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A Comparison of Maternal Health Indicators in Indonesia and ASEAN Countries: Lessons for the Development of the Midwifery Profession

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Abstract

Background. SDG 3.1 calls for a maternal mortality ratio (MMR) below 70 per 100,000 live births by 2030. Indonesia has long developed the midwifery profession, but its status compared to neighboring countries has not been extensively analyzed quantitatively.
Objectives. To compare Indonesia's MMR, its rate of decline, and maternal health service indicators with those of ASEAN countries, and to identify lessons for the development of the midwifery profession.
Methods. A comparative ecological study of 11 ASEAN countries using data from the World Bank's World Development Indicators (MMR for 2000 and 2023, births attended by health personnel, ANC4, nurse and midwife density, health expenditure, and GNI per capita at PPP). The analysis included the average annual rate of decline (ARR), Spearman's correlation with a 95% confidence interval, and log-log regression of the MMR against income.
Results. Indonesia's MMR in 2023 was 140, the third highest in ASEAN, above Cambodia (137) and Laos (112). During 2000–2023, Indonesia's MMR decreased by 55.0% (ARR of 3.5% per year), while the ARR required to achieve the 2030 target is 9.9%. The MMR is strongly correlated with births attended by health personnel (rho = −0.87), ANC4 (rho = −0.84), and GNI per capita (rho = −0.88). Indonesia's MMR is 1.96 times higher than expected given its income level, even though the coverage of births attended by health personnel is already 94.7%.
Conclusion. Indonesia's gaps lie more in the quality and continuity of care than in the number of birth attendants. The development of the midwifery profession needs to focus on emergency care competencies, robust education and regulation, equitable distribution to regions with high MMRs, and integration with the referral system.
Keywords: maternal mortality; ASEAN; midwives; quality of care; ecological study

Introduction

Reducing maternal mortality is one of the key targets of the Sustainable Development Goals (SDGs). Target 3.1 sets *a* global *maternal mortality ratio* (MMR) of less than 70 per 100,000 live births by 2030, but estimates from various UN agencies indicate that more than 700 women still die every day due to pregnancy and childbirth (World Health Organization [WHO] et al., 2025). Most of these deaths are preventable with timely, high-quality care, and effective interventions already exist for the primary direct causes—hemorrhage, hypertensive disorders, and infections (Cresswell et al., 2025; Say et al., 2014).
Southeast Asia presents a contrasting picture. ASEAN countries exhibit a wide range of income levels, health systems, and trajectories of maternal mortality decline. The concept of obstetric transition explains that countries move from a stage of high

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maternal mortality dominated by direct causes to a stage of low mortality dominated by indirect causes and noncommunicable diseases, as access to and the quality of services improve (Souza et al., 2014). Comparing Indonesia with its neighbors can reveal which stage Indonesia is in and which policies have been successful elsewhere.

Indonesia has a long history of developing the midwifery profession. The village midwife program, launched in 1989, placed more than 50,000 midwives in villages within about seven years and significantly reduced socioeconomic disparities in childbirth attended by health workers. However, disparities in access to emergency obstetric care have actually widened (Hatt et al., 2007). A study in two districts also found that midwives in remote areas were fewer in number and less experienced, and handled too few births to maintain their skills (Makowiecka et al., 2008). A review of experiences in countries with high maternal mortality rates concluded that the deployment of midwives reduces maternal mortality only when accompanied by health system strengthening, professional regulation, and access to referral care (Van Lerberghe et al., 2014).

Global evidence confirms that educated, regulated midwives working within a supportive system represent one of the most effective investments in maternal and newborn health (Renfrew et al., 2014; ten Hoope-Bender et al., 2014). Modeling estimates that expanding the coverage of midwifery interventions could prevent the majority of maternal deaths, neonatal deaths, and stillbirths (Homer et al., 2014; Nove et al., 2021). Nevertheless, the *2021 State of the World's Midwifery* report notes a global shortage of 1.1 million health workers specializing in sexual and reproductive health, maternal, newborn, and adolescent care, 900,000 of whom are midwives (United Nations Population Fund [UNFPA] et al., 2021).

