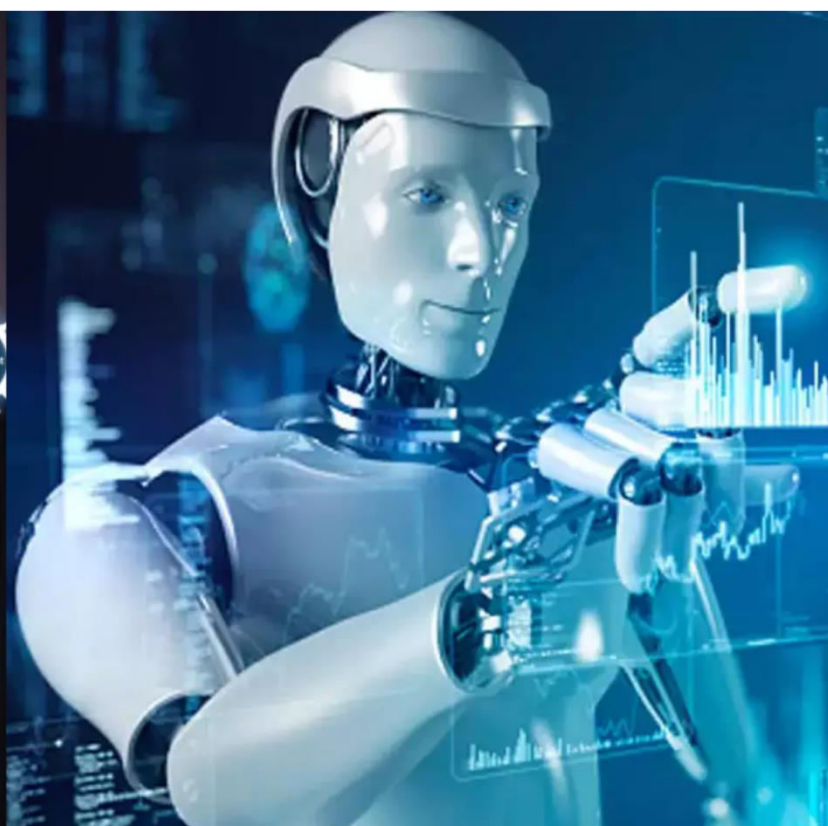




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Evaluation of the Maternal, Perinatal Death Surveillance and Response System in the Nioro Health District, Kayes province from 2019 to 2024

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ABSTRACT : Introduction: Maternal death surveillance is a process of systematically collecting, compiling, analyzing, and interpreting data on maternal deaths, and disseminating the results, in the form of reports, to all those responsible for decision-making. Mali is one of the countries with a consistently high maternal mortality rate in the world, at 325 per 100,000 live births. The maternal death surveillance and response system was introduced in Nioro in 2012 and has not been evaluated since. Therefore, we aim to assess attributes such as the system's usefulness, simplicity, stability, and acceptability.

Materials and methods: Our study took place in the Nioro health district. It had a population of 360,842 inhabitants in 2024 and an area of 11,060 km². This was a cross-sectional study conducted from July 6 to August 30, 2025. Data collection included maternal mortality surveillance data from Nioro from 2019 to 2024 and some data from stakeholders.

Results: A total of 68 audit forms and reports on maternal deaths were available. In terms of organization and operation, the committee held only one meeting per year, representing 25% of the planned meetings. Maternal deaths were audited at a rate of 97.05%. Males were the most represented sex, accounting for 53.33% of the healthcare professionals surveyed. The length of stay was between 1 and 5 years, representing 43.33%. We obtained scores of 86.66% for usefulness, 90% for simplicity, and 100% for the stability and acceptability of the maternal death surveillance system in Nioro.

Conclusion: In our study, we found the maternal death surveillance and response system to be acceptable and stable. The system was simple and useful to some extent, allowing for the analysis of maternal mortality trends. However, we noted an insufficient number of meetings of committee regarding the implementation of maternal death audits.

