Neonatal Mortality Surveillance System Evaluation, La-Nkwantanang Municipal Assembly, Greater Accra Region, Ghana, 2015-2019

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KEYWORDS: Neonatal mortality, Ghana, surveillance system evaluation, La Nkwantanang, data quality

ABSTRACT

Introduction: Neonatal mortality occurs during the first 28 days of life and in Ghana, the rate is 25 per 1000 live births. Regular evaluation of disease/event surveillance systems is required to ensure they are meeting their objectives and serving the public health mission. Therefore, we evaluated the newborn mortality surveillance system's attributes and usefulness. **Methods:** This study analyzed the La Nkwantanang Neonatal Mortality Surveillance System from 2015 to 2019 using systematic extraction of weekly and monthly reports, case-based forms and facility data sets. Stakeholders were interviewed and pertinent documents were used to evaluate the system's usefulness and attributes such as simplicity, data quality, acceptability, representativeness, timeliness, and stability. **Results:** During the period 2015 to 2019, the district reported 17 neonatal deaths with 88% (15) of these not being fully audited. The neonatal mortality surveillance system is integrated into the national IDSR reporting system. Data quality is low as only 47% (14/30) of the health facilities are reporting, with a considerable disparity in reported figures between levels of the system. There is low participation from private health facilities (9/25) due to delayed or no reporting. However, the District Health Information System version 2 offline mode allowed data input when the internet is unavailable. The system allows additional features without disruptions. **Conclusion:** The objectives of the neonatal mortality surveillance system are partially being achieved. Although data is being used for policy formulation, audits are not fully conducted.

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Introduction

Neonatal mortality is the death of a child within the first 28 days of life [1]. This period represents the most vulnerable time for a child's survival [2]. Globally, neonatal mortality constitutes 46% (2.4 million deaths) of all under-five deaths yearly, translating to 6,700 children dying each day within the first 28 days of life. In 2019, the neonatal death rate globally was 17 deaths per 1,000 live births [3]. The leading causes of all neonatal deaths are neonatal sepsis, neonatal tetanus, diarrhoea, pre-term, and birth asphyxia [2, 3, 4].

The sustainable development goals´ target of reducing neonatal mortality to 12 deaths per 1,000 live births by 2030 will be unachieved by over 60 countries and about 50% of those countries will not reach the target even by 2050 [5]. It is estimated that nearly 99% of all newborn deaths occur in developing countries [2]. According to the 2017 Ghana Maternal Health Survey, the newborn mortality rate in Ghana is 25 deaths per 1000 live births, higher than the global average. The neonatal mortality rate was estimated to be decreasing rapidly [6], however, it is still responsible for 68% of infant mortality and 48% of deaths among children under five [7]. Due to the high burden of neonatal mortality, Ghana did not achieve the Millennium development goals of 2015 [8].

In La Nkwantanang Municipality, there is limited data on neonatal mortality. The neonatal mortality surveillance system in the municipal health directorate is part of the Ghana Health Services Integrated Disease Surveillance and Response (IDSR) strategy, adopted from the WHO-AFRO IDSR, to improve the country´s ability to identify, report, and respond effectively to priority illnesses, as well as to integrate numerous current vertical surveillance systems and connect laboratory and other data sources for public health action. The IDSR approach focuses on health systems at the district and health facility levels in particular [9].

Disease/event surveillance implementation needs to be assessed regularly to ascertain if it is achieving its goals and performing its public health role. Evaluation is critical if the system is to be more helpful, have high quality, be efficient and have desirable characteristics [10]. According to Ghana´s IDSR strategy, the objective of the neonatal death surveillance system is to eliminate preventable stillbirths and neonatal deaths through active identification and reporting at community and facility levels to permit an assessment of the true magnitude of the burden of neonatal mortality; and identify underlying causes, contributing factors, and high-risk areas for neonatal deaths to guide immediate as well as longer-term actions and inform program decisions to reduce these deaths. Therefore, in La Nkwantanang Municipality, we evaluated the neonatal mortality surveillance system to determine whether its objectives are being met and to assess the attributes and usefulness of the system.

Methods

Evaluation setting

La Nkwantanang Municipality, one of Greater Accra's 29 metropolitan, municipal and district assemblies (MMDAs), is located in the northern area of the region and covers a land size of 74.4 square kilometers. Carved out of Ga East District, the municipality is bordered on the west by the Ga East Municipal Assembly, on the east by the Adentan Municipal Assembly, on the south by the Accra Metropolitan Assembly, and on the north by the Akwapim South District Assembly (Figure 1).