The issue is that high rates of childbirth attended by health workers do not always correspond to low maternal mortality rates. Cross-country analyses show that in low- and middle-income countries, more deaths result from low-quality care than from a lack of access to care (Kruk et al., 2018). A global review of childbirth care also found that many facilities lack the capacity to manage complications despite high volumes of deliveries (Campbell et al., 2016). In Indonesia, the MMR did indeed decline from 450 in 1990 to 249 in 2020 according to a systematic review, but it remains among the highest in Southeast Asia, with wide disparities across regions (Syairaji et al., 2024). Census data indicate that access to facilities and skilled personnel is a key determinant of maternal mortality in Indonesia (Cameron et al., 2019).

Quantitative comparisons between Indonesia and all ASEAN countries using the latest data are still rare, particularly those linking outcomes to a country's income level and midwifery workforce density. This study aims to (1) compare the MMR, its rate of decline, and maternal health service indicators across 11 ASEAN countries, (2) analyze the relationship between these indicators and the MMR, (3) assess Indonesia's position relative to projections based on its income level, and (4) formulate lessons for the development of the midwifery profession in Indonesia.

Methods

Study Design. This study is a comparative cross-national ecological study with a cross-sectional design, supplemented by an analysis of MMR trends from 2000 to 2023. The unit of analysis is the country. The study population consists of all 11 ASEAN member countries: Brunei Darussalam, the Philippines, Indonesia, Cambodia, Laos, Malaysia,

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Myanmar, Singapore, Thailand, Timor-Leste, and Vietnam. Timor-Leste was included because it has been accepted as an ASEAN member.

Data sources. All data were freely downloaded from the World Bank's World Development Indicators (WDI) database via its official application programming interface (API) (World Bank, 2025). MMR estimates in the WDI are derived from inter-agency estimates by the United Nations (MMEIG), namely the WHO, UNICEF, UNFPA, the World Bank Group, and the United Nations Population Division (WHO et al., 2025). Data were accessed on October 31, 2026.

Variables. The dependent variable is the 2023 MMR per 100,000 live births (code SH.STA.MMRT). The independent variables are:

1. deliveries attended by skilled health personnel (% of births; SH.STA.BRTC.ZS);
2. pregnant women with at least four antenatal care visits (ANC4, %; SH.STA.ANV4.ZS);
3. the density of nurses and midwives per 1,000 population (SH.MED.NUMW.P3);
4. current health expenditure as a percentage of gross domestic product (GDP) (SH.XPD.CHEX.GD.ZS);
5. gross national income (GNI) per capita based on purchasing power parity (PPP, international dollars; NY.GNP.PCAP.PP.CD).

The 2023 neonatal mortality rate (SH.DYN.NMRT) is presented for context. For indicators not available annually, the most recent available value is used, and the year is noted in the table.

Data analysis. The analysis was conducted in four stages.

1. *Descriptive.* Countries are ranked by the 2023 MMR, and the values for each indicator are presented in the table.
2. *Rate of decline.* The relative decline in the MMR during 2000–2023 was calculated as (MMR 2000 − MMR 2023) / MMR 2000. *The average annual rate of reduction* (ARR) is calculated using the formula ARR = ln(MMR 2000 / MMR 2023) / 23 × 100%. The ARR required for Indonesia to achieve an MMR of 70 by 2030 is calculated using the same formula.

$$\text{Penurunan relatif} = \frac{MMR_{2000} - MMR_{2023}}{MMR_{2000}} \times 100\% \quad (1)$$

$$ARR = \frac{\ln\left(MMR_{2000}/MMR_{2023}\right)}{23} \times 100\% \quad (2)$$

3. *Correlation.* The relationship between each indicator and the MMR was tested using Spearman's rank correlation, given the small number of countries and the skewed data distribution. The 95% confidence interval (95% CI) was calculated using the Fisher-z transformation and the Bonett–Wright standard error (1.06/√(n − 3)).