KEYWORDS: Assessment, surveillance system, maternal deaths, Nioro

I. INTRODUCTION

Maternal death surveillance is a process of systematically collecting, compiling, analyzing and interpreting data on maternal deaths, and disseminating the results, in the form of reports, to all those responsible for decision-making [1]. Every day in the world, more than 800 women die from complications arising during pregnancy, childbirth, and the postpartum period. The vast majority of maternal deaths occur in the poorest regions of the world, particularly in sub-Saharan Africa. In these countries, the women most at risk of maternal mortality are the poorest, those living far from health services, and the least educated [2].

It is currently estimated that the maternal mortality rate in developing countries is globally 239 per 100,000 live births, compared to only 12 per 100,000 for developed countries [3].

Analysis by region shows that the South American continent has experienced a significant decline overall, with maternal mortality rates recorded between 20 and 99 deaths per 100,000 live births [4]. However, countries like Bolivia, Paraguay and Guatemala remain behind, with rates between 100 and 300[5]. Areas of social tension such as Afghanistan and some territories in Pakistan still show high rates of maternal mortality. It should be noted that this is hardly surprising, given the key factors determining women's vulnerability [6]. Africa remains the continent with the highest rate of maternal deaths, accounting for nearly two-thirds of global maternal deaths. In southern Africa, extending to the eastern coast, maternal mortality is between 300 and 500 deaths per 100,000 live births [7]. In the sub-equatorial zone, maternal mortality rates remain very high, ranging between 500 and 1,000, as seen in countries such as Ghana, Senegal, and Rwanda. An even more alarming situation is represented by Sierra Leone, with a maternal mortality rate exceeding 1,000 [8]. Indeed, the maternal mortality rate would have fallen below 500 if more vigorous measures were not initiated urgently. These are all African countries in the equatorial bloc, namely: Central African Republic, Chad, DRC, Guinea, Liberia, Nigeria, Sierra Leone and South Sudan [9].

Another dozen country, including Ivory Coast and Cameroon, could also fall into this category, but with a much lower probability [10].

Mali is one of the countries where the maternal mortality rate remains high in the world at 325 per 100,000 live births according to the sixth Demographic and Health Survey in Mali (EDSM VI) [11].

In the Kayes region, the situation regarding maternal death surveillance during the 2024 SONU PTME/SDMPR review showed that out of 397 expected maternal deaths, only 129 were reported, representing a rate of 32%. The region has reached 74% completion of maternal death audits, with 100% coverage in the health districts (DS) of Bafoulabe, Nioro, Séfeto, and Yélimané, compared to 49% in 2022 [12].

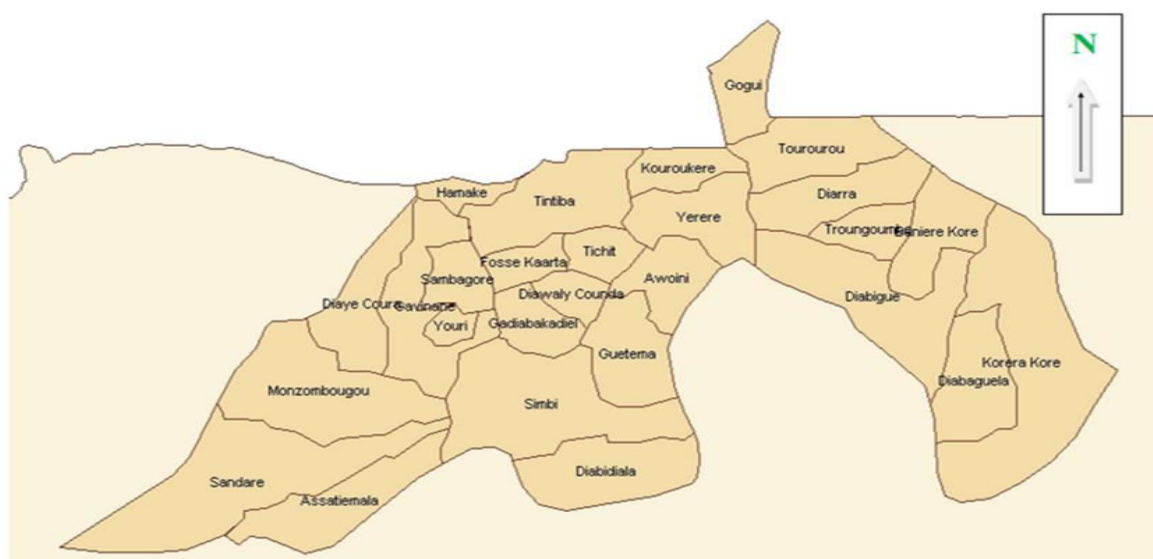
In the Nioro health district, out of 46 expected maternal deaths, 09 were notified, 09 audited, representing a notification rate of 19%, and 100% audited in 2024; 50% of the meeting of the local SDMPR committee chaired by the Prefect of the circle [12] has been completed.