The population of the municipality is projected to be 139,084 [11] with a female-to-male ratio of 51% to 49%. About 84% of the population resides in urban areas. The under-five population in the municipality is approximately 17,000 children. Around 4% of all children under 5 are within the age group of 0 to 11 months. The municipality has 30 health facilities, five of which are public facilities. The public health facilities include two (2) polyclinics, two (2) health centres and one referral hospital. Maternal and child health services are offered at 15 health facilities within the municipality, including the referral hospital.

Evaluation design

We evaluated the neonatal mortality surveillance system at the La Nkwantang Municipality using both qualitative and quantitative methods. Guided by the Centers for Disease Prevention & Control´s (CDC) updated guidelines for surveillance system evaluation [12], we reviewed and analyzed neonatal mortality surveillance data and key indicators from 2015 to 2019. We assessed the usefulness and operation of the system by interviewing key staff using semi-structured questionnaires and observing the surveillance. procedures.

Stakeholder engagement

To ensure that the evaluation findings were accepted, we had meetings with the Family Health Division at the Ghana Health Services and the regional and municipal health directorates before the onset of the evaluation. We briefed stakeholders on the purpose of the study and the various activities we intended to perform as part of the evaluation.

Selection of participants

Interviews were conducted at 10 of 15 health facilities that offer maternal health services, the municipal health

directorate, and the regional health directorate. We interviewed 19 key personnel participating in the surveillance system´s functioning at various levels. These included clinicians working with maternal and neonatal health, disease control officers, disease surveillance officers and health information officers. The Municipal Director of Health Services, regional surveillance focal person, and data managers were also interviewed on the operation of the neonatal mortality surveillance system. All participants were purposively selected based on their experience, and those who consented were interviewed.

Data collection tools and techniques

We obtained data through interviews, observations, and a review of hospital records. We conducted interviews using a semi-structured questionnaire adopted from the CDC´s updated guidelines for surveillance systems evaluation. We also conducted observations of daily routine surveillance activities at the 10 selected facilities. Respondents' understanding of case definitions and reporting flow, data collection techniques, data analysis and distribution, uses of surveillance data, system integration, and availability of resources necessary for the operation were all recorded. Surveillance personnel's actions were monitored and recorded daily.

To ensure data consistency, registers and reporting forms were verified and compared to the aggregate data in the District Health Information and Management System version 2 (DHIMS2). The data was collected from 6-31, January 2020. The DHIMS2 electronic surveillance dataset on neonatal deaths from 2015 to 2019, together with its performance metrics, was converted to MS Excel files. For the linked cause of fatalities, facility registrations and newborn death audit data were also investigated. The accuracy of electronic monthly data was verified by comparing it to data from facilities' consulting room registers and tally sheets.

Data analysis

We analysed qualitative data using content analysis with predetermined themes, as recommended by the CDC updated guidelines for surveillance system evaluation [11, 13]. The thematic areas included the system attributes, objectives and purpose of the system, and the system´s components. Quantitative data were analyzed using Microsoft Excel 2016 to calculate frequencies, means, and proportions. The results were presented using charts, graphs, and tables.

Data quality assurance

To improve data accuracy, stakeholder answers were cross-checked with facility records and reports. The availability of rules, documentation, data analysis, and feedback procedures were observed to compare and detect any data fallacy across various sources.

System attributes

To assess simplicity, we observed the reporting flow, ease of using case definition, data required for operating the system, the minimum time spent on neonatal surveillance activities, and the minimum skills needed. For flexibility, we assessed the system's ability to adapt to change, including the change in the reporting tools or case definition.

To assess acceptability, we assessed stakeholder participation in the surveillance system, type of health facility (i.e., public and private health) reporting weekly IDSR data to the municipal health directorate level.

We assessed the surveillance system's representativeness by the completeness of neonatal death audit reports and IDSR monthly reports from the health facilities. WHO standard of at least 80% was used to determine the representativeness of the health facility and municipality.

For stability, we assessed the system's ability to collect, manage, and provide data and its ability to be operational when needed. The availability of resources required for operation, data available when needed, and the percentage of time the system is fully operating were used to determine the system's stability. To assess the quality of the data, we reviewed health facility patient files, monthly IDSR reports, neonatal death audit reports and compared them to the data submitted in DHIMS. The data quality is deemed satisfactory if the completeness of reporting, including zero reporting, is 80% or more.

Timeliness of the system was assessed by evaluating the reporting time interval between the health facility reporting to the municipal i.e. the timeliness of reporting in DHIMS2 from the health facility and the municipality and the timing of the neonatal death audit. If 20% or more of the weekly IDSR report is submitted after the 5th day of the month, the system said not to be timely. We calculated the timeliness by dividing the total weekly aggregates by the number of expected reports.

Usefulness of the surveillance system

We assessed usefulness of the system by conducting interviews to ascertain the relevance of the surveillance system to stakeholders. We assessed whether data from the system had influenced any action or policy at the national or sub-national levels, and the types of actions they had influenced.