$$z = \frac{1}{2}\ln\left(\frac{1+\rho}{1-\rho}\right), \qquad SE = \frac{1{,}06}{\sqrt{n-3}} \quad (3)$$

$$\text{IK } 95\% = \tanh\left(z \pm 1{,}96 \times SE\right) \quad (4)$$

4. *Relative position in terms of income.* A linear regression of ln(MMR) against ln(GNI per capita PPP) was used to calculate the expected MMR at each country's income level. The ratio of the observed MMR to the expected MMR

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was calculated; a value above 1 indicates that the MMR is higher than expected based on the country's income.

$$\ln(MMR_i) = \beta_0 + \beta_1 \ln(GNI_i) + \varepsilon_i \quad (5)$$

$$\text{Rasio}_i = \frac{MMR_{i,\text{teramati}}}{\exp\left(\hat{\beta}_0 + \hat{\beta}_1 \ln(GNI_i)\right)} \quad (6)$$

A sensitivity analysis was conducted by excluding Myanmar from the analysis of nurse and midwife density, as its value (0.2 per 1,000 population) is far below that of other countries and likely reflects reporting issues. The analysis was performed using Python 3 (SciPy and NumPy). A p-value < 0.05 (two-tailed) was considered statistically significant.

Ethics. This study used publicly available country-level aggregate data; therefore, no ethical approval was required.

Results

Indonesia's Position in ASEAN. In 2023, Indonesia's maternal mortality ratio (MMR) was estimated at 140 per 100,000 live births, the third highest among the 11 ASEAN countries after Timor-Leste (192) and Myanmar (185). This figure is slightly higher than that of Cambodia (137) and Laos (112), even though the GNI per capita of those two countries is only about half that of Indonesia. Indonesia's MMR is also double the SDG target and nearly three times that of Vietnam (48), a country with a nearly identical GNI per capita (Figure 1). Only five countries have a MMR below 70: Singapore, Malaysia, Thailand, Brunei Darussalam, and Vietnam.

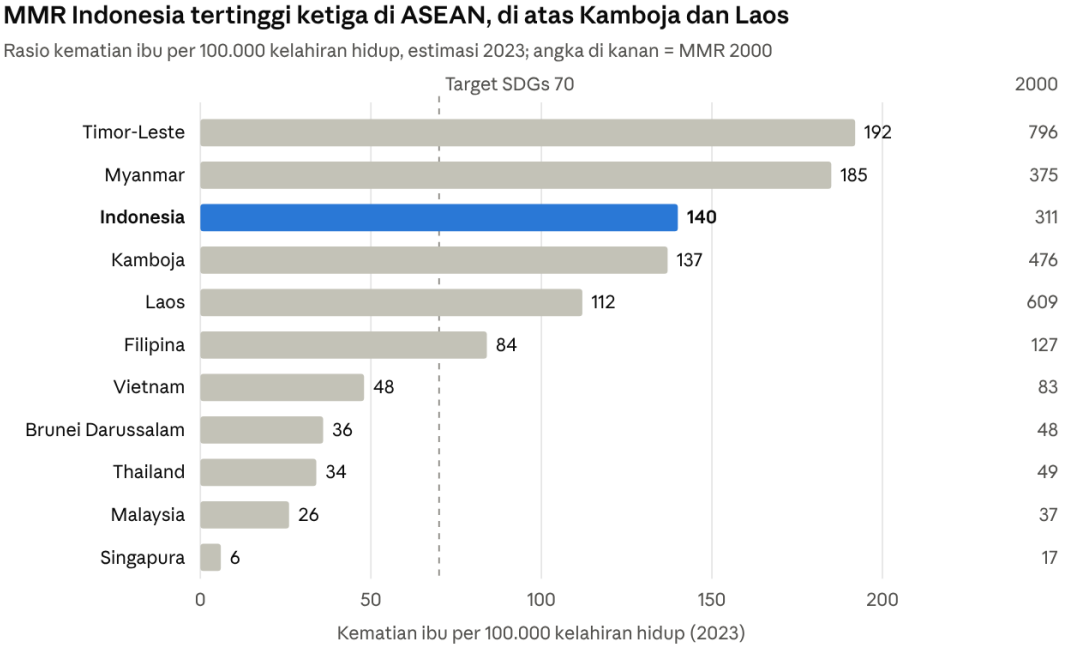


Figure 1. Indonesia's MMR is the third highest in ASEAN, above Cambodia and Laos. Source: World Bank (2025), World Development Indicators, based on estimates by WHO et al. (2025).