The maternal death surveillance and response system was introduced in Nioro in 2012 and has not been evaluated since, therefore we want to evaluate attributes such as utility, simplicity, stability and acceptability of this system.

II. MATERIALS AND METHODS

2-1. Study setting:

Our study took place in the Nioro health district.



Nioro District Health Map

Nioro had a population of 360,842 inhabitants in 2024 with an area of 11,060 km². The Nioro health district is bordered by:

- To the East by the districts of Nara and Diéma
- To the South by the district of Bafoulabé
- To the North by the district of Yélimané
- To the West by the Islamic Republic of Mauritania.

Nioro has 13 communes including 03 urban, 29 CSCom, 1 CSRéf, 1 Garrison, 1 confessional centre, 08 care offices, 09 medical offices and 47 ASC sites.

2.2. Study Type: This was a cross-sectional study.

2.3. Study Period: Our study took place from July 6 to August 30, 2025, a period of 8 weeks. Data collection occurred in August 2025. It was based on data from maternal death surveillance in the Nioro health district from 2019 to 2024 and the collection of some data from actors involved in maternal death surveillance in August 2025.

2.4. Study population: Our study focused on:

- all reported and audited maternal deaths in the Nioro health district between January 2019 and December 2024;
- healthcare professionals in the health district (CSRéf, CSCom);

2.4.1. Inclusion and Exclusion Criteria

2.4.1.1. Inclusion Criteria: The following were included in our study:

- all reported and audited cases of maternal death in the health district during the study period;
- all healthcare professionals in the health district who agreed to participate in the study.

2.4.1.2. Exclusion criteria: The following were excluded:

- all cases of maternal death notified and recorded in the health district database whose records were incomplete;
- any health professional in the health district who was absent or unable to participate during the data collection period

2.5. Sampling

2.5.1. Sampling Method: We conducted exhaustive sampling of all reported and audited deaths during the study period. The Nioro health district has 29 community health centers (CSCom) and one referral health center.

- A reasoned selection process was undertaken, considering security considerations in the district, to select the Reference Health Center (CSRéf) and twelve Community Health Centers (CSComs);
- Within the Community Health Centers: The District Medical Officers (DTC) and the maternity unit managers, totaling twenty-four (24) staff members;
- At the Reference Health Centers: The Chief Medical Officer, the Gynecologist, the Head Midwife, the SDMPR focal point, and the SLIS officer.

2.6. Operational definitions: Maternal death: death of a woman occurring during pregnancy or within 42 days after its termination, regardless of its duration and location, from any cause determined or aggravated by the pregnancy or the care it prompted, but not accidental or fortuitous according to the International Classification of Diseases, 10th Revision ICD-10 [10]. Maternal death from direct obstetric causes: maternal deaths resulting from obstetric complications related to the state of pregnancy, labor and delivery or the postpartum period, to interventions, omissions or incorrect treatment, or to a series of events resulting from any of the causes mentioned below (ICD-10). These direct obstetric causes are: abortions, hypertensive disorders, obstetric hemorrhage, infection, other direct complications [9]. Maternal death from indirect obstetric causes: maternal deaths resulting from pre-existing diseases or diseases that developed during pregnancy, and which are not related to direct obstetric causes, but which were aggravated by the physiological effects of pregnancy (ICD-10).

