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# Strengthening Community-Based Early Warning for Postpartum Maternal Mortality Prevention

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## Abstract

Postpartum maternal mortality remains a critical public health and governance issue in Indonesia, particularly in districts where maternal deaths continue to occur despite facility-based childbirth. This study aimed to examine postpartum maternal deaths in Brebes Regency, Central Java, and identify health governance factors associated with preventable deaths, including gaps in early detection, referral coordination, community surveillance, and policy implementation. This study employed a qualitative case study design, supplemented by document review of maternal death audit materials, health profiles, and Maternal and Perinatal Death Surveillance and Response (MPDSR) data, and drew on focus group discussions, interviews, and policy analysis. The findings indicate that postpartum deaths are associated not only with clinical complications,

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including hypertensive disorders, hemorrhage, infection, and non-obstetric conditions, but also with systemic vulnerabilities such as inadequate postpartum monitoring, delayed family decision-making, fragmented referral processes, weak data integration, and limited community-based surveillance. Although Indonesian health regulations recognize maternal care across pregnancy, childbirth, and the postpartum period, they have not yet provided an explicit and operational framework for a community-based early warning mechanism specifically linked to postpartum follow-up. The study therefore proposes integrating a community-based Early Warning System (EWS) with MPDSR to strengthen the preventive function of maternal death surveillance. This integration is proposed as a policy and governance option, rather than as a model that has already been tested, to support earlier detection, timely referral, and more responsive postpartum care. The study recommends risk-based postnatal monitoring, improved referral coordination, strengthened community health literacy, better integration of surveillance data, and rights-based maternal health regulation to address preventable postpartum deaths.

**Keywords**: *Maternal Mortality; Postpartum Care; Early Warning System.*

# Introduction

Maternal mortality remains a complex public health and legal-policy challenge in Indonesia. Recent national data indicate that maternal deaths have fluctuated in the last three years, with 3,572 cases reported in 2022, increasing to 4,482 in 2023, and then declining to 4,150 in 2024.[1] A similar pattern can also be observed at the provincial level. In Central Java, maternal deaths were recorded at 485 cases in 2022, declined to 427 in 2023, and rose again to 438 in 2024.[2] This pattern suggests that the decline in maternal mortality in Indonesia, as well as in Central Java, has not yet been consistent or sustainable. In terms of national health indicators, Indonesia's maternal mortality ratio was still recorded at 189 per 100,000 live births based on the 2020 Long Form Population Census, which remained above the national target of 183 per 100,000 live births as set out in the 2020–2024 National Medium-Term

[1] Kementerian Kesehatan Republik Indonesia, *Profil Kesehatan Indonesia 2024* (Jakarta: Kementerian Kesehatan RI, 2025).

[2] Dinas Kesehatan Provinsi Jawa Tengah, *Profil Kesehatan Provinsi Jawa Tengah Tahun 2024* (Semarang: Dinas Kesehatan Provinsi Jawa Tengah, 2025).

Development Plan. Indonesia has implemented a multifaceted approach to reduce MMR focusing on a shift from general service model to a primary care-centered system, technology-driven and a risk based like Strengthening Primary Healthcare, Emergency and Hospital Readiness, nutrition and prevention interventions, digital health governance.[3] At the national level, Indonesia continues to face major challenges, although the long-term trend shows a decline. Data from the Long Form Population Census 2020 show that Indonesia's MMR was 189 per 100,000 live births, declining from 346 in the 2010 Population Census and 305 in the 2015.

The fluctuation of maternal mortality indicates that maternal health interventions in Indonesia continue to face structural challenges, including unequal access to healthcare, uneven quality of services, and persistent socio-cultural barriers. Globally, maternal mortality is widely recognized as a key indicator of the quality, equity, and responsiveness of a country's health system.[4] It is also closely tied to the Sustainable Development Goals, especially the target of reducing the global maternal mortality ratio to less than 70 per 100,000 live births by 2030.[5] Yet international evidence shows that many developing countries, including Indonesia[6], continue to experience major obstacles in achieving this target—particularly during the postpartum period, which often receives less policy and programmatic attention than pregnancy and childbirth.[7]

The postpartum period is especially significant as it represents the most critical phase in the maternal continuum of care. WHO has emphasized that the days and weeks following childbirth are a crucial period for both women and newborns, requiring continuous, timely, and risk-responsive postnatal care.[8] Nevertheless, postpartum care often remains a "blind spot" in maternal health

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3 Kementerian PPN/Bappenas, *Mortalitas Di Indonesia: Hasil Long Form Sensus Penduduk 2020* (Jakarta: Bappenas, 2024).

4 World Health Organization, "Maternal Mortality," 2025.

5 United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development* (New York: United Nations, 2015).

6 Oktavia Manuama and Jessie Yunus, "Towards a Responsive Health System and Equitable Access to Quality RMNCAH Services," June 2, 2026, https://www.who.int/indonesia/news/detail/02-06-2026-towards-a-responsive-health-system-and-equitable-access-to-quality-rmncah-services#.

7 Lale Say et al., "Global Causes of Maternal Death: A WHO Systematic Analysis," *The Lancet Global Health* 2, no. 6 (2014), https://doi.org/10.1016/S2214-109X(14)70227-X.

8 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience* (Geneva: World Health Organization, 2022); Aleena M Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum," *BMJ Global Health* 8, no. Suppl 2 (2023), https://doi.org/10.1136/bmjgh-2022-010992.

systems, since policy and service delivery tend to prioritize antenatal and delivery. This imbalance is especially concerning because postpartum complications such as haemorrhage, hypertensive disorders, sepsis, and cardiovascular conditions may progress rapidly and become fatal if not identified early.[9]

In Indonesia, this issue is reflected in the distribution of maternal deaths across the continuum of pregnancy, childbirth, and the postpartum period. Regional health reports from provinces with the highest contribution to maternal deaths—West Java, East Java, and Central Java—indicate that the majority of maternal deaths occurred during the postpartum period, accounting for more than 60 percent of cases on average in recent years. By contrast, deaths during childbirth and pregnancy accounted for a much smaller proportion. This evidence suggest that the postpartum phase carries the highest mortality risk but remains insufficiently monitored and inadequately addressed within maternal health service delivery. In this sense, postpartum mortality may be understood not only as a medical problem but also as a systemic policy failure.[10]

Evidence from Central Java further indicates a persistent concentration of maternal deaths during the postpartum period. The proportion of maternal deaths increased from 62.26 percent in 2023 to 71.66 percent in 2024, and remained high at 65 percent in 2025. This pattern suggests significant gaps in postpartum surveillance and follow-up care. Although antenatal care and facility-based delivery coverage have improved in Indonesia, the quality of postpartum monitoring remains inadequate—particularly regarding relation to early detection of complications, rapid decision-making, and effective referral mechanisms. The risk becomes more acute when postpartum women return home and are no longer under direct clinical observation, leaving danger-sign detection dependent on family awareness, community health workers, and the responsiveness of primary care providers.[11]

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9 World Health Organization, "Maternal Mortality"; Say et al., "Global Causes of Maternal Death: A WHO Systematic Analysis."

10 Dinas Kesehatan Provinsi Jawa Barat, *Profil Kesehatan Provinsi Jawa Barat* (Bandung: Dinas Kesehatan Provinsi Jawa Barat, 2025); Dinas Kesehatan Provinsi Jawa Timur, *Profil Kesehatan Provinsi Jawa Timur* (Surabaya: Dinas Kesehatan Provinsi Jawa Timur, 2025); Dinas Kesehatan Provinsi Jawa Tengah, *Profil Kesehatan Provinsi Jawa Tengah Tahun 2024*; Samuel R. Schnittman et al., "Changes in Immune Activation during Pregnancy and the Postpartum Period in Treated HIV Infection," *Open Forum Infectious Diseases* 8, no. 6 (2021), https://doi.org/10.1093/ofid/ofab245.

11 Dinas Kesehatan Provinsi Jawa Tengah, *Laporan Kinerja Dinas Kesehatan Provinsi Jawa Tengah Tahun 2023* (Semarang: Dinas Kesehatan Provinsi Jawa Tengah, 2024); Kementerian Kesehatan Republik Indonesia, *Profil Kesehatan Indonesia 2024*.

