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for every child

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Published in May 2019 by
Family Health Bureau
Ministry of Health
231, De Seram Place
Colombo 10
Sri Lanka.
Web site: www.familyhealth.gov.lk

Printed by : Vishwa Graphics Pvt Ltd.

ISBN: 978-955-1503-63-2

REVIEW

Perinatal Death Surveillance in Sri Lanka 2014-2017

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Funded by:
UNICEF Country Office
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Acknowledgement

This report would not have been possible without the commitment and support from many individuals, health institutions and organizations.

We greatly appreciate the administrative support and guidance extended by Dr Anil Jasinge, Director General Health Services and Dr Sussie Perera, Deputy Director General Public Health Services II. We are thankful for giving permission to visit hospitals for conducting the review.

We appreciate the hard work undertaken by Prof. Carukshi Arambepola, the project consultant in conducting the review and writing the report, and Dr Yasaswi N Walpita for assisting her in the project.

The role played by the team at Maternal and Child Morbidity and Mortality Unit of the Family Health Bureau (FHB) is immense. We are thankful to the medical officers and data entry operators at the Unit for providing updated databases. We also thank the other consultants of the Family Health Bureau, Dr Kaushalya Kasthuriarachchi, Head of the Monitoring and Evaluation Unit, Dr Irosha Nilaweera, NPM Maternal Care and Dr Nethmini Thenuwara, NPM Intranatal and Newborn Care for their valuable inputs.

We are indebted to Dr Anoma Jayathileke who had served as a senior consultant in this field at the FHB for her kindness and providing us with valuable information that is not well-documented elsewhere.

We thank the UNICEF Country Office Sri Lanka especially Dr Safina Abdulloeva, Child Survival and Development Manager and Dr Dhammica Rowel, Health & Nutrition Officer for supporting this activity financially and technically.

The Heads of Institutions, Consultant Paediatricians, Consultant Neonatologists, Consultant Obstetricians, Matrons, Sisters in charge, Nursing Officers, Midwives and House Officers and Senior medical Staff in the selected institutions who took part in the qualitative in-depth interviews despite their busy schedules are greatly appreciated. The insights provided on the current surveillance system have made this report useful for data originators at hospital level and data collators at central level. Their inputs for identifying gaps and recommendations are specially appreciated.

The medical undergraduates Ms. Chirathu Fonseka, Zaeena Zahir, Thejani Gajasinghe and Uchitha Jayamanna who worked as research assistants of this project gave their fullest support in meticulously perusing the original records and updating the databases with utmost care.

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Foreword from the Director General Health Services

Sri Lanka has made remarkable progress in maternal and child care over the past decades. With the reduction of maternal deaths and infant deaths in the country, perinatal deaths emerged as a priority area and a quality dimension of care in an around delivery.

Sri Lanka started reviewing perinatal deaths way back in early 2000. This system has evolved over the years to become a key area in the hospital agenda. The tedious effort taken by the Family Health Bureau, the focal point of maternal and child health in the country, in reshaping the perinatal death surveillance system is highly admirable. In a context of 12 years of experience in structured perinatal death surveillance since 2006 and the availability of collated individual perinatal death data country-wide, it is high time to conduct an in-depth exploration of the surveillance mechanism and a meaningful analysis of perinatal death data.

This report has addressed the much-needed revisit of the system, proposed solutions for further improvement of the perinatal death surveillance and has provided a profile of perinatal deaths in the country.

I appreciate the contribution of all the stakeholders; Family health Bureau, Sri Lanka College of Paediatricians, Sri Lanka College of Obstetricians and Gynaecologists, Perinatal Society of Sri Lanka and the health administrators at all levels in this endeavour to improve the maternal and neonatal care in the country.

Dr Anil Jasinghe
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Background

The World Health Organization (WHO) defines perinatal death (PND) rate as the number of stillbirths (foetal deaths/ FD) occurring at or after 28 completed weeks of gestation and deaths occurring before completion of seventh day of life (early neonatal deaths/ ENND) per 1000 total births for a given year (WHO, 2006; Ghimire et al., 2018; WHO, 2016a). Majority of these FDs and ENNDs share obstetric origins in death as well as interventions that can prevent death around birth.

Despite the substantial improvement in maternal & child survival over the years, the achievements in perinatal mortality had not been impressive in the world, making the progress made through Millennium Developmental Goals during 2000-2015 less apparent. There had been a slower reduction of neonatal mortality (2%) and stillbirths (1%) compared to the rate of reduction reported for under-five children (3.4%), highlighting the need for continuing the international public health agenda beyond 2015. In response, the 'Every Newborn Action Plan (ENAP): 2015-2035' has been implemented with a global target to reduce neonatal mortality to fewer than 10 deaths per 1000 live births, and stillbirth rate to fewer than 10 per 1000 total births by 2035.

It is estimated that nearly one million neonates still die every year (i.e. around 2800 per day) in South Asia, of whom 75% do so during the first week of life. Further one million are stillborn every year in South Asia, of whom nearly half die during labour. In Sri Lanka, according to the routine Reproductive Health Management Information System (RH-MIS) of the Family Health Bureau (FHB), the PND rate was 11.2 per 1000 births in 2013 (4.8 ENNDs per 1000 live births and 6.4 FDs per 1000 total births). There had been a declining trend noted related to perinatal mortality in Sri Lanka, yet with an annual average reduction of only 3.84%. Sri Lanka strives to achieve the country-specific goals of the Sri Lanka Every Newborn Action Plan (SLENAP) 2017-2020 (FHB, 2016) in terms of a reduction of neonatal mortality rate to 4.2 per 1000 live births and stillbirth rate to 4.5 per 1000 total births by 2020. In this regard, it is imperative that effective policies and programmes are formulated to accelerate the progress, based on the evidence on PND statistics collected at national level. Such timely collection and analysis of data will ensure the quality improvements and accountability.

As early as in 2006, Sri Lanka initiated its National Perinatal Death (PND) Surveillance System to collect hospital-based data on PNDs. Sri Lanka had been the first in South Asia in this regard. Over the last decade, the system has evolved substantially in favour of the quality and completeness of data, setting an example to all other countries in the region. Currently, the surveillance system collects data using standard formats of all FDs of POG ≥ 22 completed weeks and ENNDs, taking place in specialised and non-specialised hospitals providing perinatal care in Sri Lanka. In addition, monthly PND surveillance meetings are held in all specialised hospitals for providing local action and policies. The data collected is received by the FHB to provide feedback to hospitals at district level, to generate evidence to formulate policies and programmes at central level; and to calculate PND rates at national level. After almost 12 years, the National Perinatal Death Surveillance System in Sri Lanka requires an independent review to identify its strengths & weaknesses, in order to provide recommendations for further improvement.

Methods

This review was undertaken with the broad objectives to describe the evolution of the National PND Surveillance System in Sri Lanka; to evaluate the current PND surveillance system and the institutional review process; to review the existing PND database from 2014-2017 on the quality of its data (completeness, timeliness and accuracy); and to identify the trends, causes and contributory factors of PNDs in Sri Lanka. The final goal was to make recommendations that will be useful for programme planners and managers to develop

strategies to strengthen the existing surveillance process and to capitalize on the preventable nature of PNDs, in order to further reduce the PND rate in Sri Lanka. For this purpose, a structured methodology was adopted.

1. Initially, an in-depth desk review of all programme documents and relevant literature (circulars, PND surveillance formats, guidelines, guide books, previous review reports and institutional documents relevant for the review) was conducted through a web-search and by visiting the Maternal & Child Morbidity and Mortality Surveillance Unit of FHB, consulting technical experts and through institutional visits.

2. The review team visited a few selected institutes representing different tiers of hospitals to conduct in-depth interviews with stakeholders (e.g. hospital administrators, medical and nursing staff) in order to study the surveillance process carried out in hospitals including its barriers and difficulties, to qualitatively assess the quality of PND data collected and to make observations on the PND surveillance meetings conducted in hospital.

3. Key informant interviews were conducted with the relevant current and past national programme managers and data entry operators to study the existing data entry process and evolution of the National PND Surveillance System in Sri Lanka.

4. As the main component of this review, a secondary data analysis of the 2014-2017 databases was carried out. Prior to this, all four databases were scrutinised to assess their suitability for statistical analysis, following which a substantial data cleaning and completion procedure (recorded data checked item by item with the original data), and data editing were undertaken to ensure completeness, uniformity and accuracy of the data for analysis. Considering the gross incompatibility noted of some variables which were essential for determining the FD or ENND status (type of death, timing of death, age at ENND and period of gestation), a logical framework with all possible combinations of these variables was developed to re-classify all deaths as much as possible. Similarly, some descriptions and ICD 10-codes recorded on the cause of death (COD) were re-classified according to the International Classification of Deaths-Perinatal Mortality (ICD-PM) system. Based on the edited data, PND rates were estimated for individual years while the trends and distribution of the contributory factors and COD were analysed for the 2014-2017 period.

Results

Evolution of the National PND Surveillance System in Sri Lanka

Registration of births, deaths & marriages had been initiated in Sri Lanka under the Dutch rule during 1640-1798, which was later replaced by the general registration system of births & deaths covering all districts in year 1847 under the Ordinance No.06 and No.18. The present law for registering births and deaths has been enforced from 1st August 1954 under Act No. 17 of 1951 and amended under Births, Deaths & Marriages (amendment) Law No. 41 of 1975, in which the Registrar General is held responsible for registering births, deaths and stillbirths in Sri Lanka. However, owing to the availability of stillbirth data only in 'proclaimed areas', this source has not been used for calculating PND rates for Sri Lanka.

As the focal point for maternal & child health in Sri Lanka, FHB had been collecting data on live births, stillbirths, and infant & neonatal deaths from the entire island through its field reproductive health data system (RH-MIS); and investigating such

deaths at field level using structured formats (e.g. H-678, F-2, F-6). Despite its unique contribution to the estimation of PND rates, this system posed several gaps in relation to the collection of data especially on stillbirths occurring within hospitals. In response, in 2003, along with the Perinatal Society of Sri Lanka and the Colleges of Gynaecologists & Obstetricians and Paediatricians, the FHB took the lead to design the National PND Surveillance System in Sri Lanka, which included an institution-based PND surveillance meeting and formats to retrieve such information. By 2006, this system was implemented throughout the country, well supported by Circular No. 01-05/2006. This move was in line with the WHO call for all its member states to establish mechanisms to develop proper information systems on PNDs.

The PND Surveillance System 2006 focused mainly on conducting monthly PND surveillance meetings organised by the head of specialised institutions providing perinatal care, based on the data collected on ENNDs and FDs after 28 weeks of gestation using H-26 Form (Audit on Perinatal Death). Although no clear mechanism was in place at the time to transfer such data to central level (only the minutes of the surveillance meeting were to be sent to FHB), there is evidence on admirable commitment of the FHB staff on meeting the challenge of ensuring smooth functioning of the institution-based PND surveillance and review meetings. In 2010, there was a renewed effort by the FHB to closely monitor and obtain monthly reports from all target hospitals. Once the universal coverage of these hospitals was reached, the FHB started collecting data on individual PNDs in 2014 using a summarized version of H-26 Form, collated for the whole year in an island-wide survey. In 2015, along with the launch of the Guidelines on National Feto-infant Mortality Surveillance System, a more structured system was worked out for specialised as well as non-specialised institutions to notify ENNDs and FDs of 22 or more completed weeks of gestation and/or weighing more than 500g or more. Another major change that took place was the introduction of ICD-PM system, replacing the previously used Wigglesworth classification for ascertaining the COD. During the same year, active surveillance and a special summary format were used to obtain data in the interim for the whole year, until the system was scaled-up. From 1st January 2016, two new formats were introduced, namely P-1 Format (to notify PNDs within 24 hours to the head of institute) and P-2 Format (a detailed monthly report following the PND surveillance meeting) to be sent to FHB on a monthly basis. In the current databases, P-2 Format has been used to enter data in both 2015 and 2016 years, and P-1 Format in 2017.

As per guidelines, a monthly review meeting is conducted in every specialized institution (including the private sector) organized by the head of institution on a fixed date. It is conducted in attendance of all the relevant hospital and field staff, based on the information gathered using P-1 Format. Cases are discussed in detail based on the three-delay model, while the review process should be a no-fault finding exercise simply to identify system problems that require change, develop recommendations on the change and assist in implementing the change at hospital and field levels.

Reporting of PND from hospitals

The hospitals involved in PND surveillance during 2014-2017 ranged from 78 to 192 hospitals. Contribution from the private sector was minimal. Zero reporting was relatively low (3.8% in 2014; 28.2% in 2016 and 18.8% in 2017) except in 2015, where the majority of zero reporting was from divisional hospitals. The PN deaths confirmed after re-classification (using the set of logical criteria to verify their FD/ ENND status) represented 99.9% of all deaths originally reported by hospitals in 2014 (3010 out of 3013); 81.5% (2265 out of 2780) in 2015; 88.2% (2369 out of 2687 in 2016 and 92.3% (1917 out of 2077) in 2017. This demonstrates adequate yield of data for further analysis.

Trends in the overall PND rates

The PND rate was 9.94 per 1000 total births (5.36 ENND rate per 1000 live births and 4.61 FD rate per 1000 total births) in 2014. The corresponding rates were 7.98 (4.17 ENND and 3.83 FD) in 2015; 8.08 (3.91 ENND and 4.2 FD) in 2016; and 6.79 (2.99 ENND and 3.82 FD) in 2017. All these PND rates were less than that reported for 2013 (11.2 per 1000 births). Further, from 2014 to 2017, all three series of death rates have marginally decreased, suggesting an overall declining trend of PN mortality in the country. Though unlikely, an alternative explanation for this observation could be incomplete reporting of the PNDs by hospitals. Further, ENNDs have contributed in higher rates than FD rates during 2014 and 2015, and conversely in 2016 and 2017.

Perinatal death rates by provinces and districts

A wide provincial disparity was noted. Apart from being in second place in 2014, Northern Province ranked first every year in the PND rates. Central and Uva Provinces were within the top five PND rates during each year, while it was the same at least during two years in the Western, North Western, Eastern and Sabaragamuwa Provinces. North Central (2014 and 2016) and Southern (2015 and 2017) Provinces reported the lowest PND rates. Each year, FD rates were higher compared to the ENND rates in majority of the provinces.

As for PND rates in districts, Batticaloa, Jaffna and Vavuniya Districts ranked within the first three places during all years except 2014, during which Mullaitivu District reported the highest rate within and between all provinces. This reflects the substantial contribution made by these districts to the PND rate in North & East Provinces. The relatively high PND rates seen in all three districts of Central Province reflect the PND status in estate sector. Districts of Colombo, Kandy, Kurunegala, Puttalam and Badulla, which are well-known for draining larger areas, reported PND rates higher than the average for each year.

Contributory factors

Maternal, foetal and hospital characteristics contributing to PNDs were assessed.

Each year, the majority of PNDs were reported from teaching hospitals, however the reporting by base hospitals has slightly increased from 23.1% (2014) to 28.7% (2017).

With regards to maternal characteristics, every year, majority of the FDs and ENNDs were of Sinhalese mothers (with an increasing trend across the years) aged 20-35-years (with a decreasing trend across the years). Maternal age has been stable around 29 years over the four years for both ENNDs and FDs, while FDs were on a slow declining trend in mothers over 35 years. Also, majority of the PNDs were of mothers who were gravid for the first, second or third time; of first or second parity; and having only one child or none. During each year, multi-gravid (more than five pregnancies) women were represented by only 0.5%-3.7% and multi-parous (more than five deliveries) by 0.2%-0.4%. The reporting quality of both gravida and parity was poor (gravida/ parity reported as '0' and 'data not available' categories exceeding 30% for both ENND and FDs in 2015-2017).

With regards to pregnancy characteristics, most of the FDs had taken place at 36-39 complete weeks of gestation (range: 29.2%-47.7%), however 7.8%-12.1% of babies dying in utero at 40-44 weeks of gestation is noteworthy. As for ENNDs, the majority had taken place at or above 28 completed weeks of gestation (range: 69.3%-89.5%). Further, there was no increasing tendency of ENNDs among less mature babies (POG < 28 weeks), indicating either more premature babies surviving the first seven days of life or more of them dying as still births before born alive. During all four years, the highest proportion among both FDs and ENNDs was following normal vaginal delivery (range: 25.9%-68.1%) compared to other provider-assisted delivery methods. However, vaginal delivery performed among ENNDs coming down drastically

(from 57.6% in 2014 to 25.9% in 2017) may indicate good standards of perinatal services related to birth assistance.

With regards to characteristics of the baby, majority of the FDs took place during antepartum period while there was no declining trend noted across the years of intrapartum FDs, suggesting no apparent improvement made in such care. In contrast, the majority of ENNDs took place within three days of birth, with a clear declining trend across the years of babies dying on the first day of life. The majority of ENNDs and FDs were of male sex and had varying birth weight. During each year, postmortem examinations had been carried out in less than 11% of the ENNDs (1.8%-10.7%) and even lesser among the FDs (0.6%-7.5%).

Cause of death

In 2014, the COD given as a description (using Wigglesworth classification) was available for 87.4% of the ENNDs, in contrast to only 10.9% of the FDs. The non-availability of COD according to ICD-PM groups was substantial, which was reduced after data cleaning from 56.3% to 44.1% in 2015; from 56.8% to 38.0% in 2016; and from 53.3% to 46.6% in 2017. This highlights the less competency of doctors in recording the ICD-codes, despite the intense efforts made by the FHB in training hospital staff at island-wide programmes.

According to ICD-PM groups, majority of the FDs were due to causes related to antepartum period, whereas most of the ENNDs were due to unique combinations of ICD-PM groups. As a single entity, perinatal deaths were most commonly due to congenital malformations in the years 2014 (31.7%) and 2016 (28.4%); low birth weight/prematurity in 2015 (32.4%); and unspecified causes in 2017 (32.5%). When assessed the COD specific to FDs, congenital malformations, intrauterine hypoxia & complications, unspecified causes, and disorders related to foetal growth were in the lead during each year. In contrast, the leading causes for ENNDs were congenital abnormalities, low birth weight & prematurity, and respiratory & cardiovascular disorders.

It is shown that over the years, reporting of congenital malformations, infections and low birth weight/prematurity have reduced in proportion, in contrast to the rapid increase in the 'unspecified COD' group. This may suggest that with the reporting formats becoming more complex over the years, there is a tendency among medical officers to report the COD as 'unspecified'.

Among the ENNDs, the commonest congenital malformations were due to heart & great vessel related anomalies followed by musculoskeletal system and brain & spinal cord related anomalies. As a single entity, the predominant anomalies were congenital heart disease followed by diaphragmic hernia, lung hypoplasia, anencephaly, renal anomalies/ Potter's disease and hydrocephalus. In contrast, congenital anomalies were fewer in FDs, the commonest being anencephaly and Trisomy 21. The proportion of babies having congenital malformations was slightly higher among younger mothers compared to the older ones, but this difference was not statistically significant.

Quality of the perinatal death surveillance databases

The quality of the record sheets and databases maintained at FHB was assessed on the completeness and accuracy of variables reported.

Completeness of the data was satisfactory for many variables but poor for method of assessment of POG and COD (Items V-Y2) (>50%) during all four years, despite the training conducted by the FHB on data recording and COD, especially in hospitals with poor reporting. The reporting of FDs of 22-27 gestation weeks was small in quantity (also decreasing across the years from 4.3% to 1.1%), which could be either due to poor reporting of FDs less than 28 weeks of gestation or FDs truly occurring at higher POG.

At hospital level, a few issues were noted in relation to the accuracy of data provided in record sheets, such as ineligible hand writing of the doctors, lack of uniformity of the responses given, poor consistency of the terms and calculations used, and incompatibility of data in relation to some crucial variables of P-1 Format (type of death, POG, timing of death, age at ENND and ICD-PM groups), leading to difficulty in confirming the COD as well as FD/ ENND status of deaths included in the databases. Following considerable data editing, the FDs and ENNDs re-classified according to pre-defined criteria yielded more than 85% of the original data, which is quite satisfactory. However, considering the absence of an increasing trend in the yield across the years, more intense attention should be paid to data quality in future.

At central level, there are data operators, for whom exposure and supervised training are provided after assuming duties. However, the accuracy of some variables (e.g. COD) seemed to be at stake during data entry, owing to their less familiarity with medical terminology.

Further, the coverage of all the target hospitals in the database was difficult to be assessed, in the absence of information on the hospitals considered eligible for surveillance during each year.

Quality of the process of recording and reporting of perinatal deaths at hospital level

This enquiry focused on the formats used for reporting, obtaining accurate and timely information by medical officers, data entry conducted in ward settings and timely dispatch of forms to the heads of institutions and FHB.

- **Format used for reporting**

Information collected using the P-1 and P-2 Formats is comprehensive and adequate for ascertaining the PND status, COD and contributory factors. These formats are compatible with the universal definitions of PND and cause of death, thus enabling international comparison of data as well as comparisons within the country.

Owing to the complexity of ICD-PM system, the attending house officers need the expertise of senior colleagues (senior house officer/ medical registrar/ senior registrar) in arriving at the COD, which is otherwise left incomplete. There are no quick reference guides or posters displayed on the wall for ascertaining the COD in ward settings, other than the guideline, which is also not readily available for perusal in ward settings.

Supervision during the completion of the P-1 Format by consultant-in-charge (or senior ward staff) is shown to vary. Most provide close supervision while contributing to the identification of factors contributing to PN death, the lessons learnt and action to be taken; while some do not, which would lead to incomplete recordings, as the house officers seem less experienced in providing an expert opinion in this regard.

Some house officers were of the opinion that P-1 Format is not user-friendly and too-long with intricate details on pregnancy and hospital care, which are not readily available (require detailed histories from mother and information gathered from BHT and mothers' pregnancy record), all of which could be time-consuming and tedious, thus left incomplete or delayed amidst many other duties in the ward. Retaining photocopies of the pregnancy record was one solution by them. The nursing staff was seen to be less actively involved in data completion other than ensuring its timely dispatch.

With regards to P-2 Format, there are difficulties faced by hospital administrators in obtaining the completed forms from wards and when completing the section on 'proposed action'. Monthly summary statistics collected on live births and deliveries of the hospital seem redundant, since the FHB relies on the Medical Statistics Unit for this information, when calculating the PND rates for Sri Lanka.

- **Obtaining accurate information and timely dispatch to FHB**

Despite the guidelines developed by FHB, instructions were shown in most instances not being perused or strictly adhered to, when ascertaining the POG status (resulting in FDs of 22-27 of POG taking place in gynaecology wards being over-looked) and criteria used for defining a PND based on POG and weight. There have been only fewer attempts in verifying uncertain POGs by ultrasound-scanning and correlating with the post-mortem findings of dead foetus. Verifying the birth weight is satisfactorily carried out by the attending nursing officer for any delivery irrespective of POG, though there may be issues related to measurements made. Parental consent appears to be the limiting factor in most instances for performing post-mortem, especially on ENNDs and among Muslims.

Delays beyond the stipulated 24 hours in retrieving completed forms from wards was posed as a major issue faced by the hospital administrators, for which the length of P-1 Format and post-mortem delays were cited as reasons for the delay by the ward staff. Nil reporting was explicitly poor.

- **Mechanisms in place for ensuring quality data**

Making collective efforts and plans by the medical staff for improving the quality of PND surveillance at the hospital level is commendable. Yet, the hospitals visited had no formal quality assurance evaluations incorporating PND surveillance as an indicator, and an active role played by the quality assurance cells in harnessing data. Specifically, most of the house officers interviewed were not familiar with the national guidelines & circulars and have not undergone any training prior to assuming duties. The training programmes conducted by the FHB at district level may not capture them all the time, considering their frequent turn-over every six months. Currently, there is no formal training included in the medical curriculum as well. A major deficiency identified was the FHB not providing any feedback on the data collected from hospitals at end of each year and conducting review meetings routinely at district level.

Introduction of an electronic format preferably using a mobile phone application with inclusion of drop-down menu options, mandatory checks on vital variables and cross checks for data compatibility, was well-received especially by house officers, while a few were concerned of doubling the work.

Quality of the perinatal death surveillance at central level

The Maternal & Child Morbidity and Mortality Surveillance Unit (MCMMS Unit) team led by its national programme manager has intensified quality improvement of the surveillance mechanism at central level. There is evidence on active surveillance carried out, visits paid to specialised hospitals and revisions in formats during the initial phase. Currently, there are initiatives taken by the FHB for obtaining timely data from hospitals, such as reminders sent and given at meetings with stakeholders. With the National PND Surveillance System in Sri Lanka reaching maturity, the current focus is on obtaining individual PND data mainly through the P-1 Format.

At central level, there are data operators for data entry and processing, who are recruited as apprentice trainees from technical colleges. Not having permanent staff responsible for data entry is a major limitation. It has also made it difficult to follow-up the timeliness of data flow and availability of data. However, despite the limited number of medical officers and resources, achieving the current standard is noteworthy.

Quality of the conduct of monthly PND surveillance meeting in hospitals

The conduct of PND surveillance meetings in hospitals in a methodical manner is the result of efforts made by staff at both field and central levels, which is highly commendable. As per guidelines, it was seen that the head of institution

with consultants organizes the meeting, while every measure (reminders, calendar dates, refreshments as incentives) is taken for conducting it on pre-scheduled dates, which are usually rotated throughout the year to give opportunity for every unit to participate.

- **Conduct of the meeting**

In some hospitals, the meetings were conducted as per given in the guidelines. In some, there were areas identified that need further improvement, of which the major weakness was in relation to the meeting not being geared towards its specified objectives, as given in the guidelines. Though many hospital administrators circulated the previous minutes and a summary of all the cases prior to the meeting, in some, the P-1 Formats were not available at the time. Lack of an agenda was a major deficiency identified, which prevented the attendees re-visiting the follow-up action decided for previous cases. Attendance varied by the hospitals, with some including all the categories of field and ward staff as specified in the guidelines. There is no provision in the guidelines for the person most familiar with the case to present and to be released from his duties, making the task of fact finding less effective during the review in such instances.

- **Discussion of the cases**

As per guidelines, though cases should be discussed for a fact-finding mission, based on the three-delay model, some cases presented mostly focused on the medical parameters of mother and foetus, with lack of coordination between the presenters and a uniform presentation format for COD, leading to repetition. P-1 Format was hardly referred to during the discussion or the data re-visited for verification of the data presented, for cross checking the quality of data recorded. Though pathological findings were well-presented in all hospitals for arriving at a suitable COD, its compatibility with the COD given in P-1 Format was not re-visited.

Guidelines do not specify having a moderator (only about having a person to organize the meetings) to lead the discussion at the meeting. Such moderation can generate active discussions between the field and hospital staff in the audience; learning points to be well-summarized or highlighted for each case; constructive feedback to be given for improvement of the staff; and to take collective decisions based on deficiencies/defaults identified. No opportunities were available for the nursing officer attending on the death to present the case or contribute their views at the discussion. Having medicalized discussions in English language and having no previous recordings of the case were identified as some barriers. Further, having an agenda not being specified in the guidelines, action proposed and decided upon at previous meetings are not followed-up.

Conclusions & Key Recommendations

Since 2006, the National PND Surveillance System in Sri Lanka has evolved at a steady pace into a well-structured surveillance mechanism, which is efficient in obtaining information on PNDs taking place in hospitals, using comprehensive data collection formats based on most updated definitions and global guidance on PND surveillance; and an effective no fault-finding review process of all PNDs at hospital level for instilling local action on perinatal care. The data collection system is well-supported by circulars issued by the Ministry of Health and occupies a smooth data flow. While the data collection formats had undergone several revisions over the years, the recent adoption of ICD-PM classification on cause of death is highly commendable. Thus, this system is recommended as a model that could be adopted by other countries in the region.

With the coverage of target hospitals being almost 100%, the PND Surveillance System of Sri Lanka has reached a significant juncture, where the focus now should be shifted to the timeliness and accuracy of the data collected, and the reviews conducted. It requires scaling-up of the system, to improve data quality throughout the process from data collection at hospital level to data processing and

dissemination at central level; and also to ensure that the overarching objective of the PND review meetings in hospitals is met through lessons learnt and action based on local evidence.

Given below are the key recommendations made following the review.