Ethical consideration

The evaluation was conducted within the scope of the Integrated Disease Surveillance and Response system of the Ghana Health Service and did not have to receive approval from the Ethics and Review Committee. Ghana Health Service's Disease Surveillance Department gave permission to examine and use the data for this evaluation. Additionally, permission was obtained from the Greater Accra Regional Director of Health Services. The data was stripped of any identifiers. Computer data was encrypted using a password that was accessible only on a need-to-know basis. No names were used in the analysis.

Results

During the period of the evaluation, 17 neonatal deaths were reported from health facilities to the municipality, of which the highest number (6) was recorded in 2018. Of the total neonatal deaths reported, only 12% (2/17) were audited and had full neonatal mortality audit reports available (Table 1). Birth asphyxia was the primary cause of the majority of the deaths (65%, 11/17). The major secondary underlying causes of death were neonatal sepsis, prematurity, and meconium aspiration (Figure 2).

System operation and data flow

There are five reporting levels, each with clearly defined responsibilities (Figure 3). Neonatal deaths are reported through a web-based centralized system, the DHIMS2, using the IDSR reporting forms. When clients from the community present themselves in the health facility's OPD, emergency, or consultation rooms for screening, their information and diagnoses are entered into registers.

Resources used for the neonatal mortality surveillance system

As part of Ghana's IDSR, the neonatal mortality surveillance system used shared resources with other diseases/events under surveillance in Ghana. The system is run by the Ghana Health Service and is primarily operated by government employees, as part of their duties. There is no neonatal mortality surveillance focal person at any level of the system. Stationery and computers are the only resources needed to operate the system.

Level of integration

Neonatal mortality is one of the 43 diseases and events of public health importance under the Ghana Health Services integrated surveillance system. The system is being operated at the national, regional, district/municipality, health facility, and community levels of the health system.

Aggregates of cases and fatalities are validated and submitted at the end of each month to the next level through DHIMS2. The IDSR forms are forwarded to the municipal health directorate. Facilities are supposed to report their data by the fifth day of the following month. The aggregated data from the facilities are examined by the health information officer (HIO) and disease control officer (DCO) for timeliness and completeness at the municipal level. At all stages of data flow, data analysis is anticipated. Performance evaluations are supposed to be done yearly at the district/municipal level, during which data is exchanged. However, facilities are encouraged to conduct frequent assessments throughout the year.

At the national level, the data is analyzed, reports are generated, and feedback is given to the regional and municipal level through emails, text, or annual reports. A report is developed each year and shared with national and international partners.

Performance of the neonatal mortality surveillance system

A total of 17 neonatal deaths were reported in the 10 facilities over the evaluation period. Out of the 10 maternal health services facilities visited, 3 health facilities (30%) did not have a stillbirth, perinatal, and neonatal deaths audit committee. At the referral health facility and polyclinic, although neonatal death audit committees existed, no neonatal death audits were conducted for any of the 15 reported deaths. In the facilities where the other 2 neonatal deaths were reported, audits were conducted within one month after the deaths, and reports were available (Table 1).

Of the 19 respondents interviewed (Table 2), 74% (14/19) were females and 74% (14/19) had been at their post for more than three years. The clinical staff made up the highest proportion of respondents (47%, 9/19) followed by health information officers (26%, 5/19) and disease control officers (21%, 4/19) (Table 2). Some of the health facilities (40%, 4/10) had the updated IDSR Technical Guidelines available and visible.

The usefulness of the system

Although every respondent agreed that a neonatal surveillance system should be used for decision-making, including the prompt audit of any neonatal deaths that occur, only 16% (3/19) of the respondents had carried out any action utilizing data from the newborn monitoring system as evidence. There was no evidence that surveillance data had been used for any action or policy at the district level, although they indicated that it had been used for improvement in neonatal care. However, at the

regional and national levels, the data is being edited and used for policymaking, e.g., the annual health report. Neonatal mortality was also not considered a high priority at all levels, due to its relatively low rate.

Attributes of the Neonatal Mortality Surveillance System

Simplicity

All health facilities surveillance officers (100%, 10/10) had the monthly neonatal death reporting forms and knew the case definition for neonatal mortality. Of the four disease control officers (DCO) interviewed, three (75%) had been trained in IDSR, but this was over three years ago. The other DCO had never received any formal IDSR training. All 10 health facilities (100%) did not have a reporting structure posted on the walls of the health facilities. Only the municipality, regional and national levels had reporting structures and trends analysis of priority diseases/events posted on their walls. All health facilities described the process of reporting neonatal mortality data as simple.