A substantial body of literature shows that maternal mortality is often driven not only by clinical causes but also by delays in care-seeking and service delivery. The Three Delays Model remains one of the most influential frameworks for understanding maternal mortality because it links death outcomes to three types of delay: recognizing danger signs and deciding to seek care, delay in reaching an appropriate health facility, and delay in receiving adequate treatment after arrival. Contemporary evidence synthesis continues to support the model, particularly in low- and middle-income settings where household decision-making, transport barriers, fragmented referral systems, and limited service readiness interact to produce preventable maternal deaths. In Indonesian, particularly in rural or semi-rural districts, these delays continue to shape maternal mortality outcomes in the postpartum phase.[12]

This situation also raises an important legal and health governance questions. Under Indonesia's current health law framework, maternal health is not merely a policy priority but part of the state's responsibility to ensure access to safe and quality maternal healthcare. Law No. 17 of 2023 on Health recognizes maternal health services across the continuum—from pre-pregnancy period through pregnancy, childbirth, and the postpartum period. This framework is further elaborated through Government Regulation No. 28 of 2024, which specifies postpartum care services, including health education and information (KIE), counseling, screening for complications, management and referral of complications, and contraceptive services. The technical implementation of reproductive health services is currently regulated under Minister of Health Regulation No. 2 of 2025, which replaced Minister of Health Regulation No. 21 of 2021. The current regulatory framework promotes maternal health through primary healthcare, family, and community-based services. However, it does not yet provide an explicit and operational community-based early warning mechanism specifically designed to support comprehensive and integrated postpartum follow-up and early detection of complications. This gap provides a policy basis for considering the integration of a community-based Early Warning System (EWS) with Maternal and Perinatal Death Surveillance and Response (MPDSR) to strengthen

[12] Sereen Thaddeus and Deborah Maine, "Too Far to Walk: Maternal Mortality in Context," *Social Science and Medicine* 38, no. 8 (1994): 1091–1110, https://doi.org/https://doi.org/10.1016/0277-9536(94)90226-7; Valentina Actis Danna et al., "Utility of the Three-Delays Model and Its Potential for Supporting a Solution-Based Approach to Accessing Intrapartum Care in Low- and Middle-Income Countries. A Qualitative Evidence Synthesis," *Global Health Action*, 2020, https://doi.org/10.1080/16549716.2020.1819052.

postpartum monitoring, referral coordination, and timely response to maternal risks. Normatively, these regulations require that postpartum care must be available at the primary health care level for all mothers. However, the continued concentration of maternal mortality in the postpartum period demonstrates a gap between legal norms and implementation in practice. In particular, there is no sufficiently explicit and operational regulatory mechanism governing active, community-based postpartum early detection and follow-up.[13]

From a rights-based perspective, this implementation gap is significant. International human rights standards require health services to satisfy the principles of availability, accessibility, acceptability, and quality (AAAQ).[14] In maternal healthcare, these principles apply throughout the reproductive cycle, including the postpartum period. Where postpartum care depends largely on mothers returning to health facilities on their own initiative, the state may formally provide services while substantively failing to ensure effective access and continuity of care. This suggests that postpartum mortality should be undestood not only as a public health problem but also as a legal and governance issue involving state accountability in the fulfillment of women's health rights.

In response to these challenges, recent studies have highlighted the importance of community-based approaches and early warning mechanisms for improving maternal outcomes. Early Warning Systems (EWS), particularly when adapted beyond hospitals and integrated into community surveillance, can enhance the early recognition of postpartum complications and accelerate referral processes.[15] Such systems can strengthen the role of families, village midwives, and community health volunteers in detecting changes in maternal condition after discharge and linking high-risk women to timely care.[16] At the same time, integration with Maternal and Perinatal Death Surveillance and Response (MPDSR) may allow maternal mortality data to serve not only as a

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13 Lia Dwi Prafitri, Suparni Suparni, and Gigih Setianto, "Pendampingan Ibu Hamil Dalam Upaya Deteksi Dini Resiko Tinggi Kehamilan," *Journal of Community Development* 5, no. 3 (2024), https://doi.org/10.47134/comdev.v5i3.287.

14 Committee on Economic, Social and Cultural Rights, "General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12)," 2000.

15 Jane Martin et al., "Maternal Early Warning Criteria Predict Postpartum Severe Maternal Morbidity and Mortality after Delivery Hospitalization Discharge: A Case–Control Study," *American Journal of Obstetrics and Gynecology MFM* 4, no. 6 (2022), https://doi.org/10.1016/j.ajogmf.2022.100706.

16 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

retrospective audit mechanism but also as a proactive governance instrument for prevention.[17]

Despite the growing international literature on hospital-based maternal early warning tools, studies examining community-based EWS within Indonesia's maternal healthcare legal and policy framework remain very limited. Most existing research focuses on clinical management or digital health innovation, whereas the regulatory, governance, and health law dimensions of postpartum early warning systems have received far less scholarly attention.

This article therefore argues that postpartum maternal mortality in Brebes Regency should be understood as a contemporary legal and policy issue, rather than merely as a clinical problem. It contends that Indonesia's maternal health framework suffers from an implementation gap between national legal commitments and local service realities—particularly during the postpartum period. It further proposes that integrating community-based EWS into maternal policy and MPDSR can support a more preventive, evidence-based, and rights-oriented model of maternal health governance, contributing not only to SDG 3 on good health and well-being, but also to SDG 5 on gender equality and SDG 16 on peace, justice, and strong institutions.[18] Accordingly, this article examines postpartum maternal mortality in Brebes Regency through the intersecting perspectives of referral governance, community-based early warning, MPDSR, and rights-based accountability, highlighting the need to strengthen the implementation of Indonesia's maternal health framework at community and local health-system levels.

This study employed a qualitative case study design and integrated public health and health law perspectives through a health system governance framework. The analysis focused on how community-based EWS can be connected with MPDSR to strengthen postpartum risk detection, referral decision-making, and policy accountability. The Three Delays Model was used

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17 World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation* (Geneva: World Health Organization, 2021).

18 United Nations, *Transforming Our World: The 2030 Agenda for Sustainable Development*; Fahmeeda Idrees et al., "Social Autopsy a Tool for Maternal and Perinatal Death Surveillance and Response (MPDSR) Reporting in Pakistan," *Pakistan Journal of Health Sciences*, 2022, https://doi.org/10.54393/pjhs.v3i05.146; Edwin Tayebwa et al., "Assessing Implementation of Maternal and Perinatal Death Surveillance and Response in Rwanda," *International Journal of Environmental Research and Public Health* 17, no. 12 (2020), https://doi.org/10.3390/ijerph17124376.

as an analytical lens for examining delays in recognizing danger signs, reaching facilities, and receiving timely care after arrival.[19]

A rights-based health policy approach was also applied to assess whether postpartum service delivery fulfills the state obligation to ensure availability, accessibility, acceptability, and quality of maternal healthcare beyond childbirth. This approach allowed the study to connect empirical service-delivery barriers with normative obligations under Indonesian health law and international right-to-health principles.[20]

The study was conducted in Brebes Regency, Central Java, because this district has consistently recorded one of the highest maternal death burdens in the province. The site was selected purposively based on the availability of MPDSR data, the presence of community-based maternal health programs, and geographic variation affecting access to health services. Field exploration covered district-level maternal health governance, referral dynamics, and selected primary-care contexts—such as Puskesmas Tanjung and Puskesmas Siwuluh—which were discussed in the FGDs as examples of frontline postpartum monitoring and information-system challenges.[21]

This multi-actor approach was used to generate a comprehensive understanding of EWS implementation and referral dynamics at the community level. In qualitative inquiry, participant selection was undertaken through purposive sampling and snowball sampling to ensure that those included had direct experience and relevant knowledge of the phenomenon under study.[22] Participants were selected using purposive sampling based on their roles, experience, and direct involvement in maternal health governance, postpartum care, referral services, community monitoring, and family-level

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19 World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*; Gill Walt and Lucy Gilson, "Reforming the Health Sector in Developing Countries: The Central Role of Policy Analysis," *Health Policy and Planning*, 1994, https://doi.org/10.1093/heapol/9.4.353; Actis Danna et al., "Utility of the Three-Delays Model and Its Potential for Supporting a Solution-Based Approach to Accessing Intrapartum Care in Low- and Middle-Income Countries. A Qualitative Evidence Synthesis."

20 Committee on Economic, Social and Cultural Rights, "General Comment No. 14: The Right to the Highest Attainable Standard of Health (Art. 12)."

21 Dinas Kesehatan Provinsi Jawa Barat, *Profil Kesehatan Provinsi Jawa Barat*; Dinas Kesehatan Provinsi Jawa Tengah, *Profil Kesehatan Provinsi Jawa Tengah Tahun 2024*; Dinas Kesehatan Provinsi Jawa Timur, *Profil Kesehatan Provinsi Jawa Timur*.

22 John W. Creswell and Cheryl N. Poth, "Qualitative Inquiry and Research Design: Choosing Among Five Approaches," *Public Administration* (Thousand Oaks, California: SAGE Publications, Inc, 2018), https://uk.sagepub.com/en-gb/eur/qualitative-inquiry-and-research-design/book266033#resources; John W Creswell, *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, *Australasian Emergency Nursing Journal*, vol. 11, 2007.

decision-making. The Focus Group Discussions (FGDs) were conducted in four sequential stages and involved a total of 62 participants.