Recording and reporting of PNDs at hospital level

- An efficient mechanism with data quality checks at strategic points, should be introduced for smooth flow of high-quality data from the ward to institutional heads.
- Data recording should be made a shared responsibility with accountability among the medical staff (attending doctor should complete the formats under direct supervision of the consultant/senior colleague) and nursing staff (recording of basic information and timely dispatch) in ward settings. Consultant should be overall in charge and supervise the process; and verify and endorse the completeness and accuracy of data, including the sections on deficiencies and suggestions.
- Incorperating PND surveillance as an indicator in quality assurance systems in hospitals is further recommended.
- Guidelines on the hospital-based data surveillance mechanism need to be strengthened on providing further guidance on entering some crucial variables. In this regard, developing quick reference guides and posters displaying the ascertainment of COD is recommended.
- For complete and timely data, the data collected should be limited to the most crucial variables required for monitoring of trends. Duplication of data should also be avoided. Limiting the variables, in accordance with the model format proposed by the WHO (WHO, 2016b) is suggested.
- The data collection format (P-1 Format) should be simplified and made more user-friendly, preferably in electronic format supported by mobile applications, that could be accessed by the medical staff while ensuring the confidentiality of data. Such a format should provide drop-down menus to ensure uniformity of responses given; flow diagrams and charts designed for easy reference to arrive at the cause of death and type of death; and cross-checks for mandatory entry of crucial data (e.g. type, timing and age at death) and for assessing incompatibility of data.
- Since it is the intern house officer who is most often completing the format, they should be given a training on data collection procedures and formats during the orientation programme at the time of recruitment, with recognition for continued professional development. For the purpose of training, identifying and training a permanent medical officer (e.g. MO-Public Health, MO-Quality Assurance) as a trainer in addition to the consultants is an efficient method to ensure training. Consultant community physicians should take over the training at provincial level under the guidance of FHB.
- A strong campaign should be launched for promoting parental consent for post-mortem examinations, starting from midwife, nursing staff and medical staff including the obstetrician/ gynaecologist, physician, neonatologist and pathologist.
- For scaling-up the system, pragmatic strategies need to be identified for obtaining data on early foetal deaths (22-27 completed weeks gestation) and on nil reporting. Reporting also needs to be improved from the private sector while the surveillance is recommended to be limited to specialised institutions.

Data entry and dissemination at central level

- Data entry at central level should be streamlined, with a dedicated permanent data entry operator, preferably with a bio-medical background; and a dedicated intermediary

qualified medical officer assigned to oversee the system.

- The system should be upgraded into a well-designed sophisticated electronic database with in-built quality checks and having the capacity to generate automated reminders; carry out real-time data analysis on trends and data quality; and provide feedback to data originators in hospitals and higher authorities.
- Introducing an on-going data monitoring mechanism to check for receipt of quality data, which includes dry-runs and random checks at regular intervals by medical officers is recommended.
- A protocol/ guide should be developed to provide guidance for data entry operators on data entry, especially on handing medical data and discrepancies.
- The list of hospitals eligible for providing data should be regularly updated.
- The collected data should be analysed by end of every year by the national program officers to provide a feedback to all data reporting hospitals and to identify the deficiencies early and corrective measures required.

Institution-based perinatal death surveillance meetings

- It is highly recommended that all strictly adhere to the mandate given and the purpose of the PND surveillance meeting. In this regard, appointing a moderator for generating a discussion is highly recommended. Guidelines developed on the review process should also be strengthened on this aspect.
- It is highly recommended that this meeting be stream-lined to use it as the platform to take corrective action at local level. In this regard, findings presented by neonatologist, physician and forensic staff should corroborate for identifying deficiencies in the health care system. Also, at end of every case, the lessons learnt/ points to ponder should be identified.
- The PND surveillance meeting should be well participated by all including the nursing staff who had provided care, by giving them an opportunity to present their observations. In this regard, a non-threatening environment should be created for encouraging active participation of medical and nursing staff alike. Conducting meetings bilingually and pitching it to suit the level of the audience are recommended.
- The format of the review at PND surveillance meeting should be to identify the deficiencies and correct them. Consultants should play an active role in this regard. MO-PH or MO-MCH should play an active role in corrective action at the filed level.
- To ensure follow-up action, minutes should be maintained at every PND surveillance meeting; and follow-up action should be included as an agenda item and revisited at the next meeting. Minutes should be followed up by the central national program.
- Yearly reviews of the National PND Surveillance System in Sri Lanka should be conducted, with representatives of the target hospitals.

As way forward, it is high time the PND surveillance system including institutional reviews, is advocated as an important linkage for achieving the sustainable development goals on child mortality in Sri Lanka; and is considered a national priority in the agenda of health system development of Sri Lanka.

"While we have more than halved the number of deaths among children under the age of five in the last quarter century, we have not made similar progress in ending deaths among children less than one month old. Given that majority of these deaths are preventable, clearly, we are failing the world's poorest babies."

Henrietta H. Fore, UNICEF Executive Director

Chapter One

BACKGROUND

1.1 Global trends in neonatal deaths and stillbirths

Millennium Development Goals -2000 catalysed impressive political, financial and social commitments in the world towards improvement of child survival. In line, neonatal deaths in the world fell substantially from 4.6 million in 1990 to 2.6 million in 2015 (42.4% decline) and stillbirths from 4 million to 2•1 million (47% decline), but at a slower pace than post-neonatal childhood death rates (Wang et al., 2016).

Live birth is the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of the pregnancy, which after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached (WHO, 1993; WHO, 2006; WHO, 2016a).

The neonatal period begins with birth of a baby and ends 28 completed days after birth. Deaths during this period are classified as early (death of a newborn during the first seven days after birth; typically called days '1-7' in clinical practice and days '0-6' in surveys and vital registration) and late (death of a newborn after the seventh day but before 28 completed days of life; days '8-28' clinically and days '7-27' in surveys) neonatal deaths (WHO, 2016a). In contrast, stillbirth (also called foetal death) refers to a dead-born fetus showing no signs of life, which can occur either before the onset of labour (antepartum death) or during labour (intrapartum death). A stillbirth is further identified by a foetus that has reached a weight of 500g, or if it is unavailable, gestational age of 22 completed weeks or body length of 25cm, and accordingly classified as early (500-1000g birth weight or 22-27 completed weeks of gestation) and late (at ≥ 1000g birth weight or ≥ 28 completed weeks of gestation) foetal death (WHO, 2016a).

According to the World Health Organization (WHO) estimates for the year 2000, the neonatal mortality was 4 million, reflecting 30 neonatal deaths per 1000 live births in the world; 5 per 1000 in developed region, 33 per 1000 in developing regions and 42 per 1000 in least-developed countries. As much as 98% of these deaths occurred in the developing regions, signifying a six-fold risk of death during the neonatal period in developing countries compared to that in developed countries. The highest number of neonatal deaths was reported from Asia, which is where most children are born, accounting for an average neonatal death rate of over 32 per 1000 live births (WHO, 1993).

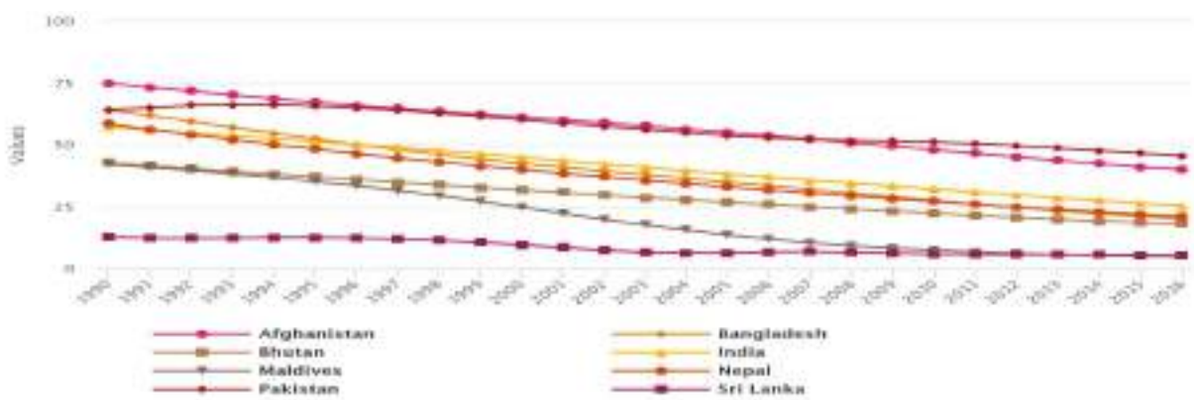


Figure 1.1: Neonatal death rate per 1000 live births in South Asia 1990–2016

Source: Levels & Trends in Child Mortality, United Nations Inter-Agency Group for Child Mortality Estimation (UNIGME), 2017

Following the adoption of Millennium Development Goals (MDG) in 2000 with targets set for 2015, the neonatal mortality was reduced to 2.6 million (18.6 per 1000 live births) by 2015 in the world (Wang et al., 2016). The progress witnessed in developing countries was remarkable. Particularly in South Asia, this decline was from 2.2 million in 2000 (58.7 per 1000 live births) to 1 million by 2016 (29.8 per 1000 live births) (UNIGME, 2017) (Figure 1.1).

Despite this achievement, nearly 2800 newborn babies still die each day in South Asia, representing 57% of all deaths in children under five in South Asia (Askeer et al., 2017) and almost 39% of all neonatal deaths in the world. Currently, one in every 35 babies born in South Asia dies in their first month; while such death is nine times more likely in a South Asian baby compared to a baby born in a high-income country (UNIGME, 2017). Further, as with every region in the world, 75% of this neonatal mortality is attributable to deaths in the first week of life (early neonatal deaths) (WHO, 2006). Closely linked with this situation are stillbirths, as shown by South Asia and Sub-Saharan Africa being responsible for 76.2% of all stillbirths in the world in 2009 (Cousens et al., 2011). Currently, an estimated one million babies are stillborn every year in South Asia, which is equivalent to 37% of the world's total stillbirths (UNIGME, 2017).

Globally, stillbirths have reduced over time from 4 million in 1990 (28.1 per 1000 total births) to 3.3 million in 2000 (WHO, 2006; Stanton et al., 2006) and 2.1 million by 2015 (14.9 per 1000 total births) (Wang et al., 2016; Lawn et al., 2014). However, nearly half of these babies still die during labour (intrapartum stillbirths), highlighting the tragic circumstance of them being alive at the start of labour. Explicitly, intrapartum stillbirths in developing regions are estimated to account for 24-37% of all stillbirths, reflecting that 9 out of every 1000 births occur during delivery (Table 1.1). In contrast, developed countries report an average intrapartum stillbirth rate of only 0.6 per 1000 births, highlighting a 14-fold risk for such deaths in developing countries (WHO, 2006). These are lives that could be saved with improved access to skilled birth attendance and better intrapartum care.

Majority of the early neonatal deaths and stillbirths share the obstetric origins for death. As such, many of the interventions that prevent early neonatal deaths can also prevent stillbirths, thus emphasising the need for preventing deaths close to birth as well as those soon after birth – i.e. during the perinatal period.

Table 1.1: Intrapartum stillbirth (SB) mortality for the year 2000 by United Nations Regions and Sub-regions

Regions and countries	SB rate	No. SB (000)	Intrapartum deaths as a % of SB	No. of intrapartum deaths (000)	Intrapartum mortality rate
WORLD	**24**	**3328**	**33**	**1097**	**8**
More developed regions	6	84	10	8	41
Less developed regions	26	3244	34	1089	9
Least developed countries	31	850	35	301	11
AFRICA	**32**	**1002**	**35**	**349**	**11**
Eastern Africa	27	297	33	98	9
Middle Africa	41	191	37	71	15
Northern Africa	18	85	32	27	6
Southern Africa	21	26	28	7	6
Western Africa	41	403	36	147	15

ASIA	**27**	**2124**	**33**	**709**	**9**
Eastern Asia	19	396	24	96	5
South-Central Asia	34	1410	37	518	13
South-Eastern Asia	19	223	30	68	6
Western Asia	18	94	29	27	5
EUROPE	**8**	**61**	**10**	**6**	**1**
Eastern Europe	15	41	10	4	1
Northern Europe	5	5	10	1	1
Southern Europe	5	7	10	1	0.5
Western Europe	4	8	10	1	0.4
LATIN AMERICA AND CARIBBEAN	**10**	**112**	**25**	**28**	**2**
Caribbean	18	14	31	4	6
Central America	11	37	24	9	3
South America	8	62	24	15	2
Northern America	3	16	10	2	0.3
OCEANIA	**23**	**6**	**35**	**2**	**8**
Australia/ New Zealand	3	1	10	0.1	0.3
Melanesia	25	6	36	2	9
Micronesia	7	0.1	24	0.02	2
Polynesia	11	0.2	24	0.04	3

Source: Neonatal and Perinatal Mortality: Country, Regional and Global Estimates, WHO, 2006

1.2 Global trend in perinatal mortality

The perinatal period commences at 22 completed weeks (154 days) of gestation (the time when birth weight is normally 500g) and ends seven completed days after birth (WHO, 1993). The WHO recommends that, if possible, all foetuses and infants weighing at least 500g at birth, whether alive or dead, should be included in the statistics. However, the legal requirements for registration of foetal deaths and live births vary between and even within countries. Therefore, for international comparison, 1000g of weight and/or 28 weeks gestation are considered (WHO, 1993; Lawn et al., 2010).

Perinatal death (PND) refers to a foetal death (FD) occurring at or after 28 completed weeks of gestation and an early neonatal death (ENND) occurring before completion of seventh day of life (WHO, 2006; Ghimire et al., 2018; WHO, 2016a).

According to the WHO estimates for year 2000, the perinatal mortality was 6.3 million in the world (3.3 million stillbirths and 3 million ENNDs), of which almost all had occurred in developing countries (WHO, 2006). It was shown that the PND rate was five times higher in developing countries than in developed regions; 10 deaths per 1000 total births in developed regions, 50 per 1000 in developing regions and over 60 per 1000 in least-developed countries. Further, stillbirths represented more than half of the PNDs in developing countries (WHO, 2006).

It should be noted that PND rate in the world has decreased over the years to 4.1 million by 2015 (Figure 1.2). However, 95% of these deaths still

occur in low- and middle-income countries (LMICs) (Ghimire et al., 2018; Wang et al., 2016; UNIGME, 2017). The largest number of PNDs is reported from South Asia and sub-Saharan Africa (Ghimire et al., 2018; Wang et al., 2016; UNIGME, 2017).

About three-quarters of all neonatal deaths (i.e. ENNDs) and almost half of the stillbirths (i.e. intrapartum stillbirths) take place during the period of labour and delivery (Lehtonen et al., 2017).

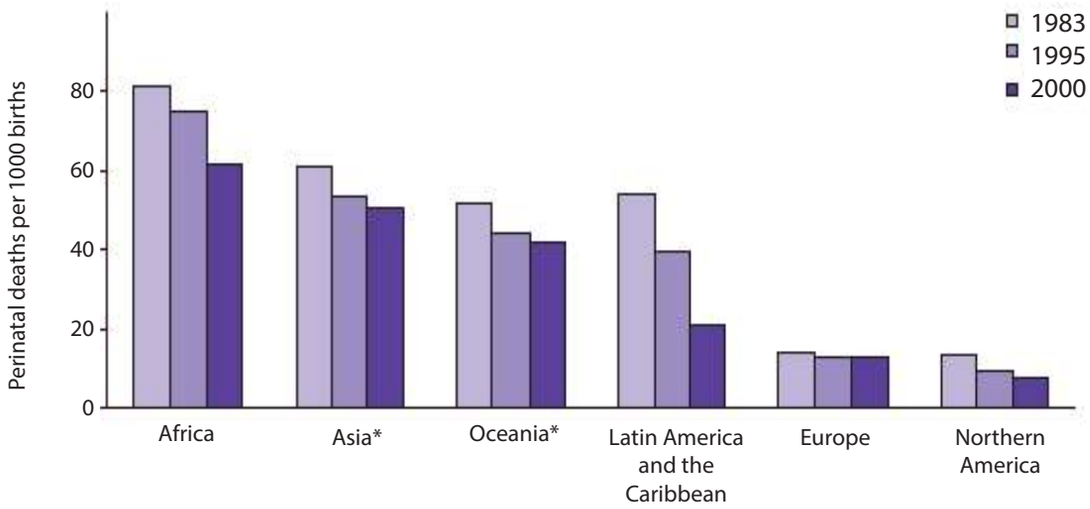


Figure 1.2: Perinatal mortality by region 1983, 1995 and 2000

Source: Neonatal and Perinatal Mortality: Country, Regional and Global Estimates, WHO, 2006

1.3 Trend in perinatal mortality in Sri Lanka

Public health field staff is expected to report all mortality statistics related to under-5 deaths occurring in their area through the routine Reproductive Health Management Information System (RH-MIS) of the Family Health Bureau (FHB). Based on such field-based data, over the years, infant deaths have declined at a slow pace in Sri Lanka (FHB, 2018). According to the latest statistics, 2542 Infant deaths have been reported in 2016, giving a rate of 8.2 per 1000 live births (Figure 1.3).

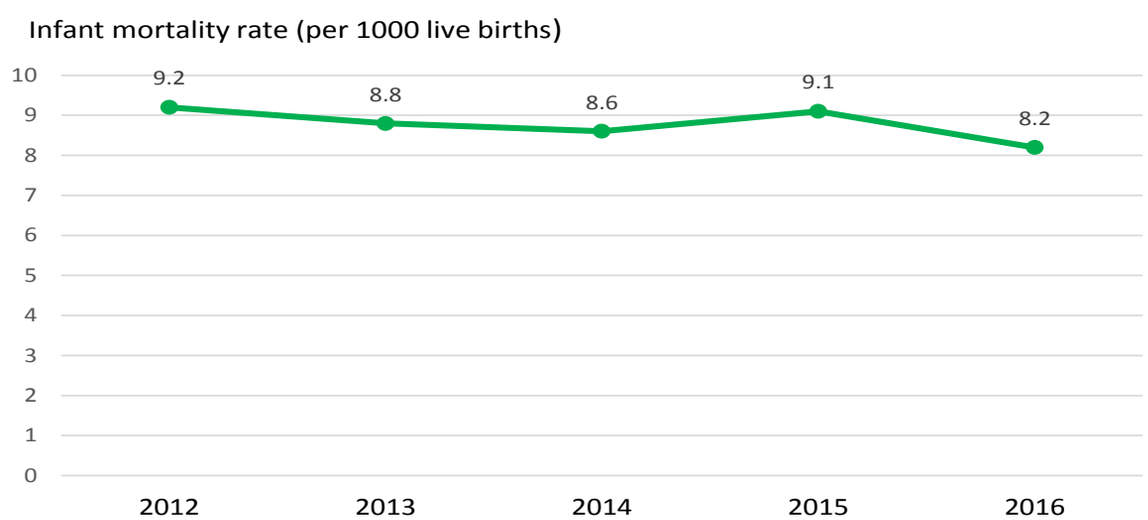


Figure 1.3: Infant mortality rates reported in Sri Lanka (2012–2016)

Source: RH-MIS, FHB, 2018

Figure 1.4 highlights wide district disparities of infant mortality in relation to both neonatal and post neonatal deaths, the differentials being more in respect of neonatal mortality.

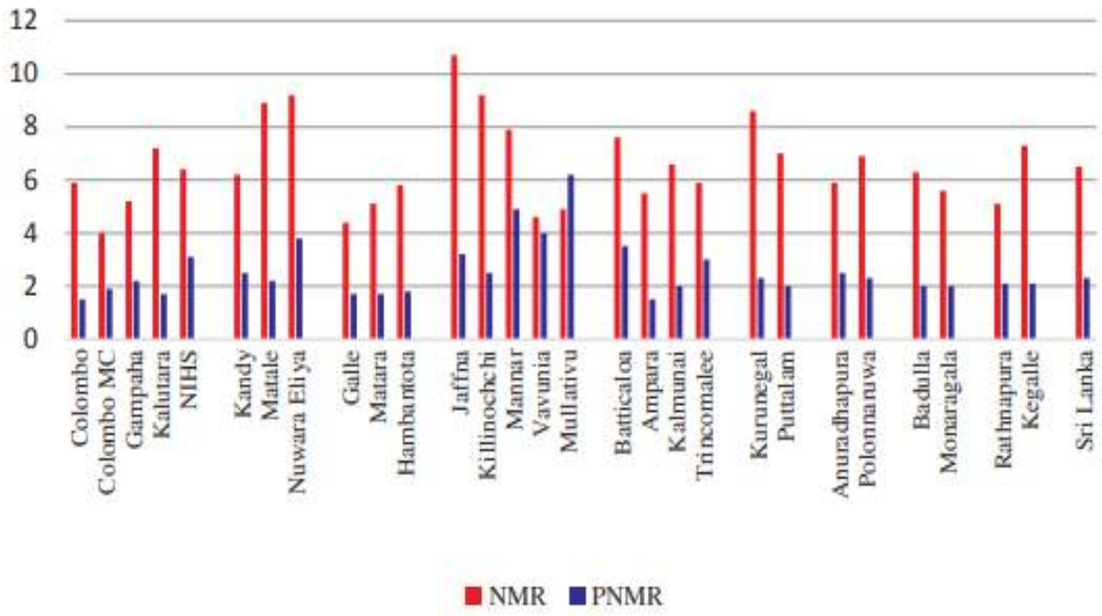


Figure 1.4: District disparities in neonatal mortality and post-neonatal mortality 2013

Source: RH-MIS, FHB, 2018

Figure 1.5 shows the contribution of early neonatal deaths to the total number of infant deaths during 2007-2016 based on routine surveillance system data of the FHB (FHB, 2018). The trend demonstrates that the bulk of infant deaths occur within the first seven days of life (early neonatal deaths). Further, these early neonatal deaths have declined at a slower pace, as shown by early neonatal deaths comprising 56.4% of all deaths in 2007 declined to only 53.3% by year 2016 (FHB, 2018). This highlights the importance of focusing on the events around birth, to further reduce infant mortality.

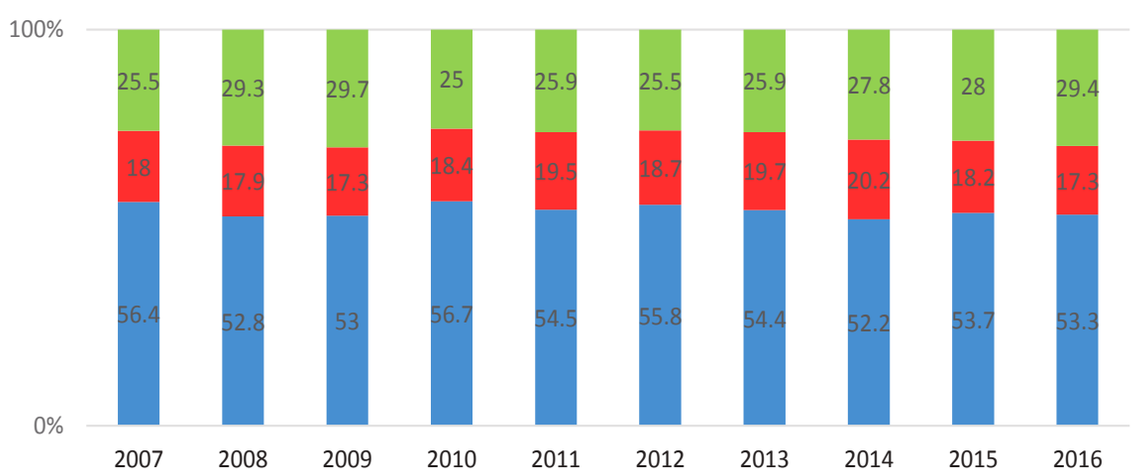


Figure 1.5: Percentage distribution of deaths up to one year of age (2007–2016)

Source: RH-MIS, FHB, 2018

Along with early neonatal deaths, stillbirths have also declined in the country. In 2016, public health midwives reported 1848 stillbirths in their routine reports, giving a stillbirth rate of 5.9 per 1000 births, in comparison to 6.9 stillbirths per 1000 births reported in 2012 (FHB, 2018) (Figure 1.6).

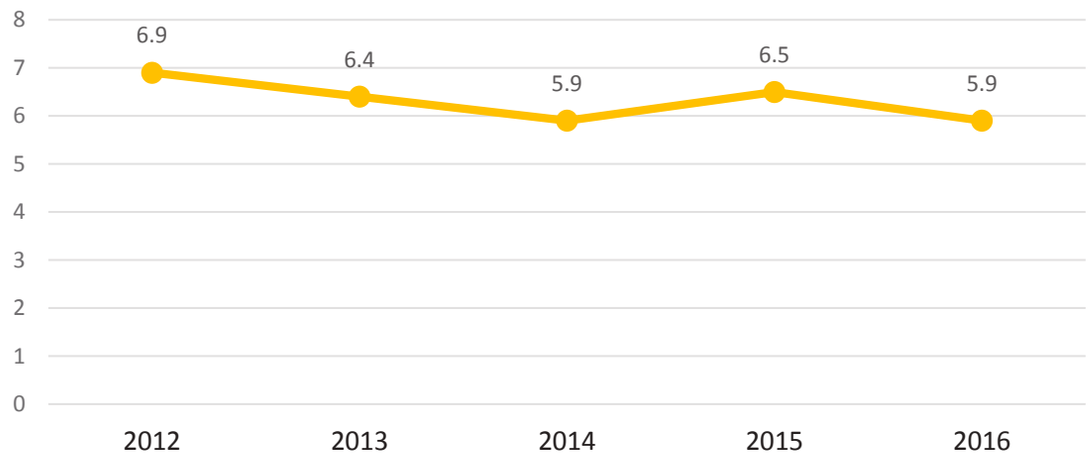


Figure 1.6: Stillbirth rates reported in Sri Lanka (2012–2016)

Source: RH-MIS, FHB, 2018

Table 1.2 compares the stillbirth, early neonatal and perinatal mortality from 2007-2013 extracted from the Annual Report on Family Health 2016 based on the births and deaths reported through the RH-MIS of FHB, with data reported by the Registrar General's Department (FHB, 2015).

Table 1.2: Trends in perinatal mortality in Sri Lanka 2007-2013

Year	Stillbirth rate (per 1000 births)		Early neonatal death rate (per 1000 live births)		PND rate (per 1000 births)
	FHB [1]	RG [2]	FHB [1]	RG [2]	FHB [1]
2007	8.5	N/A	6.1	4.5	14.6
2008	8.7	N/A	5.6	4.6	14.3
2009	7.5	N/A	5.5	4.6	13.0
2010	7.7	N/A	6.0	4.9	13.7
2011	7.1	N/A	5.5	5.2	12.6
2012	6.9	N/A	5.1	N/A	12.0
2013	6.4	N/A	4.8	N/A	11.2
Annual average decline %	4.65%		2.69%		3.84%

1 Calculated based on the numbers reported in the RH-MIS 2007-2013 of Family Health Bureau (FHB)

2 Reported by the Registrar General's (RG) Department 2007-2013

N/A= Not available; PND=perinatal deaths

It is shown that the early neonatal death rates reported through the RH-MIS is higher than those reported by the Registrar General's Department. This is most likely due to under reporting of live births (which is the denominator of the above rates) through the returns from the field health services being higher than the reporting of infant deaths (FHB, 2015).

There is a declining trend noted related to perinatal mortality in Sri Lanka, with an annual average reduction of 3.84%. The rates are based on RH-MIS data of the FHB. The Registrar General's Department does not report a PND rate, since stillbirth rates are available only from 'proclaimed areas' where there are medically qualified registrars of death. This legal framework has not changed since its initiation in 1952, when institutional deliveries accounted for only 36.7% of all births. Addressing this issue, in 2016, the Ministry of Health issued a circular to direct all the institutions to facilitate the registration of stillbirths, so that the Registrar General's Department has timely access to this data.

1.4 Causes of perinatal deaths in Sri Lanka

In LMICs, almost half of the PNDs occur during the period of labour and delivery [Lehtonen, 2017) owing to causes such as prematurity, low birth weight, obstructed labour, pregnancy complications and infections [Lawn et al., 2005). Particularly in South Asia, determinants such as maternal age, poor socio-economic status, illiteracy, obesity & overweight, and poor water & sanitation have been identified. Addressing these determinants is an important strategy for reducing the largely preventable PNDs (Shah et al., 2000).

In Sri Lanka, according to the Annual Report on Family Health of 2013, 43% of infant deaths are due to congenital deformities, 26% due to prematurity and 11% due to asphyxia (Figure 1.7). These causes are derived based on the field investigations into infant deaths conducted by the medical officer of health (MOH) or public health nursing sister (PHNS) (FHB, 2014).

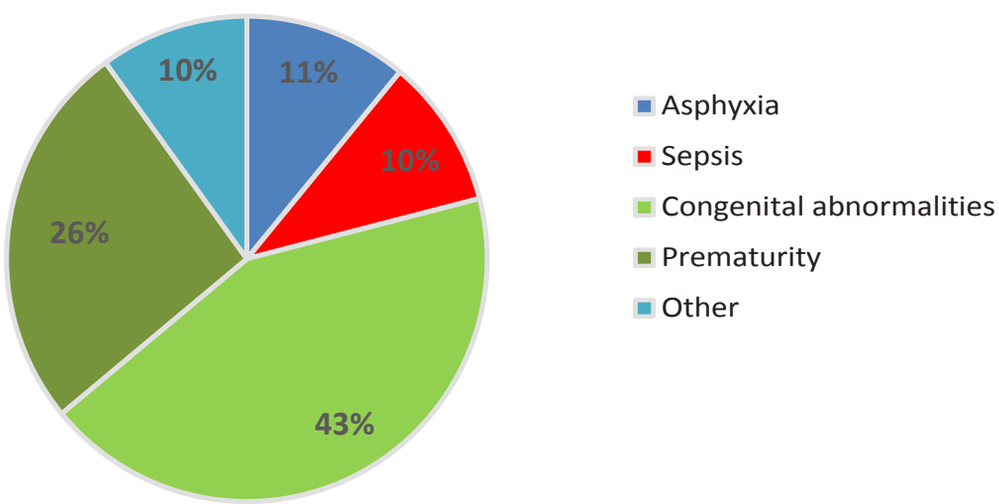


Figure 1.7: Percentage distribution of the cause of infant deaths in 2013

Source: RHMIS, FHB, 2014

In 2015 too, the common causes of neonatal mortality were congenital anomalies (41%), prematurity (21%), birth asphyxia (21%) and infections (11%). The latest statistics in 2016 also show that congenital abnormalities have remained the most frequent cause of infant mortality (54.5%) but a higher percentage than in 2013 and 2015 (FHB, 2018) (Figure 1.8).