Flexibility

Neonatal mortality surveillance is easily integrated into the IDSR System without any challenges. All health facility personnel (100%, 19/19) agreed that introducing any additional form would not increase the reporting time of neonatal mortality. No changes to the system were seen within the evaluation period. There is no additional cost for adding or removing health facilities from the system. Therefore, the system is deemed to be flexible.

Acceptability

Throughout the study period, only 46.7% (14/30) of the municipal´s facilities (both government and private facilities) had ever submitted monthly reports to the municipal health directorate via DHIMS2, out of the expected 80%. All health facilities within the system received feedback from the higher levels. Thus, we determined the system to be partially acceptable. *Representativeness* All (5/5) public facilities in the municipality submitted reports throughout the evaluation period. Getting a report from the private facilities was, however, challenging. Additionally, deaths were recorded and reported in both perinates and neonates in only two health facilities: a polyclinic and a private referral hospital. All other health facilities reported only deaths of neonates. Thus, the system is partially representative.

Stability

At the facility level, only one of the four disease control officers had not been formally trained in DHIMS2. Majority had been trained and were familiar with reporting though it had been more than a year. During scheduled upgrades, there was minimal interruption in the system's regular operation. Respondents did not get additional compensation for reporting data as part of their regular duties. In addition, the resources needed to run the system daily were already in place in the facility; thus, there was no new expense to the system. The DHIMS's 'offline mode' function allowed data input even when the internet was unavailable. The system was deemed stable.

Data quality

Data analysis and verification were done monthly at all levels of the surveillance system. The verification usually included neonatal mortality data. The data verification is done by a multidisciplinary team that consists of the DCOs, HIOs, and DDNS. Only 47% (14/30) of health facilities were reporting monthly via DHIMS2. This includes all public primary-care facilities (4), faith-based hospitals (1), and private facilities (9).

Timeliness

The timeliness of reporting during the period was 46.7% (14/30). Neonatal death audits were conducted within a week for only 12% (2/17) of the total deaths during the evaluation period. The audits were done at the referral hospital.

Discussion

Data from this assessment suggests that the neonatal mortality surveillance system in the La-Nkwantanang municipality is achieving its objectives partially. Although the system captured neonatal deaths, not all these deaths were audited during the evaluation period across the different sites. This suggests considerable variations in site capacities for determining the actual cause of a child's death within the municipality, as only 12% of the deaths were audited. This is contrary to the World Health Organization's recommendation on neonatal and stillbirth audits [14].

To prevent unwanted early death events and improve the health care system, it is required to count fatalities, gather information about the causes of these deaths and identify contributing and preventable variables. A neonatal deaths audit is critical for lowering stillbirths and neonatal mortality. In addition, the audits help to inform policies for the reduction of neonatal mortality. This is consistent with other findings in Zimbabwe, South Asia, and Jordan [15,16,17].

Despite seeming to treat data collection as their primary responsibility, participants agreed that data from the system should be analyzed. Further discussion revealed

that they believed neonatal death was not a high-priority condition in their institutions because of the relatively lower fatality rate connected with it. This is consistent with findings from Dadzie et al. when they evaluated the pneumonia surveillance system in Tema [18]. The decision to keep or cease using a monitoring system is highly impacted by how effective the system is at treating the particular health issue at hand.

According to the World Health Organization, the mere collecting of data without transforming that data into actionable information undermines the very objective of disease surveillance systems. Lack of knowledge among healthcare workers usually results in failure to report perinatal or neonatal deaths. Adequate knowledge among healthcare workers is crucial for accurate detection, prompt reporting, and response to neonatal deaths, as discussed by Kilonzo et al [19]. However, at the national level, the data is being used as evidence for policy formulation.

Our findings showed that the neonatal mortality surveillance system is stable at all levels. This is an essential attribute for measuring the functionality of a surveillance system. The DHIMS reporting platform was functional although sometimes unavailable during downtime for system maintenance. Data for internet connectivity was irregular, but the system requires minimal internet connectivity. However, the lack of dedicated staff for the system caused delays in proper monitoring and reporting. A study on implementing surveillance tools reported inadequate human resources as a major challenge that affects the system´s functioning negatively [20].

Limitations

The respondents may have stated what is desirable rather than what they do contributing to reporting bias. To boost trustworthiness, we reviewed records, conducted observations, along with the interviews with various levels of health workers. Additionally, due to the lack of individual-level data, we could only estimate timeliness by two indicators. Assessing timeliness at each stage of monitoring would have been useful.

Conclusion

Overall, the objectives of the neonatal mortality surveillance system in La Nkwantanang Municipality are being partially achieved. Although neonatal mortality is not being fully prioritized, the system was useful and data generated had resulted in the improvement of child health services in the municipality. The municipality´s neonatal mortality surveillance system is simple, stable, flexible, and partially timely, but low on acceptability, representativeness, and data quality.