Data were collected through methodological triangulation to improve credibility. The fieldwork comprised four FGDs.[23]

**Table 1.** Data Sources and Analytical Focus of the Qualitative Case Study

| Data source | Scope / participants or materials | Analytical purpose |
|---|---|---|
| Four FGDs | District Health Office; hospital and primary healthcare personnel; community health volunteers and families; Puskesmas-level stakeholders. | Identify service-delivery barriers, referral problems, community roles, and policy implementation gaps. |
| Semi-structured IDIs | Village midwives, community health volunteers, and family members involved in postpartum monitoring or complication response. | Explore household decision-making, danger-sign recognition, and referral-delay mechanisms. |
| Document review | MPDSR documents, maternal death reports, health profiles, and maternal health regulations. | Triangulate death patterns, modifiable factors, and legal-policy gaps. |

*Source:* Processed by author, 2026

The data were analyzed using thematic analysis, involving stages of data reduction, coding, categorization of themes, interpretation, and conclusion drawing. The analysis was conducted iteratively to ensure that the findings accurately reflected participants' experiences and the institutional context in

[23] Creswell and Poth, "Qualitative Inquiry and Research Design: Choosing Among Five Approaches."

which maternal deaths occurred.[24] Qualitative analysis software, including NVivo, was employed to support coding and theme clustering.

In addition to thematic analysis, this study employed a policy and regulatory analysis to assess the alignment of postpartum maternal health practices in Brebes Regency with Indonesia's current maternal health policy and legal framework. The analysis considered the provisions of Law No. 17 of 2023 on Health, Government Regulation No. 28 of 2024 as its implementing regulation, and Minister of Health Regulation No. 2 of 2025 on Reproductive Health Services, which replaced Minister of Health Regulation No. 21 of 2021. These provisions were examined alongside relevant WHO guidance on maternal and perinatal death surveillance and response to identify regulatory, implementation, and governance gaps related to postpartum monitoring, early detection, referral coordination, and community participation. This combined analytical approach enabled the study to interpret empirical findings within the current legal and policy context and to identify policy options for strengthening postpartum maternal health governance in Indonesia.

To ensure research trustworthiness, the study employed data triangulation, member checking, and peer discussion during interpretation. Ethical principles were upheld by maintaining participant confidentiality and securing informed consent prior to interviews and discussions. The use of MPDSR data adhered to confidentiality and health-data protection under applicable Indonesian health regulations and ethical standards.[25] Ethical approval was obtained from Health Research Ethics Committee, Ministry Of Health, Semarang Health Polytechnic ( No. 1352/EA/F.XXIII.38/2025).

# Postpartum Mortality as a Governance Problem in Central Java and Brebes Regency

The quantitative review of maternal mortality data demonstrates that the distribution of deaths is heavily concentrated in the postpartum period. In the high-burden provinces reviewed, postpartum deaths consistently accounted for more than half of all maternal deaths between 2022-2024, and in several cases

[24] Nicola K. Gale et al., "Using the Framework Method for the Analysis of Qualitative Data in Multi-Disciplinary Health Research," *BMC Medical Research Methodology* 13, no. 1 (2013), https://doi.org/10.1186/1471-2288-13-117.

[25] Creswell and Poth, "Qualitative Inquiry and Research Design: Choosing Among Five Approaches."

reached approximately 60 to 70 percent of total cases. This recurring pattern indicates that postpartum complications constitute a dominant mortality burden and should be addressed as a priority policy concern rather than a secondary stage of care.[26]

Data from Central Java show a particularly strong concentration of maternal deaths in the postpartum period. In 2022, Central Java recorded 485 maternal deaths, of which 302 cases (62.26%), occurred during the postpartum period. In 2023, the province recorded 438 deaths, with 275 cases (62.78%), occurring postpartum. In 2024, the number of deaths declined to 427, but the proportion occurring during the postpartum period increased sharply to 306 cases (71.66%). In 2025, Central Java recorded at 337, of which 219 cases (65%), occurred during the postpartum phase.[27] Although the total number of maternal deaths in the province shows some decline, the persistantly high postpartum share indicates that the postpartum period remains the most vulnerable point in the maternal continuum of care.

A similar pattern is observed in Brebes Regency. According to the compiled district data used in this study, Brebes Regency recorded 50 maternal deaths in 2022, 54 in 2023, 54 in 2024, and 34 in 2025. In each year, postpartum deaths constituted the largest category: 60% in 2022, 65% in 2023, 70.3% in 2024, and 64.7% in 2025. These figures confirm that postpartum mortality is a recurrent and dominant pattern in the district.[28]

**Table 2.** Postpartum maternal death pattern in Central Java and Brebes Regency, 2022-2025.

| Year | Central Java total deaths | Central Java postpartum deaths (%) | Brebes total deaths | Brebes postpartum deaths (%) |
|---|---|---|---|---|
| 2022 | 485 | 302 (62.26%) | 50 | 60.0% |
| 2023 | 438 | 275 (62.78%) | 54 | 65.0% |

[26] Dinas Kesehatan Provinsi Jawa Barat, *Profil Kesehatan Provinsi Jawa Barat*; Dinas Kesehatan Provinsi Jawa Tengah, *Profil Kesehatan Provinsi Jawa Tengah Tahun 2024*; Dinas Kesehatan Provinsi Jawa Timur, *Profil Kesehatan Provinsi Jawa Timur*.

[27] Dinas Kesehatan Provinsi Jawa Barat, *Profil Kesehatan Provinsi Jawa Barat*; Dinas Kesehatan Provinsi Jawa Tengah, *Profil Kesehatan Provinsi Jawa Tengah Tahun 2024*; Dinas Kesehatan Provinsi Jawa Timur, *Profil Kesehatan Provinsi Jawa Timur*.

[28] The Brebes figures are presented in the study's compiled district dataset and should be cross-checked against the final district health office report before journal submission

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|---|---|---|---|---|
| 2024 | 427 | 306 (71.66%) | 54 | 70.3% |
| 2025 | 337 | 219 (65.0%) | 34 | 64.7% |

*Source*: Central Java Provincial Health Office (2022–2025)[29]; Brebes Regency Government (2025)[30]; and Brebes District Health Office (2025)[31]

Taken together, the provincial and district data suggest that while women may survive pregnancy and childbirth but remain highly vulnerable during the days and weeks following delivery, when formal clinical supervision is often reduced. WHO has repeatedly emphasized that the first days and weeks after childbirth are critical for maternal survival and require timely, continues, and risk-responsive postpartum care. The Brebes Regency pattern therefore supports the argument that postpartum mortality constitutes a major blind spot in maternal health governance.[32]

The findings also indicate that postpartum mortality in Central Java and Brebes Regency cannot be explained solely by clinical causes. The persistence of postpartum dominance over four consecutive years suggests systemic weaknesses in postpartum monitoring, early recognition of danger sign, referral decision-making, and continuity of care after discharge from maternity services.[33] This interpretation is consistent with WHO guidance on MPDSR, which emphasizes that maternal death patterns should be analyzed not only in terms of direct medical causes but also in terms of avoidable systemic and

[29] Dinas Kesehatan Provinsi Jawa Tengah, "Profil Kesehatan Jawa Tengah Tahun 2023," Dinas Kesehatan Provinsi Jawa Tengah, May 2024, https://dinkesjatengprov.go.id/v2018/dokumen/1Profil_Kesehatan_2023/files/downloads/Profil Kesehatan Jawa Tengah 2023.pdf; Dinas Kesehatan Provinsi Jawa Tengah, *Profil Kesehatan Provinsi Jawa Tengah Tahun 2024*.

[30] Pemerintah Kabupaten Brebes, *Naskah Akademik Dan Draft Peraturan Bupati Brebes Nomor 38 Tahun 2025 Tentang Rencana Kerja Pemerintah Daerah Tahun 2026* (Brebes: Pemerintah Kabupaten Brebes, 2025), https://brebeskab.go.id/file/download/DOK_RKPD_KAB_BREBES_2026.pdf.

[31] PPID Dinas Kesehatan Daerah Kabupaten Brebes, "Data Kesehatan 2025," PPID Dinas Kesehatan Daerah Kabupaten Brebes, 2025, https://ppid.dinkesda.brebeskab.go.id/data-kesehatan-2025-2/.

[32] World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

[33] Mohammad Afzal Mahmood et al., "Health System and Quality of Care Factors Contributing to Maternal Deaths in East Java, Indonesia," *PLoS ONE* 16, no. 2 February (2021), https://doi.org/10.1371/journal.pone.0247911; Justine Dol et al., "Timing of Maternal Mortality and Severe Morbidity during the Postpartum Period: A Systematic Review," *JBI Evidence Synthesis*, 2022, https://doi.org/10.11124/JBIES-20-00578; Oktavia Beni Kujariningrum et al., "Maternal Predisposing Factors with The Incidence of Low Birth Weight in Central Java," *Kemas* 18, no. 3 (2023), https://doi.org/10.15294/kemas.v18i3.32644.

governance-related factors.[34] In this regard, the Brebes Regency case illustrates how maternal mortality can be understood as a combined outcome of medical vulnerability and institutional failure to ensure continuous and anticipatory postpartum care.