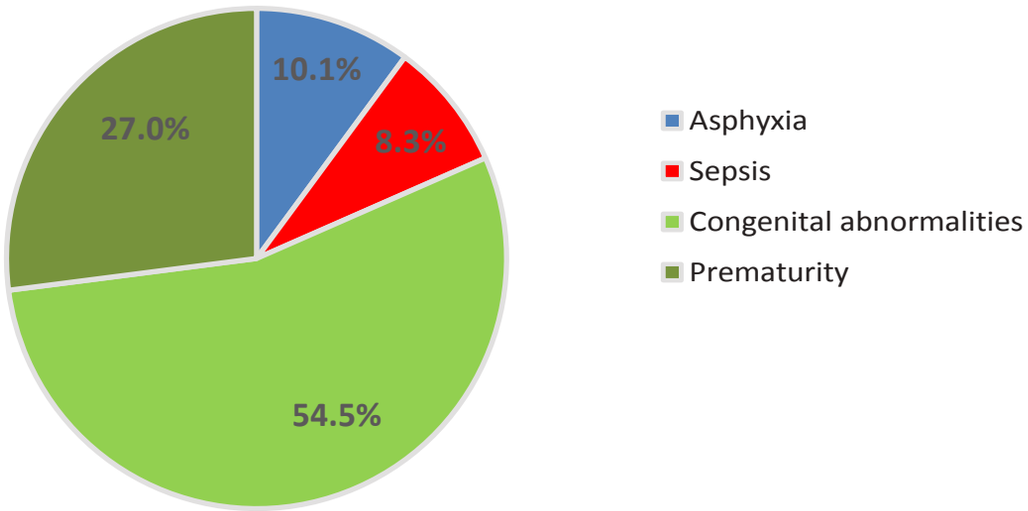


Figure 1.8: Percentage distribution of the cause of infant deaths 2016

Source: RHMIS, FHB, 2018

When the neonatal deaths reported by Registrar General's Department in 2011 were further analysed, the cause of early neonatal deaths in the majority (73.7%) is given as conditions originating in the perinatal period, with nearly 17% reported as being due to congenital malformations, deformations and chromosomal abnormalities (FHB, 2015) (Table 1.3).

Table 1.3: Distribution of the cause of neonatal deaths in 2011

Broad cause of death	Early neonatal deaths		Late neonatal deaths	
	No.	%	No.	%
I-001 Certain infectious and parasitic diseases A00-B99	28	1.5	18	2.7
I-026 Neoplasms C00-D48	2	0.1	1	0.1
I-051 Endocrine, nutritional and metabolic diseases E00-E88	4	0.2	2	0.3
I-058 Diseases of the nervous system G00-G98	9	0.5	12	1.8
I-064 Diseases of the circulatory system I00-I99	12	0.6	8	1.2
I-072 Diseases of the respiratory system J00-J98	17	0.9	9	1.3
I-078 Diseases of the digestive system K00-K92	3	0.2	0	0.0
I-084 Diseases of the genitourinary system N00-N98	1	0.1	0	0.0
I-092 Certain conditions originating in the perinatal period	1512	80.3	495	73.7
I-093 Congenital malformations, deformations and chromosomal abnormalities	260	13.8	113	16.8
I-094 Symptomatic signs and abnormal clinical and laboratory findings, not classified	28	1.5	10	1.5
I-095 External cause of morbidity and mortality V01-Y99	8	0.4	4	0.6
Total	**1884**	**100.0**	**672**	**100.0**

Source: Newborn Care in Sri Lanka: a Bottle Neck Analysis, FHB, 2015

1.5 Projections and targets on the perinatal mortality

It is shown that 33% of stillbirth and 71% of newborn deaths can be averted annually with increased coverage and quality interventions such as antenatal care and skilled birth attendance, Detection and management of pregnancy-induced disorders, as well as intrauterine growth restriction and management of preterm labour (Lancet, 2014; Ghimire et al., 2018). The World Health Organization also recommends community-based cost-effective newborn care interventions in this regard.

Despite the substantial improvement in maternal and child survival over the years, the progress made on perinatal mortality had not been impressive (UNIGME, 2017). The rate of reduction in neonatal mortality has been much lower (2%) than that reported for under-5 children (3•4%). It had been even slower for stillbirths (1%), making the progress made through MDGs less apparent (Lancet, 2014; UNIGME, 2017; Lawn., 2016), especially in LMICs where perinatal mortality still poses a major public health challenge. This highlighted the need for continuing to implement the international public health agenda beyond 2015 (Wang et al., 2016). Consequently, a renewed commitment to dramatically improve the health and survival of newborn babies and end preventable stillbirths in the next two decades was made - Every Newborn Action Plan (ENAP): 2015-2035. It focuses on a target to reduce neonatal mortality to fewer than 10 deaths per 1000 live births, and stillbirth rates to fewer than 10 per 1000 total births by 2035. These targets are expected to result in global averages of seven and eight, respectively. ENAP has further laid out an interim post-2015 goal, calling for a reduction of newborn deaths and stillbirths to a level as low as 12 by 2030 (WHO, 2014).

In order to achieve the global targets of ENAP: 2015-2035 (WHO, 2014), for South Asian countries, goal is set by UNICEF Regional Office for South Asia to reduce neonatal deaths from 28 per 1000 live births in 2016 to 21 per 1000 live births by 2021 (UNIGME, 2017).

In order to achieve the same, Sri Lanka aims to reach the following (FHB, 2017; FHB, 2016):

- To reduce neonatal deaths to 3.4 per 1000 live births by 2025 and further to less than 2.2 by 2030
- To reduce stillbirths to 3.5 per 1000 total births by 2025 and to less than 2 by 2030

Country-specific goals of the Sri Lanka Every Newborn Action Plan (SLENAP) 2017-2020 (FHB, 2016) include:

- Reduction of neonatal mortality rate to 4.2 per 1000 live births by 2020
- Reduction of stillbirth rate to 4.5 per 1000 total births by 2020

This country-specific goal on neonatal mortality was determined based on the average annual rate of reduction (AARR) of 4.35% from 2000 to 2012. Given a lesser rate (2.33%) for the period 2007-2013 based on data reported by the FHB, intense attention would be required if the 2030 goal is to be achieved (Figure 1.9) (FHB, 2015).

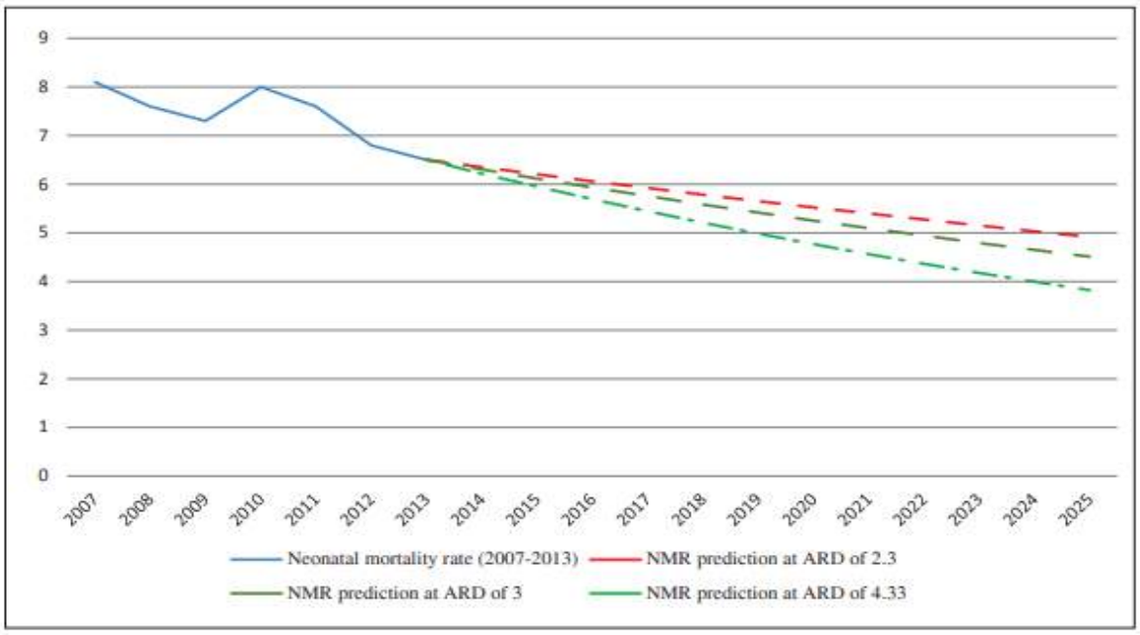


Figure 1.9: Projections for neonatal mortality rate for Sri Lanka 2013-2025

Source: Newborn Care in Sri Lanka: a Bottle Neck Analysis, FHB, 2015

The goal on neonatal deaths was determined based on the AARR of 1.32% from 2000 to 2009. Given a higher rate (4.6%) for the period 2007-2013 based on FHB data, it appears that Sri Lanka is on course to achieve the 2030 goal on stillbirths (Figure 1.10) (FHB, 2015).

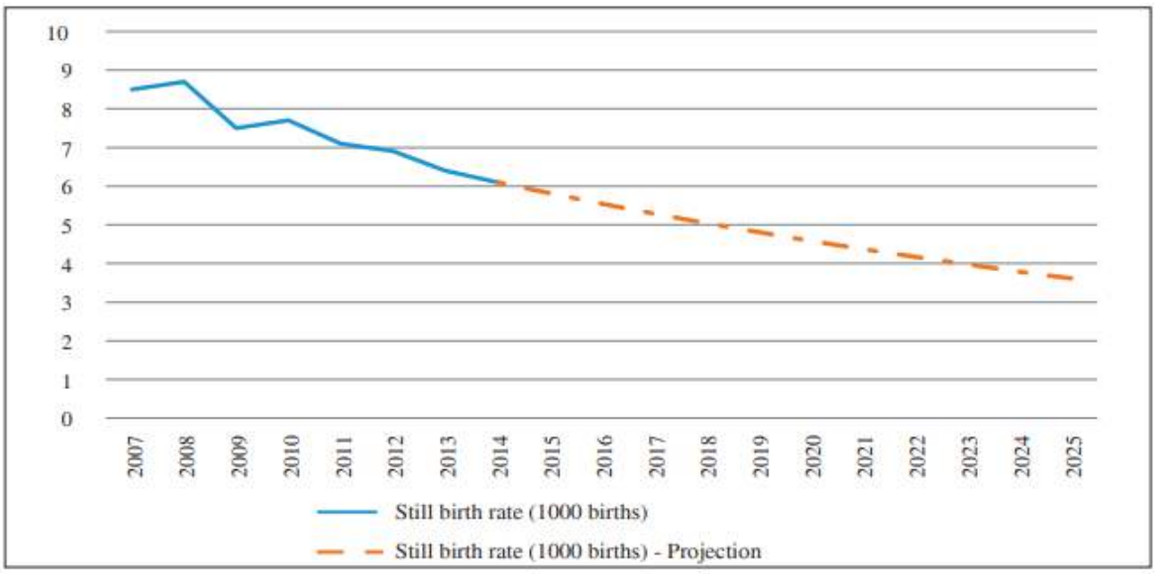


Figure 1.10: Projections for stillbirth rate for Sri Lanka 2013–2025

Source: Newborn Care in Sri Lanka: a Bottle Neck Analysis, FHB, 2015

1.6 National Perinatal Death Surveillance System in Sri Lanka

For achieving the given targets on perinatal mortality, it is imperative that statistics are collected at the national level to guide the formulation of effective policies and programmes to accelerate the progress of survival. Such timely collection and analysis of data will ensure the quality improvements and accountability. To this end, establishing PND surveillance systems serves as an effective strategy. Such systems can be used to monitor the follow-up of every pregnant woman and assess how well the targets are being achieved. In response, in 2006, the National Perinatal Death (PND) Surveillance System was established in Sri Lanka by the Ministry of Health, with FHB as the national nodal point, to report all PNDs from specialised hospitals.

In 2012, the National PND Surveillance System received data almost from 97% of the government sector institutions with specialist services, which are mandated by the Ministry of Health to conduct PND reviews (FHB, 2015) ((Table 1.4). However, there is no way of determining if all PNDs occurring in an institution were reported. The institutions that reported investigations accounted for 88.8% of births in the country, excluding those that may have occurred in the community.

Table 1.4 : Mortality rates from the perinatal death surveillance reviews

Deaths and rates	TH/PGH *	DGH *	BH *	Non weighted rate
Live births	122572	95986	118613	337171
Stillbirths	597	412	444	1453
Early neonatal deaths	776	429	432	1637
Perinatal deaths	1373	841	876	3090
Stillbirth rate (SBR)	4.85	4.27	3.73	4.29
Early neonatal mortality rate (ENMR)	6.33	4.47	3.64	4.86
Perinatal mortality rate (PNMR)	11.15	8.72	7.36	9.13

** TH/PGH= teaching hospital/ provincial general hospital; DGH=district general hospital; BH= base hospital*
Source: Newborn Care in Sri Lanka: a Bottle Neck Analysis, FHB, 2015

The National Maternal and Newborn Health Strategic Plan 2017–2025, which has been drawn in parallel with Sustainable Development Goals (SDG) advocates triple investment, in which every mother and newborn receive an essential package of care, while Emergency Newborn and Obstetric care (EmNOC) is also made accessible to women (FHB, 2017). These programmes however need to be further strengthened through sustainable quality assurance systems. In this regard, the information system established way back in Sri Lanka has been considerably improved to capture the follow-up of women through all milestones during pregnancy, delivery and postpartum period in a sequential manner. In parallel, the follow-up of PNDs has also improved to some extent.

The National Maternal and Newborn Health Strategic Plan 2017–2025 identifies this need as a priority in its objectives, strategies and major activities, as follows (FHB, 2017):

Objective 5 – Count every mother, fetus and newborn through measurement, programme tracking and accountability

Strategy 4 – Ensure that surveillance systems provide timely information that would result in timely response

Major activities:

- Upgrade the maternal mortality, infant mortality, PND and birth defect surveillance systems
- Link the surveillance systems (maternal mortality, perinatal mortality, birth defects surveillance, infant death investigation) with each other and with routine information systems (IMMR, RH-MIS) to ensure uniformity of data and prevent duplication (electronic/ web-based and/or paper-based systems)
- Disseminate information on surveillance data timely for action

Strategy 6 – Enhance monitoring/evaluation capacity and usage of data for decision making and planning at different levels

Major activities:

- Develop capacity of healthcare workers at all levels to monitor and interpret data
- Establish expert panels at national and district levels to analyse and review, service delivery using available data
- Conduct/strengthen regular maternal and child health (MCH) reviews, hospital progress reviews and MOH conferences to monitor service provision using data
- Disseminate data to all levels for decision making and planning
- Create inter-sectoral accountability and linkages to report, share and use of accurate data

Chapter Two

METHODS

The objectives and methodology of this review were defined by the consultancy team in collaboration with the National Programme Manager of the Child Morbidity and Mortality Surveillance Programme at FHB and the experts from UNICEF Country Office Sri Lanka. Further, this review was endorsed by the Technical Advisory Committee on Newborn and Child Health (TACNCH) and the Technical Advisory Committee on Maternal Health (TACMH).

2.1 Objectives

Overall objective of the review was to evaluate the current National PND Surveillance System in Sri Lanka and the institutional review process of Sri Lanka; to analyse and review the existing database of PNDs from 2014-2017 on the quality of its data; and to identify the trends, causes and contributory factors for PNDs in Sri Lanka.

Specific objectives

1. To describe the establishment and evolution of the National PND Surveillance System in Sri Lanka
2. To review the quality of data available at central level through the National PND Surveillance System in Sri Lanka
3. To evaluate the current PND surveillance and institutional review process in Sri Lanka, in order to identify the strengths and weaknesses, with a view of evidence for action
4. To make evidence-based recommendations for action to decrease the PNDs in Sri Lanka
5. To identify the trends, causes and contributing factors for PNDs in Sri Lanka during the period of 2014-2017

The goal was to make recommendations that will be useful for programme planners/ managers to develop strategies to strengthen the existing surveillance process and capitalize on the preventable nature of PNDs, in order to further reduce the PND rate in Sri Lanka.

2.2 Framework of the review process

In summary, following methodologies were used to achieve the above objectives (Figure 2.1).

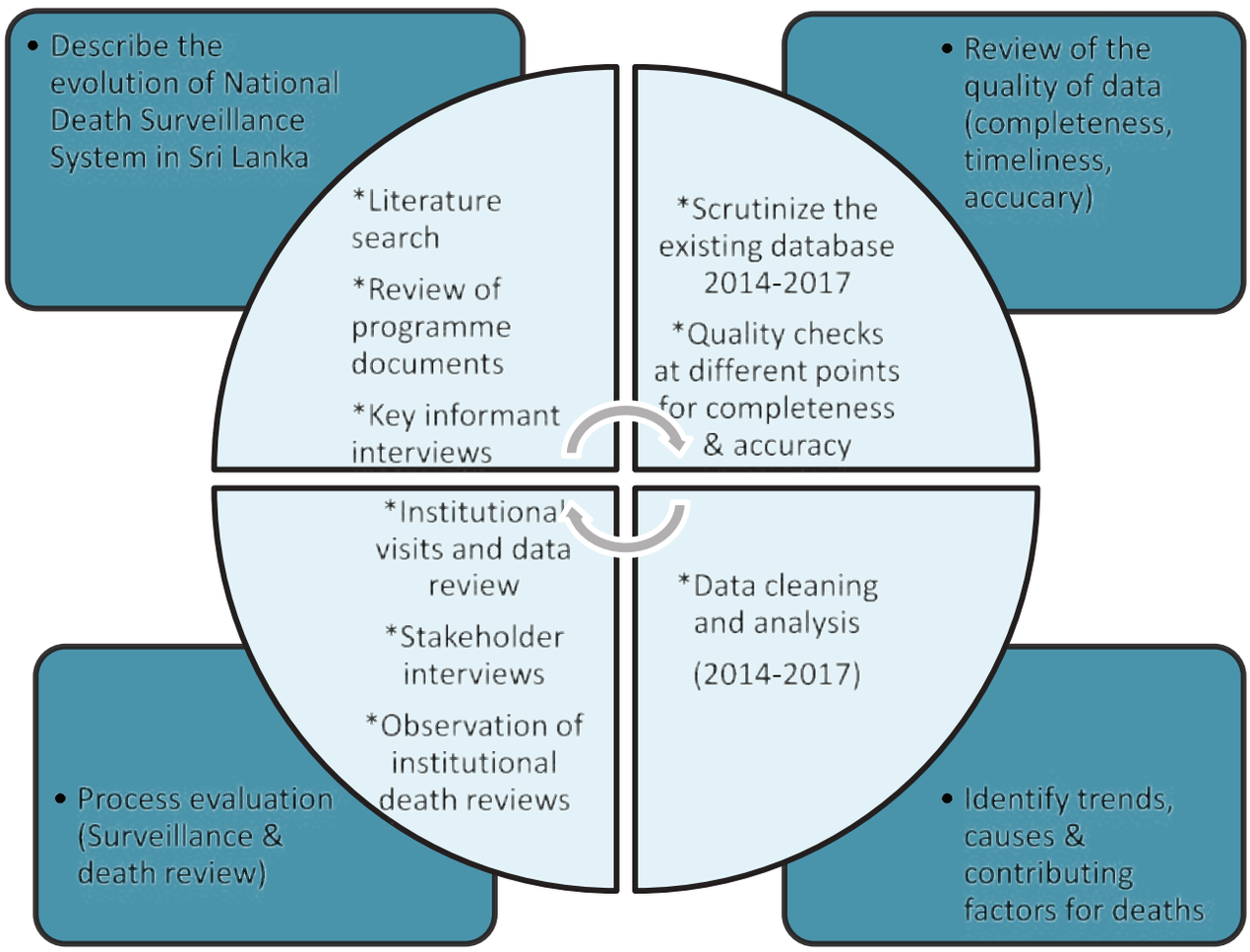


Figure 2.1: Framework of the review process

2.3 Methods used for data collection

2.3.1 In-depth desk review of the programme documents & other literature

An in-depth review of all programme documents and other literature was carried out at the initial phase of the review. The documents were collected via web-search, by visiting the Maternal & Child Morbidity and Mortality Surveillance Unit of the FHB, consulting technical experts and the relevant national programme managers, and through institutional visits.

The types of documents collected included circulars, PND surveillance formats, guidelines and guide books, previous review reports in the relevant areas and institution-specific documents used at the PND reviews.

2.3.2 Institutional visits

The review team visited FHB and other selected institutions representing different tiers of hospitals pertaining to PND surveillance, including one of the two premier maternity hospitals in the country.

The following activities were carried out at these institutions.

a. Stakeholder interviews

Director and deputy directors; consultants (obstetricians, neonatologists and paediatricians); medical officers (MO) coordinating the PND surveillance including MO-Health Education, MO-Quality and MO-Public Health; matrons and sister in charge of wards; house officers, senior house officers, nurses, PHNS, and ward and public health midwives.

At these stakeholder interviews, the existing institutional mechanisms for PND surveillance were explored in detail, while a qualitative assessment was carried out on the awareness of stakeholders on the process, practices and procedures followed by them and their commitment. The barriers and difficulties perceived by the participants were also inquired into.

b. Qualitative assessment of the PND surveillance data at institutional level

The review team investigated the quality of PND surveillance data available at institutional level by assessing the completeness, timeliness and accuracy of data reported. Further, the participants were inquired on the understanding and methods followed to ensure accuracy of data entered (e.g. finding ICD-PM broad cause, specific cause etc), encouragement on carrying out post-mortem examinations, level of supervision/active involvement of consultants and other senior doctors on the data entered in PND surveillance forms, and verification of data.

c. Observation of perinatal death reviews

The review team participated as independent observers of the PND reviews conducted at the above institutions with permission. Close observation was done on the conduct of the meeting, participation of different categories and active involvement of the participants etc.

At the end of each review, a discussion was carried out with the coordinator of the review and selected participants on their understanding of the objectives of having a review, their perception on the usefulness of having a review, any system changes that has taken place as a result of previous reviews, follow up mechanisms, and the strengths and limitations that they have identified of the PND surveillance system.

2.3.3 Key informant interviews

In-depth interviews were carried out with the following personnel in order to verify the process and explore the evolution of PND surveillance.

- Current and past national programme managers of the Maternal & Child Morbidity and Mortality Surveillance System of the FHB
- Medical officers and graduates in charge of PND data entry
- Representatives from the Perinatal Society of Sri Lanka

2.3.4 Analysis of secondary data (databases maintained at the Family Health Bureau)

Data included in the databases had been extracted from the following formats:

- 2014 database - Summarized version of H-26 Form collated for the whole year in an island-wide survey by the FHB
- 2015 database - Special format collated for the whole year and from active detection of PNDs by FHB through visits to all relevant hospitals in every district
- 2016 database - Monthly summary information of PNDs included in P-2 Format
- 2017 database - Monthly information on individual deaths included in P-1 Format

Secondary data analysis was the main component of the review and conducted in three steps.

a. Scrutinizing the existing databases for completeness and accuracy

Databases of all the PNDs maintained at FHB for the period 2014-2017 (one database per year) were scrutinised by the two independent reviewers (principal investigator and co-investigator) in several ways to assess their suitability for statistical analysis. In a sample from each year, completeness of data both at the hard copy level and at central data entry level was assessed. Further, compliance with the accurate coding system of PNDs and its coverage were verified.

b. Data cleaning and completion

Since the databases were identified to have many deficiencies, it was decided to carry out a thorough data cleaning and completion procedure prior to analysis. For this purpose, the following data cleaning and completion procedure was carried out over two months. Initially, all the original PND surveillance reports sent during this period by hospitals as hard copies (P-1 and P-2 Formats) were retrieved from the record room. Next, each record included in the databases was cross-checked with the original report, item by item on all required variables. If any data recorded in the formats had not been entered, those were freshly added to the database. If there were any errors in data entry, those were also corrected. If any data was not recorded in the available format, it was identified as 'not available'. Further, cleaning was done to correct the inaccurate coding at hard copy level.

For data cleaning, six medical undergraduates were trained and carried it out for 2014-2016 databases, while it was not done for the database of 2017, as it had the data entered very recently and verified against the original P-1 Format by data entry operators of FHB.

c. Data preparation for analysis

After data cleaning, the datasets were further prepared by the two independent reviewers for statistical analysis. All the required variables were edited to ensure uniformity in coding. Within records, gross incompatibilities existed between variables that were essential to verify each death as FD or ENND. In view of these discrepancies, a flow diagram with all possible combinations of the relevant variables was developed for determining the PND status, through which the uncertain deaths were re-classified as much as possible (Annexure 1). This re-classification considered the type of death (Item G); timing of death (Item U); age at ENND (Item T); and the period of gestation (POG) of FD (Item O), as given in the summary sheet of P-1 Format.

A similar procedure was followed for preparation of data on the cause of death (COD). The recorded COD was first verified

on its timing of death (Item U-antepartum, intrapartum, ENND and unable to classify) and then on its compatibility with the International Classification of Deaths-Perinatal Mortality (ICD-PM) groups. In the 2014 database, the COD was available only as descriptions compatible with the Wigglesworth classification, and were coded according to the ICD-PM system. If the description was not in the form of a proper COD, those were re-categorized as 'COD not available (N/A)'. From 2015 onwards, the COD was available in ICD-PM codes or as descriptions. If only a description of the COD or only the code for specific cause was given, coding for the COD was done according to ICD-PM groups. If code and description were both available, the code was checked for accuracy against the description.

2.4 Data analysis to identify trends, causes & contributing factors for deaths

After data cleaning and completion, the verified data were analysed using Statistical Package for Social Science (SPSS) version 21.

Data were analysed as individual records of reported deaths as well as data disaggregated by hospitals. The analysis was done separately for each year (2014, 2015, 2016 & 2017), so that trends related to PND could be studied across the four years. Also, it was because the coverage of hospitals differed by the years.

Operational definition used for stillbirths and ENNDs in the analysis

- **Stillbirths**

Terminology around stillbirths has changed over time, with variations across settings (WHO, 1993; WHO, 2006; WHO, 2016a). According to the latest WHO communication (WHO, 2016a), for international comparability, WHO recommends reporting of late foetal deaths (i.e. 3rd trimester stillbirths) at ≥ 1000g birth weight, or if missing, ≥ 28 completed weeks of gestation, or if missing, ≥ 35cm body length, with birth weight given priority over gestational age (Figure 2.2).

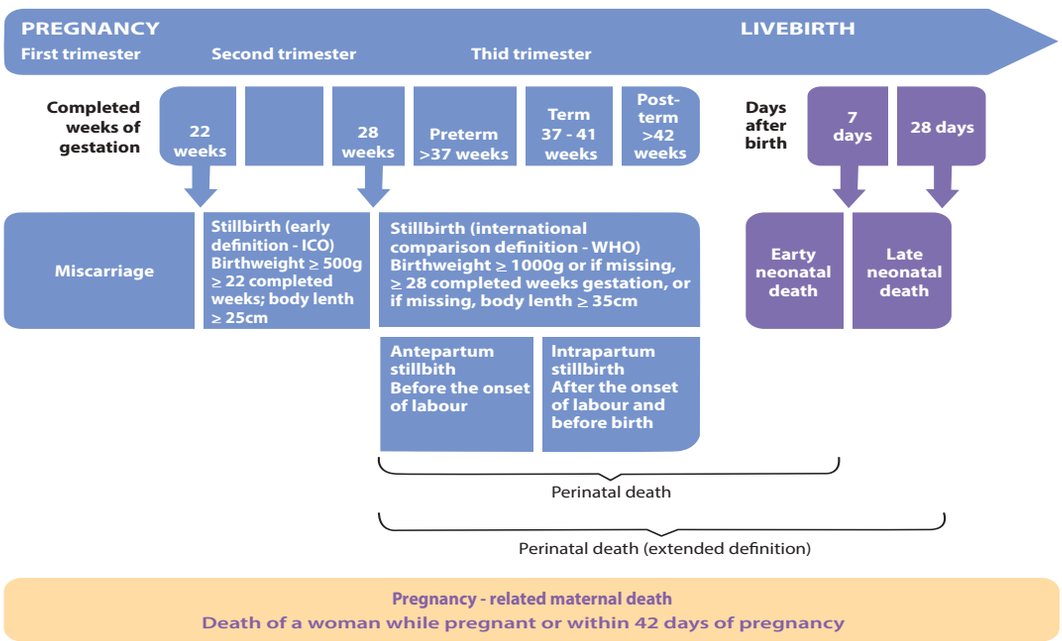


Figure 2.2: Pregnancy outcome definitions

Source: Making Every baby Count. Audit & Review of Stillbirths and Neonatal Deaths, WHO, 2016

However, since there is a range of 'normal' birth weights for a given gestational age and gender, with substantial regional variations, a gestational age threshold has been recommended as a single parameter, because it is a better predictor of viability than birth weight, and information about gestational age is more likely to be available than birth weight for stillbirths. This is also true for Sri Lanka, with routine ultra-sound scans being incorporated into clinical practice during pregnancy to ascertain the POG.