Recommendations

We recommend that the Ghana Health Services and the Municipal Health Directorate conduct stakeholder meetings with the private health facility on the importance of reporting IDSR priority diseases; train and assign disease control officers at all health facilities, including private health facilities, in the municipality to ensure timely, quality, and accurate reporting of IDSR priority diseases The Municipal Health Directorate is encouraged to institute measures to ensure the timeliness of reporting by conducting quarterly mentorship at health facilities with challenges and ensuring that all neonatal deaths in the district are audited.

What is known about this topic

- Globally, about 6.700 children die each day within the first 28 days of life, constituting nearly 50% of all under-five deaths yearly. Nearly 99% of all newborn deaths occur in developing countries
- The leading causes of all neonatal deaths are neonatal sepsis, neonatal tetanus, diarrhoea, pre-term, and birth asphyxia
- It is important to assess disease/event surveillance systems regularly to ensure they are achieving their goals and performing their public health roles.

What this study adds

- This study assesses the attributes of the neonatal mortality surveillance system of a municipality in the Greater Accra region of Ghana. It assesses its usefulness; identifies gaps and explores reasons for its inability to achieve its objectives
- The study offers recommendations for improvement and information to support healthcare decisions, planning and interventions in the municipality, in order to reduce neonatal mortality rates and improve birth outcomes in the municipality

Competing interests

The authors declare no competing interests.

Authors' contributions

DGJ, BCT, ASA - Finalization of manuscript. EK, DA, CLN, BBK - Development of the evaluation protocol and report.

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Figure 3: IDSR Surveillance System Data Flow, La Nkwantanang Municipality

References

1. Pathirana J, Muñoz FM, Abbing-Karahagopian V, Bhat N, Harris T, Kapoor A, Keene DL, Mangili A, Padula MA, Pande SL, Pool V, Pourmalek F, Varricchio F, Kochhar S, Cutland CL.Neonatal death: Case definition & guidelines for data collection, analysis, and presentation of immunization safety data . Vaccine [Internet]. 2016 Jul 19 [version of record 2016 Nov 28; cited 2024 Mar 11];34(49):6027-37. https://doi.org/10.1016/j.vaccine.2016.03.040 PubMed | Google Scholar

2. WHO, UNICEF, World Bank. Levels & Trends in Child Mortality: Report 2019, Estimates developed by the United Nations Inter-agency Group for Child Mortality Estimation [Internet]. New York (NY): UNICEF; 2019 Sep [cited 2024 Mar 8]. [about 52 p.]. Download UN-IGME-child-mortality-report-2019.pdf.

3. UNICEF. Neonatal mortality data [Internet]. New York (NY); UNICEF: 2019 [updated 2023 Jan; cited 2024 Mar 7].

4. Tette EMA, Nartey ET, Nuertey BD, Azusong EA, Akaateba D, Yirifere J, Alandu A, Seneadza NAH, Gandau NB, Renner LA. The pattern of neonatal admissions and mortality at a regional and district hospital in the Upper West Region of Ghana; a cross sectional study . Moyer CA, editor. PLoS ONE [Internet]. 2020 May 4 [cited 2024 Mar 7];15(5):e0232406. https://doi.org/10.1371/journal.pone.0232406 PubMed | Google Scholar

5. WHO. Child mortality and causes of death [Internet]. Geneva (Switzerland): WHO; c2024 [cited 2024 Mar 7].

6. Ministry of Health(Ghana). Ghana National Newborn Health Strategy and Action Plan 2014-2018: A road map to reduce neonatal deaths nationwide [Internet]. Accra (Ghana): Ministry of Health-Ghana; 2014 Jul [cited 2024 Mar 7]. 69p. Download national_newborn_health_strategy_and_action_plan_2014___2018.

7. Ghana Health Service. Ghana Annual Report 2019 [Internet]. Accra (Ghana): Ghana Health Service; 2019 [cited 2024 Mar 11]. 66p. Download Ghana Annual report 2019.

8. Adjei G, Darteh EKM, Nettey OEA, Doku DT.Neonatal mortality in the central districts of Ghana: analysis of community and composition factors . BMC Public Health [Internet]. 2021 Jan 21 [cited 2024 Mar 12];21(1):173. https://doi.org/10.1186/s12889-021-10156-6 PubMed | Google Scholar

9. Adokiya MN, Awoonor-Williams JK, Beiersmann C, Müller O.The integrated disease surveillance and response system in northern Ghana: challenges to the core and support functions . BMC Health Serv Res [Internet]. 2015 Jul 28 [cited 2024 Mar 12];15(1):288. https://doi.org/10.1186/s12913-015-0960-7 PubMed | Google Scholar

10. Alemu T, Gutema H, Legesse S, Nigussie T, Yenew Y, Gashe K.Evaluation of public health surveillance system performance in Dangila district, Northwest Ethiopia: a concurrent embedded mixed quantitative/qualitative facility-based cross-sectional study . BMC Public Health [Internet]. 2019 Oct 22 [cited 2024 Mar 12];19(1):1343. https://doi.org/1186/s12889-019-7724-y PubMed | Google Scholar

11. German RR, Lee LM, Horan JM, Milstein RL, Pertowski CA, Waller MN, Guidelines Working Group Centers for Disease Control and Prevention (CDC). Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group. MMWR Recomm Rep [Internet]. 2001 Jul 27[cited 2024 Mar 12];50(RR-13):1-35; quiz CE1-7.

