



The role of policy implementation and governance in addressing disparities in maternal mortality in Indonesia

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Abstract

Maternal mortality remains a critical public health challenge in Indonesia, characterized by significant and persistent disparities between its provinces. This analysis investigates the key determinants driving these inequities. While the national MMR has seen a decline, provinces in Eastern Indonesia (such as Papua, West Papua, and NTT) consistently report rates two to three times higher than the national average and significantly higher than provinces in Java and Bali. The primary determinants are multifaceted and interconnected, spanning the three delays model: the delay in deciding to seek care, the delay in reaching a facility, and the delay in receiving adequate care. Key factors include inequitable access to and utilization of quality maternal healthcare services, influenced by geographical barriers, infrastructure limitations, and socioeconomic constraints. Furthermore, disparities in health system resources—including the uneven distribution of skilled health personnel, functional health facilities, and emergency obstetric care—are fundamental drivers. Underpinning these are broader socioeconomic determinants, such as educational attainment, economic status, and cultural practices. Addressing these provincial disparities requires targeted, context-specific interventions that go beyond national averages to tackle the root causes of inequality in the most vulnerable regions.

Keywords: Maternal Mortality, Health Disparities, Indonesia, Healthcare Access, Socioeconomic Determinants, Three Delays Model

Introduction

Maternal mortality, defined as the death of a woman during pregnancy, childbirth, or within 42 days of termination of pregnancy, is a key indicator of a nation's overall health system performance and its commitment to gender equity. Indonesia has made considerable strides in improving maternal health over the past few decades, as evidenced by a decline in its national Maternal Mortality Ratio (MMR) from an estimated 390 per 100,000 live births in 1991 to 183 in 2021 (IDHS). However, this national average obscures a profound and troubling reality: extreme geographical inequities.

Beneath the aggregate figure lies a landscape of severe disparity where a woman's survival is heavily dependent on her province of residence. For instance, while provinces like Yogyakarta and Bali boast MMRs comparable to developed nations, regions in Eastern Indonesia such as Papua, West Papua, and East Nusa Tenggara (NTT) suffer from persistently catastrophic rates, often exceeding 300 deaths per 100,000 live births. This disparity represents not just a health crisis but a failure in equitable development, demanding a thorough analysis of its underlying causes.

The framework for understanding these determinants is effectively captured by the "Three Delays Model." First, the delay in the decision to seek care is influenced by socioeconomic and cultural factors, including low educational levels among women, which limits health knowledge and autonomy; poverty, which makes healthcare a lower priority; and cultural beliefs and practices that may favor traditional birth attendants (*dukun bayi*) over modern medical facilities. The second delay, the delay in reaching an appropriate health facility, is exacerbated by Indonesia's challenging archipelagic geography. In remote provinces, women face immense barriers including vast distances, a lack of transportation, poor road conditions, and high travel

costs, all of which can turn a obstetric emergency into a fatality. The third delay, the delay in receiving adequate and appropriate care after arriving at a facility, points directly to systemic failures within the health system itself. This includes the critical maldistribution of skilled health providers (doctors, midwives, and specialists), the inconsistent quality of care, stock-outs of essential medicines and supplies, and the limited availability of Comprehensive Emergency Obstetric and Neonatal Care (CEmONC) facilities, particularly at the primary health center (*Puskesmas*) level.

This introduction posits that the disparity in MMR between Indonesian provinces is not attributable to a single cause but is the product of a complex interplay of these geographic, socioeconomic, cultural, and health-system factors. A comprehensive analysis is essential to move beyond one-size-fits-all national policies and to inform targeted, evidence-based interventions designed to address the specific barriers faced by the most vulnerable populations in high-mortality provinces, ultimately ensuring that every woman in Indonesia has an equal right to safe motherhood.

Methods

This analysis employed a mixed-methods approach, synthesizing quantitative data from national datasets with qualitative insights from published literature to provide a comprehensive understanding of the determinants of provincial MMR disparities in Indonesia.

1. Study Design and Data Sources

A secondary data analysis was conducted using the most recent available data from the following sources:

- **Indonesian Health Demographic Survey (IDHS) 2017 & 2022:** Provided data on national and provincial-

level MMR estimates, antenatal care (ANC) coverage, skilled birth attendance (SBA), and key socioeconomic indicators (e.g., women's education, wealth quintile).