In recent decades, viability has increased in settings where intensive care is available, moving the cut-off point for a death to be defined as a stillbirth (rather than a late foetal death) earlier. However, the WHO's recommended threshold of 28 completed weeks is appropriate for mortality audits in low- and middle-income settings. In contrast, in Sri Lanka, according to the National PND Surveillance System Guidelines 2016, all FDs of POG ≥ 22 completed weeks are to be notified, so as not to miss earlier stillbirths, thus preventing the underreporting of the true burden.

- **Early neonatal deaths**

According to the latest WHO communication (WHO, 2016a), the early neonatal period is the first 7 days after birth, in which the first day of life (i.e. the 24 hours following birth), is typically called 'day 1'in clinical practice or 'day 0' in surveys and vital registration. According to the National PND Surveillance System Guidelines 2016, 'day 0' is considered the day of birth (from the time of birth till midnight same day) and 'day 1' as the next day following birth, thus the ENN period given as 'days 0-7'. It further specifies ENNDs irrespective of their POG.

Considering the above facts, the review team decided through consensus, on an operational definition for PNDs for the purpose of statistical data analysis.

> According the operational definition used, all confirmed FDs (dead-born foetus of POG ≥ 28 completed weeks) and ENNDs (all NNDs within first seven days of life, irrespective of their POG) were considered as perinatal deaths (PND).

Foetal deaths of POG less than 28 completed weeks were not considered when calculating the PND rates (in compliance with the FD definition used for international comparison) and, also when assessing the contributory factors and cause of death (for better interpretation of data in concurrence with the data considered for calculating the PND rates).

The following equations were used to calculate the relevant death rates:

Early neonatal death (ENND) rate = (No. of ENND/ No. of live births) * 1000

Foetal death (FD) rate = (No. of FD/ No. of live births + stillbirths) * 1000

Perinatal death (PND) rate = (No. of ENND + FD)/ (No. of live births + stillbirths) * 1000

Data on live births and stillbirths available for each hospital and district at the Medical Statistics Unit (MSU) of the Ministry of Health were used for the denominator.

The analysis was focussed on estimating the PND, FD and ENND rates for 2014-2017 and identifying the trends over the four years, possible contributing factors and COD of FD, ENND and PNDs. Thus, calculation of percentages and comparisons over years as well as appropriate cross-tabulations were carried out.

Data compilation and report writing were done as per the agreed objectives of the review by the consultancy team.

Chapter Three

RESULTS

3.1 Evolution of the National Perinatal Death Surveillance System in Sri Lanka

3.1.1 Evolution of the civil registration system in Sri Lanka

Sri Lanka's history of vital event registration spans over several centuries. Registration of births, deaths and marriages was initiated under the Dutch rule during the period of 1640-1798. The first British enactment on registration of births, deaths and marriages took place in 1815 under regulation No. 07 and the second enactment in 1822, both applied for Maritime districts only. The general system of registration of births and deaths covering all districts was established in year 1847 under Ordinance No.06, which was later replaced by the Ordinance No.18 in year 1867. In 1867, the Registrar General's Department was established under the Ministry of Public Administration & Home Affairs to register births, deaths and marriages. Registration was deemed compulsory after 1897 (Dept. of Registrar General, 2018). The present law for registration of births and deaths was passed under Births and Deaths Registration Act No. 17 of 1951, in which stillbirth was legally defined as "a death prior to complete expulsion or extraction from its mother of a product of conception which has had a duration of not less than 28 weeks of gestation, death being indicated by the fact that alter such separation, the foetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles". It further specified that "in the proclaimed areas, no person shall bury, cremate or otherwise dispose of, or cause to be buried- cremated or otherwise disposed of, the body of a still-born child unless the death is registered". This Act was enforced from 1st August 1954, and was later amended by the Births, Deaths and Marriages (amendment) Law No. 41 of 1975. The Act charged Sri Lanka's Registrar General with responsibility for the registration of births, deaths and stillbirths in Sri Lanka and to oversee all delegated government personnel engaged in carrying out the provisions of the Act (Dept. of Registrar General, 2018).

With time, completeness of the country's civil registration system data increased to reach levels as high as 97% for births and 100% for deaths in 2017, but the quality of mortality statistics is shown to be relatively low (Sri Lanka Implementation Working Group, 2018). Further, the Registrar General's Department does not report a PND rate since stillbirth rates are available only from 'proclaimed areas' where there are medically qualified registrars of death. This legal framework has not changed since 1952 when institutional deliveries accounted for only 36.7% of all births (FHB, 2015).

3.1.2 Evolution of the reporting of perinatal deaths by the Ministry of Health Sri Lanka

With the establishment of FHB in 1968 as the focal point for maternal and child health in Sri Lanka, the Ministry of Health through its field reproductive health data system (RH-MIS) had been collecting and analysing data on live births, stillbirths and infant & neonatal deaths. Investigations of such deaths at field level had also evolved over time becoming more structured with the introduction of investigation formats (E.g. H-678, F-2, F-6). It was observed at the time, that although the coverage of registration of births through this system was less than that reported by the Registrar General's Department, the infant, neonatal and early neonatal mortality reported through RH-MIS was higher than those reported by the Registrar General (FHB, 2015). Also, since data are collected from the entire island through this system, it uniquely enabled the calculation of PND rate (FHB, 2015). However, several gaps were present in this system in relation to the collection of antepartum

and intrapartum deaths especially occurring within the hospital system.

In early 1990s, with the under-5 mortality rates gradually decreasing, neonatal mortality emerged as an increasingly prominent component all over the world. Consequently, 'quality' information on perinatal and neonatal mortality was in great demand. In response, the WHO prepared a comprehensive report on 'Neonatal and Perinatal Mortality' in the year 2006 (WHO, 2006). This report provided neonatal and perinatal mortality estimates by country, regional groupings and globally. For countries that did not have data, models were developed to estimate the mortality. Consequently, it urged all its member states to establish mechanisms to develop proper information systems on PNDs.

By this time, through the field reproductive health data system (RH-MIS), Sri Lanka was already collecting data on stillbirths and neonatal deaths. However, this system was not comprehensive enough to capture all PNDs especially the antepartum and intrapartum mortality statistics, and to review this data from their points of origin. Therefore, in 2006, it was decided to establish a hospital-based information system and a review mechanism on perinatal mortality statistics in Sri Lanka. The foundation for an efficient surveillance system was already in place at the time, for which, under the leadership of FHB, the relevant professional colleges (e.g. College of Gynaecologists and Obstetricians, College of Paediatricians) and the Perinatal Society of Sri Lanka came together in 2003 to design a hospital-based PND surveillance system and a review mechanism. By 2004, review formats were developed to collect information on antenatal, intrapartum and postpartum care of the baby (if delivered live) and were piloted in a few institutions. 'Wigglesworth classification' was used for the classification of cause of death, for which the FHB conducted a few island-wide training sessions.

With the directives of WHO, the hospital-based PND surveillance process was properly streamlined and established in 2006. It should however be noted that long before this initiative, some interested institutions/ centres (e.g. neonatal intensive care units), consultants and a few academics around the country carried out PND reviews in their respective institutions in early 1980's. Institutions like Peradeniya Teaching Hospital (TH), Colombo South TH, Kethumathi Hospital, etc had their own PND reviews purely as an academic activity. However, until 2003, there was no coordinated effort from the government to streamline these initiatives.

3.1.3 Evolution of the procedure, formats and definitions used in the hospital-based perinatal death surveillance

The first circular related to the National PND Surveillance System in Sri Lanka was issued by the Director General of Health Services (DGHS) in December 2006 (Circular No. 01-05/2006) (Annexure 2). It specified the following objective and process involved in surveillance:

Objective - To make available quality feto-infant mortality data, to utilize such data effectively at different levels (field, hospital, district and national levels) and to translate lessons learnt in to practice by dissemination to all stakeholders of MCH

Process - Systematic collection, analysis and interpretation of data related to feto-infant deaths, essential for planning, implementation and evaluation of public health practices, closely integrated with the dissemination of these data to those who need to know and linked to prevention and control of such deaths

The directives documented in Circular No. 01-05/2006 are summarised below:

- *All specialised institutions providing perinatal care services* should conduct the PND surveillance meetings, *organised by the head of each institution* who is responsible for and should ensure efficient functioning of PND surveillance within the institution.
- Data should be collected on *all foetal deaths occurring after the 28th week of POG* and all neonatal deaths occurring *within the first 7 days of birth*.
- *'Wigglesworth Classification'* should be used for classification of death.

A new format for reporting PNDs was introduced - **H-26 (Audit on Perinatal Death),** which had been already piloted in 2004 (Annexure 3).

- The format should be completed within 2 days of all PNDs occurring in specialised institutions.
- Filling this form should be initiated by the officer confirming the death and completed if needed by other relevant units (all units must maintain a register of the forms completed).
- Relevant sisters-in charge should inform all PNDs occurring in each unit to the head of institution by maintaining a register and be responsible to send the format completed by the medical officer to the heads of institutions within 7 days.
- All completed forms should be filed by sisters-in-charge of obstetrics unit for FDs deaths, and by neonatal intensive care unit (NICU) or special care baby unit (SCBU) for ENNDs.

It should be noted that the circular does not specify whether copies of H-26 Form should be sent to FHB. Therefore, it is doubtful whether all individual formats reached FHB after the meetings.

Conduct of monthly PND surveillance meetings was newly introduced. All heads of specialised institutions providing perinatal care should organise and carry out these meetings on a fixed date at their institutions.

- It should be well-attended by obstetricians, paediatricians, MO-MCH and MOH of the catchment area of hospital, MOs attached to obstetrics and neonatal units, nurses in charge of relevant units and medical record officer (MRO).
- MO-MCH or MO-Preventive Health should be the secretary of the meeting.
- Data collected using H-26 should be used for presenting data at the meeting by MO attached to the relevant unit.
- Each death should be discussed in detail and corrective action identified and implemented at institutional level.
- Minutes and an attendance register should be maintained at the meeting; copies of minutes should be sent to the FHB, DPDHS and the relevant consultants.

Though initiated early, the process established in 2006 did not have a clear mechanism to transfer information gathered through H-26 Format to the central level. The circular instructed only to send the minutes of the review meetings to FHB. However, there is evidence shown on the admirable commitment of FHB, in getting the maximum number of hospitals involved

in perinatal death review. The main challenge at the time was to scale-up the initiation and establish conducting of the monthly surveillance activity in all target hospitals island-wide. To meet this challenge, in 2010, a renewed effort was undertaken by the Maternal & Child Morbidity and Mortality Surveillance Unit to closely monitor and obtain monthly reports. For this purpose, target institutions were visited, and review meetings were attended by resource personnel of the FHB. Zero reporting was introduced. Further, there had been attempts made during this period to collate the surveillance data at FHB level. For example, the FHB has reported a perinatal mortality rate of 4.29 per 1000 births in the year 2012 using its PND surveillance data (FHB, 2015). With all these initiatives, by 2013, nearly 100% of the specialised institutions were conducting PND surveillance meetings and a majority sending monthly reports to the FHB.

Once the universal coverage of hospital-based monthly perinatal death reviews was reached, from 2014 onwards, the emphasis was mainly placed on collecting the individual PND data from hospitals and analysing them at central level. To this end, in 2014, a summarized version of H-26 Form (Annexure 4) was used to gather data for the whole year from all relevant institutions in a survey conducted by the FHB.

In 2015, along with the launch of National Feto-infant Mortality Surveillance System, the PND surveillance was planned to be revised to suit the country data needs (Figure 3.1). As a result, a more structured system was worked out, with several major modifications proposed to the system implemented in 2006.

Given below are the changes proposed in the PND surveillance, which were planned to be implemented from 2016.

- All FDs of POG ≥ 22 completed weeks or ≥ 500g weight, and ENNDs should be included in the PND surveillance at hospital level.
- All the PNDs classified as above of both government and private hospitals should be notified to the head of specialised as well as non-specialised institutions providing PN care, using the given format within 24 hours.
- A detailed monthly report should be sent to the FHB following the PND surveillance meeting conducted at specialised hospitals, along with the data of individual PNDs.
- Another major change was the introduction of ICD-PM system for categorizing the COD, replacing the Wigglesworth classification.

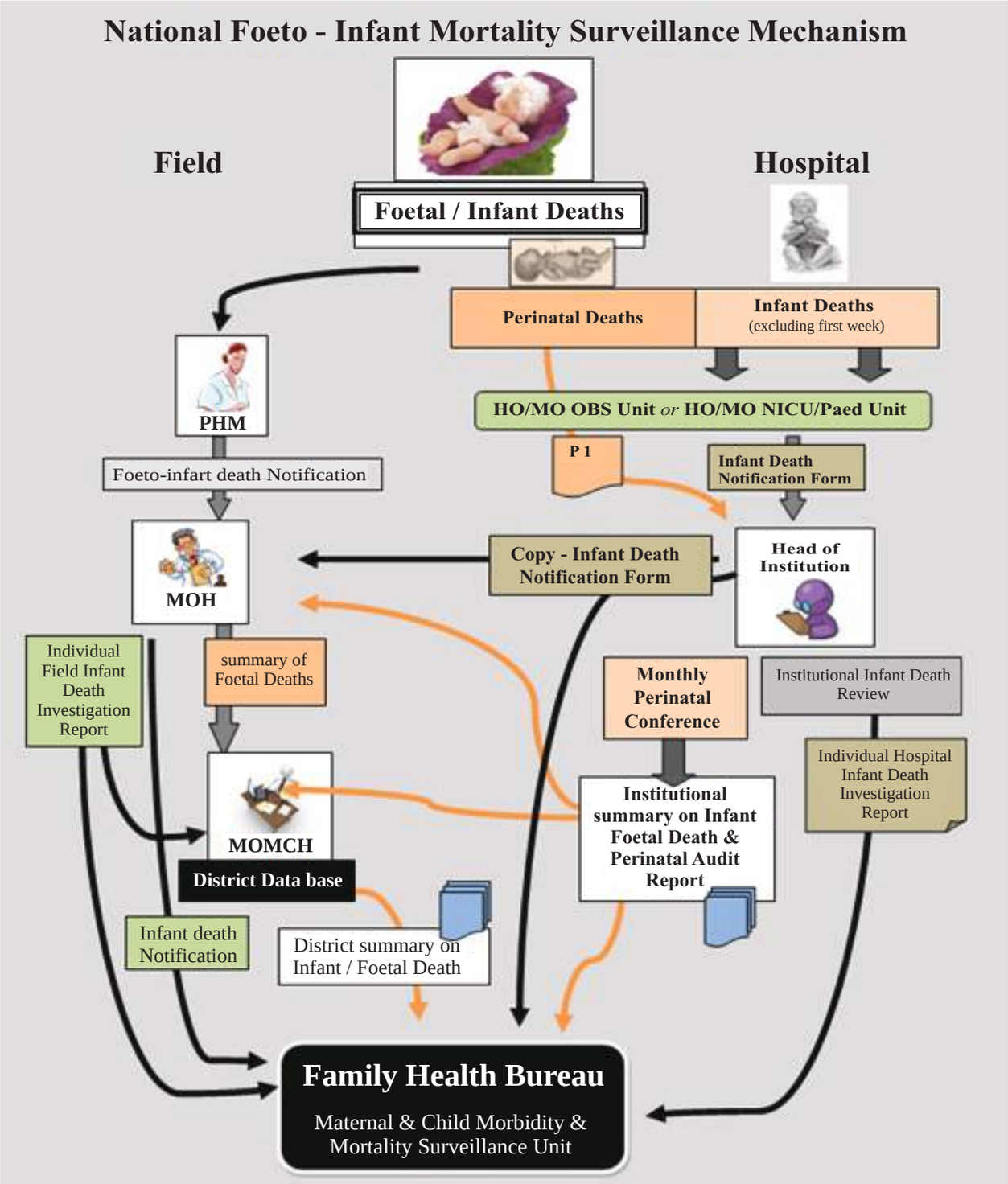


Figure 3.1: Mechanism of the National Feto-Infant Mortality Surveillance in Sri Lanka

Source: Guidelines on the National Feto-infant Mortality Surveillance Mechanism, FHB

To assess the feasibility of the proposed comprehensive system, a pilot implementation was carried out in the Western Province in 2015. Until this system was scaled-up to cover the entire island from 2016, a special summary format (Annexure 5) was used by the FHB, to collect data on all FDs of ≥ 22 completed weeks of gestation or of ≥ 500g weight, and ENNDs (including ICD-PM system for COD) during the interim period of 2015, from specialised as well as non-specialised institutions. Further, active surveillance was carried out to complement this data collection process.

In the same year, two new formats were field-tested (P-1 and P-2 Formats) (Annexure 6).

P-1 (Perinatal Death Documentation) Format - An elaborative form which includes a summary sheet, cause of death and maternal conditions contributing to death, post-mortem details, death registration information and a detailed case abstraction (maternal history, antenatal and intrapartum care, baby details, neonatal care), views of the investigation team on factors contributing to death and overall view of the investigation team, lessons learnt and actions taken

P-2 Format - A summary containing essential information for the entire institution for a month

The implementation of these new formats both at institutional and field levels was commenced from 1st January 2016, as instructed By the DGHS letter No. FHB/EH/12/2015 dated 24.02.2016 (Annexure 7).

In 2016, the data collecting forms were subjected to further changes, which were backed by a new letter (No. FHB/EH/12/2016 dated 20.05.2016) from DGHS (Annexure 8). However, despite many scaling-up activities, the introduction of P-1 and P-2 Formats took longer than expected at the implementation level, resulting in substantial incompleteness of data, and therefore another simplified format was introduced in 2018 (Annexure 9). It is yet to reach all the institutions as of this review, thus most of the hospitals are still using the previous version (2016) of P-1 and P-2 Formats.

In addition to the hospital-based PND Surveillance System of Sri Lanka, there have been some other collaborative efforts from the government to improve the quality of available statistics in this regard. One such directive from the Ministry of Health is through Circular No. 02-155/2015 (Annexure 10) issued by the DGHS, instructing hospital administrators to complete the Declaration of Stillbirth Form (B-22) for all stillbirths occurring in their institutions in triplicate and send one copy to the RG's Department. This decision was taken, as the registration of stillbirths by the RG is currently limited to proclaimed areas, and therefore unable to provide national statistics on stillbirths. In further strengthening the process of stillbirth registration, the Ministry of Health has facilitated the conduct of pathological post-mortems on PNDs, by formulating guidelines and distribution of equipment.

3.2 Current hospital-based Perinatal Death Surveillance System

The initially developed Guidelines on National Feto-infant Mortality Surveillance Mechanism (Annexure 2) were revised in 2016 to incorporate the reporting of all FDs of POG ≥ 22 completed weeks or ≥ 500g (Annexure 11). However, its implementation took longer and has been in practice only from latter part of 2017.

Sections 3.2.1-3.2.2 highlight some vital information given in the guidelines.

3.2.1 Classification and definitions used for identifying perinatal deaths

The following definitions are used in the current PND Surveillance System:

- Live birth - The complete expulsion or extraction from the mother of a product of human conception, irrespective of the duration of pregnancy, which, after such expulsion or extraction, breathes or

shows any other evidence of life

- Neonatal death - Death that occurs during the first 28 days of life, further categorized as 'early' (0 - 7 days) or 'late' (8 -28 days).
  Day 0 – the day of birth (from the time of birth till midnight the same day)
  Day 1 – the next day following birth
- Foetal death - Death that occurs at or after 22 completed weeks of gestation in which the developing foetus dies either in utero or upon delivery. They are classified as early (22-27 weeks gestation) or late (28 weeks gestation or more).
  This definition of foetal death avoids the confusion arising from the use of terms such as "stillbirth" and "miscarriage."
- Perinatal death - This includes all foetal deaths at ≥ 28 completed weeks of gestation (weighing ≥ 1000 g) (late foetal deaths), and infant deaths of less than 7 days (early neonatal deaths).

The WHO recommends the inclusion of foetuses and live born neonates weighing between 500-1000g in national statistics both because of its inherent value and also it improves the coverage of reporting at 1000 g and over. Therefore, all foetuses and infants weighing at least 500g or 22 weeks of POG at birth, whether alive or dead, should be included in the statistics (However, data on foetal deaths with POG < 22 weeks (500g) are only for information and not considered in statistical calculations).

3.2.2 Notification of feto-infant deaths at hospital level

All PNDs (FDs at 22 completed weeks of gestation or more (weighing ≥ 500g), and deaths of less than 7 days) of both government and private hospitals should be notified to the head of the institution by the medical officer confirming the death (at obstetric or paediatric unit) using the following forms:

- **Perinatal Death Documentation Format (P-1)** within 24 hours
  A copy of P-1 should be kept with the obstetrician or the paediatrician/ neonatologist (in specialised institutions) or the highest level of medical officer (in non-specialised/ peripheral hospitals) for future reference and to be used at monthly hospital PND audits. The original copy should be sent to Director (Maternal & Child Health (MCH)), FHB attached to the following form.

- **Monthly Report - Hospital Perinatal Mortality Surveillance Meetings (P-2)** every month

Further instructions are given on the completion of P-1 and P-2 Formats (Annexure 11). Sister/ nurse-in-charge of the unit where the death occurred, with the instructions from the consultant of the unit, should ensure that the format is completed by the relevant officers.

Once a PND is reported in a government or private hospital, Head of the Institution where the index case was managed should take the custody of the bed head ticket (BHT), investigations, transfer forms and all other documentation related to the mother and/or infant. All the pages should be numbered, and the original document should be made available for perusal of relevant officers (clinicians, judicial medical officers (JMO) and MOHs).

All relevant documents should be made available for the investigation procedures and review meetings. The BHT should not be reproduced. BHT should not be taken out of the office of the Head of the Institution and extraction of information from the BHT should be done within the office premises of the head of the institution only.

A post-mortem (PM) should be conducted, wherever possible, in cases of infant deaths when the cause of death could not be accurately determined (Annexure 11). The placenta should be examined, and the findings should be documented in the BHT. It should be sent to the pathologist or JMO for further reporting.

A Certificate of Stillbirth (B-22) should be filled by the MO confirming the death in triplicate for each foetal death ≥ 28 weeks of gestation:

- First copy handed over to parents
- Second copy sent to Registrar General's Department
- Third copy to be kept as the office copy

3.2.3 Hospital-based perinatal death surveillance meetings

These meetings should be conducted once a month or on a fixed date by every specialised institution (including the private sector) providing perinatal care. Head of the institution with consultants (obstetricians, paediatricians and neonatologists) should organize the meetings.

The following health care personnel should participate with relevant information:

- Head of the Institution
- Obstetrician, paediatrician, neonatologist and other relevant specialists
- Medical officers of the obstetrics and neonatal units
- MO-MCH and MOH from the catchment area
- MO-Preventive Health
- JMO
- Grade I nursing officer /nursing officer in charge of the ward or labour room
- MRO

Data of the index cases should be collected through the P-1 Format. The same format should be used for presenting the data at the meeting by the MO attached to the relevant obstetrics unit or SCBU/ NICU.

The index case should be discussed in detail based on three-delay model in order to identify deficiencies associated with seeking medical care, reaching the hospital and management of the mother and/or the neonate at the hospital.

The PND audit process should be a 'no-fault finding' exercise of the healthcare workers involved in the management of the pregnant mothers or infants. Whole process of the review should be confidential, and each participant of the institutional review should sign the confidentiality agreement (F-4) prior to the review meeting.

The review process should focus on establishing if circumstances represent system problems that require change, developing recommendations for change and assisting in the implementation of change at hospital level and field level.

Along with all P-1 Formats, the completed P-2 Format should be sent within one week after conducting the meeting to the Director-MCH by head of the institution. The National Programme Manager (Child Morbidity and Mortality Surveillance) will compile all PND data and maintain a database at FHB.

3.3 Reporting of perinatal deaths by hospitals

Details of the hospitals reporting on PNDs are given in Table 3.1.

Table 3.1: Hospital reporting on perinatal deaths according to the PND surveillance system

Hospitals reporting perinatal deaths *	2014	2015	2016	2017
• Teaching Hospitals (TH)	15	14	14	13
• Provincial General Hospitals (PGH)	3	3	3	3
• District General Hospitals (DGH)	18	16	19	18
• Base Hospitals (BH)	39	49	63	62
• Divisional Hospitals (DH)	2	107	2	-
• Rural Hospitals (RH)	-	3	-	-
• Private Hospitals	1	-	2	-
Total no. of hospitals reporting on deaths	**78**	**192**	**103**	**96**
No. of hospitals with 'zero' death reporting	**3**	**111**	**29**	**18**
No. of hospitals reporting at least one death per year	**75**	**81**	**74**	**78**

** It is not the same list of hospitals considered during each year.*

The total number of hospitals that had been involved in the PND surveillance (including zero reporting) during 2014-2017 period ranged from 78 to 192 hospitals. It is shown that reporting by base hospitals had increased over time, whereas the reporting from private hospitals had been minimal and static.

In 2015, a substantial number of divisional hospitals (n=107) had been included in the database (this was following active surveillance of PNDs carried out by the FHB in 2015 by vising all the target hospitals including non-specialised hospitals), the majority of which contributed to zero reporting of deaths during that year (57.8% of the total hospitals). In other years, zero reporting was relatively low (3.8% in 2014; 28.2% in 2016 and 18.8% in 2017).

Zero reporting from divisional hospitals is likely to be due to mothers being transferred to larger hospitals in the event of an impending perinatal death. Therefore, removing non-specialised institutions from PND surveillance does not seem to affect the completeness of data.

Table 3.2 shows the deaths reported by their type ('FD' or 'NND'), as recorded in the database according to data gathered on Item G in the summary sheet of P-1 Format (Annexure 6).

Table 3.2 : Distribution of all deaths recorded in the database by the type of death

Deaths recorded in the database	2014	2015	2016	2017
No. of NND reported	1615	1379	1184	908
No. of FD reported	1395	1172	1408	1123
No. of unclassified deaths reported	3	209	95	46
Total no. of deaths reported	**3013**	**2760**	**2687**	**2077**

When all deaths reported were analyzed by the type of death (item G- FD or NND), timing of death (item U- AP, IP, ENND, unable to classify (UTC)) and age at death of neonatal deaths (item T- from D0 to completion of D7) as given in the summary sheet of P-1 Format, gross discrepancies were shown with each other in relation to the operational definition used to identify a PND (refer section 2.4), thus some deaths were not compatible with either foetal or early neonatal death. Considering these discrepancies, all deaths reported were re-classified according to a set of logical criteria decided upon by the review team (Annexure 1). Deaths after re-classification are shown in Table 3.3.

Table 3.3 : Distribution of all deaths re-classified according to Items G (Type of death-FD or NND), U (Timing of death- AP, IP, ENND) and T (Age at death of NND) in the summary sheet of P-1 Format

Type of death *	2014		2015		2016		2017	
	No.	%	No.	%	No.	%	No.	%
Neonatal deaths								
NND-early	1545	51.3	1177	42.6	1138	42.4	838	40.3
NND-late	0	0.0	148	5.4	27	1.0	13	0.6
NND-not known	70	2.3	172	6.2	21	0.8	50	2.4
Total	**1615**		**1497**		**1186**		**901**	
Foetal deaths								
FD-POG ≥ 28	1355	45.0	1088	39.4	1231	45.8	1079	51.9
FD-POG 22-27	0	0.0	51	1.8	25	0.9	12	0.6
FD-POG not known	40	1.3	39	1.4	153	5.7	48	2.3
Total	**1395**		**1178**		**1409**		**1139**	
PND status not available	**3**	0.1	**85**	3.1	**92**	3.4	**37**	1.8
Total	**3013**	**100.0**	**2760**	**100.0**	**2687**	**100.0**	**2077**	**100.0**

** NND-early=Neonatal death during the first 7 days of life; NND-late=Neonatal death during 8-28 days of life; NND-not known=Not able to determine the timing of death based on the recorded data; FD-POG ≥ 28=Foetal death of ≥ 28 completed weeks of gestation; FD-POG 22-27=Foetal death of 22-27 completed weeks of gestation; FD-POG not known=Not able to determine the POG based on the recorded data; PND status not available=Type of death is not recorded either as FD or NND*

The proportion of neonatal deaths notified irrespective of the age at which the death took place consisted of 53.6%, 54.2%, 44.2% and 43.3% out of all deaths reported during 2014, 2015, 2016 and 2017 years, respectively (Table 3.3). The proportion of foetal deaths reported irrespective of the POG at which death had occurred, in the corresponding years consisted of 46.3%, 42.6%, 52.4% and 54.8%. Of these FDs, a small proportion (2.4%; 88/3726) represented those occurring before completion of 28 weeks of gestation.