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Service indicators. The rate of births attended by health personnel in Indonesia (94.7%) is on par with high-performing countries, but the rate of ANC4 coverage (77.4%) and health spending (2.7% of GDP) are among the lowest in the region (Table 1). Indonesia's density of nurses and midwives (3.2 per 1,000 population) is in the middle, below Malaysia (4.1), the Philippines (4.8), and Singapore (6.6), and slightly below Thailand (3.6), a country with an MMR of about one-quarter of Indonesia's. The Philippines, on the other hand, has a higher density (4.8) but its MMR is still 84, while Vietnam, with a density of only 1.4, has already achieved an MMR of 48.

Table 1. Maternal health indicators and health systems in ASEAN countries, ranked by 2023 MMR

Country	MMR 2023	Healthcare-Attended Deliveries, % (year)	ANC4, % (per year)	Nurses and midwives per 1,000 (year)	Health spending, % of GDP 2023	GNI per capita (PPP) 2023 (US$)	AKN 2023
Singapore	6	99.6 (2021)	–	6.6 (2022)	4.5	116,630	1.1
Malaysia	26	99.6 (2019)	97.4 (2016)	4.1 (2023)	4.0	35,380	4.2
Thailand	34	99.1 (2019)	90.0 (2019)	3.6 (2023)	4.5	23,020	5.3
Brunei Darussalam	36	99.6 (2021)	93.2 (2012)	6.6 (2021)	2.2	86,200	5.7
Vietnam	48	96.1 (2021)	88.2 (2021)	1.4 (2016)	4.6	14,260	9.1
Philippines	84	84.4 (2017)	86.5 (2017)	4.8 (2021)	5.1	12,200	13.9
Laos	112	64.4 (2017)	62.2 (2017)	1.0 (2023)	1.3	8,620	13.6
Cambodia	137	98.7 (2022)	75.6 (2014)	1.0 (2019)	4.6	7,270	9.9
Indonesia	**140**	**94.7 (2019)**	**77.4 (2017)**	**3.2 (2023)**	**2.7**	**15,020**	**9.5**
Myanmar	185	60.2 (2016)	58.6 (2016)	0.2 (2022)	4.5	5,810	20.1
East Timor	192	56.7 (2016)	76.7 (2016)	1.7 (2020)	9.6	5,300	22.1

Note: MMR = maternal mortality ratio per 100,000 live births; ANC4 = at least four antenatal care visits; GDP = gross domestic product; GNI = gross national income; PPP = purchasing power parity; NMR = neonatal mortality rate per 1,000 live births. A hyphen (–) indicates that data is not available. Source: World Bank (2025), adapted.

MMR decline rate, 2000–2023. Indonesia's MMR fell by 55.0%, from 311 to 140, with an annual rate of decline (ARR) of 3.5%. This rate is slower than that of Laos (7.4%), Timor-Leste (6.2%), Cambodia (5.4%), and Singapore (4.5%). Cambodia, which in 2000 had a much higher MMR (476), is now on par with Indonesia. To achieve an MMR of 70

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by 2030, Indonesia will need an annual reduction rate (ARR) of approximately 9.9%—nearly three times the current rate (Table 2).