- **Pregnancy-related deaths:** all deaths of women during pregnancy or within 42 days after pregnancy, regardless of their cause (ICD-10).

- **Late maternal death:** maternal death related to pregnancy (from direct or indirect obstetric causes) that occurs more than 42 days, but less than one year after the end of pregnancy (ICD-10).
- **Preventability of a death:** A maternal death would be considered preventable if one or more changes in the care provided or in the patient's behavior could have prevented the fatal outcome. Each case is determined as "definitely preventable", "possibly preventable", "not preventable" or "not enough information to conclude" [11].

Definition of attributes

- **Utility:** A public health surveillance system is useful when it contributes to the prevention and control of adverse health events, including a better understanding of the implications of these public health events [3; 7].
- **Simplicity:** The simplicity of a public health surveillance system refers to both its structure and its ease of use [6]. A system is considered simple if its structure is lightweight with a limited number of actors, the case definition is clear and precise, and the data collection and transmission procedures are rapid and standardized [3].
- **Stability:** Stability refers to the reliability (i.e., the ability to collect, manage, and deliver data in a fail-safe manner) and availability (the ability to be operational when needed) of the public health surveillance system [6].
- **Acceptability:** Acceptability reflects the willingness of individuals and organizations to participate in the surveillance system [6].

2.7. Data Collection Method or Technique

Data was collected in two ways:

- A review of clinical audit forms, the data from which was used to create an Excel database of maternal death cases.
- The DHIS2 was used to determine the number of reported maternal deaths per health area and per year, as well as the completeness and timeliness of reporting.

The administration of the questionnaire to collect data on the usefulness of the monitoring system, its organization and operation, the technical performance attributes namely simplicity, acceptability, stability, completeness, timeliness and data quality.

2.8. Data Collection Tools (Instruments): The data collection tools were:

maternal death audit forms; audit session reports; maternal death notification forms; Excel spreadsheet; DHIS2; and the questionnaire.

2.9. Data analysis method: The data were entered into an Excel spreadsheet and imported into Epi-info 7.2.6.0 software for analysis. Zotero was used for bibliographic references.

2.10. Ethical considerations: The protocol was submitted to the CSRef administration for approval. The confidentiality of the information collected was guaranteed by the anonymization of the results.

III. RESULTS

A total of 68 notification forms, audit sheets, and maternal death audit reports were available and entered in the district.

Organization and operation of the SSDMPR

Created according to decision No. 22021-070/P-CN of 23/7/2021, the local committee for Surveillance of Maternal, Perinatal Deaths and Response (SDMPR) of the Nioro circle is composed of fifteen (15) members and chaired by the prefect of the Nioro circle.

Within the CSRef, there is a maternal death audit committee, chaired by the Chief Medical Officer of the Nioro health district. This audit committee is composed of data collectors, members, and a chairperson.

The audit committee notifies all deaths within seventy-two (72) hours, audits them, and forwards the notification form, the incident report, the audit form, and the audit report to the next higher level (DRS).

Operation of the SSDM in the Nioro health district

The holding of meetings of the maternal death monitoring committee in the Nioro health district from 2019 to 2024. Instead of 4 meetings per year, the committee only held one meeting per year, i.e. 25% of planned meetings.

Table I: Distribution according to the number of audited maternal deaths per year in the Nioro health district from 2019 to 2024.

Year	Number of reported maternal deaths	Number of audited maternal deaths	%
2019	16	14	87,5
2020	10	10	100
2021	14	14	100
2022	8	8	100
2023	11	11	100
2024	09	09	100
TOTAL	68	66	

Maternal deaths were audited in 97.05% of cases

- Health professionals surveyed by sex in the Nioro health district in 2025. Males were the most represented, accounting for 53.33% of the health professionals surveyed in the Nioro health district in 2025. Midwife nurses were the most represented, at 33.33%, among the health professionals surveyed by qualification in the Nioro health district in 2025.
- The length of stay of 1 to 5 years was the most represented, at 43.33%, based on the number of years of service in the health district in 2025.