Of the re-classified deaths, the following were identified as PNDs for further analysis in this report (Table 3.4). As for deaths in 2014, 'FD-POG not known' and 'NND-not known' categories (Table 3.3) were also included as PNDs for the analysis, assuming that they depicted POG ≥ 28

completed weeks and death within first seven days, respectively. This was done so; in 2014, the requirement was only to collect deaths of POG ≥ 28 completed weeks; the recordings available on age at death were all within 1-7 days; and unlike in other years, 2014 data were collected using a summarized version of H-26 during a survey by the FHB.

The deaths included in the report represented 99.9% of all deaths that were originally reported by hospitals in 2014 (3010 out of 3013); 81.5% (2265 out of 2780) in 2015; 88.2% (2369 out of 2687 in 2016 and 92.3% (1917 out of 2077) in 2017.

Table 3.4 : Distribution of the perinatal deaths compatible with the operational definition (foetal deaths of ≥ 28 completed weeks of gestation and neonatal deaths up to first week of life) used in the review

Type of death	2014 *		2015		2016		2017	
	No.	%	No.	%	No.	%	No.	%
Total ENND	1615	53.7	1177	52.0	1138	48.0	838	43.7
Total FD	1395	46.3	1088	48.0	1231	52.0	1079	56.3
Total PND	**3010**	**100.0**	**2265**	**100.0**	**2369**	**100.0**	**1917**	**100.0**

** 'FD-POG not known' and 'NND-not known' categories of 2014 (Table 3.3) included here for further analysis.*

From 2014 to 2017, PNDs reported have decreased in number. This reduction has been mainly contributed by the ENNDs, declining from 53.7% in 2014 to 43.7% by 2017.

3.4 Trends in perinatal death rates in Sri Lanka (2014-2017)

Trends in PND rates in Sri Lanka (2014-2017) are given in Figure 3.2.

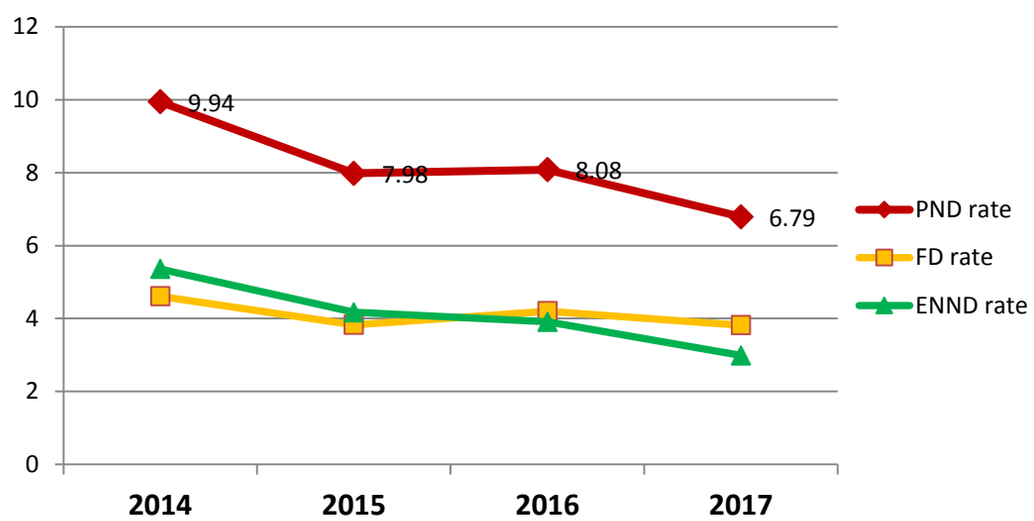


Figure 3.2: Trends in perinatal, foetal and early neonatal death rates in Sri Lanka 2014–2017

In 2014, the PND rate was 9.94 per 1000 total births (5.36 ENND rate per 1000 live births and 4.61 FD rate per 1000 total births). In comparison, the corresponding PND rates were 7.98 per 1000 total births (4.17 ENND rate and 3.83 FD rate) in 2015; 8.08 per 1000 total births (3.91 ENND rate and 4.2 FD rate) in 2016; and 6.79 per 1000 total births (2.99 ENND rate and 3.82 FD rate) in 2017. Further, ENN deaths have contributed in higher rates than FD rates during 2014 and 2015, and conversely in 2016 and 2017.

- The PND rates of all four years were less than that reported for 2013 (11.2 per 1000 births).
- All three types of death rates have marginally declined from 2014 to 2017. This could be due to an overall decrease in the trend of PN mortality in the country or due to a declining tendency of hospitals in the reporting of PNDs.

3.4.1 Perinatal death rates by provinces

Given below are the PND trends observed by provinces for the four years (Figures 3.3-3.6). A wide variation in the death rates by provinces is noted.

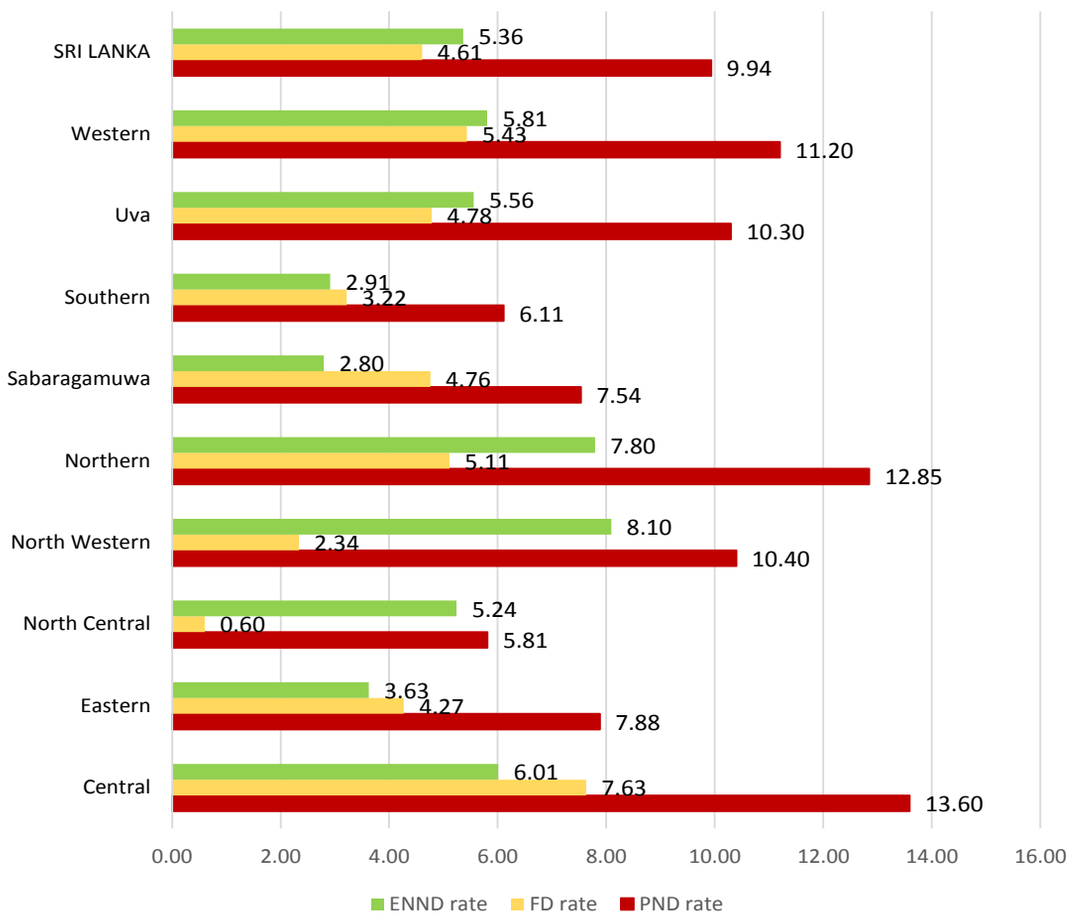


Figure 3.3: Distribution of perinatal death rates by provinces - 2014

In 2014, the PND rate was 9.94 per 1000 total births (5.36 ENND rate and 4.61 FD rate) (Figure 3.3). The highest PND rate was reported from Central Province (13.6 per 1000 total births) closely followed by Northern (12.85), Western (11.2), North Western (10.4) and Uva (10.3) Provinces, while it was lowest in the North Central Province (5.81 per 1000 total births). Early NNDs contributed in higher rates than FD rates in 5 out of 9 provinces.

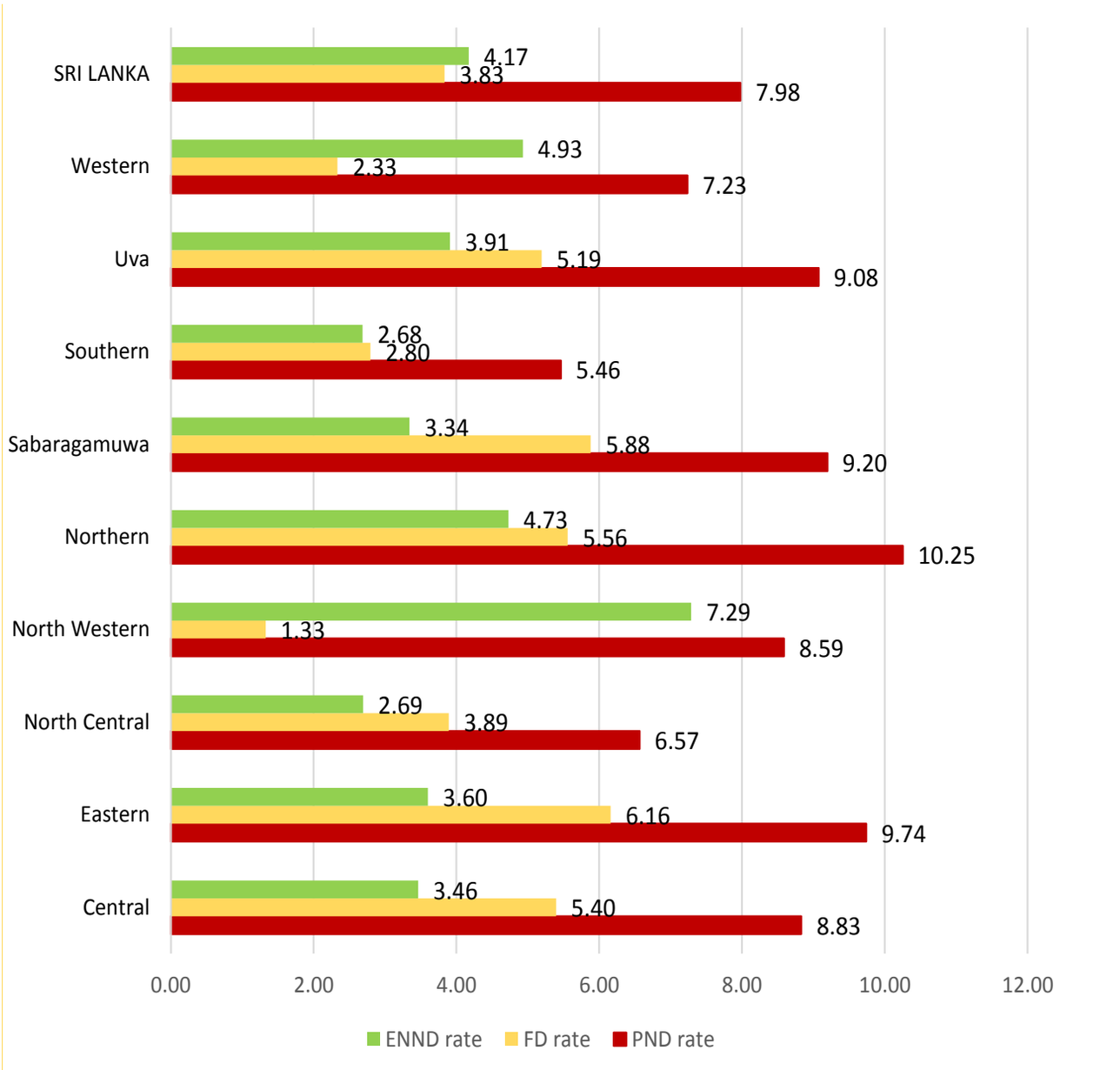


Figure 3.4: Distribution of perinatal death rates by provinces - 2015

In 2015, the PND rate was 7.98 per 1000 total births (4.17 ENND rate and 3.83 FD rate) (Figure 3.4). A similar provincial variation as in 2014 was noted. PND rates above the average rate reported for 2015 were from Northern (10.25), Eastern (9.74), Sabaragamuwa (9.2), Uva (9.08), Central (8.83) and North Western (8.59) Provinces, and the lowest from Southern Province (5.46). Foetal deaths contributed in higher rates than ENND rates in 7 out of 9 provinces.

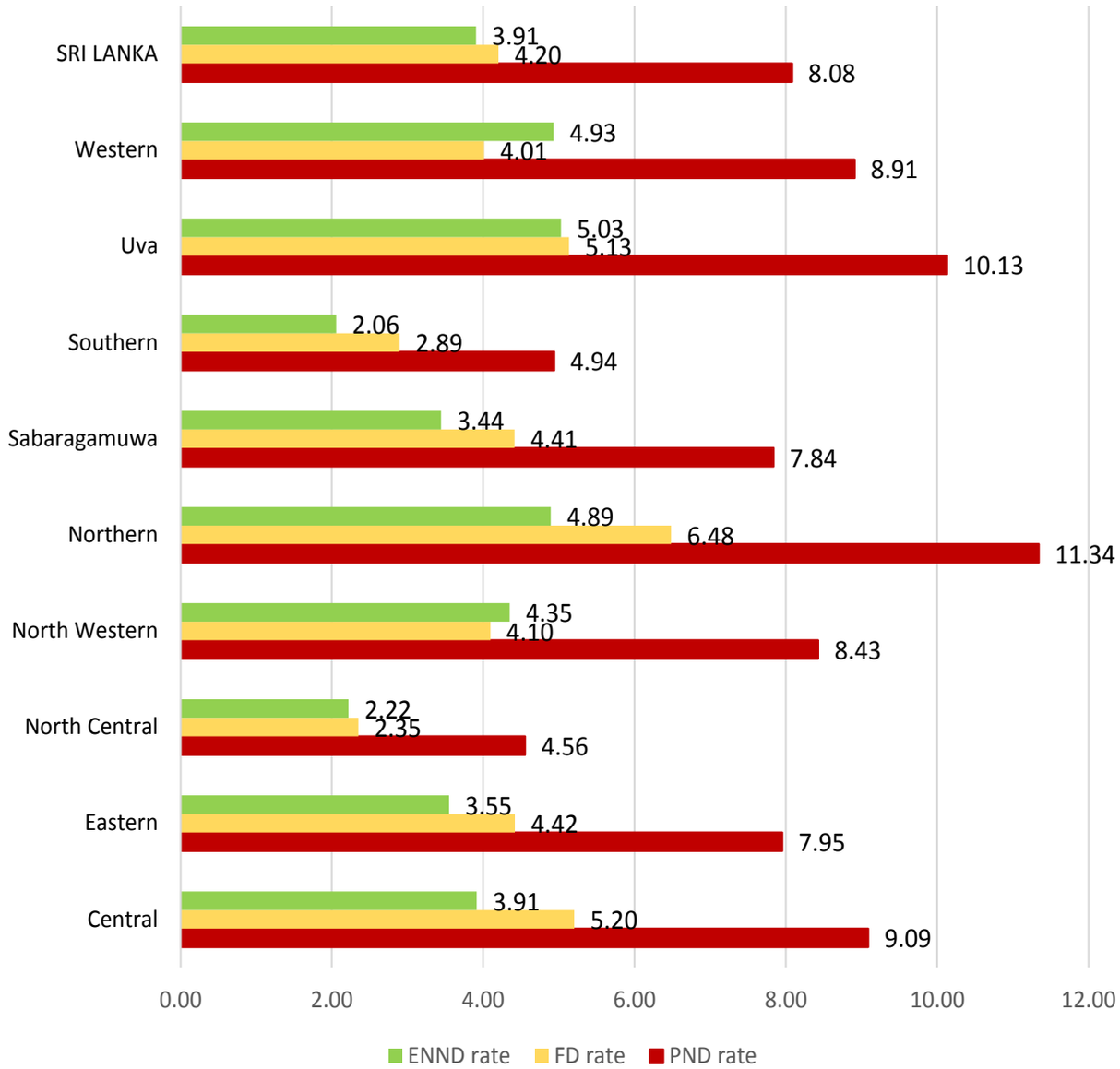


Figure 3.5: Distribution of perinatal death rates by provinces - 2016

In 2016, the PND rate was 8.08 per 1000 total births (3.91 ENND rate and 4.2 FD rate) (Figure 3.5). A similar provincial variation was noted. PND rates above the average rate reported for 2016 were from Northern (11.34), Uva (10.13), Central (9.09), Western (8.91) and North Western (8.43) Provinces, and the lowest from North Central Province (4.56). Foetal deaths contributed in higher rates than ENND rates in 7 out of 9 provinces.

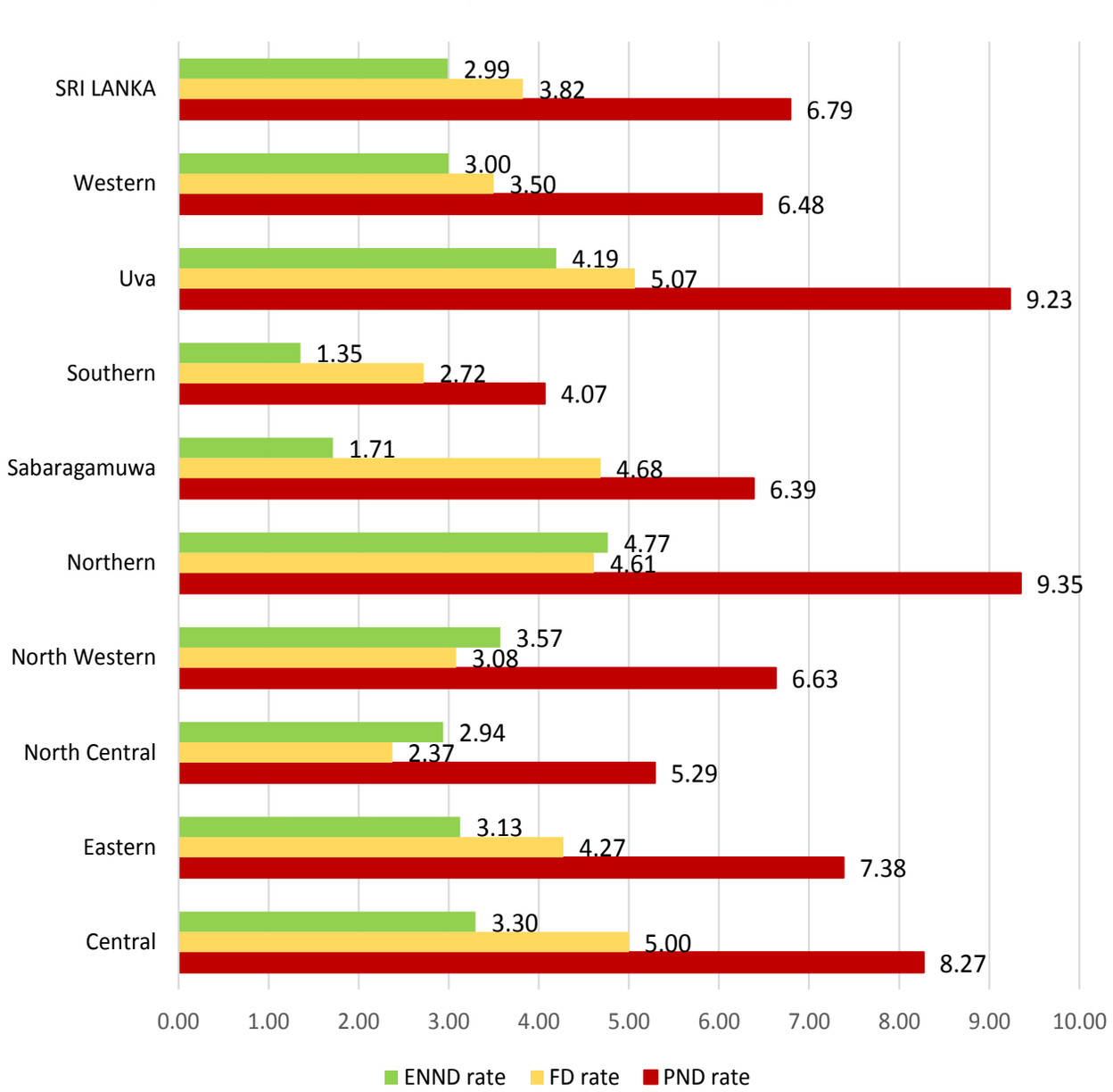


Figure 3.6: Distribution of perinatal death rates by provinces - 2017

In 2017, the PND rate was 6.79 per 1000 total births (2.99 ENND rate and 3.82 FD rate) (Figure 3.6). A wide variation in the rates was noted by provinces. The highest PND rate was reported from Northern Province (9.35 per 1000 total births) closely followed by Uva (9.23), Central (8.27) and Eastern (7.38) Provinces, while it was lowest in Southern Province (4.07 per 1000 total births). Foetal deaths contributed in higher rates than ENND rates in 6 out of 9 provinces.

3.4.2 Perinatal death rates by districts

There was a wide district variation in PND noted as well (Figures 3.7-3.10).

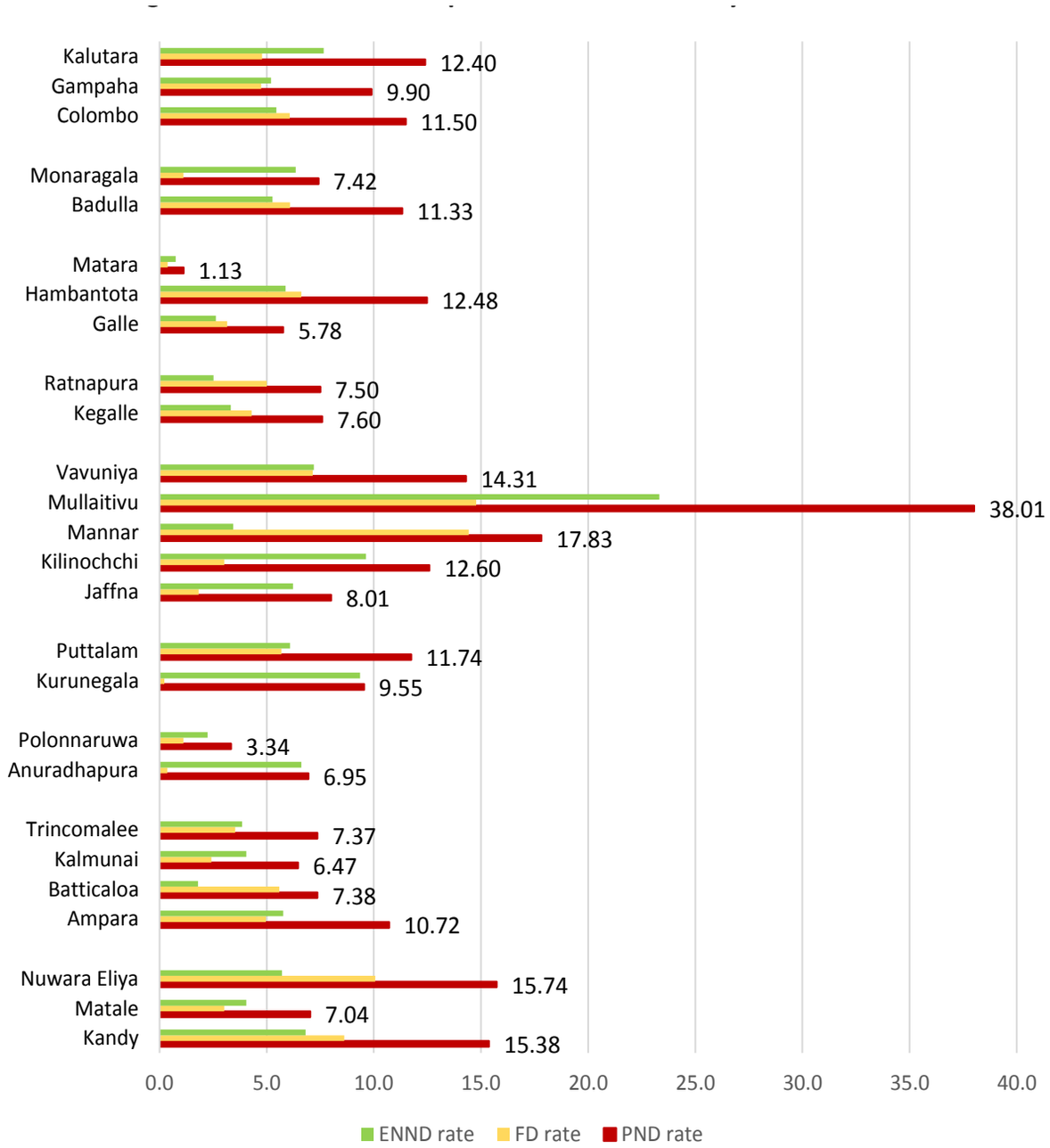


Figure 3.7: Distribution of perinatal death rates by districts - 2014

In 2014, the highest PND rate was reported from Mullaitivu District (38.01 per 1000 total births) while all other rates ranged between 17.83 to 1.13 (Figure 3.7). Other districts that reported rates higher than the average for 2014 were Kalutara, Colombo, Badulla, Hambantota, Vavuniya, Mannar, Kilinochchi, Puttalam, Ampara, Nuwara Eliya and Kandy Districts.

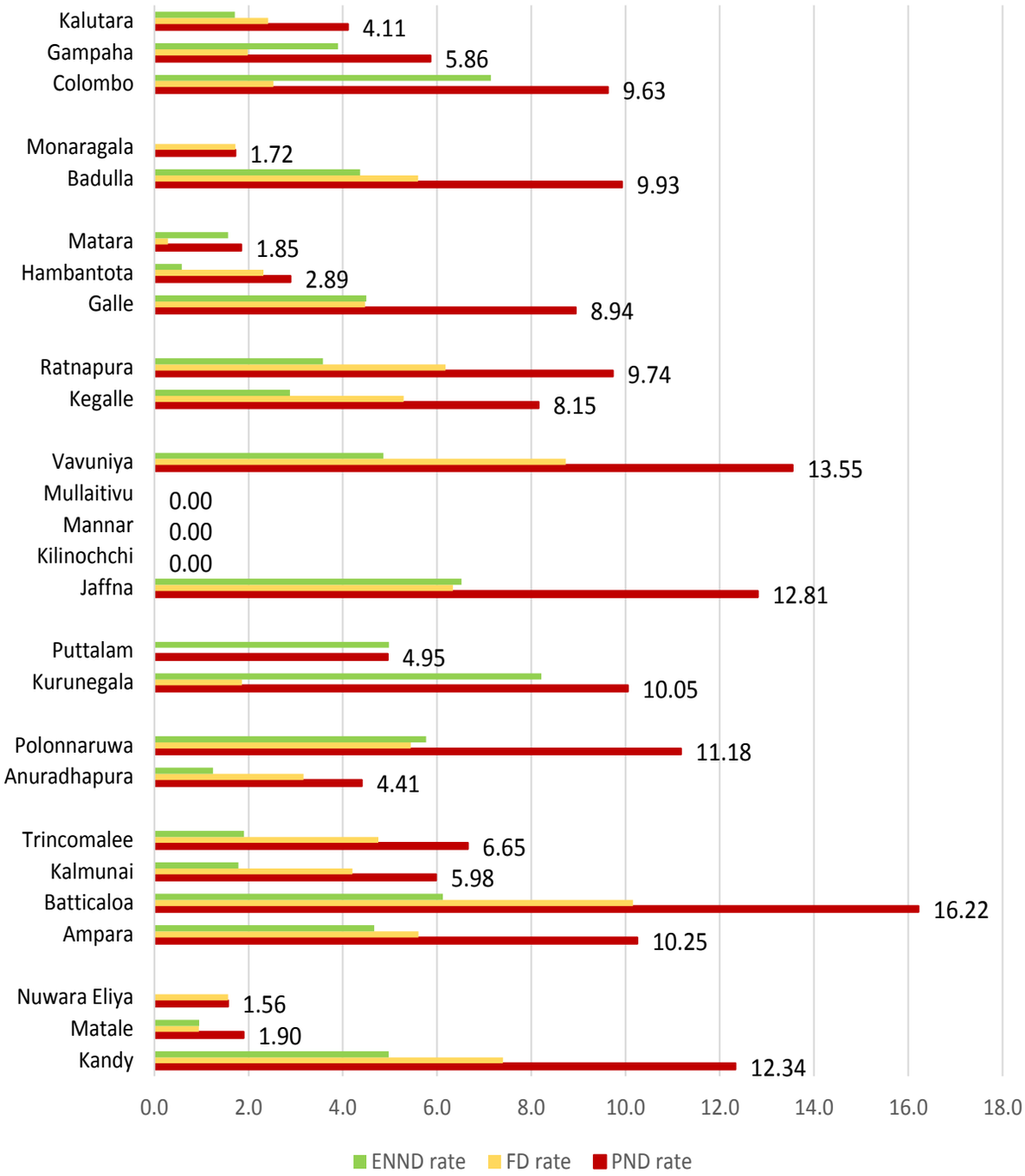


Figure 3.8: Distribution of perinatal death rates by districts - 2015

In 2015, the highest PND rate was reported from Batticaloa District (16.22 per 1000 total births) (Figure 3.8). There were no data reported from most districts in Northern Province. Other districts that reported rates higher than the average for 2015 were Vavuniya, Jaffna, Kandy, Polonnaruwa, Ampara, Kurunegala, Badulla, Colombo, Ratnapura, Galle and Kegalle Districts.