More specifically, data from Brebes Regency demonstrate that although total maternal deaths fell in 2025, postpartum mortality still accounted for nearly two-thirds of declined cases. This indicates that even where overall mortality begins to decline, the structure of risk remains fundamentally unchanged. From a policy perspective, this is a critical finding: it suggests that improvements in antenatal and delivery services alone are insufficient if postpartum surveillance, early warning, and referral systems remain weak. Therefore, postpartum maternal mortality should be addressed as a distinct governance problem requiring specific regulatory and service-delivery responses, including community-based surveillance and stronger integration with MPDSR.

## ICD-MM Causes of Maternal Death and Audit Findings

The review of Maternal and Perinatal Audit Surveillance and Response (AMPSR) and Application Maternal dan Perinatal Death Notification-Audit (AMPDN-AD) data at the Central Java level for 2024-2025 indicates that the leading suspected causes of maternal death were non-obstetric complications, hypertensive disorders, and obstetric hemorrhage. This pattern reflects the WHO ICD-MM classification framework, which distinguishes direct obstetric causes, indirect or non-obstetric causes aggravated by pregnancy, and other related categories to improve comparability and policy responses. In the present study, the same dominant pattern was also observedd in Brebes Regency, where maternal deaths were likewise concentrated in non-obstetric complications, hypertensive disorders, and obstetric hemorrhage.[35]

Based on the AMPSR and AMPDN-AD review in Central Java, the distribution of suspected maternal death causes by ICD-MM group shows both continuity and change across 2024 and 2025. In 2024, the largest category was

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[34] World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*.

[35] World Health Organization, "The WHO Application of ICD-10 to Deaths during Pregnancy, Childbirth and the Puerperium: ICD-MM," *WHO Library*, vol. 129, 2012.

Group 7, non-obstetric complications, with 206 cases (48.2%). In 2025, the same category remained dominant with 137 cases (40.8%), followed by hypertensive disorders and obstetric hemorrhage. Figure 1 summarizes these patterns visually to avoid over-reliance on lengthy descriptive paragraphs.[36]

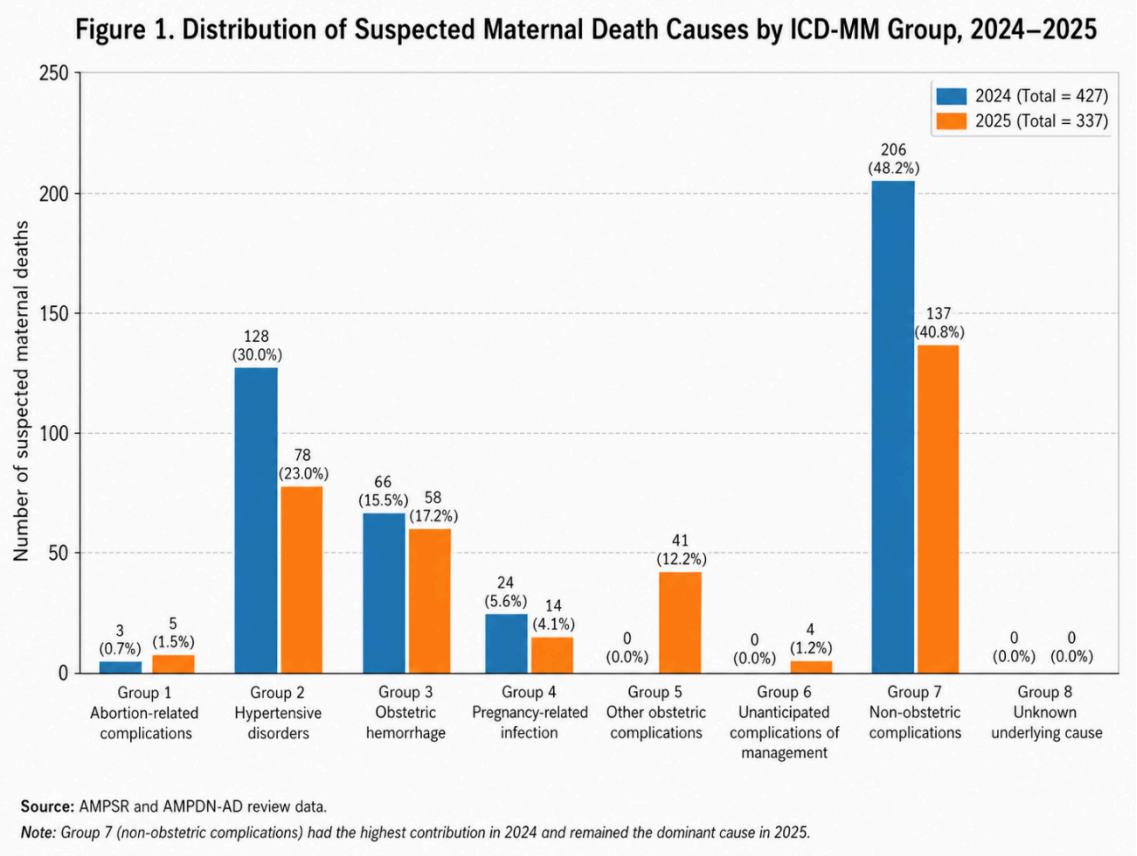



**Figure 1.** Distribution of suspected maternal death causes by ICD-MM group in Central Java, 2024-2025

The bar chart shows that the overall pattern remained broadly similar across both years: non-obstetric complications as the leading category, followed by hypertensive disorders and obstetric hemorrhage. Although total suspected maternal deaths declined from 427 in 2024 to 337 in 2025, hemorrhage remained proportionally significant, and other obstetric complications became more visible in the 2025 classification. This pattern suggests that audit quality and diagnostic granularity should be further strengthened, while prevention

[36] World Health Organization, "The WHO Application of ICD-10 to Deaths during Pregnancy, Childbirth and the Puerperium: ICD-MM."

strategies should prioritize comorbidity management, postpartum blood-pressure surveillance, and rapid response to hemorrhage.[37]

Overall, the audit data indicate that non-obstetric complications and hypertensive disorders remained the largest contributors to suspected maternal deaths in Central Java, even though the total number of cases declined in 2025. This finding is consistent with the broader international evidence that severe hemorrhage and hypertensive disorders remain leading global causes of maternal death, while indirect causes also account for a substantial share of mortality, particularly where women enter pregnancy with untreated comorbidities or where health systems struggle to manage complex cases across the continuum of care.[38] In this sense, the Central Java pattern reflects not only a clinical burden but also a broader systemic challenge in identifying, monitoring, and managing women with coexisting risks during pregnancy and particularly in the postpartum period.

The prominence of non-obstetric complications is particularly significant from a governance perspective. This suggests that maternal mortality cannot be addressed solely through emergency obstetric interventions focused on labor and delivery. Instead, maternal death prevention requires stronger screening and continuity of care for women with pre-existing or concurrent illnesses, including cardiovascular disease, severe anemia, infection, and other chronic or systemic conditions. WHO's MPDSR guidance makes clear that maternal death reviews should not be confined to immediate medical causes but should identify modifiable clinical and systemic factors contributing to preventable deaths.[39] Therefore, the persistence of Group 7 as the dominant category underscores the need for earlier risk stratification, improved continuity across antenatal, delivery, and postpartum care, and stronger coordination between maternal services and broader clinical care pathways.

The continued prominence of hypertensive disorders also warrants particular attention. Hypertensive disease in pregnancy and the puerperium

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37 World Health Organization, "Many Pregnancy-Related Complications Going Undetected and Untreated," WHO International, March 8, 2025, https://www.who.int/news/item/08-03-2025-many-pregnancy-related-complications-going-undetected-and-untreated--who; World Health Organization, "Maternal Mortality."

38 World Health Organization, "Many Pregnancy-Related Complications Going Undetected and Untreated"; World Health Organization, "Maternal Mortality."

39 World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*; Megan E. Passey et al., "Diagnosing Potentially Preventable Hospitalisations (DaPPHne): Protocol for a Mixed-Methods Data-Linkage Study," *BMJ Open* 5, no. 11 (2015), https://doi.org/10.1136/bmjopen-2015-009879.

remains among the most dangerous and rapidly progressive maternal conditions, particularly when diagnosis, monitoring, and referral are delayed. WHO recently reaffirmed that hypertensive disorders, such as preeclampsia remain leading causes of maternal death worldwide.[40] In the context of this study, the substantial share of maternal deaths attributed to Group 2 suggests that postpartum blood pressure surveillance, recognition of warning signs, and referral readiness remain inadequate.[41] This is particularly relevant because many hypertensive complications worsen or become clinically apparent after delivery, when mothers are often already outside direct hospital observation.

The pattern observed for obstetric hemorrhage is particularly important. Although the number of hemorrhage-related deaths declined slightly in 2025, their proportion increased. This indicates that hemorrhage remained a major unresolved risk even as total maternal deaths declined. Global evidence consistently identifies hemorrhage as the single leading cause of maternal death worldwide.[42] In practical terms, the persistence of hemorrhage in the Central Java audit data underscores the need for more reliable postpartum surveillance, timely recognition of abnormal bleeding, rapid referral, and robust emergency response capacity across all levels of the health system.