Attribute Assessment

- **Utility:** In our study, maternal mortality trend analysis was performed in 86.66% of cases. Interviewees acknowledged in 76.66% of cases that the proposed public health actions improved maternal healthcare, and 100% considered the SDMPR useful.
- **Simplicity:** Interviewees judged the case definition to be simple in 90% of cases; 90% stated that they completed the form in 15-20 minutes and for 100% the notification procedure was simple.
- **Stability:** Respondents found that notification forms were available in their department in 100% of cases, and the telephone was used as a means of communication in 100% of cases. The healthcare workers interviewed emphasized that the most commonly used data storage methods in their department were electronic medical records and paper files in 100% of cases.
- **Acceptability:** All healthcare professionals (100%) interviewed affirmed their willingness to continue with the maternal death surveillance and response system; to agree to complete the maternal death notification forms and find the time spent completing the notification forms acceptable.

IV. DISCUSSION

A total of 30 healthcare professionals were interviewed, and 68 maternal death audits were conducted. Males were the most represented, comprising approximately 53.33% of those interviewed. Nurse-midwives were the most represented group, at approximately 33.33%, followed by healthcare technicians at 23.33%.

- **Functionality** of the SSDM in the health district: The study revealed that the Maternal Death Surveillance and Response Committee was functional but it has shortcomings in its operation and this can be explained by the instability of administration due to changes.
- **Utility:** In our study, maternal mortality trend analysis was performed in 86.66% of cases. Interviewees acknowledged in 76.66% of cases that the formulated public health actions improved maternal healthcare. These results are higher than those of Tsitsi Brenda Makanyanga et al., who found that trend analysis was performed in 19.6% of cases and public health actions were formulated in 62% [7]. Our results are similar to those of S. Tapesana et al. [13], who found 97% for trend analysis and 53% for public health actions. This can be explained by the training of all DTCs and maternity ward managers in SDMPR.

- **Simplicity:** The definition was judged simple in 90% of cases. This result is higher than that of S. Tapesana et al., who found 62%. This difference could be explained by their large sample size of 100 [13]. Respondents reported completing the form in 15-20 minutes in 90% of cases and indicated that the notification procedure was simple in 100% of cases. This result is higher than that of S. Tapesana et al. [13] (68%) and that of Tsitsi Brenda Makanyanga et al. [7] (85.4%) within 15-20 minutes.
- **Stability:** Notification forms are available in 100% of the services surveyed. This result is equal to that of Tsitsi Brenda Makanyanga et al. [7], who also found 100% form availability. Our result could be explained by the regular provision of forms to health facilities by the health district. The telephone was the most frequently used communication device in 100% of cases. This result is similar to that of Mpumelelo Maphosa et al., who found that 100% of facilities had a telephone for communication [14]. This could be explained by the fact that the telephone is the most widely used means of communication in our society. The healthcare workers interviewed emphasized that the most frequently used data storage methods in their department were electronic medical records and paper records in 100% of cases. This result is higher than that of Tsitsi Brenda Makanyanga et al. [7], who found that 31.6% of facilities use only the electronic system. This difference can be explained by the use of the DHIS2 tool in all our facilities.
- **Acceptability:** All (100%) health workers interviewed expressed their willingness to continue participating in the maternal death surveillance system. This result is similar to that of a study conducted by Faith Mutsigiri Murewanhema et al. in the Mutare district of Zimbabwe and by Mpumelelo Maphosa et al., who each found that 100% of health workers affirmed their participation [14; 15]. Respondents unanimously considered completing the notification forms a duty for them, and 100% of the health professionals surveyed found the time required to complete the notification forms acceptable. This result is higher than that of Tamba Mina Millimouno et al., who found 80% [16]. This difference may be explained by the feedback provided to the Community Health Centers (CSComs) after the maternal death audit sessions.

Study limitations: We were unable to reach the desired sample size due to a lack of financial resources and the inaccessibility of certain structures for security reasons, which prevented us from determining certain attributes such as the representativeness and cost of the surveillance system.

V. CONCLUSION

In our study, we found the maternal death surveillance and response system to be acceptable and stable. The system was simple and useful to a certain extent, allowing for the analysis of maternal mortality trends. This study improved staff knowledge of the system at the organizational level.