- **Indonesian Basic Health Research (Riskesdas) 2018:** Supplied complementary data on health facility utilization, prevalence of obstetric complications, and community-level health behaviors.
- **Ministry of Health (Kemenkes) Republic Indonesia and Badan Pusat Statistik (BPS - Central Statistics Agency) Reports:** Provided official data on health infrastructure, including the density and distribution of health workers (doctors, midwives, nurses), the number and functionality of *Puskesmas* (community health centers), and hospitals, particularly those designated as providing Emergency Obstetric and Neonatal Care (EmONC).
- **Peer-Reviewed Literature:** A systematic review of academic studies from 2010-2023 was conducted using databases like PubMed, Google Scholar, and Scopus. Search terms included "maternal mortality Indonesia," "health disparities Indonesia," "three delays Indonesia," "[province name] maternal health," and related terms. This provided context, qualitative findings, and deeper explanations for the observed quantitative trends.

2. Variables

- **Dependent Variable:** Provincial Maternal Mortality Ratio (MMR), modeled from IDHS data.
- **Independent Variables (Grouped by Determinant)**
 - **Health Service Access & Utilization:** % of births assisted by a skilled health professional, % of mothers receiving ≥ 4 antenatal care visits, CEmONC facility availability per 500,000 population.
 - **Health System Resources:** Doctor-to-population ratio, midwife-to-population ratio, density of functional *Puskesmas*, health budget per capita.
 - **Socioeconomic Factors:** Female literacy rate, percentage of population below the poverty line, average years of schooling for women, women's employment status.
 - **Geographic & Demographic Factors:** Percentage of population living in rural areas, index of geographic remoteness (constructed from travel time to nearest hospital), population density.

3. Analytical Approach

1. **Descriptive Analysis:** Provincial MMR rates and independent variables were mapped and tabulated to visualize the disparities. Provinces were grouped into high-MMR (e.g., Papua, NTT, West Sulawesi) and low-MMR (e.g., DIY Yogyakarta, Bali, Jakarta) clusters for comparative analysis.
2. **Correlation Analysis:** Spearman's rank correlation coefficient was used to assess the strength and direction of the relationship between provincial MMR and the

various independent variables (e.g., correlation between MMR and poverty rate, or MMR and skilled birth attendance).

- **Qualitative Synthesis:** Findings from the literature review were thematically analyzed using the Three Delays framework to explain the mechanisms behind the quantitative correlations. For example, qualitative studies explaining why women in Papua choose traditional birth attendants were used to interpret low SBA rates.

Limitations

The analysis is constrained by the inherent limitations of the underlying data. MMR estimates in Indonesia, particularly at the provincial level, are model-based and subject to wide confidence intervals due to the challenges of accurate registration and reporting of maternal deaths. Furthermore, establishing definitive causality is difficult with ecological (province-level) data, as correlations do not necessarily prove causation. The analysis instead identifies strong associations and plausible pathways of influence.

Results

The analysis reveals stark and systematic disparities in MMR across Indonesian provinces, strongly correlated with a clear set of interconnected determinants.

1. Magnitude of Provincial Disparity:

The geographical inequality is extreme. According to IDHS-derived estimates, while the national MMR stood at 183 in 2021, provinces like Yogyakarta (48) and Bali (80) have achieved rates on par with upper-middle-income countries. In stark contrast, the easternmost provinces report catastrophically high figures: Papua (486), West Papua (334), and East Nusa Tenggara (NTT) (295). This means a woman in Papua is approximately ten times more likely to die from pregnancy-related causes than a woman in Yogyakarta. Other provinces with significantly elevated MMR include West Sulawesi (264), Maluku (238), and Aceh (228).

2. Determinants of Disparity

- a. **Health Service Access and Utilization:** A strong negative correlation was found between MMR and key coverage indicators. Provinces with the highest MMR consistently showed the lowest coverage.
 - **Skilled Birth Attendance (SBA):** The correlation was profound ($\rho \approx -0.85$). In low-MMR provinces like Bali and Jakarta, SBA coverage exceeds 98%. In high-MMR Papua, it plummets to 57.4%, meaning nearly half of all births are not assisted by a trained professional.
 - **Antenatal Care (ANC):** A similar pattern was observed for the percentage of mothers receiving the recommended four or more ANC visits ($\rho \approx -0.78$). Coverage was below 70% in Papua, West Papua, and NTT, compared to over 90% in Java and Bali.
 - **Emergency Care (EmONC):** The availability of fully functional CEmONC facilities is critically low in

Eastern Indonesia. Fewer than 20% of hospitals in these regions me *kuldeep* l signal functions for emergency care, compared to over 80% in Java. The ratio of CEmONC facilities to population in Papua was less than one-third of the ratio in Yogyakarta.

b. Health System Resources

The maldistribution of human resources for health is a primary driver of the third delay.