Another important finding is the emergence in 2025 of other obstetric complications and unanticipated management complications as explicit categories in the audit data. This reflects greater audit sensitivity, or more detailed cause-of-death documentation rather than an entirely new epidemiological phenomenon. The WHO's ICD-MM framework was specifically developed to promote more consistent classification and interpretation of maternal deaths across different settings.[43] From this

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40 World Health Organization, "Many Pregnancy-Related Complications Going Undetected and Untreated."

41 Jessica Spiegelman et al., "430: Remote Postpartum Blood Pressure Surveillance for Hypertensive Disorders of Pregnancy: A Randomized Clinical Trial," *American Journal of Obstetrics and Gynecology* 222, no. 1 (2020), https://doi.org/10.1016/j.ajog.2019.11.446; Francis M. Hacker et al., "Implementation of a Universal Postpartum Blood Pressure Monitoring Program: Feasibility and Outcomes," *American Journal of Obstetrics and Gynecology MFM* 4, no. 3 (2022), https://doi.org/10.1016/j.ajogmf.2022.100613; Brittany J. Arkerson et al., "Remote Monitoring Compared with In-Office Surveillance of Blood Pressure in Patients with Pregnancy-Related Hypertension: A Randomized Controlled Trial," *Obstetrics and Gynecology* 142, no. 4 (2023), https://doi.org/10.1097/AOG.0000000000005327.

42 World Health Organization, "Many Pregnancy-Related Complications Going Undetected and Untreated"; World Health Organization, "Maternal Mortality."

43 World Health Organization, "The WHO Application of ICD-10 to Deaths during Pregnancy, Childbirth and the Puerperium: ICD-MM."

perspective, the appearance of these categories suggest a positive improvement in audit quality and diagnostic granularity. At the same time, it may reveal that some previous deaths had been absorbed into broader categories without sufficient specificity. Either way, this shift underscores the importance of continued strengthening of maternal death review methods and cause-of-death attribution.

Taken together, the AMPSR and AMPDN-AD findings suggest that the burden of maternal mortality in Central Java—and by extension in high-risk districts such as Brebes—cannot be understood purely in obstetric terms. The data point to a mixed pattern in which indirect conditions, hypertensive disorders, and hemorrhage interact with health system weaknesses in monitoring, referral, and response. This interpretation is consistent with WHO's position that maternal mortality is shaped not only by direct medical causes but also by the quality of surveillance, risk identification, and the health system's capacity to respond before a woman's condition becomes irreversible.[44] Accordingly, these findings support the argument that improving maternal outcomes in the postpartum period requires not only enhanced clinical care but also stronger early warning mechanisms, more integrated surveillance, and more actionable use of maternal death review data.

In the context of this study, the audit review strengthens the policy argument for integrating a community-based Early Warning System (EWS) with MPDSR. If maternal deaths remain heavily concentrated in conditions that are potentially detectable—such as hypertension, worsening chronic illness, or postpartum hemorrhage—then death reviews should not remain a retrospective accountability exercise alone. They should also inform a proactive risk-monitoring system capable of identifying warning signs earlier at the household and primary care levels. Such integration would make maternal surveillance more preventive, more responsive, and better aligned with the objective of reducing avoidable postpartum mortality.

# Qualitative Findings: Systemic Pathways of Postpartum Maternal Mortality

[44] World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*; World Health Organization, "Maternal Mortality."

Postpartum maternal mortality in Brebes Regency, as revealed through the FGD findings, reflects a structural problem that extends beyond clinical causation into health-system governance, institutional coordination, and socio-cultural dynamics, as shown in Table 3.

**Table 3.** Integration of main themes across FGDs

| Main Theme | Health Office | Hospitals & Primary Health Centers | Village Health Posts/Sub-Health Centers & Midwives | Community Health Cadres & Community Members |
|---|---|---|---|---|
| **Postpartum period as a high-risk period** | The postpartum period is a major contributor to maternal mortality. | Severe cases are often referred during the postpartum period. | Postpartum monitoring has not yet been optimal. | Postpartum mothers are often considered already safe. |
| **Delays in family decision-making** | Identified as a major cause. | Delayed decision-making worsens the condition. | Childbirth and postpartum cases are often reported late. | Influenced by myths, economic constraints, and husbands being away. |
| **Lack of integration in the referral system** | Zoning and related policies need improvement. | Referral information systems and service availability remain limited. | Referral coordination is not yet consistent. | Community members do not fully understand the referral pathway. |
| **Suboptimal quality of postpartum care** | The quality of postnatal care needs to be strengthened. | Postpartum visits are not yet continuous. | Postpartum education is not routinely repeated. | Health education is not yet fully understood. |

| | | | | |
|---|---|---|---|---|
| **Role of cadres and the community** | Cadres are part of the monitoring strategy. | Cross-sector coordination is needed. | Cadres help with field monitoring. | Cadres are active but need further training. |

*Source:* Processed by author, 2026

Discussions at the District Health Office showed that maternal death is increasingly understood as an outcome of deficiencies in data governance, program implementation, and policy responsiveness. However, the persistence of postpartum mortality indicates a gap between knowledge production and policy execution: data are collected and discussed, but have not yet been fully operationalized into anticipatory and preventive strategies.

This gap becomes more evident when examining the multilevel determinants identified through FGDs. At the individual level, maternal vulnerability is shaped by advanced age, comorbidities, and limitations in early detection capacity among frontline health workers. Yet, these factors alone do not sufficiently explain maternal mortality outcomes. Instead, they interact with service-level weaknesses, particularly the inconsistency and discontinuity of antenatal and postnatal care provision. The postpartum period, repeatedly identified as the most critical phase, emerges as a point of systemic neglect, where monitoring intensity declines despite heightened clinical risk. This paradox—where risk increases while surveillance weakens—indicates a misalignment in service design, suggesting that maternal health programs remain disproportionately oriented toward pregnancy and delivery rather than extending adequate protection into the postpartum continuum.

Recent maternal and child health statistics indicate that maternal health remains an significant public health concern in Brebes Regency. In 2025, Brebes regency recorded 22,141 live births and 34 maternal deaths, while the infant mortality rate stood at 13.15 per 1,000 live births. Of the total births, 22,044 deliveries were assisted by health professionals, indicating high coverage of skilled birth attendance. However, maternal deaths persisted despite the high proportion of facility-based and professionally assisted deliveries. The trend in maternal mortality also shows considerable fluctuations across years. Official data from the Brebes Regency 2026 Regional Government Work Plan (RKPD) recorded 62 maternal deaths in 2020, increasing to 105 cases in 2021, before declining to 50 cases in 2022 and reaching 54 cases in both 2023 and 2024. In

2025, the number declined to 34.[45] Although this represents a reduction compared with previous years, the persistence of maternal deaths despite high skilled birth attendance underscores the importance of examining factors beyond the intrapartum period, particularly postpartum monitoring, early detection of complications, referral coordination, and continuity of care. Other maternal and child health indicators also demonstrate continuing challenges. The number of severe malnutrition cases decreased from 599 cases (0.63%) in December 2025 to 485 (0.51%) in April 2026. In contrast, the number of stunting cases increased from 11,094 (11.61%) in December 2025 to 11,502 cases (12.17%) in April 2026. These data illustrate the continuing complexity of maternal and child health challenges in Brebes Regency and reinforce the need for integrated, sustained, and community-responsive health interventions.[46]

At the system level, referral delays constitute a central structural mechanism through which risk is converted into mortality. The repeated finding that many deaths occur within 48 hours of hospital admission is particularly significant, as it indicates that the failure of the system often precedes the point of hospital care. In other words, mortality is often determined before definitive treatment can even be initiated. Cross-district referrals, unclear referral pathways, and limited readiness at receiving facilities further compound this issue, creating a fragmented network in which responsibility is diffused and accountability becomes difficult to enforce. This condition reveals that the referral system does not operate as an integrated continuum of care but rather as a series of loosely connected nodes, thereby increasing the probability of delay at each transition point.

FGDs with hospital and primary healthcare personnel reinforces this structural diagnosis by exposing operational inefficiencies within service delivery. Even when patients successfully reach health facilities, the system is not always capable of responding with adequate speed, coordination, or quality. Limitations in specialist availability, human resources, and administrative processes—including financial barriers—indicate that access alone is insufficient

[45] The infant mortality rate (IMR) in Brebes Regency also fluctuated during the period 2020–2024, declining slightly from 9.50 per 1,000 live births in 2020 to 9.45 in 2021 and 9.42 in 2022, before increasing to 12.14 in 2023 and subsequently declining to 9.87 in 2024. This fluctuation further illustrates the continuing challenges in maternal and child health and the need for sustained and integrated health-system interventions. Read on Pemerintah Kabupaten Brebes, *Naskah Akademik Dan Draft Peraturan Bupati Brebes Nomor 38 Tahun 2025 Tentang Rencana Kerja Pemerintah Daerah Tahun 2026* (Brebes: Pemerintah Kabupaten Brebes, 2025).