12. La Nkwantanang Madina Municipal Assembly. La Nkwantanang Madina-Municipal Assembly 2021 [Internet]. Madina (Ghana): LaNMMA; 2021 [cited 2024 Mar 11].

13. Blignault I, Ritchie J.Revealing the wood and the trees: reporting qualitative research . Health Promot J Aust [Internet]. 2009 Aug 1 [cited 2024 Mar 12];20(2):140-5. https://doi.org/10.1071/HE09140 Google Scholar

14. Negandhi PH, Neogi BS, Das AN, Chopra S, Phogat A, Sahota R, Gupta RK, Zodpey A, Gupta R.Factors associated with stillbirths in Haryana, India: A qualitative study . WHO South-East Asia Journal of Public Health [Internet]. 2018 Sept [cited 2024 Mar 11];7(2): 114-121. https://doi.org/10.4103/2224-3151.239423 Google Scholar

15. Bhutta ZA, Das JK, Bahl R, Lawn JE, Salam RA, Paul VK, Sankar MJ, Blencowe H, Rizvi A, Chou VB, Walker N.Can available interventions end preventable deaths in mothers, newborn babies, and stillbirths, and at what cost? The Lancet [Internet]. 2014 May 19 [cited 2024 Mar 12];384(9940):347-70. https://doi.org/10.1016/S0140-6736(14)60792-3 Google Scholar

16. Mundagowa PT, Chimberengwa PT, Chadambuka E.An evaluation of the perinatal mortality surveillance system in Gwanda District, Matabeleland South Province, Zimbabwe . S. Afr. J. Child Health [Internet]. 2020 Jun 1 [cited 2024 Mar 11]; 14(2):82-86. https://doi.org/10.7196/SAJCH.2020.v14i2.1659 Google Scholar

17. Mutsigiri-Murewanhema F, Mafaune PT, Juru T, Gombe NT, Bangure D, Mungati M, Tshimanga M.Evaluation of the maternal mortality surveillance system in Mutare district, Zimbabwe, 2014-2015: a cross sectional study . Pan Afr Med J [Internet]. 2017 Jul 18 [cited 2024 Mar 12];27:204. https://doi.org/10.11604/pamj.2027.204.7210 PubMed | Google Scholar

18. Dadzie D, Addo-Lartey A, Peprah N, Kenu E.Evaluation of surveillance system for pneumonia in children below five years, Tema Metropolis, Ghana, 2012 - 2016 . GMJ [Internet]. 2020 Aug 31 [cited 2024 Mar 12];54(2 Suppl):11-7. http://dx.doi.org/10.4314/gmj.v54i2s.3 PubMed | Google Scholar

19. Kilonzo A, Kouletio M, Whitehead SJ, Curtis KM, McCarthy BJ. Improving surveillance for maternal and perinatal health in 2 districts of rural Tanzania . Am J Public Health [Internet]. 2011 Oct 10 [cited 2024 Mar 12];91(10):1636-40. https://doi.org/10.2105/ajph.91.10.1636 PubMed | Google Scholar

20. Jayatilleke K. Challenges in implementing surveillance tools of high-income countries (Hics) in low middle income countries (LMICS) . Curr Treat Options Infect Dis [Internet]. 2020 Aug 28 [cited 2024 Mar 12];12(3):191-201. https://doi.org/10.1007/s40506-020-00229-2 PubMed | Google Scholar

Table 1: Reported neonatal deaths, La Nkwantanang Municipality, 2015-2019			
Year	**Number of neonatal deaths reported**	**Audit report not available n (%)**	**Audit report available n (%)**
2015	0	0	0
2016	3	3(100%)	0
2017	5	5(100%)	0
2018	6	4(67.7%)	2 (33.3%)
2019	3	3(100%)	0
Total	17	15 (88.2%)	2(11.8%%)

Table 2: Demographic characteristics of interviewees during the evaluation on the neonatal mortality surveillance system in La Nkwantanang Municipal Health District, 2020 (n=19)

