + These explanations should be considered hypotheses that require further exploration. For instance, examining variables such as gross domestic product, female education level, fertility rate, healthcare spending, HIV/AIDS prevalence, and others in each region could provide more concrete insights [108]. However, these interpretations can guide policymakers to focus on socioeconomic development and comprehensive healthcare system strengthening as crucial strategies for further reducing MMR.
    - Again, motivating my study
  + According to our forecasting, no region will reach the target. Reducing maternal deaths is among the most challenging SDG targets because Africa would need an 86 percent reduction in MMR, which is unrealistic given the present rate of decline
* Make sure to compare to machine learning approach in the literature review
  + Especially the prophet forecasting model to split by year, gives the necessarily comparable error metrics
  + Could also compare African countries’ projections

Monitoring maternal health

<https://pmc.ncbi.nlm.nih.gov/articles/PMC6916345/pdf/TMIH-2019-TMI-13313.pdf>

* WHO’s Constitution entered into force in 1948, with one of its functions being ‘to promote maternal and child health and welfare’
* Rosenfield and Maine to publish their seminal 1985 paper declaring maternal mortality a neglected tragedy and asking ‘Where is the M in MCH?’ [36], cited the estimated 500,000 annual maternal deaths mentioned by the Director General of WHO during the WHA in 1979. The authors argued for ‘a dramatic shift in priorities’ and ‘major investment in a system of comprehensive maternity care’, calling upon the World Bank to prioritise maternal mortality
* In response to increasing concern and demand for data, WHO published 1983 data in 1986 [38] and began monitoring trends, continually improving the modelling and estimation methods, and publishing reports every few years
* In September 2000, world leaders came together at the UN in New York for the Millennium Summit to adopt the UN Millennium Declaration, committing their nations to a new global partnership to eradicate extreme poverty, and setting out a series of goals to be achieved by 2015, which soon came to be known as the MDGs. The Declaration, signed by 189 countries

A close-up of a data

AI-generated content may be incorrect.

* By 2015, the 44% decline in global MMR had missed the ambitious target of 75%, and MMR was still almost 20 times higher in low- versus high-income countries
  + Global 75% target
* Despite major global efforts to develop MNCH targets and indicators and improve data collection and estimation methods since the 1980s (see Figure 1), and especially around the start of the MDG era, and again just before the start of the SDGs, there are still major data gaps, particularly in countries with the highest burden of mortality and morbidity and with poor routine health management information systems and limited CRVS systems. Global, regional and national estimates are now available for MMR, NMR and SBR, with modelling methods employed to enable international comparison and to provide estimates, including for countries with little or no data. But further improvements to the data sets, disaggregated analyses of these data, and refinements of the modelling methods are all vital for continued close monitoring of progress, and improved programming.
* Countdown to 2030 was launched to accelerate momentum to achieve the SDG targets for improved MNCH and to support the renewed Global Strategy [117]. Some of the suggestions for improvement in the SDG era, acknowledged in the 2015 Countdown report, include the following: establish a better set of baseline data than was available for the MDGs; improve data collection, measurement and estimation methods, especially for maternal mortality (and add data on stillbirths); use common (international) standards of measurement and reporting; and select indicators carefully for validity and reliability [63].

<https://obgyn.onlinelibrary.wiley.com/doi/epdf/10.1111/1471-0528.12735>

* ountries are gradually shifting from a pat-tern of high maternal mortality to low maternal mortality,from predominance of direct obstetric causes of maternalmortality to an increasing proportion of indirect causes,noncommunicable causes, ageing of the maternal popula-tion, and moving from the natural history of pregnancy andchildbirth towards institutionalization of maternity care,increasing rates of obstetric intervention and eventualover-medicalization. This is the ‘obstetric transition’ phe-nomenon, which has implications for the strategies aimed atreducing maternal mortality
  + shows importance of looking at a wider variety of trends
    - stage determines strategies to reduce maternal mortality (as described in paper)

<https://ieeexplore.ieee.org/document/10529290>

* Advancements in healthcare technology, including machine learning and deep learning, show potential for reducing maternal mortality rates in India and other countries, aligning with sustainable development goals