[46] PPID Dinas Kesehatan Daerah Kabupaten Brebes, "Data Kesehatan 2025," PPID Dinas Kesehatan Daerah Kabupaten Brebes, 2025, https://ppid.dinkesda.brebeskab.go.id/data-kesehatan-2025-2/.

to ensure survival. This finding underscores a critical insight: maternal mortality in the postpartum period is not merely a problem of access to care but of the system's capacity to deliver timely and appropriate care under urgent conditions. Furthermore, inconsistent management of high-risk postpartum mothers suggests potential gaps between established clinical standards and their implementation in routine practice. The issue is therefore not the absence of clinical guidelines or standard operating procedures (SOPs), but the extent to which these standards are consistently understood, applied, supervised, and monitored across levels of care. From a patient-safety perspective, such inconsistencies may increase the risk that postpartum danger signs are not recognized promptly, interventions are delayed, or referral decisions are not initiated in a timely manner. These risks are particularly salient during the transition from facility-based childbirth to home-based postpartum care, when clinical oversight becomes less intensive and responsibility for recognizing deterioration is increasingly shared with families and community health workers. This highlights the importance of quality assurance mechanisms that extend beyond the availability of SOPs to encompass routine supervision, documentation, clinical audit, feedback, and corrective action. In this context, MPDSR serves not only as a mechanism for reviewing maternal deaths but also as a source of system-level learning by identifying recurrent failures in monitoring, referral, communication, and adherence to clinical protocols. Integrating these lessons with a community-based Early Warning System would strengthen the link between clinical standards, patient safety, and continuous quality improvement, particularly during the postpartum period.[47]

Beyond the formal health system, findings from the focus group discussions (FGDs) with community health volunteers and family members highlight the significant role of sociocultural and household-level factors in shaping postpartum care and maternal health outcomes. Postpartum care is embedded within a social environment characterized by family support, community monitoring, and culturally defined recovery practices, including a period that may extend to 40 days after childbirth. However, these existing community-based support mechanisms are not consistently integrated into standardized early warning, referral, and surveillance processes. Their effectiveness is further constrained by limited knowledge of postpartum danger signs, economic difficulties, geographical barriers, and persistent traditional

[47] Pemerintah Kabupaten Brebes, *Naskah Akademik Dan Draft Peraturan Bupati Brebes Nomor 38 Tahun 2025 Tentang Rencana Kerja Pemerintah Daerah Tahun 2026*.

beliefs. Consequently, the initial stages of response—particularly recognition of danger signs and decisions regarding when and where to seek care—remain vulnerable to delay. These findings suggest that postpartum maternal mortality should be understood as a multi-level governance issue involving interactions between health system limitations and household- and community-level factors. An important gap therefore exists between community-based support and formal mechanisms for systematic risk detection, referral, and surveillance. Strengthening this interface through a community-based Early Warning System (EWS) linked to maternal health services and Maternal and Perinatal Death Surveillance and Response (MPDSR) would provide a more integrated approach to early detection, timely referral, and continuous postpartum care.

At the primary care level, weak information systems and operational constraints illustrate how early warning capacity can be limited. Incomplete documentation, unsynchronized data, and inadequate monitoring of high-risk mothers reduce primary care's ability to trigger timely interventions. Rather than functioning as an active surveillance tool, the information system remains passive, documenting events only after they occur. This condition is exacerbated by limited human resources, high workloads, and low community engagement.

When these findings are integrated, a coherent structural pattern specific to Brebes Regency emerges. Postpartum maternal mortality results from the cumulative interaction of four interdependent failures: inadequate early risk recognition at the household and community level, discontinuity and inconsistency in postpartum service delivery, fragmentation and delay within the referral system, and weak governance characterized by limited integration of data, policy, and implementation. These failures reinforce one another: delayed recognition leads to late presentation at health facilities, late presentation increases pressure on constrained referral services, and weak data integration hinders systematic resolution of recurring patterns in future interventions.

This integrated understanding has significant implications. The persistence of postpartum maternal mortality despite multiple programs—such as AMPSR, postpartum monitoring protocols, and local innovations—suggests that the core problem lies not in the absence of interventions but in their lack of systemic integration. Current approaches remain predominantly programmatic and fragmented, whereas the nature of the problem is inherently systemic and requires coordinated, cross-level responses. Therefore, effective reduction of maternal mortality in the postpartum period necessitates a fundamental shift toward an integrated governance model, in which community-based early

detection, primary care surveillance, referral readiness, and audit-driven policy learning are connected within a single, coherent operational framework.

## Legal and Policy Implications of Community-Based Postpartum Early Warning Early Detection Failure and Household-Level Delay

Village midwives and frontline primary care providers reported that families often struggle to distinguish normal postpartum discomfort from danger signs requiring immediate treatment. This knowledge gap increases delays in recognition and decision-making, especially where postpartum women are already outside direct clinical observation.

From a health policy perspective, these findings suggest that the principles of availability and accessibility of maternal health services have not yet been fully translated into effective postpartum care at the community level. Law No. 17 of 2023 on Health establishes the legal framework for maternal health across the continuum of care,[48] while Government Regulation No. 28 of 2024 further regulates maternal health services and recognizes the roles of families and communities in monitoring maternal health, supporting access to health facilities, and implementing community-based health efforts. The technical framework is further provided by Minister of Health Regulation No. 2 of 2025 on the Implementation of Reproductive Health Services, which replaced Minister of Health Regulation No. 21 of 2021. In addition, Minister of Health Regulation No. 19 of 2024 on the Implementation of Community Health Centers (Puskesmas) strengthens the framework for primary healthcare, service networks, quality improvement, recording and reporting, supervision, and community-oriented health services.[49] However, the findings from Brebes suggest that the practical implementation of these provisions remains constrained by gaps in postpartum monitoring, community health literacy, referral coordination, and integration between community-based support and

[48] Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

[49] Novita Rudiyanti and Budi Utomo, "Challenges of Health Workers in Primary Health Facilities in Implementing Obstetric Emergency Referrals to Save Women from Death in Indonesia: A Qualitative Study," *Belitung Nursing Journal* 10, no. 6 (2024), https://doi.org/10.33546/bnj.3525.

the formal health system. The challenge therefore lies not in the absence of legal recognition but in translating existing legal and policy provisions into operational mechanisms that ensure continuous, accessible, and responsive postpartum care. If postpartum services remain predominantly oriented toward facility visits by mothers while early detection mechanisms in homes and communities are not strengthened, then the preventive approach has not been fully operationalized. Thus, delayed early detection is not merely a clinical problem but also reflects an implementation gap in maternal health policy that has not sufficiently reached the household context.

The community-based EWS proposed in this study can accelerate the identification of high-risk conditions. Simple parameters—such as blood pressure, pulse, body temperature, abnormal bleeding, severe headache, seizures, shortness of breath, fever, foul-smelling lochia, and decreased consciousness—can help community health volunteers, midwives, and families recognize deterioration before it becomes severe. In clinical settings, related approaches such as the Modified Early Obstetric Warning Score (MEOWS) have been used to identify impending maternal deterioration, although their effectiveness still depends on the quality of follow-up and referral response.[50]

## Referral Fragmentation and Service Readiness

The findings also identify delayed referral as one of the greatest barriers in the maternal health system in Brebes Regency. Informants explained that referral processes are often delayed due to limited transportation, suboptimal inter-facility communication, administrative procedures, and the unpreparedness of destination facilities to receive patients promptly. These findings demonstrate that referral problems are not merely a matter of facility availability but also of the effectiveness of coordination across levels of service and the speed of response when a mother's condition deteriorates. Substantively, this is consistent with WHO's framework which emphasized that maternal mortality reduction depends heavily on the availability of timely,

[50] Martin et al., "Maternal Early Warning Criteria Predict Postpartum Severe Maternal Morbidity and Mortality after Delivery Hospitalization Discharge: A Case–Control Study"; Alexander Friedman et al., "Implementing Obstetric Early Warning Systems," *American Journal of Perinatology Reports* 08, no. 02 (2018), https://doi.org/10.1055/s-0038-1641569.

coordinated, and high-quality services across the continuum of care, including the postpartum period.[51]

Within the framework of health decentralization, these findings imply that district-level maternal referral policy must be more adaptive to geographic, socio-economic, and local capacity conditions. Law No. 17 of 2023 positions local government as an key actor in health service provision and community empowerment. Therefore, local policy innovation may be directed toward strengthening referral systems that are more responsive, for example through postpartum maternal risk mapping, stronger inter-facility communication, and the integration of community-based warning signs into referral pathways. If maternal risk data are available early, referrals need no longer remain reactive after the condition has become severe, but may instead be prepared from the earliest signs of danger.

From a health policy law perspective, failure of the referral system can be understood as an inefficiency in service governance that undermines the fulfillment of women's health rights. MPDSR is relevant here because WHO emphasizes that maternal death audits must be used to identify modifiable factors—including delayed recognition of symptoms, delayed referral, and governance obstacles—in order to prevent similar deaths in the future.[52] Therefore, integrating EWS with MPDSR may strengthen referral decision-making through structured risk data and make referral systems faster, more responsive, and more accountable.