However, we noted an insufficient number of meetings of the Maternal Death Surveillance and Response (MDR) Committee regarding the implementation of maternal death audits.

Furthermore, we believe that holding regular MDR Committee meetings could improve the system's usefulness and simplicity.

RÉFÉRENCES

1. Gin-mn. Operational guidance framaternal-and-neonatal-death-review-guide; 2014: 98-01
2. OMS. Mortalité maternelle, avril 2025 Consulté 2 septembre 2025]. Disponible sur: <https://www.who.int>
3. Belchior E, Lévy-Bruhl D, Le Strat Y, Herida M. Cost-effectiveness of a herpes zoster vaccination program among the French elderly people. Hum Vaccines Immunother. 1 sept 2016;12(9):2378-82.
4. Saucedo M, Deneux-Tharaux C. Mortalité maternelle en France, 2016–2018, fréquence, causes et profil des femmes. Gynécologie Obstétrique Fertel Sénologie. avr 2024;52(4):185-200.
5. Organisation mondiale de la Santé. Surveillance des décès maternels et riposte : directives techniques : prévention des décès maternels, informations au service de l'action [Internet]. Genève: Organisation mondiale de la Santé; 2015: 123 p. [Consulté le 15 septembre 2025]. Disponible sur: <https://iris.who.int/handle/10665/194270>
6. CDC. Actualisation des directives pour l'évaluation des systèmes de surveillance en santé publique. MMWR. USA, 27 juillet 2021;50(13): 1-51
7. Makanyanga TB, Madzima B, Mungati M, Chadambuka A, Gombe NT, Juru TP, et al. Maternal death surveillance and response system evaluation in Makonde District, Zimbabwe, 2021. PLOS ONE. 1 juill 2024;19(7):e0301929.

8. 10_36_4_2021.pdf [Internet]. [Consulté le 15 septembre 2025]. Disponible sur: https://www.malimedical.org/wp-content/uploads/2022/01/10_36_4_2021.pdf
9. OMS. Directives techniques de la SDMPR, février 2018, 134p. Consulté le 16 septembre 2025. disponible sur le site : <http://platform.who.int>
10. MSDS/DGSHP. Guide technique pour la SIMR au Mali, 3^{ème} édition, décembre 2021: 500p
11. Abrahams Y, Saucedo M, Rigouzzo A, Deneux-Tharaux C, Azria E, ENCMM group. Maternal mortality in women with pre-viable premature rupture of membranes: An analysis from the French confidential enquiry into maternal deaths. *Acta Obstet Gynecol Scand.* déc 2022;101(12):1395-402.
12. Dellagi RT, Belgacem I, Hamrouni M. Évaluation du système de suivi des décès maternels dans les structures publiques de Tunis (1999-2004). 2008;
13. Chirundu D. Evaluation of the Maternal Death Surveillance and Response System, Sanyati, Zimbabwe 2017. *TEXILA Int J PUBLIC Health.* 29 juin 2017;5(2):69-78.
14. Maphosa M, Juru TP, Masuka N, Mungati M, Gombe N, Nsubuga P, et al. Evaluation of the Maternal Death Surveillance and response system in Hwange District, Zimbabwe, 2017. *BMC Pregnancy Childbirth.* 29 mars 2019;19(1):103.
15. Mutsigiri-Murewanhema F, Mafaune PT, Juru T, Gombe NT, Bangure D, Mungati M, et al. Evaluation of the maternal mortality surveillance system in Mutare district, Zimbabwe, 2014-2015: a cross sectional study. *Pan Afr Med J* [Internet]. 2017 [Consulté le 15 septembre 2025];27. Disponible sur: <http://www.panafrican-med-journal.com/content/article/27/204/full/>
16. Millimouno TM, Sidibé S, Delamou A, Bello KOA, Keugoung B, Dossou JP, et al. Evaluation of the maternal deaths surveillance and response system at the health district level in Guinea in 2017 through digital communication tools. *Reprod Health.* 18 janv 2019;16(1):5.



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