Table 2. Decline in MMR, 2000–2023, in ASEAN Countries

Country	MMR 2000	MMR 2023	Decrease (%)	Annual Rate of Decline (% per year)
Laos	609	112	81.6	7.4
East Timor	796	192	75.9	6.2
Cambodia	476	137	71.2	5.4
Singapore	17	6	64.7	4.5
Indonesia	**311**	**140**	**55.0**	**3.5**
Myanmar	375	185	50.7	3.1
Vietnam	83	48	42.2	2.4
Philippines	127	84	33.9	1.8
Thailand	49	34	30.6	1.6
Malaysia	37	26	29.7	1.5
Brunei Darussalam	48	36	25.0	1.3

Note: ARR = average annual rate of decline, ln(MMR 2000/MMR 2023)/23 × 100%. Source: World Bank (2025), adapted.

Relationship between indicators and MMR. The MMR is strongly negatively correlated with the coverage of deliveries attended by health personnel (rho = −0.87; 95% CI −0.97 to −0.54; p < 0.001), ANC4 (rho = −0.84; 95% CI −0.97 to −0.42; p = 0.002; n = 10), and GNI per capita (rho = −0.88; 95% CI −0.97 to −0.57; p < 0.001). The correlation with nurse and midwife density was also negative (rho = −0.68; 95% CI −0.92 to −0.10; p = 0.021), but was no longer significant after Myanmar was excluded (rho = −0.62; 95% CI −0.91 to 0.05; p = 0.054; n = 10). Health spending as a percentage of GDP was not correlated with the MMR (rho = 0.22; 95% CI −0.47 to 0.74; p = 0.52).

Indonesia's MMR compared to projections based on income. Regressing ln(MMR) on ln(GNI per capita) yielded a coefficient of −0.92, meaning that a 1% increase in income is associated with a roughly 0.9% decrease in the MMR. At its income level, Indonesia's MMR is projected to be around 71, but the observed figure is 140—or 1.96 times the projection. Only Brunei Darussalam has a higher ratio (2.51). In contrast, Vietnam (0.64), Thailand (0.71), and Malaysia (0.80) have MMRs lower than projected based on their income levels, while Cambodia (0.99) and Laos (0.94) are in line with projections.

Discussion

This study yielded four key findings. First, Indonesia's MMR in 2023 was the third highest in ASEAN and higher than that of Cambodia and Laos, which have significantly lower incomes. Second, the rate of decline in Indonesia's MMR during 2000–2023 (3.5% per year) was far below the rate required to achieve the SDG target (9.9% per year). Third, Indonesia's MMR is approximately twice what would be expected based on its income level. Fourth, the coverage of births attended by health workers in Indonesia is already high, so the main issue is no longer the availability of birth attendants but rather the quality and continuity of care.

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The gap between coverage and outcomes. Coverage of births attended by health personnel is strongly correlated with the MMR at the regional level, but Indonesia and Cambodia demonstrate that coverage above 90% does not guarantee a low MMR. This pattern aligns with findings that in low- and middle-income countries, deaths resulting from low-quality care outnumber those resulting from a lack of care (Kruk et al., 2018). A global review of childbirth services also indicates that many births occur in small facilities unable to manage obstetric complications (Campbell et al., 2016). In Indonesia, the experience with the village midwife program shows a similar pattern: deliveries attended by health workers are increasing most rapidly among the poorest groups, but access to cesarean sections and emergency obstetric care remains unequal (Hatt et al., 2007). Midwives in remote areas also handle too few deliveries to maintain their clinical skills (Makowiecka et al., 2008).

Indonesia's ANC4 coverage (77.4%) is lower than that of Vietnam, Thailand, Malaysia, and the Philippines. Comprehensive antenatal care is the primary opportunity to detect pregnancy-induced hypertension and non-obstetric comorbidities—two groups of causes whose share of maternal deaths in Indonesia continues to rise (Syairaji et al., 2024). Within the framework of obstetric transition, Indonesia is at a stage where direct causes remain dominant, but indirect causes and noncommunicable diseases are beginning to rise, necessitating more continuous and integrated care (Souza et al., 2014).