## Community Roles and Health Literacy

This study found that community involvement—especially by health volunteers and family members—plays an important role in the early detection of postpartum complications. In many cases, family members are the first to notice changes in the mother's condition at home. However, without clear guidance, they often do not know when symptoms should be considered dangerous or when immediate medical assistance is required. For this reason, a community-based EWS has the potential to strengthen the capacity of both families and health volunteers to recognize danger signs systematically and in a

[51] Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

[52] World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*.

standardized manner. Such an approach is fully consistent with WHO recommendations that place families, communities, and primary care services as integral parts of quality postnatal care.[53]

From a rights-based policy perspective, strengthening the community supports the principle of community empowerment, as the public is no longer positioned merely as a recipient of services but as an active participant in protecting maternal health. This principle aligns with Law No. 17 of 2023, which affirms the government's obligation to promote community participation in health service delivery. Accordingly, the role of community actors in maternal health should not be understood as supplementary but as a functional element of a preventive and responsive health system.

Nevertheless, this study shows that the success of community-based EWS implementation depends heavily on training for health workers, clarity of volunteer roles, supervisory support, and a supportive regulatory framework. Without a policy basis and a clear mechanism for integration, community-based innovation risks becoming fragmented, dependent on personal initiative, and difficult to sustain. WHO literature on the maternal and newborn care continuum emphasizes that effective postnatal care requires alignment among guidance, workforce, financing, documentation, and referral systems ensuring that useful interventions do not remain merely conceptual.[54]

# Regulatory Gap and Rights-Based Accountability

The discussion of findings indicates that although maternal health regulations in Indonesia have already governed healthcare through promotive, preventive, curative, and rehabilitative approaches, postpartum implementation continues to face structural gaps. Existing policies are more strongly directed toward clinical aspects of facility-based care, while community-based early detection mechanisms have not yet been regulated in a specific and operational manner. This condition creates a policy gap that may hinder innovation in maternal care, particularly in addressing postpartum vulnerabilities that emerge once mothers return home. Normatively, the state's obligation to provide safe, timely, and high-quality services throughout the reproductive cycle demands

[53] World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*.

[54] Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

stronger policy attention to the postpartum phase that has so far been relatively under-monitored.[55]

## Integrating Community-Based EWS with MPDSR

The integration of EWS with MPDSR can be viewed as a new policy model that strengthens the maternal health system through a preventive and data-driven approach. MPDSR enables local governments and health facilities to analyze patterns of death, causes of delay, and governance weaknesses in a more structured manner. If integrated with MPDSR, EWS can function as a bridge between retrospective maternal death audits and prospective risk control. WHO explicitly states that MPDSR should be used to identify modifiable factors and to guide quality-improvement actions.[56] Therefore, combining MPDSR and EWS may strengthen evidence-based policymaking, enhance accountability, and support faster, and more targeted referral governance.

From a health law perspective, the Brebes Regency findings indicate that postpartum maternal protection must be analyzed as a matter of legal implementation, not merely service delivery. Law No. 17 of 2023 on Health establishes the overarching legal framework for health services—including promotive, preventive, curative, rehabilitative, and palliative health efforts—while assigning responsibility to the central and local governments to ensure accessible and high-quality health services. These provisions are further elaborated in Government Regulation No. 28 of 2024, which serves as the implementing regulation of the Health Law and provides detailed framework for the delivery of health services, community participation, health information systems, and government supervision. In reproductive health, these provisions are further operationalized in Minister of Health Regulation No. 2 of 2025, which regulates reproductive health services, community participation, recording and reporting, and supervision. Together, these instruments establish the legal and policy framework for strengthening continuous, accessible, and community-oriented maternal health services, including postpartum care. Government Regulation No. 28 of 2024, implementing Law No. 17 of 2023 on Health, establishes the current framework for maternal and postpartum care, including community participation. This framework is further operationalized

[55] Republic of Indonesia, "Law No. 17 of 2023 on Health," 2023.

[56] World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*.

in Minister of Health Regulation No. 2 of 2025, which replaced Minister of Health Regulation No. 21 of 2021. However, the availability of formal postpartum services may not ensure continuity or timely access when monitoring remains passive. A community-based Early Warning System (EWS) integrated with MPDSR may therefore strengthen early risk detection, referral, and postpartum follow-up within the existing maternal health framework. When postpartum monitoring remains passive and dependent on mothers returning to facilities, the availability of services is not sufficient to guarantee effective accessibility, continuity, or quality. A community-based EWS integrated with MPDSR can therefore be framed as an operational instrument for fulfilling women's reproductive health rights, particularly the right to timely risk detection, referral, and follow-up after childbirth.[57]

Overall, the results of this study confirm that maternal deaths during the postpartum period in Brebes Regency results from the accumulation of problems at the individual, family, community, health facility, information system, and referral system levels. Accordingly, the focus of intervention cannot be limited to strengthening emergency obstetric services in hospitals. It must also include staged risk assessment beginning in late pregnancy, active postpartum monitoring, strengthening family literacy regarding danger signs, optimizating the role of community volunteers and midwives, reforming of maternal referral systems, using maternal death audit findings as the basis for ongoing improvement.

Within this framework, strengthening the maternal-postnatal Early Warning System (EWS) must be positioned as a core strategy for reducing maternal mortality. EWS should not be understood merely as a hospital-based clinical tool but as a cross-level warning system that includes early detection at home, community monitoring, rapid response in primary care, and timely escalation of referral. If integrated with MPDSR, EWS can function as a bridge between retrospective maternal death audits and prospective risk control. In this sense, the study offers not only practical implications for maternal service delivery in Brebes Regency but also a conceptual contribution to the development of maternal health policy that is more responsive to postpartum vulnerability.[58]

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57 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*.

58 World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*.

# Policy Recommendations: Toward an Integrated Postpartum EWS-MPDSR Model

Based on the findings and legal analysis, the policy recommendations are directed toward strengthening postpartum protection through a preventive, risk-based, and integrated approach extending from households to hospitals. The recommendations below translate the Brebes evidence into operational policy actions so that the transition from maternal death audit to risk prevention becomes clearer and more accountable.[59]

## Integrate EWS into Maternal Health Policy

Both the central and local governments need to develop technical regulations that explicitly integrate a community-based Early Warning System (EWS) into the maternal healthcare system. This integration is important because the findings of this study show that many postpartum complications develop after mothers return home from delivery facilities, while the postpartum period is often insufficiently monitored in an active manner.

Operationally, EWS may be designed as a simple instrument that can be used by midwives, community health volunteers, and family members to recognize changes in maternal condition through indicators such as blood pressure, pulse, temperature, abnormal bleeding, severe headache, seizures, shortness of breath, fever, foul-smelling lochia, and decreased consciousness. This approach is consistent with WHO recommendations: during the first 24 hours after childbirth, all postpartum women require routine assessment of vaginal bleeding, uterine tone, fundal height, temperature, pulse, blood pressure, and urination; during subsequent postnatal contacts, assessments should continue with regard to danger signs, maternal well-being, lactation, and referral needs.[60]

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[59] World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; WHO, "WHO Urges Quality Care for Women and Newborns in Critical First Weeks after Childbirth," World Health Organization, 2022.

[60] World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; WHO, "WHO Urges Quality Care for Women and Newborns in Critical First Weeks after Childbirth"; World Health Organization, "Raising the Importance of Postnatal Care," WHO, 2022.

From a health law perspective, the integration of EWS reinforces the implementation of Law No. 17 of 2023 on Health and Minister of Health Regulation No. 2 of 2025, which replaced Minister of Health Regulation No. 21 of 2021, both of which mandate promotive, preventive, curative, and continuous maternal health services throughout the post-delivery period. In this sense, EWS should not be viewed as an additional policy external to the legal framework but rather as an operationalization of the state's existing duty to ensure maternal protection beyond childbirth.

## Strengthen MPDSR as a Preventive Instrument

MPDSR should be strengthened so that it functions not merely as a maternal death audit mechanism but also as a proactive instrument for prevention. WHO emphasizes that MPDSR is intended to identify modifiable factors and to use that information to prevent similar deaths in the future. Therefore, MPDSR data should be utilized more rapidly and strategically to map high-risk areas, identify groups of mothers with dominant risk factors, reveal patterns of referral delay, and detect weaknesses in postpartum monitoring.[61]

Within the local policy context, MPDSR should be integrated with the maternal-postnatal Early Warning System (EWS) so that audit findings no longer remain merely evaluative documents but instead serve as the basis for actual intervention. Such strengthening would support more evidence-based policymaking, particularly in identifying priorities among high-risk postpartum women, determining the need for home visits, and enabling faster referral responses.[62]

## Reform the Maternal Health Referral System

Reform of the maternal health referral system should focus on stronger cross-facility coordination, simplification of administrative procedures, and the use of digital technology to accelerate communication across services. The

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[61] World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*.