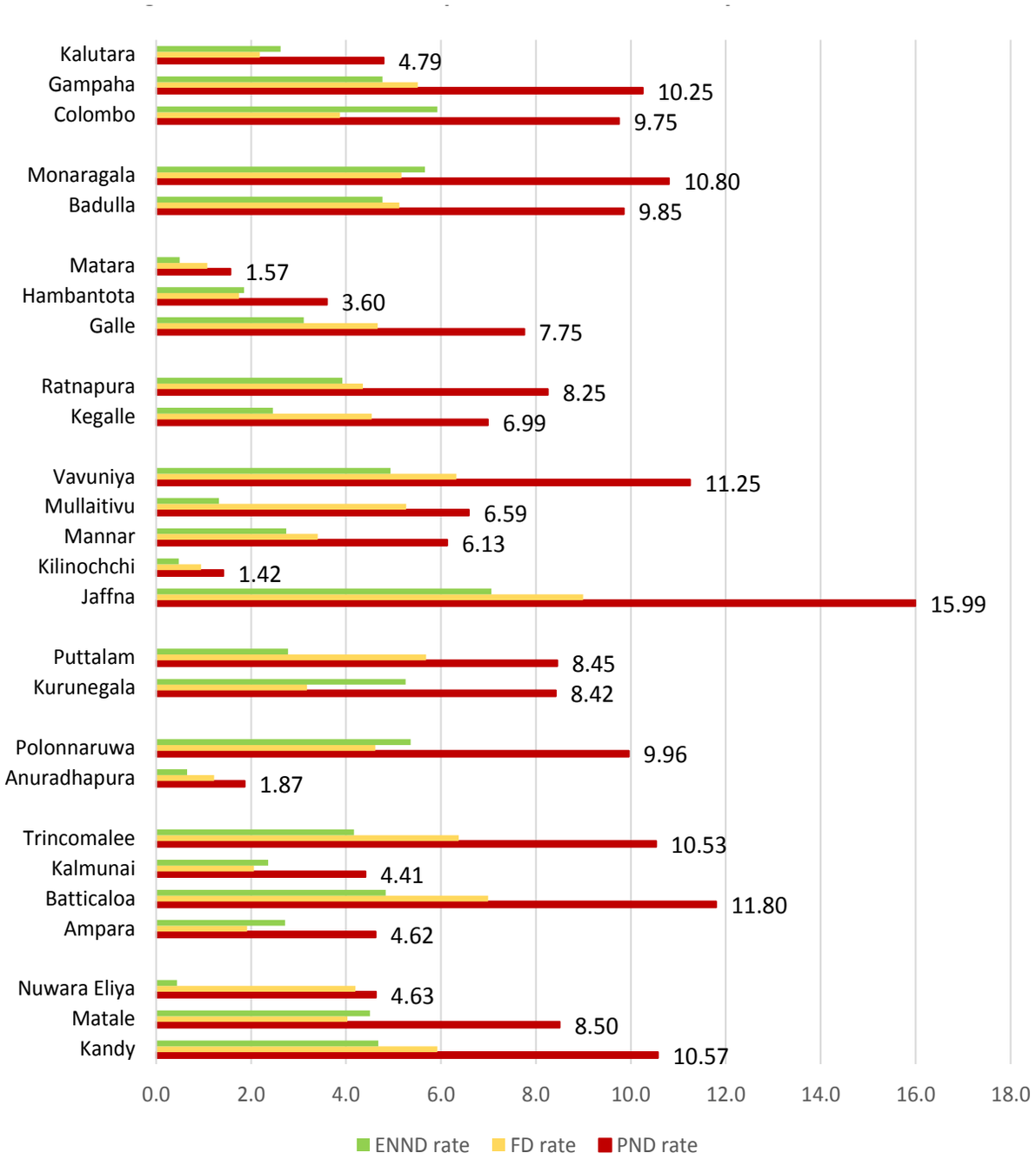


Figure 3.9: Distribution of perinatal death rates by districts - 2016

In 2016, the highest PND rate was reported from Jaffna District (15.99 per 1000 total births) (Figure 3.9). Other districts that reported rates higher than the average for 2016 were Batticaloa, Vavuniya, Monaragala, Kandy, Trincomalee, Gampaha, Polonnaruwa, Badulla, Colombo, Matale, Puttalam, Kurunegala and Ratnapura Districts.

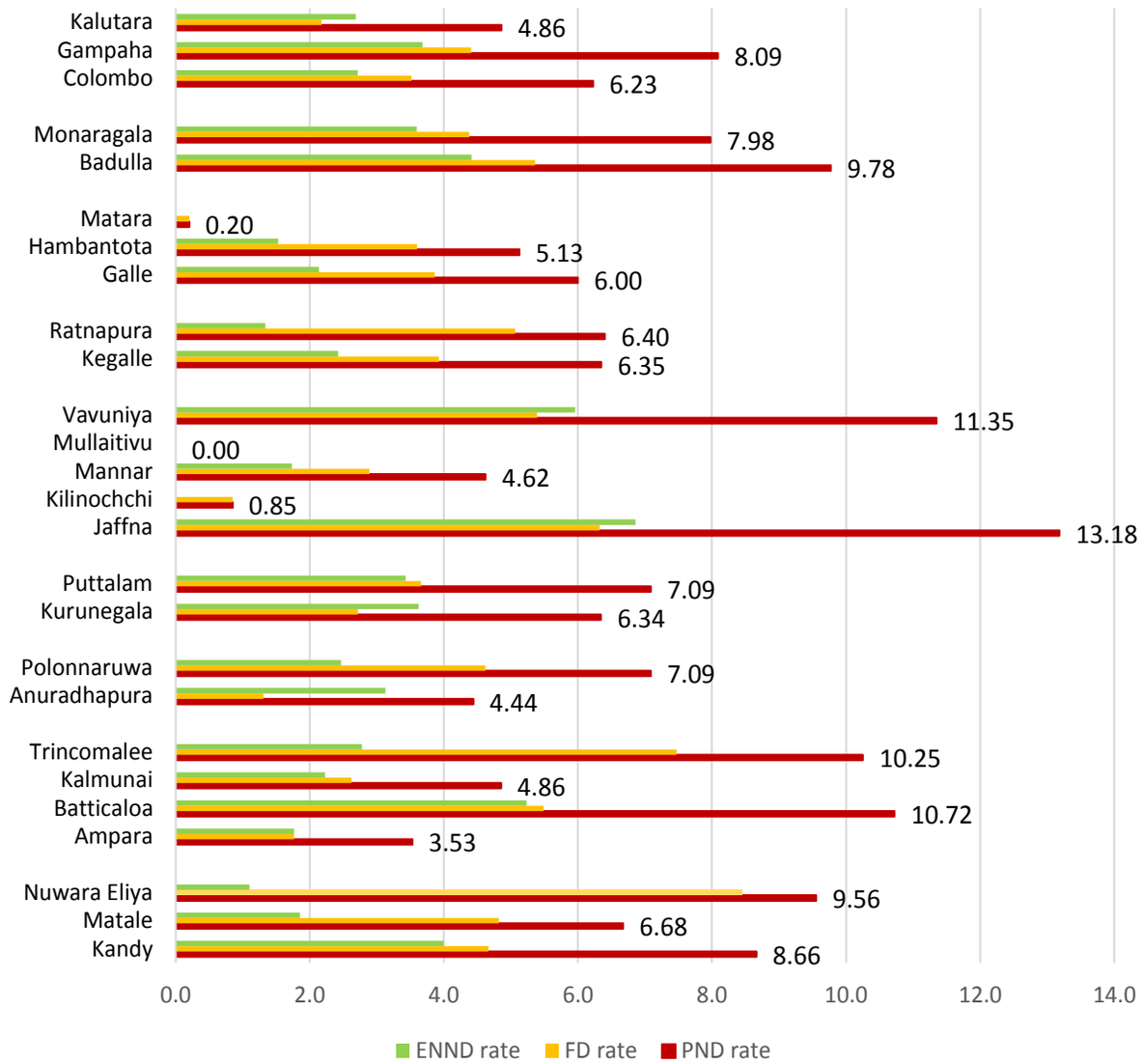


Figure 3.10: Distribution of perinatal death rates by districts - 2017

In 2017, the highest PND rate was reported from Jaffna District (13.18 per 1000 total births) (Figure 3.10). Other districts that reported rates higher than the average for 2017 were Vavuniya, Batticaloa, Trincomalee, Badulla, Nuwara Eliya, Kandy, Gampaha, Monaragala, Puttalam, Anuradhapura Districts.

- The relatively high PND rates seen in all three districts of Central Province reflects the PND status in estate sector.
- In North & East Provinces, Jaffna, Vavuniya and Batticaloa Districts have contributed substantially to the PND rate during all four years.
- Districts of Colombo, Kandy, Kurunegala, Puttalam and Badulla with larger patient draining areas reported PND rates higher than the average for each year.

3.4.3 PND rates by hospitals

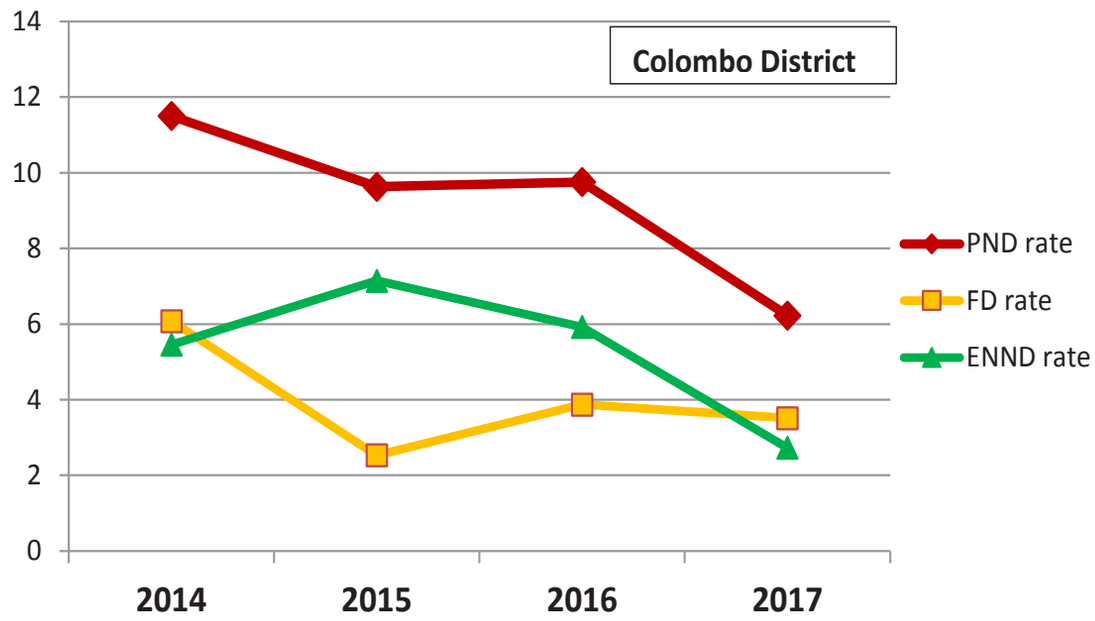
The PND rates by individual hospitals were also analyzed (data not shown).

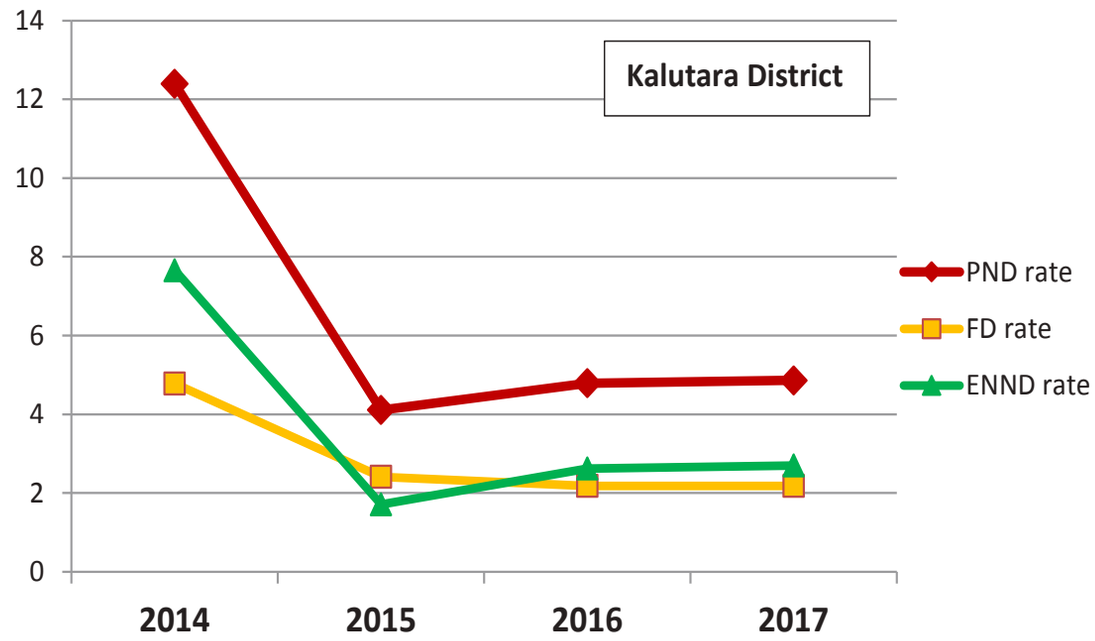
3.4.4 Trends in perinatal death rate by districts and provinces

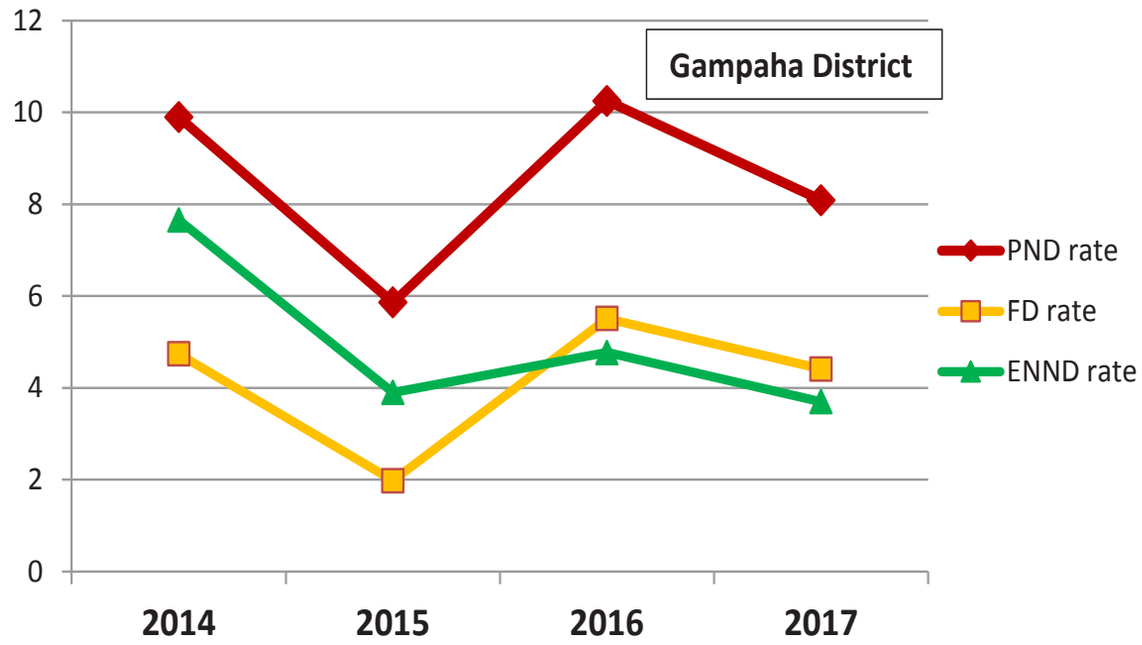
Trends in PND rate from 2014 to 2017 are shown by provinces and districts (Figure 3.11 a-i).

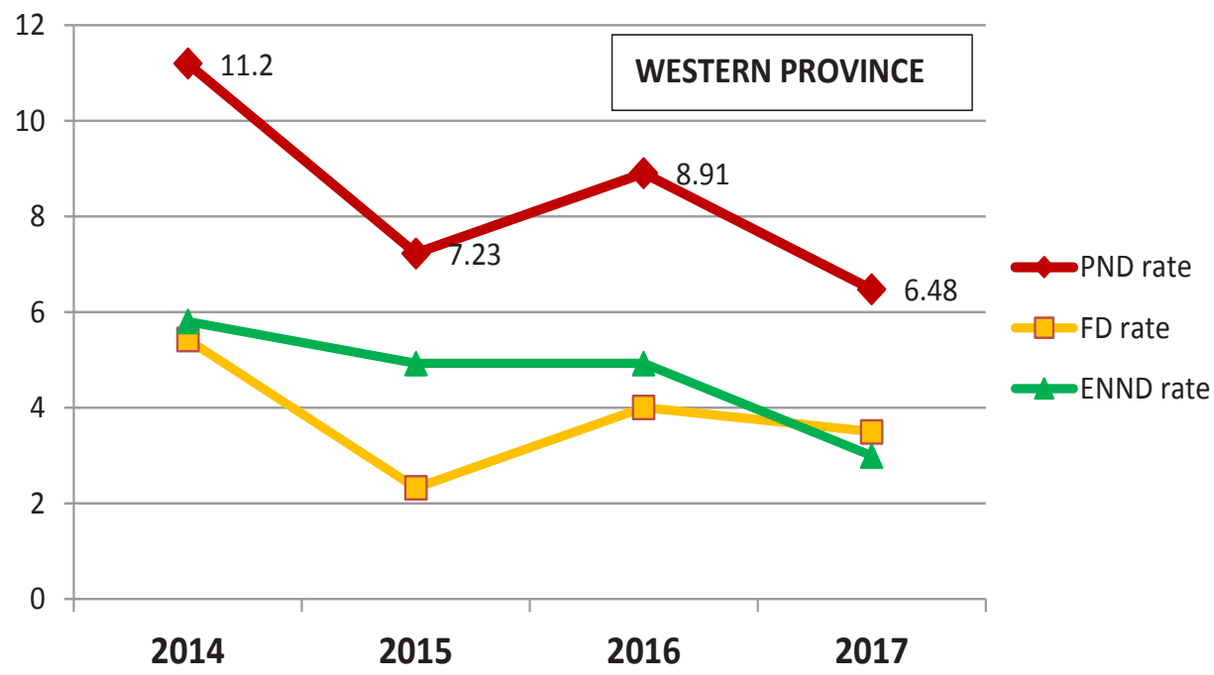
Figure 3.11: Trends in the perinatal death rates of provinces and districts 2014–2017

a. Western Province



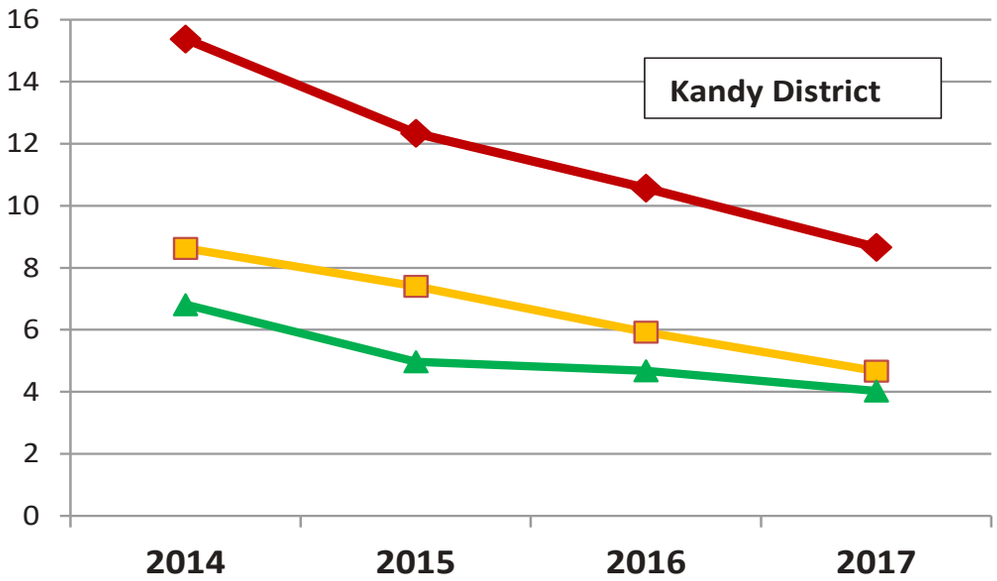


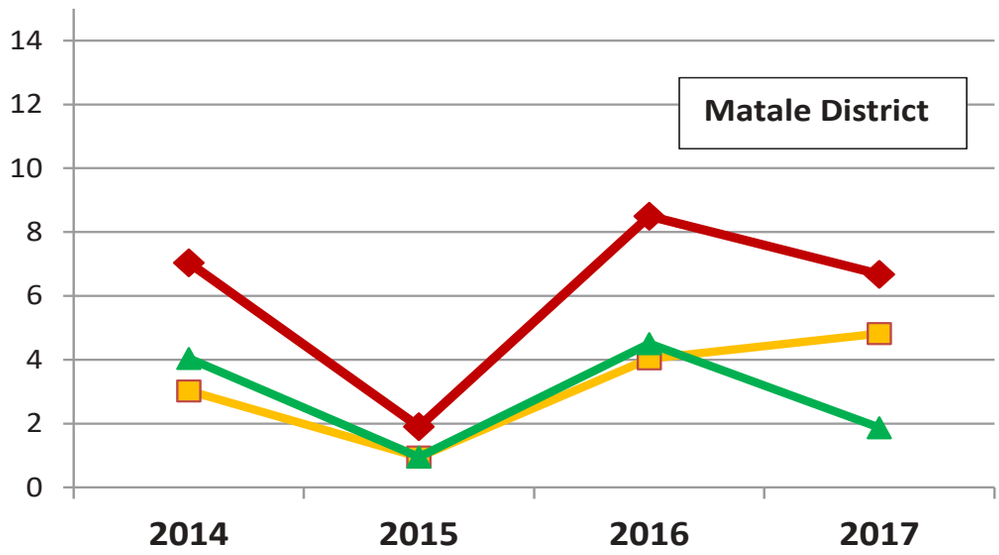


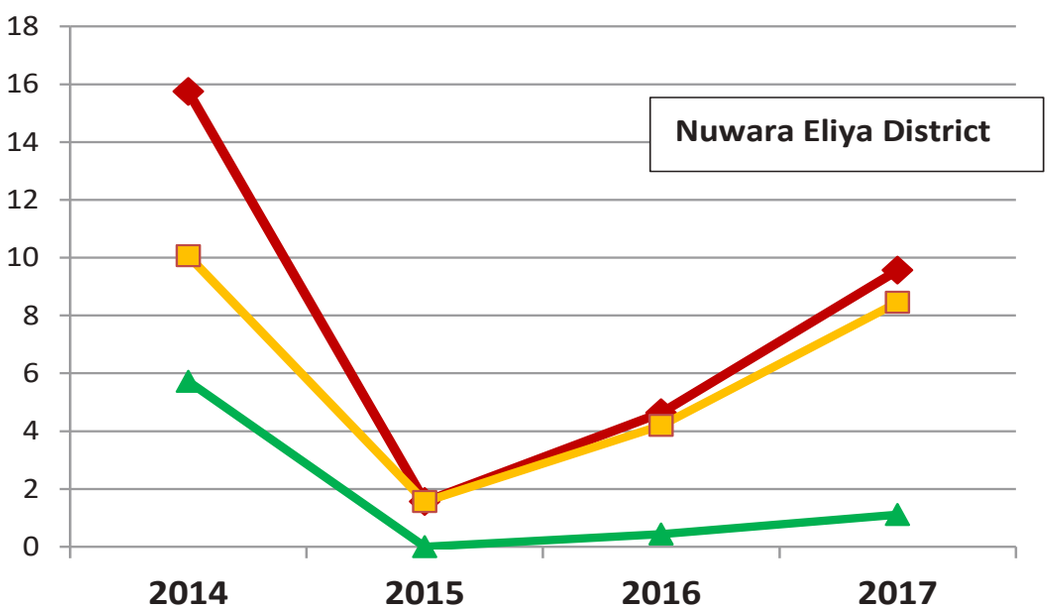


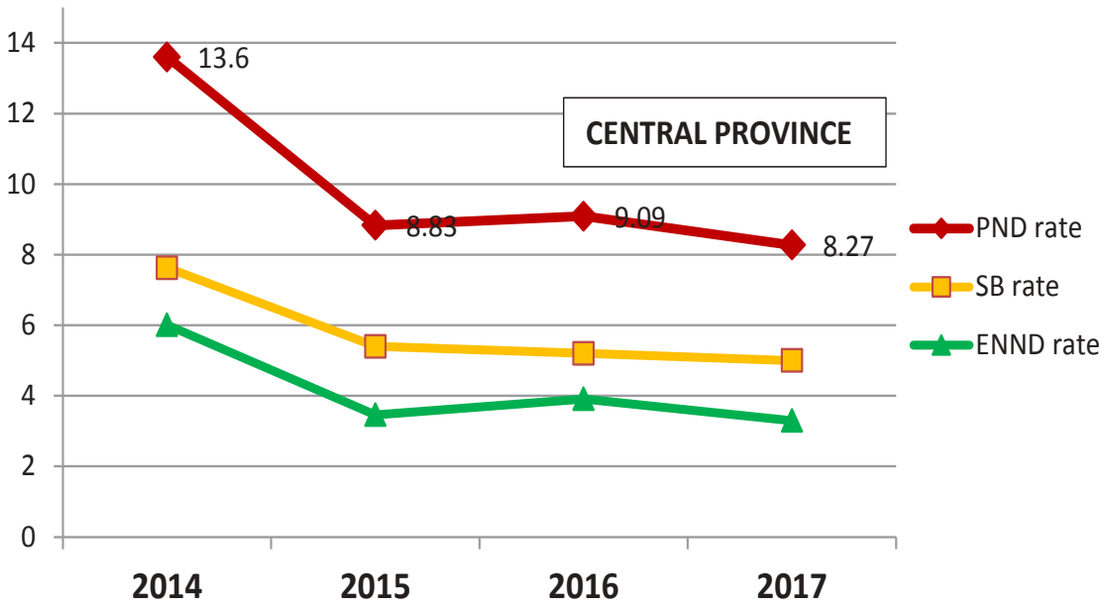
Western Province showed a declining trend in PND rate over the period of 2014-2017. Greater contribution to PND rates in the province by 2017 had been from Colombo and Kalutara Districts. The rate of drop over the four years had been similar in ENND and FD rates, but the drastic drop in PND rate from 2014 to 2015 had been due to the reduction in FD rate.