Characteristic	**Frequency**	**Percent**
Position		
Clinical staff	9	47.4
Health Information Officer	5	26.3
Disease Control Officer	4	21.0
Administrator	1	5.3
Gender		
Male	5	26.3
Female	14	73.7
Years of experience		
Years	5	26.3
>3 years	14	73.7

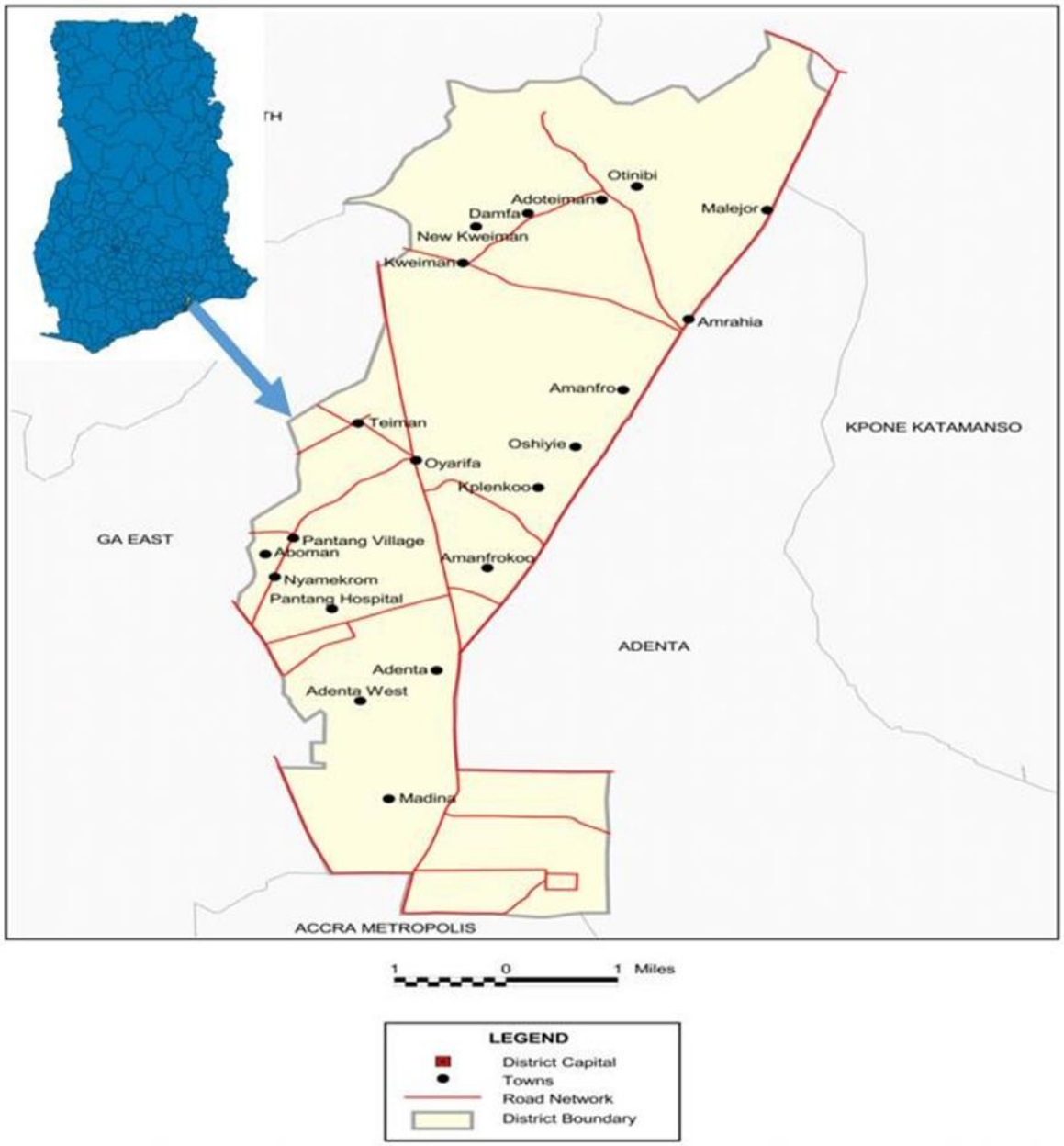

Figure 1: Map of La Nkwantanang Municipal Assembly: A map of the study site, a municipality in the Greater Accra region of the country. The map was obtained from the Municipal Health Directorate