- **Health Worker Density:** The doctor-to-population ratio in Papua (0.1 per 1,000) is less than one-fifth of that in Jakarta (0.6 per 1,000). The gap is even more severe for specialist doctors (obstetricians/gynecologists), who are almost exclusively concentrated in provincial capitals and urban centers in Java and Sumatra, leaving vast rural areas without essential surgical expertise.

- **Health Infrastructure:** While the number of *Puskesmas* is relatively even per capita, their functionality is not. *Puskesmas* in remote areas often lack basic equipment, essential medicines like oxytocin and magnesium sulfate, and the trained staff to perform life-saving procedures, rendering them unable to provide basic emergency care.

c. Socioeconomic Factors

These factors underpin the first delay—the decision to seek care.

- **Poverty:** A very strong positive correlation was found between the provincial poverty rate and MMR ($\rho \approx +0.82$). The poorest provinces (Papua, West Papua, NTT, Gorontalo) align almost perfectly with the highest MMR provinces. Poverty limits financial access to transportation and services, even when nominally available.
- **Women's Education:** The correlation between the average years of schooling for women and MMR was strongly negative ($\rho \approx -0.79$). Higher education is associated with greater health knowledge, increased autonomy in decision-making, and a higher likelihood of rejecting harmful traditional practices in favor of modern healthcare.

d. Geographic and Demographic Factors

These factors are the primary cause of the second delay.

- **Rurality and Remoteness:** The percentage of the population living in rural areas correlated positively with MMR ($\rho \approx +0.70$). The high-MMR provinces are characterized by difficult terrain—mountains, forests, and thousands of islands—with dispersed populations. Travel times to a hospital capable of performing a Caesarean section can exceed 6-8 hours, a fatal duration in an obstetric emergency like hemorrhage or eclampsia.
- **Transportation and Infrastructure:** Qualitative studies from NTT and Maluku consistently cite the lack of affordable transportation, poor road conditions, and the absence of functional ambulance services as the most significant barriers to reaching care in time.

3. Interplay of the Three Delays

The results demonstrate how these determinants interact through the Three Delays framework. In a high-MMR province like Papua:

1. **Delay 1:** A young, poorly-educated woman from a poor household may not recognize danger signs or may defer to family or a traditional birth attendant due to cost and cultural norms.
2. **Delay 2:** If a complication arises, her remote village may be hours from a motorable road. The family must arrange and pay for private transport to a distant Puskesmas.
3. **Delay 3:** Upon arrival, the *Puskesmas* may be unequipped to handle the emergency (e.g., no blood transfusion capability). Referral to a hospital requires another long journey. At the hospital, a surgeon or anesthetist may not be available, or essential drugs may be out of stock. This cascade of failures, rooted in systemic disparities, directly leads to a preventable maternal death. This chain of failure is far less common in well-resourced provinces, where all three delays are effectively mitigated.

Discussion

This analysis confirms that disparities in maternal mortality rates between Indonesian provinces are not random but are the result of a deeply entrenched and synergistic interplay of geographic, socioeconomic, and health-system factors. The findings underscore that Indonesia's national MMR average is a misleading metric, masking a reality of profound inequality where a woman's survival is predicated on her postal code. The discussion interprets these results within the broader context of Indonesia's development challenges and existing literature.

1. Interpretation of Key Findings

The extreme disparity between Eastern Indonesia (Papua, NTT) and Western Indonesia (Java, Bali) is the most salient finding. This East-West gradient mirrors well-documented patterns of inequity in infrastructure development, economic investment, and human resource allocation across the archipelago (Titaley *KULDEEP.*, 2019) ^[18, 19]. The strong correlation between poverty, low female education, and high MMR is consistent with global evidence that maternal mortality is fundamentally a disease of poverty and disempowerment (Say *KULDEEP.*, 2014) ^[16]. In the Indonesian context, poverty not only limits financial access but also exacerbates geographic barriers, as the cost of transportation becomes an insurmountable obstacle.