[62] World Health Organization, *Maternal and Perinatal Death Surveillance and Response: Materials to Support Implementation*; World Health Organization, "Raising the Importance of Postnatal Care."

findings of this study indicate that referral delays remain influenced by transport barriers, suboptimal communication, and financing or administrative procedures that slow the management of postpartum cases. WHO identifies the postpartum period among the most critical phases because a large proportion of maternal deaths occur within the first six weeks after childbirth, when rapid response is particularly necessary.[63]

For this reason, maternal referral policy should become more flexible and adaptive to geographic and socio-economic conditions. The use of digital risk notifications, real-time referral communication, and synchronized data on high-risk mothers across facilities may help reduce delays in decision-making and patient acceptance at referral facilities. This approach is consistent with WHO's emphasis on continuity of maternal and newborn care across households, primary care, and referral levels.[64]

## Strengthen Community-Based Health Literacy

Maternal health education programs should be expanded through community-based approaches focusing on the recognition of postpartum danger signs. WHO emphasizes that families and communities play an important role in positive postnatal care, since many changes in the mother's condition are first recognized at home.[65] Therefore, family members, community health volunteers, and other maternal caregivers should be provided with clear and repeated guidance on postpartum danger signs, postnatal visit schedules, reporting pathways, and circumstances requiring immediate referral.

This health literacy policy should not be limited to of a one-time educational intervention alone, but should instead form part of a systematic community empowerment strategy. Educational materials should be adapted to the local context, account for myths and cultural barriers, and be linked directly to postpartum monitoring mechanisms and community-based Early Warning Systems (EWS). Such a policy is consistent with the promotive and preventive orientation of Indonesia's current health framework, established by Government Regulation No. 28 of 2024 and further operationalized through

63 World Health Organization, "Raising the Importance of Postnatal Care."

64 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

65 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; World Health Organization, "Raising the Importance of Postnatal Care."

Minister of Health Regulation No. 2 of 2025, while supporting meaningful community participation in maternal health protection.

## Develop a Rights-Based Maternal Health Legal Framework

The government should strengthen the maternal health legal framework by incorporating a women's reproductive rights-based approach into postpartum care policy. Law No. 17 of 2023 on Health mandates that health efforts must be implemented through promotive, preventive, curative, rehabilitative, and palliative approaches, while Minister of Health Regulation No. 2 of 2025, which replaced Regulation No. 21 of 202, affirms that post-delivery health services are an integral part of the maternal health continuum and must be delivered continuously.

In the context of this study, strengthening a rights-based legal framework means ensuring that every mother receives services that are available, accessible, of adequate quality, and continuous throughout the postpartum period. Accordingly, technical regulations at both national and local levels should explicitly include obligations for risk-based postpartum monitoring, community-based early detection, follow-up of high-risk mothers, and integration of data across service levels. This would help reduce the gap between legal norms and actual service delivery, while reinforcing the state's accountability for protecting maternal health rights.[66]

## Establish Risk-Based Postpartum Monitoring and Postnatal Contact Standards

An important recommendation is the establishment of risk-based standards for postpartum monitoring and the frequency of postnatal visits, with

[66] Galym Zhussipbek, "Human Right to Health, Social Rights, and Human Dignity versus Relativist Challenge of Neoliberal Capitalism," *Age of Human Rights Journal*, no. 25 (2025), https://doi.org/10.17561/tahrj.v25.9272; Zahara Nampewo, Jennifer Heaven Mike, and Jonathan Wolff, "Respecting, Protecting and Fulfilling the Human Right to Health," *International Journal for Equity in Health* 21, no. 1 (2022), https://doi.org/10.1186/s12939-022-01634-3; Denise Jurow, "The World Health Organization (WHO): The Health and Human Rights Relationship," *Canadian Journal of Midwifery Research and Practice* 4, no. 1 (2024), https://doi.org/10.22374/cjmrp.v4i1.166.

a clear distinction between normal postpartum cases and those involving complications or high risk. This recommendation is important because postnatal visit schedules should not be applied uniformly to all women. The World Health Organization (WHO) does set a minimum of four postnatal contacts for healthy mothers and newborns: within the first 24 hours, at 48–72 hours, between day 7 and day 14, and at six weeks postpartum. The guideline also emphasizes the need for more intensive follow-up for women with certain conditions or risk factors.[67]

For normal postpartum cases, policy may provide that mothers receive a minimum of four standard postnatal contacts, focusing on bleeding, uterine involution, blood pressure, body temperature, pulse, elimination, pain, psychological condition, breastfeeding success, and education on danger signs. The first contact should occur within the first 24 hours, followed by contacts at 48–72 hours, between day 7 to day 14, and week 6. In this group, monitoring may be conducted through a combination of facility-based services and home visits, provided that continuity of observation is maintained.[68]

By contrast, for postpartum women with complications or high-risk conditions—for example, those with a history of preeclampsia/eclampsia, postpartum hemorrhage, caesarean section, severe anemia, infection, heart disease, diabetes, hypertension, mental health conditions, sick newborns, limited access to services, or social vulnerability—should be subject to more intensive monitoring than the standard schedule. This may involve additional home visits, more frequent observation by village midwives, active communication by community volunteers, and rapid consultation pathways to primary health centers or referral hospitals. Thus, the principle should be: normal postpartum care requires a minimum of four contacts, whereas high-risk or complicated postpartum care requires more than four contacts, according to clinical assessment and social risk. This risk-based approach is fully aligned with the objective of WHO postnatal care, namely ensuring that women with greater needs receive enhanced monitoring and follow-up.[69]

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67 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; WHO, "WHO Urges Quality Care for Women and Newborns in Critical First Weeks after Childbirth."

68 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*.

69 World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*.

In implementation, local governments may adopt a risk-based operational classification for postpartum monitoring. First, normal-risk postpartum women are those without identified maternal or neonatal complications and may receive routine postnatal contacts in accordance with national standards. Second, moderate-risk postpartum women may include mothers with conditions requiring closer observation, such as a history of hypertensive disorders or postpartum hemorrhage, anemia, cesarean delivery, wound or breastfeeding problems, persistent but non-severe postpartum symptoms, or limited family and social support. This group may require additional home visits, telephone or telemonitoring follow-up, and earlier reassessment when warning signs emerge. Third, high-risk or complicated postpartum women may include those with current or severe hypertensive disorders, significant postpartum hemorrhage, suspected or confirmed infection, severe anemia, thromboembolic events, or other serious non-obstetric complications requiring urgent clinical management. These women should receive intensive clinical monitoring, clear referral plans, rapid access to emergency services, and coordinated follow-up between primary and referral facilities. This classification should function as a locally adapted operational tool and remain aligned with applicable national clinical guidelines rather than replacing established clinical assessment and referral criteria.

Such a model would make the maternal-postnatal Early Warning System (EWS) more functional as each level of risk would be directly linked to a specific monitoring response, rather than remaining merely a risk label without operational consequences.[70]

Overall, the policy recommendations of this study show that reducing postpartum maternal mortality requires comprehensive system reform. The integration of Early Warning System (EWS), strengthening of Maternal and Perinatal Death Surveillance and Response (MPDSR), referral reform, enhancement of community health literacy, reinforcement of a rights-based legal framework, and establishment of risk-based postpartum monitoring and visit frequency together constitute an interconnected policy package. If implemented simultaneously, these measures can shift maternal services from a reactive to a preventive model, from a facility-centered approach to one that is

[70] World Health Organization, *WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience*; Wojcieszek et al., "WHO Recommendations on Maternal and Newborn Care for a Positive Postnatal Experience: Strengthening the Maternal and Newborn Care Continuum."

community-linked, and from a uniform model to one that is more adaptive to the needs of both normal mothers and those with complications or high risk.[71]

# Conclusion

This study demonstrates that postpartum maternal mortality in Brebes Regency constitutes a systemic and governance-related problem rather than merely a clinical issue. The evidence shows the persistent dominance of postpartum deaths in the district, while qualitative findings reveal weaknesses in early recognition of danger sign, continuity of postpartum services, referral coordination, information systems, and policy implementation. These findings confirm that preventable maternal deaths are produced through a cumulative risk pathway: household-level recognition is delayed, referral systems are fragmented, health facilities face readiness constraints, and postpartum monitoring remains insufficiently integrated with community-based surveillance.

From a policy and health law perspective, the findings underscore the need to reorient maternal health strategies toward an integrated and rights-based model of postpartum care. Strengthening Early Warning Systems (EWS) and connecting it with Maternal and Perinatal Death Surveillance and Response (MPDSR) can transform maternal health governance from a reactive audit-oriented model into a proactive prevention system. Such integration would enable earlier risk identification, faster referral decision-making, clearer accountability, and stronger fulfillment of women's reproductive health rights. Ultimately, the study contributes to maternal health policy by proposing a governance model that integrates early detection, referral responsiveness, community empowerment, and legal accountability to achieve sustainable reductions in preventable postpartum maternal mortality.

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