Lessons from neighboring countries. Vietnam has achieved an MMR of 48 with a per capita income slightly below Indonesia's and a lower density of nurses and midwives, while Malaysia and Thailand have long been below the SDG targets. All three countries have MMRs lower than expected given their income levels. The data from this study cannot directly explain the reasons, but a review of country experiences shows that successful reductions in maternal mortality generally combine the deployment of midwives with the strengthening of referral systems, financial protection, and consistent quality oversight (Van Lerberghe et al., 2014). Cambodia and Laos also demonstrate that rapid reductions remain achievable even from very high starting points, with annual rates of reduction (ARR) exceeding 5% per year. In contrast, the Philippines—which has the third-highest density of nurses and midwives after Brunei and Singapore—still has an MMR of 84, indicating that workforce numbers alone are insufficient.

Indonesia's health spending (2.7% of GDP) is among the lowest in the region. At the regional level, health spending is not correlated with the MMR, likely because high-income countries such as Brunei and Singapore spend a small percentage of GDP but a large absolute amount, while Timor-Leste spends a large percentage of its small GDP. Nevertheless, low spending limits Indonesia's ability to fund the continuing education, equipment, and referral systems necessary for quality care.

Implications for the development of the midwifery profession. These findings offer several lessons:

1. *From quantity to quality*. Indonesia already has a large number of midwives. The next focus should be on competency, particularly the early detection and management of complications, in line with a quality framework for midwifery care that emphasizes education, regulation, and a supportive work environment (Renfrew et al., 2014; ten Hoope-Bender et al., 2014).

2. *Education and regulation.* Midwives educated to international standards and subject to regulation can provide the majority of essential interventions for maternal and newborn health (Homer et al., 2014; Nove et al., 2021). Educational accreditation, competency testing, and continuing professional development need to be strengthened.
3. *Case volume and skills.* Midwives who rarely assist with deliveries need regular training using emergency simulations and must work as part of a team with referral facilities.
4. *Equitable distribution.* The global shortage of midwives remains significant (UNFPA et al., 2021), and Indonesia's highest maternal mortality rates are found in Sulawesi and the eastern regions (Syairaji et al., 2024). Placement policies and incentives must be directed toward these areas.
5. *Continuity of care.* Increasing coverage of comprehensive antenatal care (ANC) and postpartum visits is just as important as having deliveries attended by health care providers.

Limitations. This study has several limitations. First, a country-level ecological design cannot demonstrate causal relationships and is susceptible to ecological bias. Second, the sample size of only 11 countries limits statistical power and results in wide 95% confidence intervals. Third, the years of data vary across indicators and countries, as some indicators are only available from surveys conducted every few years. Fourth, the MMR is an estimate from the MMEIG model that has a range of uncertainty and may differ from national figures; for example, the results of the 2020 Long Form Population Census for Indonesia (189 per 100,000 live births) (Central Statistics Agency, 2023). Fifth, the World Bank's density indicator combines nurses and midwives, so it does not specifically reflect the number of midwives, and the data for Myanmar is likely incomplete.

Conclusion

Indonesia lags behind most ASEAN countries in reducing maternal mortality. The 2023 MMR of 140 per 100,000 live births ranks Indonesia third highest among the 11 countries, roughly double the rate expected given its income level, with a rate of decline that is only one-third of the rate needed to achieve the 2030 SDG target. The coverage of deliveries attended by health workers is already high, so the key lessons from neighboring countries are the importance of quality of care, continuity of care from antenatal through the postpartum period, and a functioning referral system—not merely increasing the number of health workers.

Recommendations.

1. *For professional organizations and midwifery educational institutions:* strengthen competency-based education in accordance with international standards, conduct competency assessments, and provide regular training in obstetric emergencies.
2. *For the Ministry of Health and local governments:* increase spending on maternal health, direct the placement of midwives and provide incentives for them to work in areas with high maternal mortality rates, and strengthen referral networks between midwives and hospitals.

3. *For midwives in clinical practice:* increase coverage of comprehensive antenatal care (ANC) and postpartum visits as opportunities for early detection of complications.
4. *For researchers:* conduct a qualitative comparison of Indonesia's midwifery policies with those of Vietnam, Thailand, and Malaysia, and analyze provincial-level data to map quality gaps.

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