The critical shortfall in skilled birth attendance and EmONC availability in high-MMR provinces is a direct failure of health system governance and resource allocation. While programs like the midwife village program (*Bidan di Desa*) increased the physical presence of providers, they did not always ensure quality, supervision, or the necessary supportive environment (Holloway *KULDEEP.*, 2014) ^[13]. A midwife in a remote Papua village without functional equipment, a reliable drug supply, or a clear referral pathway is ill-equipped to manage complications, leading to the tragic third delay.

2. The Synergy of the Three Delays:

The value of the Three Delays model is in illustrating how these determinants are not isolated but act in a cascade of failure.

- **The First Delay is rooted in socioeconomic disparity:** Low education and cultural practices, often intertwined with economic marginalization, lead to a lack of recognition of danger signs and a preference for traditional care. This is not merely a "cultural" issue but often a rational choice in a context where modern health services are perceived as distant, expensive, and unwelcoming (Sialubanje *et al.*, 2015)^[15].
- **The Second Delay is a direct consequence of geographic and infrastructural neglect:** The government's challenge in connecting thousands of islands and remote hinterlands is immense, but the result is that physical isolation remains the most frequently cited barrier in qualitative studies from Eastern Indonesia.
- **The Third Delay reveals the systemic weaknesses within the health system itself:** The maldistribution of human resources is a classic problem of health systems worldwide, but it is particularly acute in Indonesia. Factors include poor working conditions, lack of career incentives, and personal safety concerns for health workers placed in remote conflict-prone areas (Peters *et al.*, 2018)^[15]. This, combined with chronic underfunding for health infrastructure at the district level, means facilities exist in name but not in functionality.

3. Policy Implications and Recommendations

Addressing these disparities requires moving beyond blanket national policies to targeted, multi-sectoral interventions tailored to the specific barriers in high-MMR regions.

- **Tackling the First Delay:** Interventions must focus on community empowerment. This includes: (1) Investing in girls' education and conditional cash transfer programs that incentivize health-seeking behavior; (2) Strengthening community-based health education programs that involve traditional leaders and birth attendants to build bridges between communities and the formal health system.
- **Mitigating the Second Delay:** Innovation is key. Policy should: (1) Scale up successful programs like ambulance boat services (*ambulans perahu*) and motorcycle midwife teams for last-mile connectivity; (2) Invest in digital health (telemedicine) to provide remote consultations and triage, reducing unnecessary and difficult journeys.
- **Eliminating the Third Delay:** This requires a fundamental strengthening of the health system with a focus on equity. Priorities include: (1) Implementing strong affirmative action and incentive packages (financial, professional, familial) to attract and retain skilled health workers in underserved areas; (2) Ensuring every *Puskesmas* meets minimum service

standards for emergency maternal care, including a reliable supply of essential medicines; (3) Mandating and auditing the functionality of CEmONC services in all district hospitals.

Limitations and Research Gaps

This analysis relied on modeled MMR estimates, which are imperfect. There is an urgent need to strengthen Civil Registration and Vital Statistics (CRVS) systems to obtain real-time, accurate data on maternal deaths. Furthermore, more qualitative research is needed to understand the nuanced cultural decision-making processes and the specific barriers faced by the most marginalized subgroups within these provinces, such as indigenous communities.

Conclusion

The disparity in maternal mortality rates between Indonesian provinces is a stark indicator of inequitable development. It is a crisis driven not by a lack of knowledge or policy, but by a failure to ensure that the benefits of national progress reach the most peripheral and marginalized populations. The analysis conclusively shows that women in Papua, NTT, and other eastern provinces face a perfect storm of barriers: they are more likely to be poor and less educated, live in remote locations with terrible infrastructure, and have access to a health system that is understaffed, under-equipped, and often dysfunctional. Addressing this requires a paradigm shift from national-level reporting to hyper-local, equity-focused solutions that simultaneously tackle the socioeconomic determinants of health and radically strengthen the health system's reach and quality in underserved regions. The goal must be to ensure that every woman in Indonesia, regardless of where she lives, has a right to safe motherhood.

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