b. Central Province



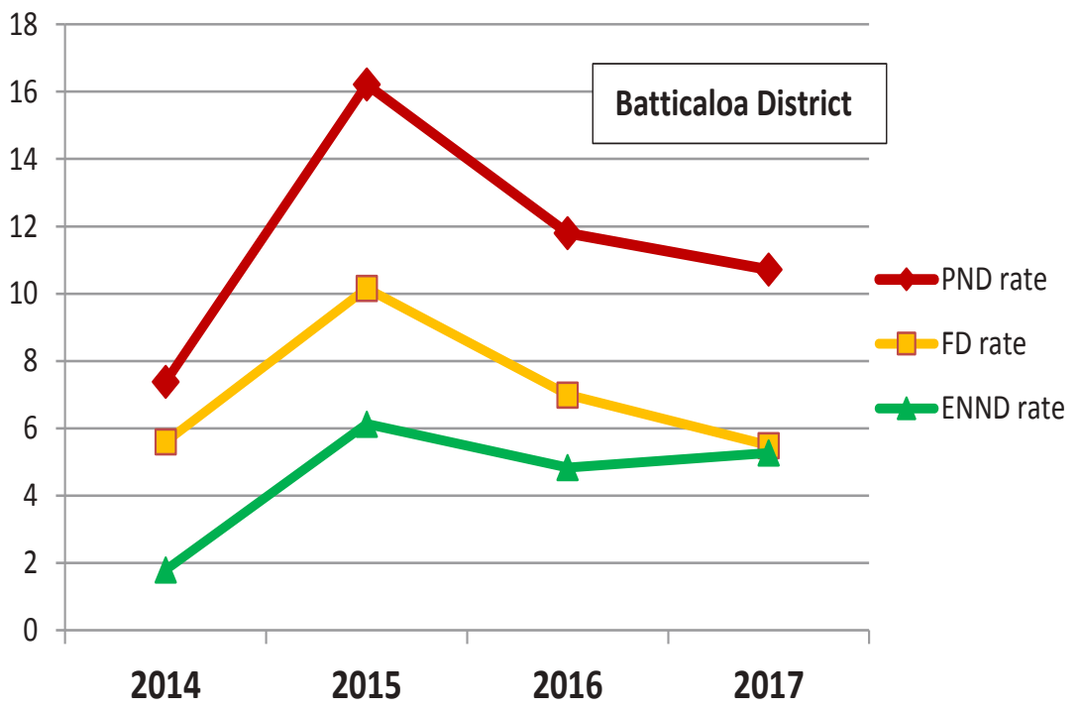


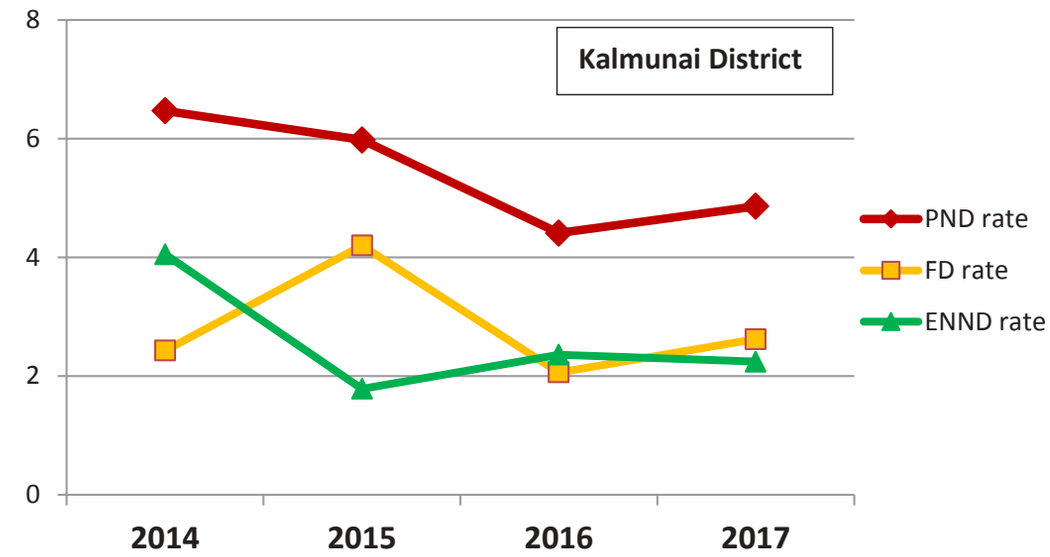


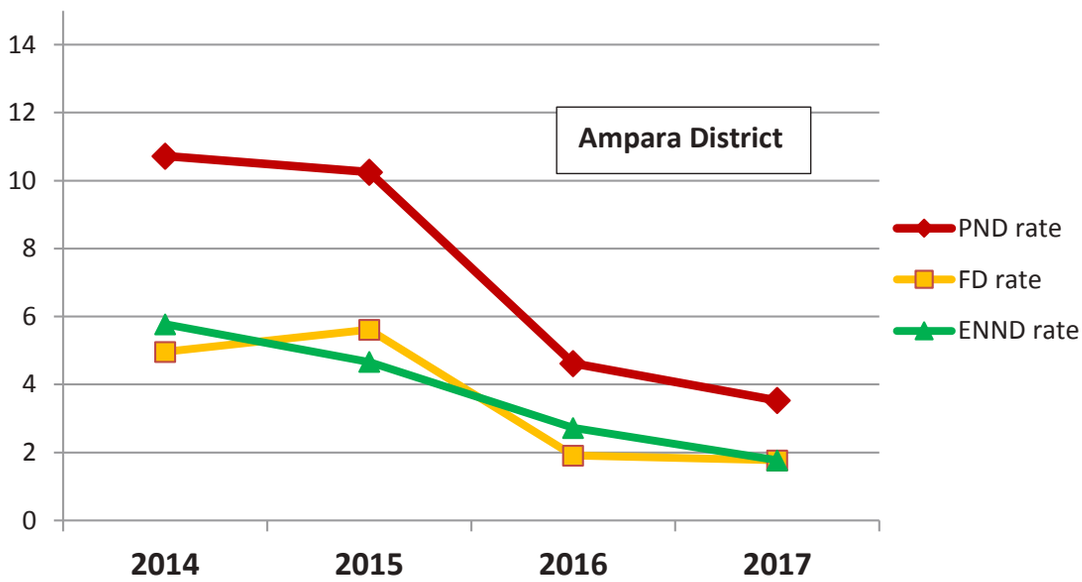


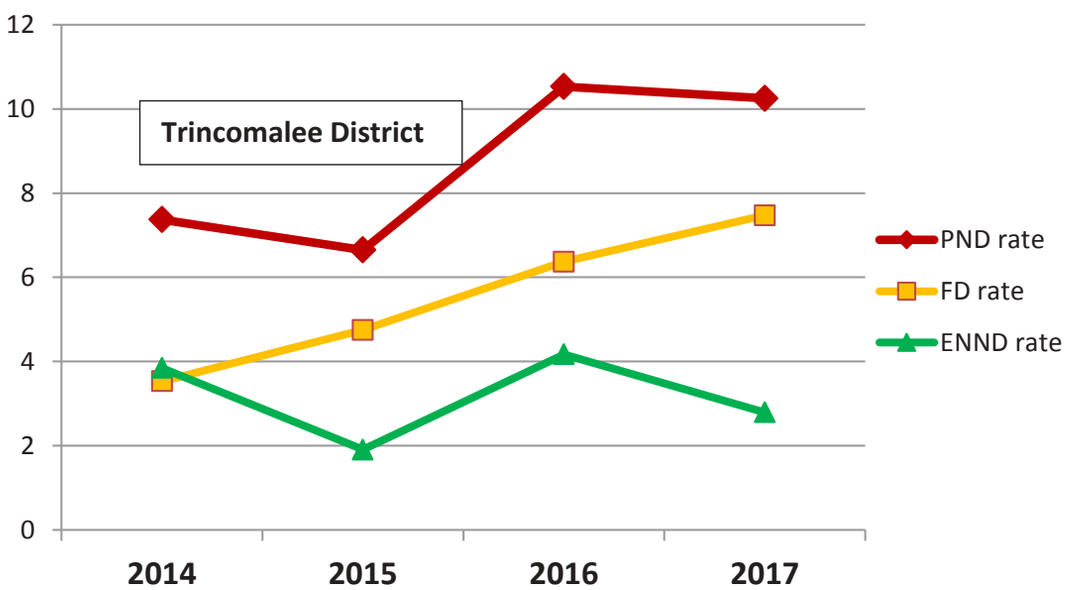
Both Kandy and Nuwara Eliya Districts have been the main contributors to PNDs in Central Province. Overall, the province showed a drastic improvement in all rates by 2015 followed by a small static drop during 2015-2017. In contrast, Kandy District showed a gradual decline in all three rates, while no such decline could be sustained from 2015 in Nuwara Eliya District.

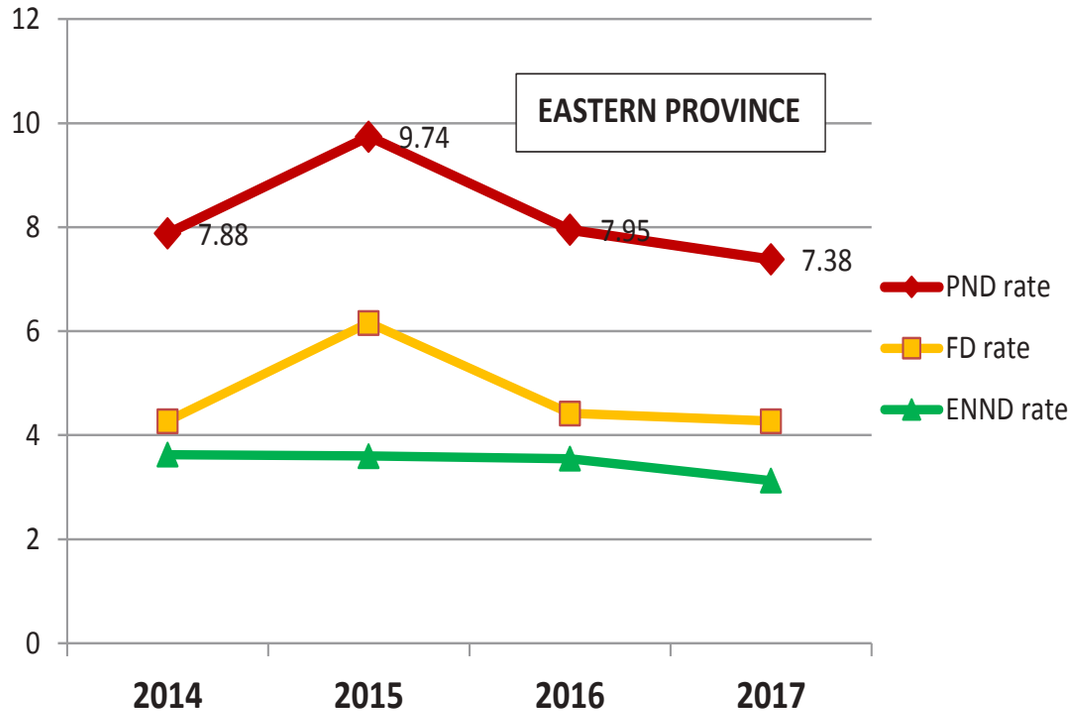
c. Eastern Province




Kalmunai District
8
6
4
2
0
2014
2015
2016
2017
PND rate
FD rate
ENND rate

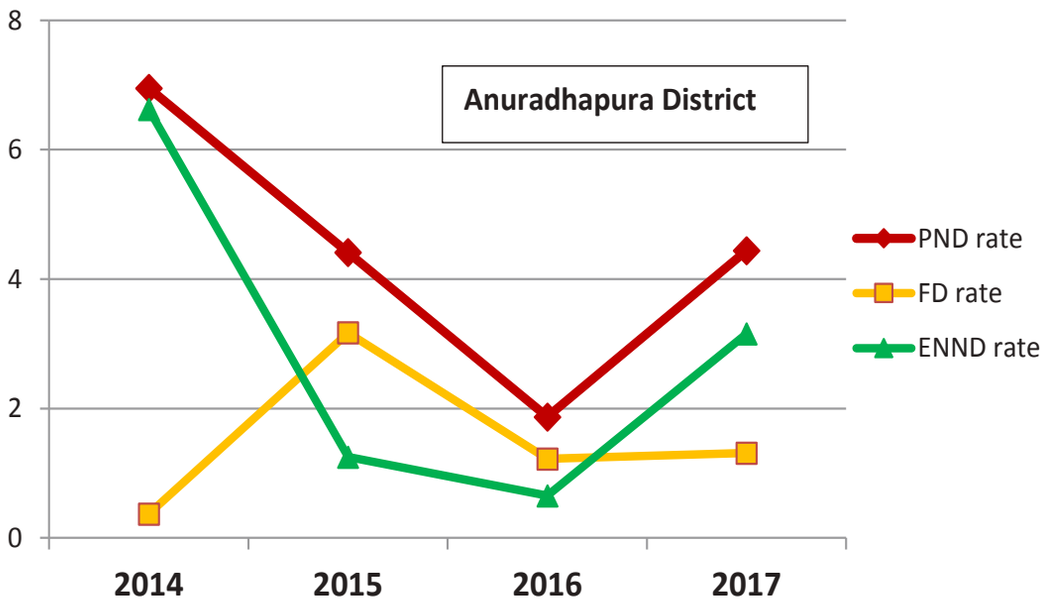

Ampara District
14
12
10
8
6
4
2
0
2014
2015
2016
2017
PND rate
FD rate
ENND rate

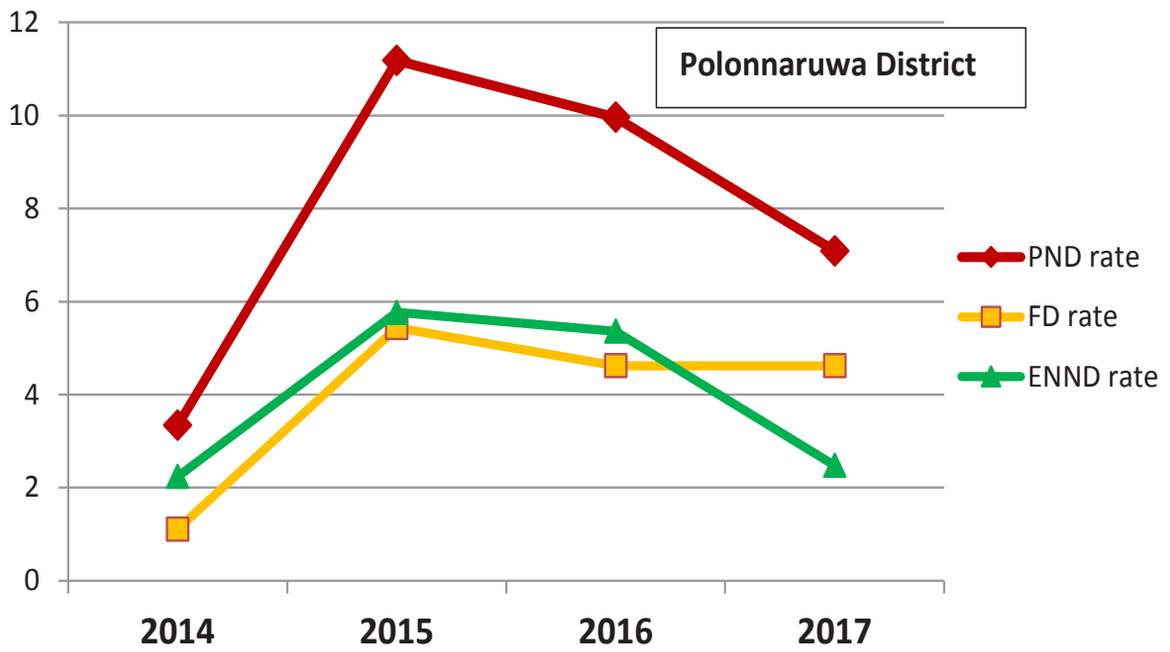

Trincomalee District
12
10
8
6
4
2
0
2014
2015
2016
2017
PND rate
FD rate
ENND rate

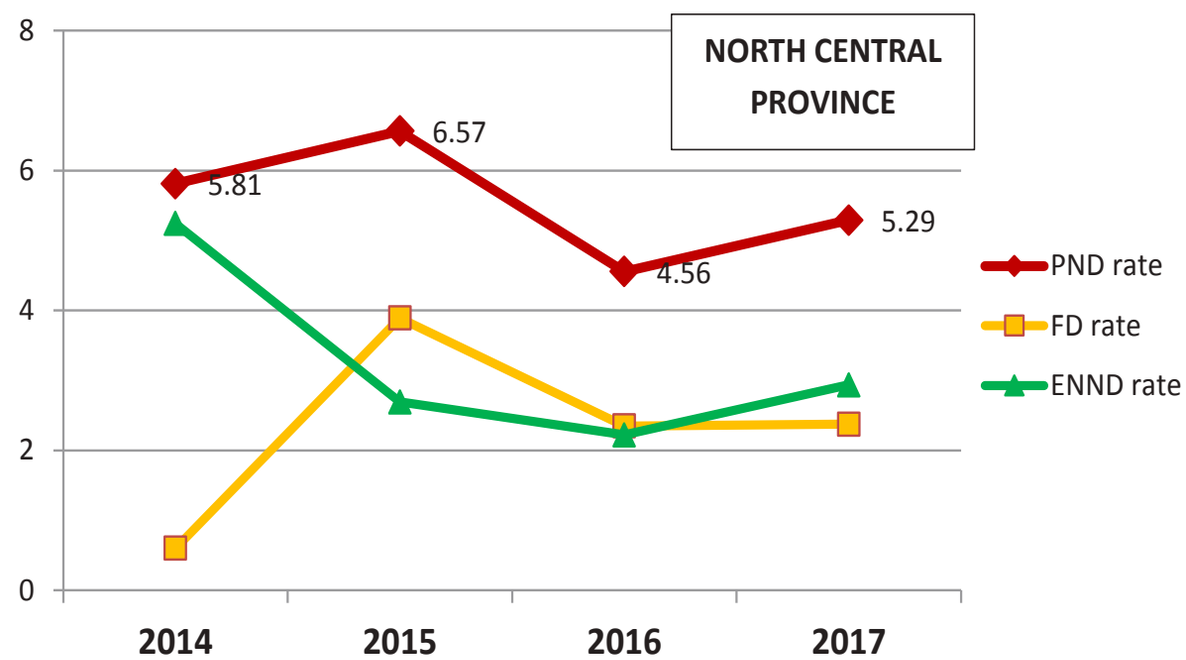


The rate of decline in all three types of death have been slow in the Eastern Province and its districts. In 2015, almost all districts peaked in their rates most likely due to an improvement in PND surveillance in the Eastern Province or due to increased foetal deaths. Except in Trincomalee, the rates have improved from 2015 onwards.

d. North Central Province

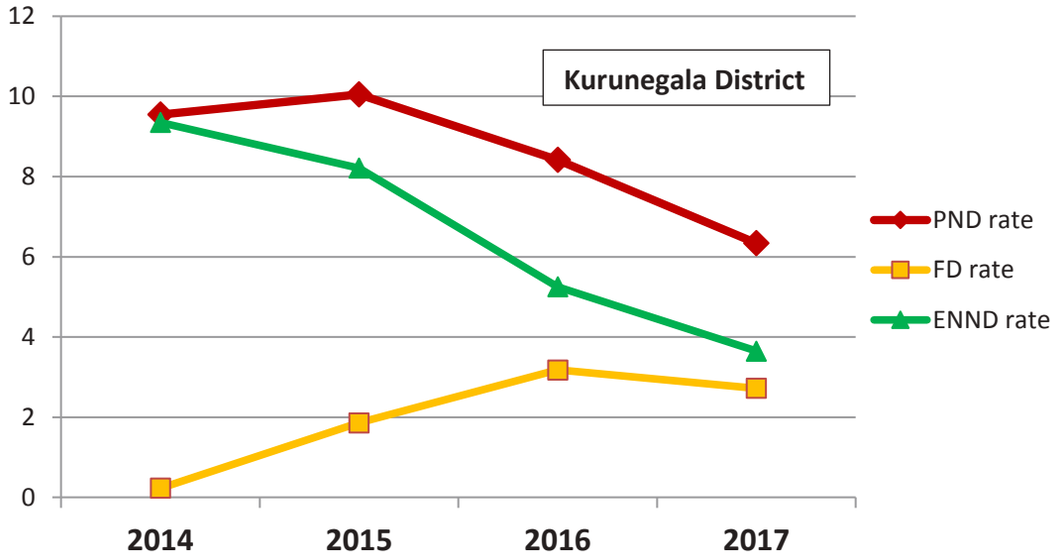


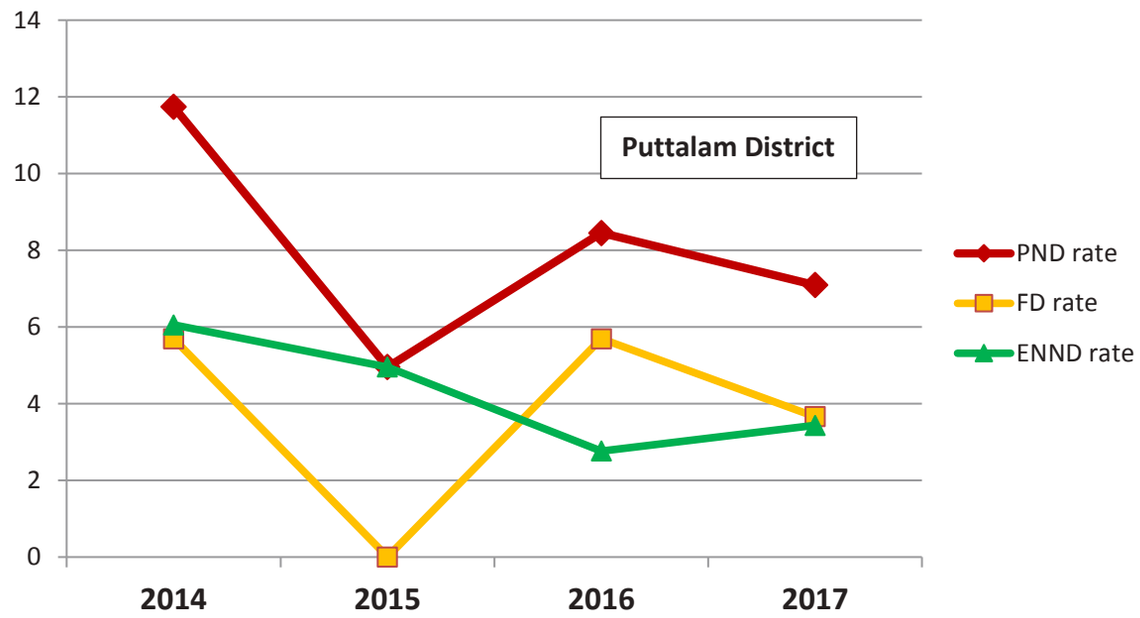


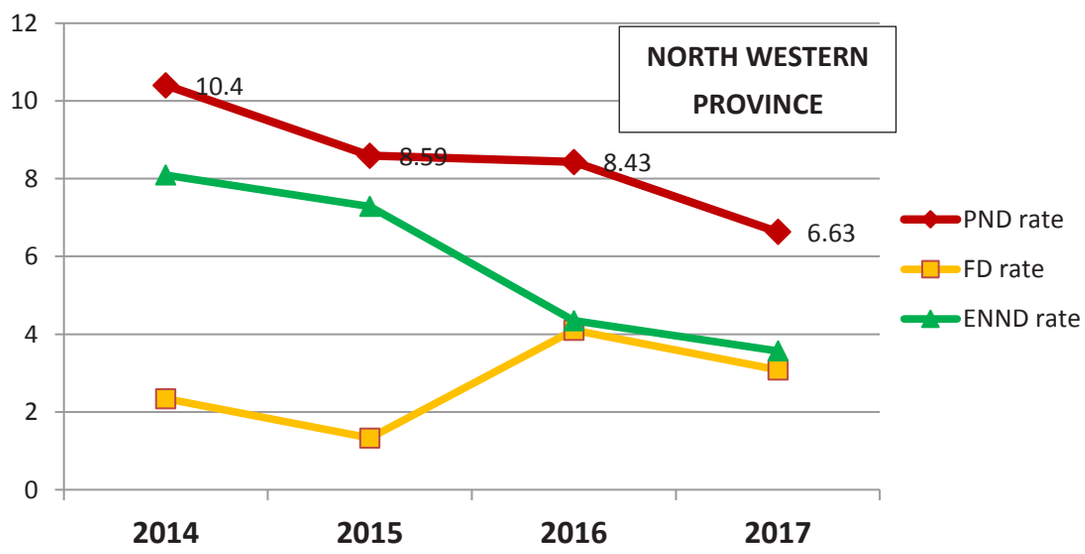


Greater contribution to PND rates in the North Central Province had been from Polonnaruwa District. Foetal death and PND rates reached the lowest in 2016 in the province as well as in Anuradhapura District.

e. North Western Province

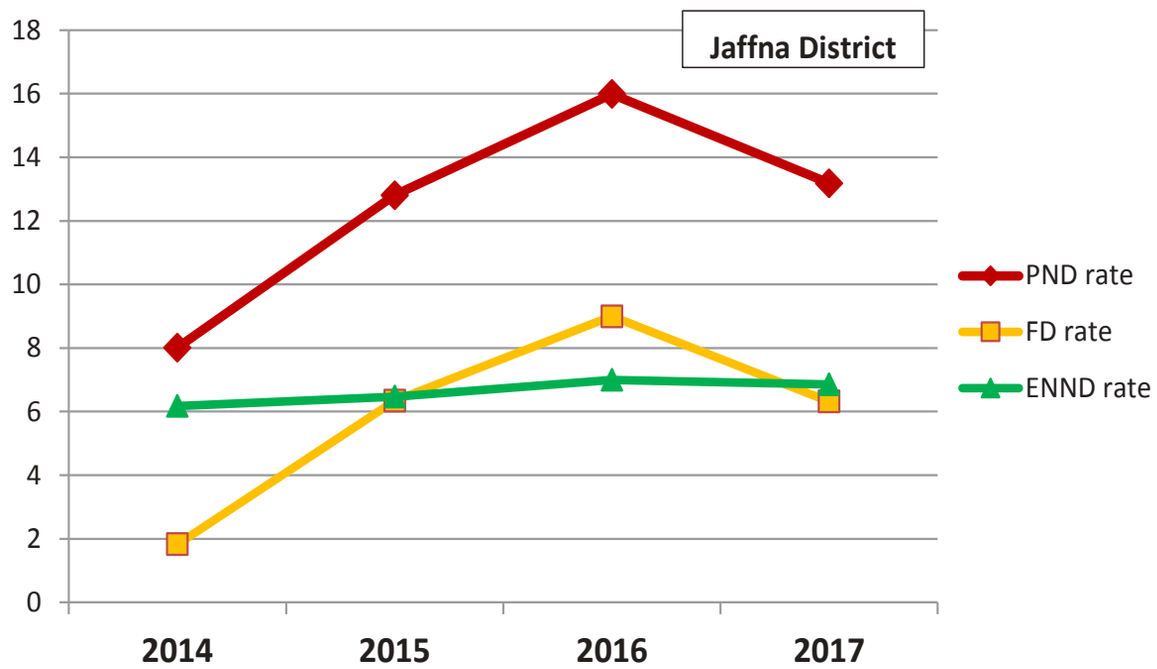


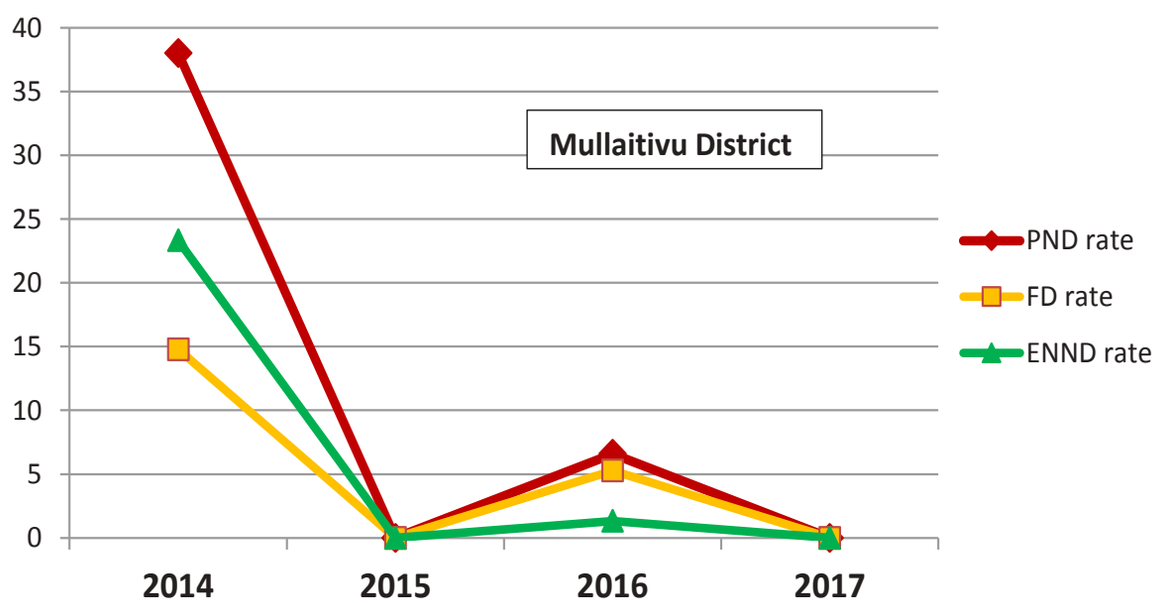


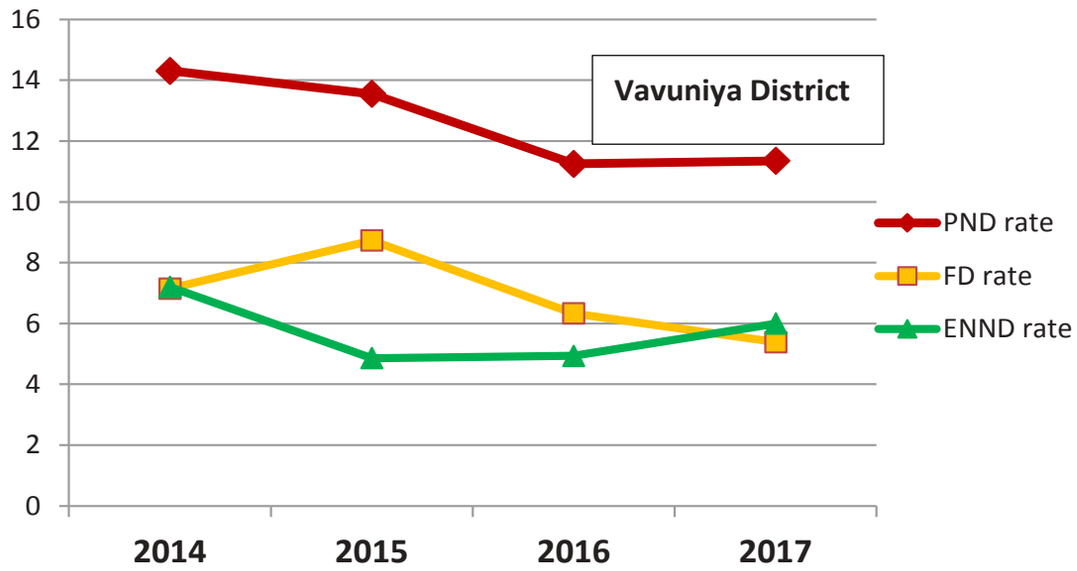


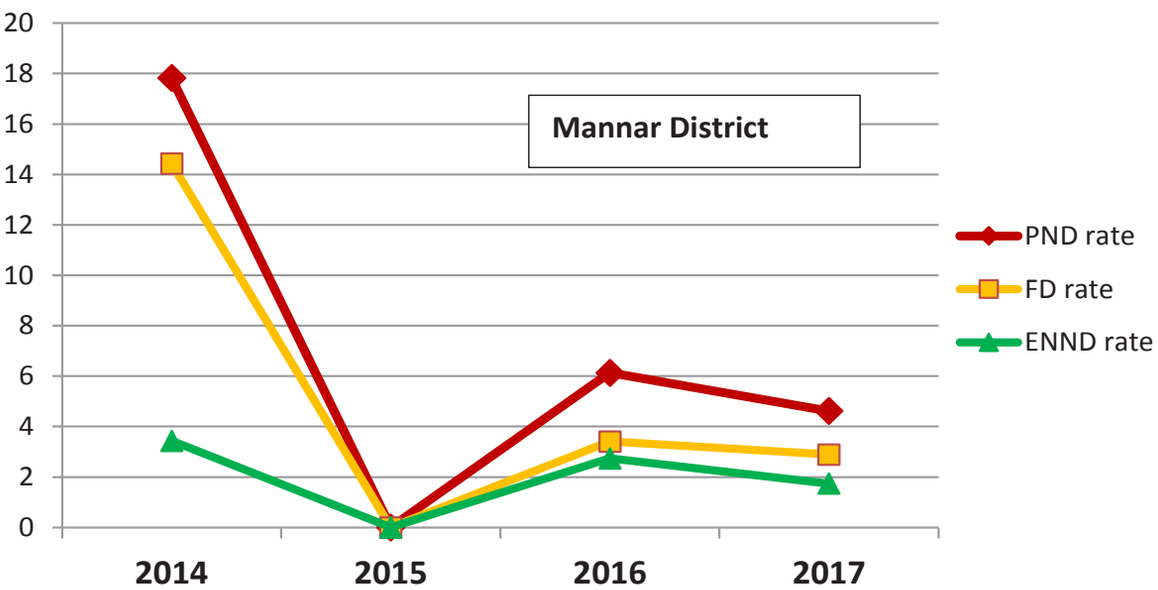
Puttalam District showed a greater decline in PND rates than Kurunegala District from 2014 to 2017, with a drastic reduction especially in the FD rate in 2015. This seemed to have contributed to a reduction in the PND rate in the North Western Province.