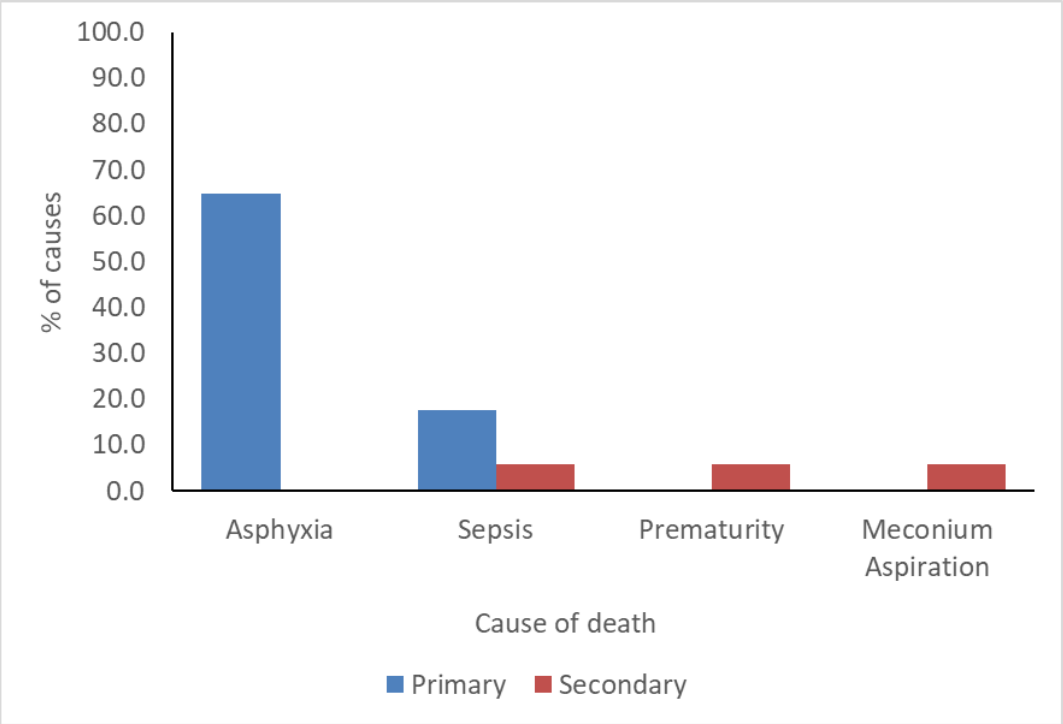

Figure 2: Causes of neonatal death, La Nkwantanang Municipality, 2015-2019. DHIMS2 surveillance dataset on neonatal death from 2015 – 2019

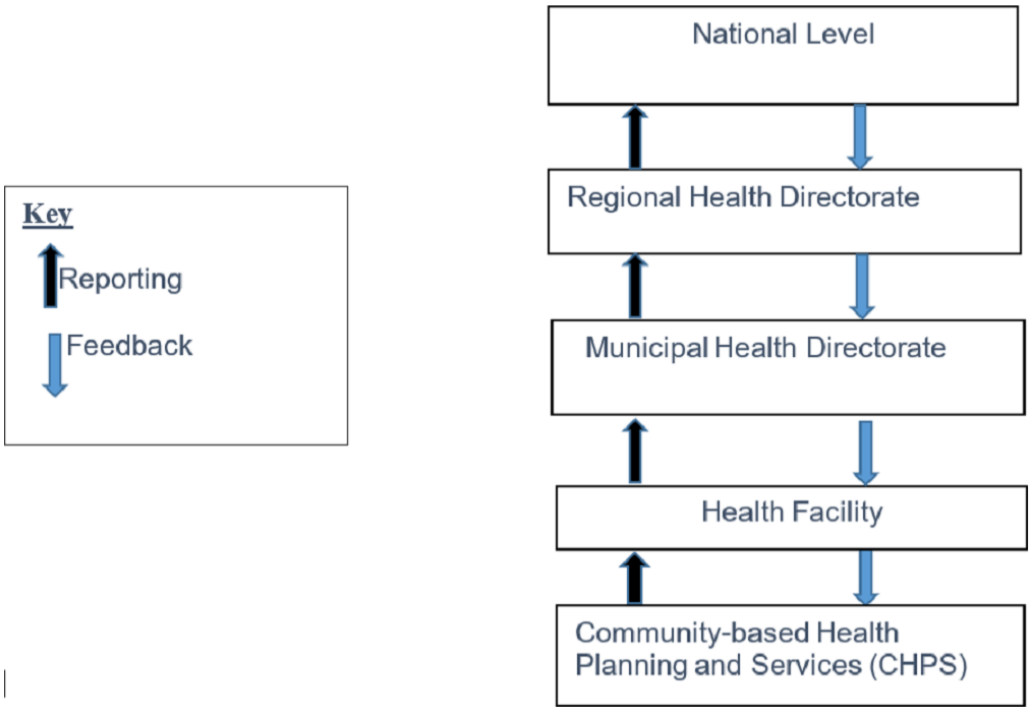

Figure 3: IDSR Surveillance System Data Flow, La Nkwantanang Municipality