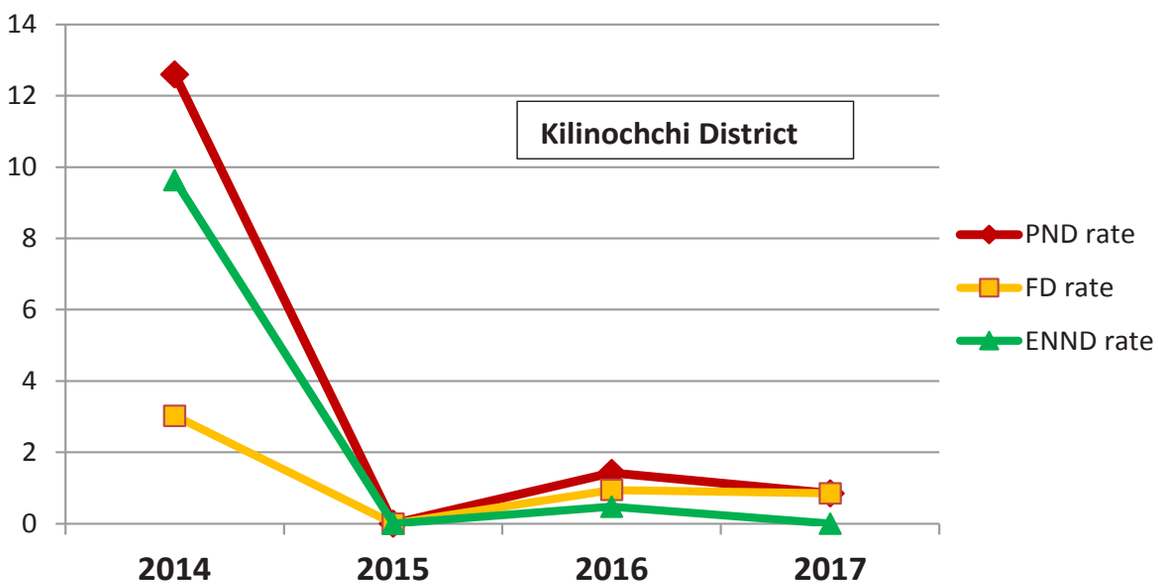
f. Northern Province

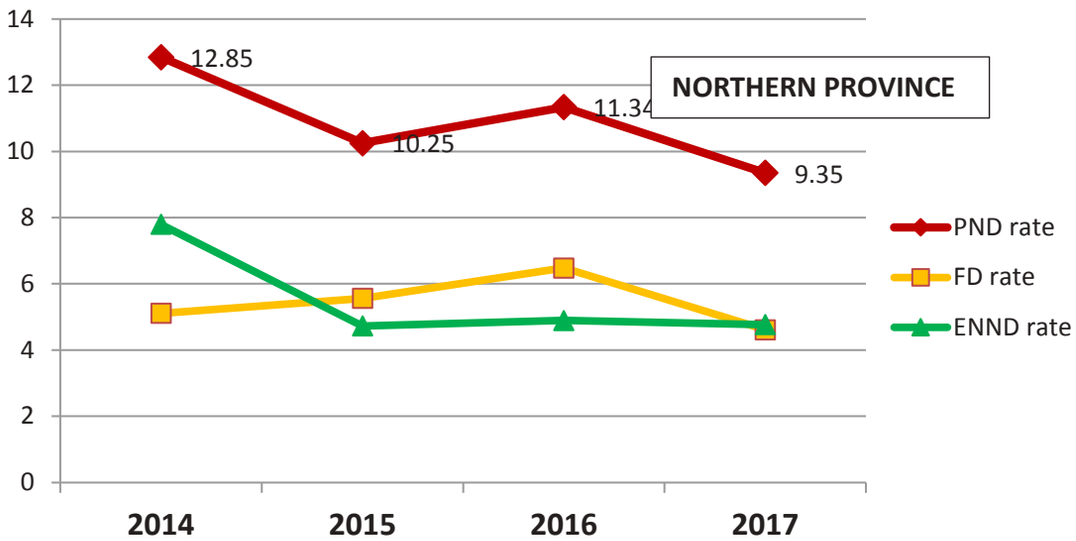





Vavuniya District
16
14
12
10
8
6
4
2
0
2014
2015
2016
2017
PND rate
FD rate
ENND rate

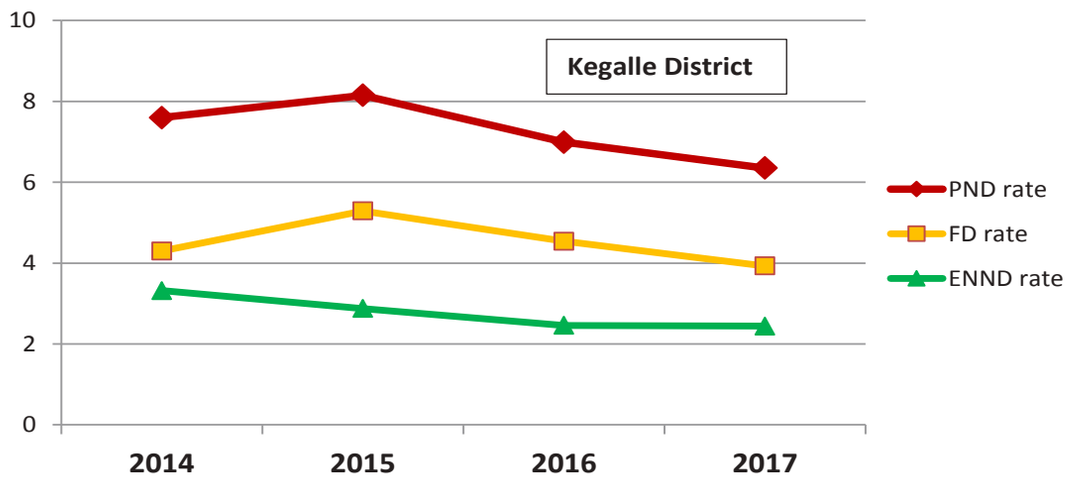

Mannar District
20
18
16
14
12
10
8
6
4
2
0
2014
2015
2016
2017
PND rate
FD rate
ENND rate

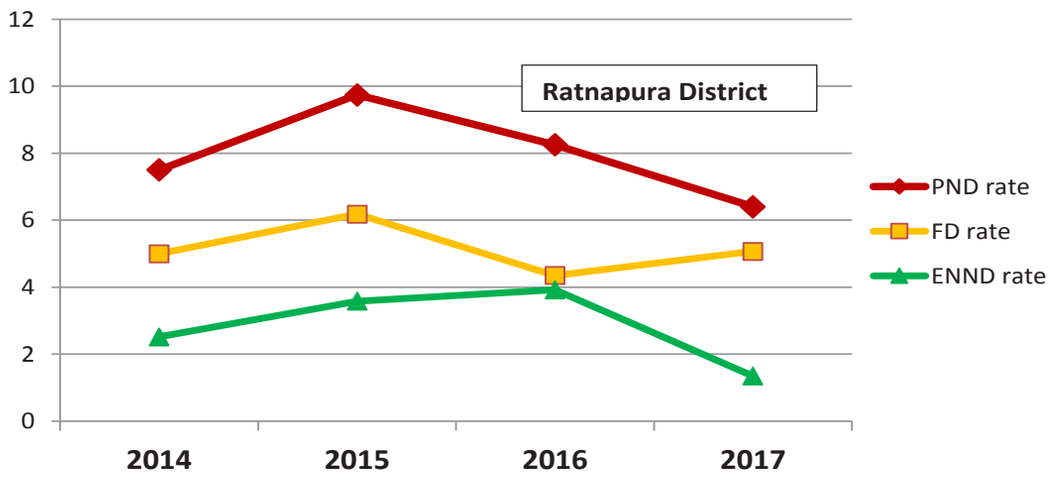

Kilinochchi District
14
12
10
8
6
4
2
0
2014
2015
2016
2017
PND rate
FD rate
ENND rate

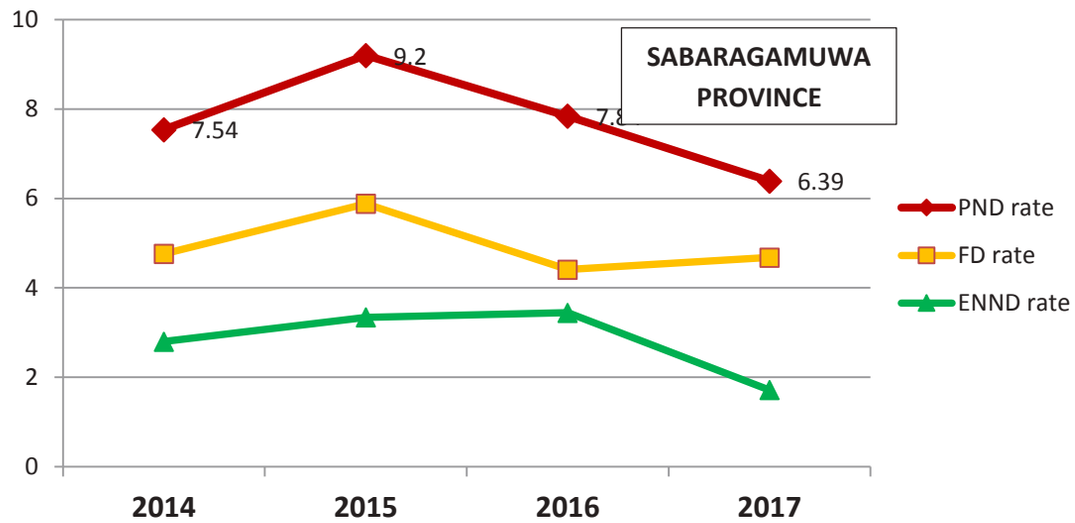


A wide variation in the PND rates are noted in the Northern Province, with the highest rates reported from Mullaitivu District (over 35 per 1000 total births). All three rates have drastically reduced from 2014 to 2015 in Mullaitivu, Mannar and Kilinochchi Districts, in contrast to an increase in both PND and FD rates in Jaffna District by 2016.

g. Sabaragamuwa Province

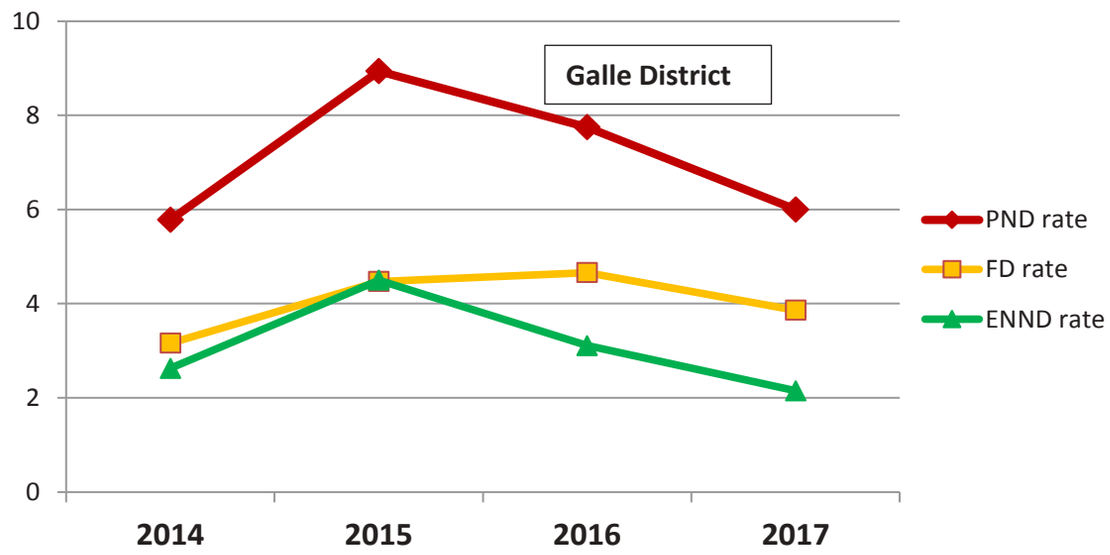


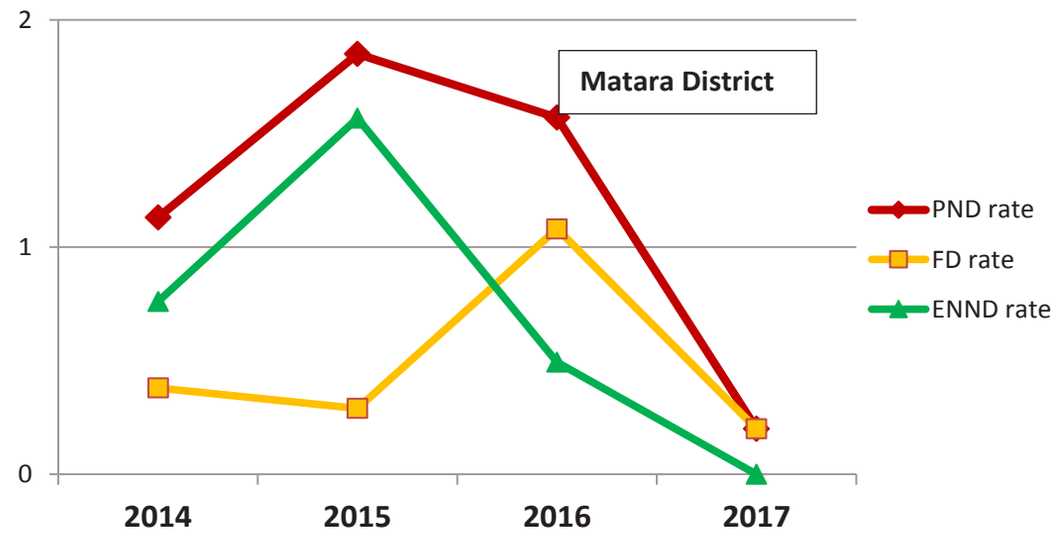


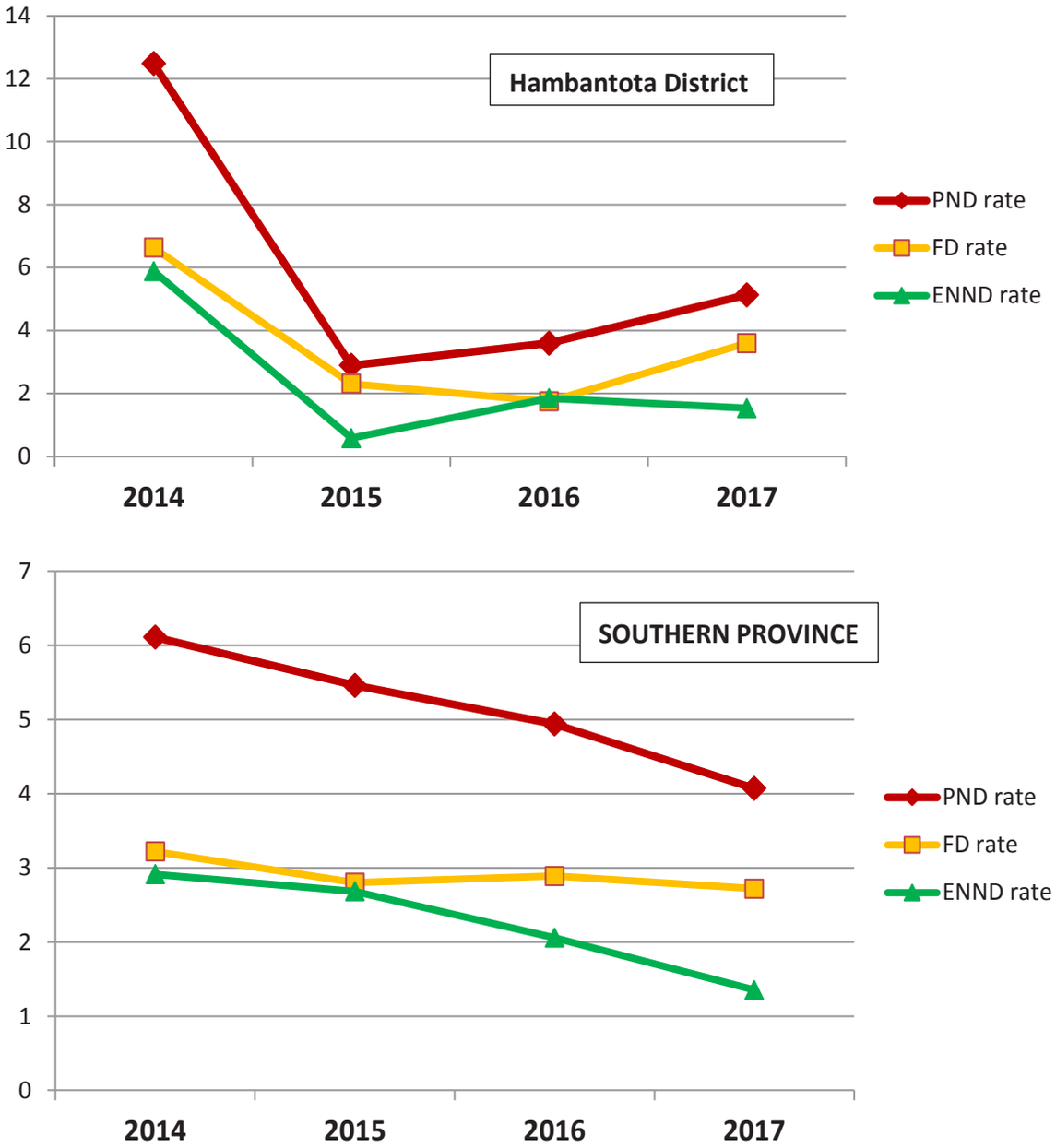


Both districts in the Sabaragamuwa Province have shown a steady decline in PND rates from 2015 onwards, which are compatible with the overall trends reported for the province.

h. Southern Province

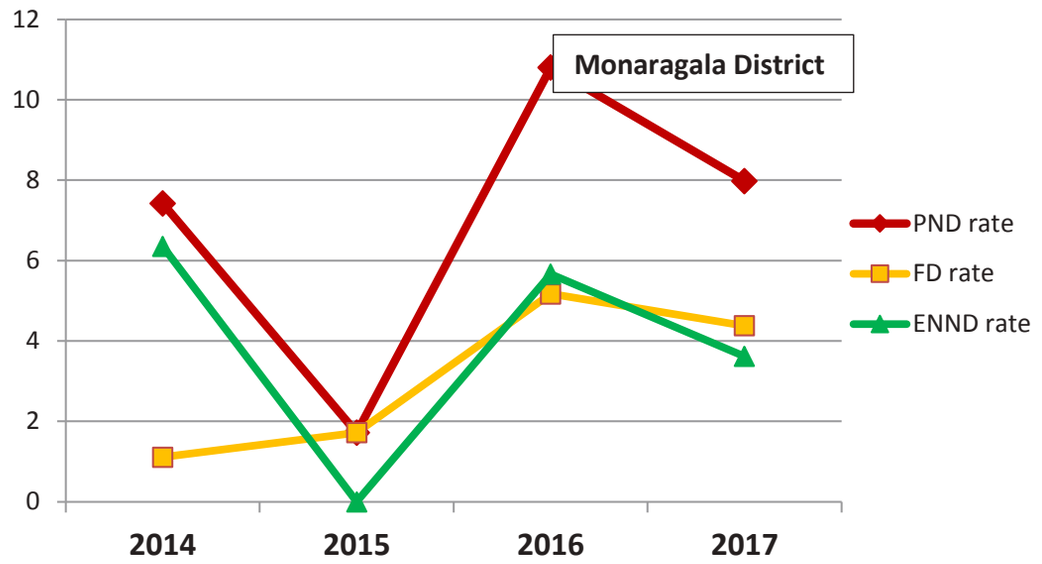


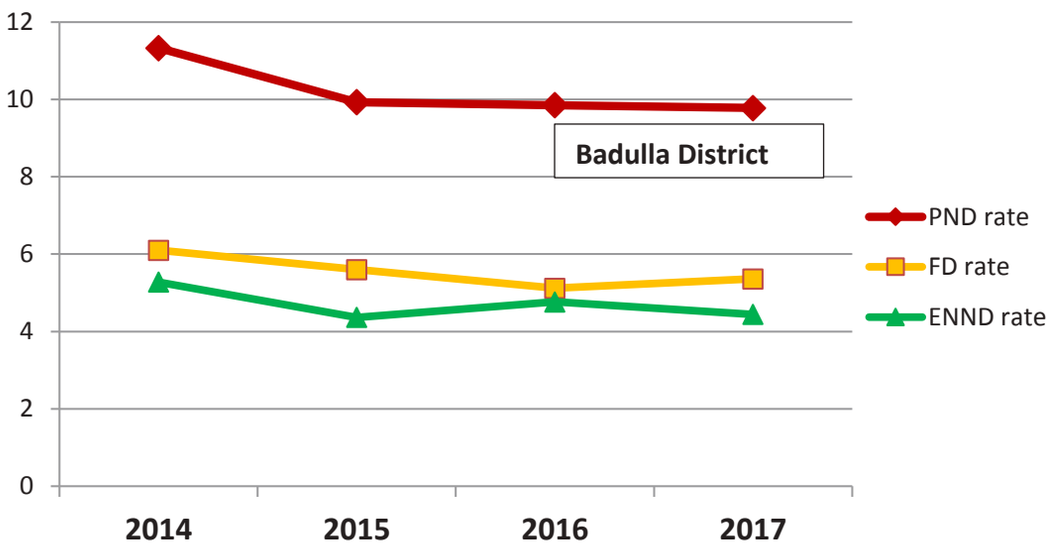


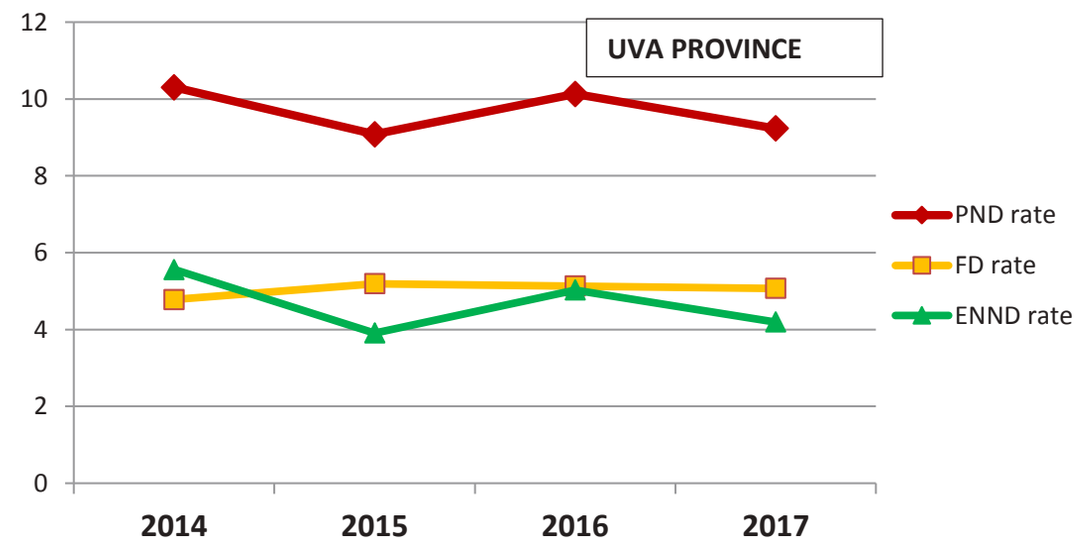


A gradual decline in the PND and ENND rates are observed in Southern Province. The contribution to PNDs from Matara District had been the least (less than 2 per 1000 total births). The lowest reported rates were for ENNDs in 2015 in Hambantota District in contrast to the highest corresponding rates in the same year in Galle District.

i. Uva Province







The decline in all three types of death rates had been at a slower pace in the Uva Province as well as in its two districts. Greater contribution to the PND rate in the province was from Badulla District, whereas the decline gained in 2015 could not be sustained in the following years in Monaragala District.

3.5 Characteristics of the perinatal deaths

Perinatal deaths of 2014-2017 are described below by the type of hospital and maternal, baby and pregnancy related characteristics.

3.5.1 By the type of hospital

Perinatal deaths taking place in all specialised institutions (hospitals with an obstetrician or a pediatrician/ neonatologist) and in non-specialised/ peripheral hospitals with obstetric care are included in the National PND Surveillance System in Sri Lanka (Table 3.5).

Table 3.5 : Distribution of the perinatal deaths by type of hospital

Type of hospital *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Teaching hospital	548	472	1020	549	421	970	453	429	882	339	349	688
	33.9%	33.8%	33.9%	46.6%	38.7%	42.8%	39.8%	34.8%	37.2%	40.5%	32.3%	35.9%
Provincial general hospital	232	124	356	246	173	419	133	167	300	113	135	248
	14.4%	8.9%	11.8%	20.9%	15.9%	18.5%	11.7%	13.6%	12.7%	13.5%	12.5%	12.9%
District general hospital	462	423	885	202	215	417	282	293	575	181	249	430
	28.6%	30.3%	29.4%	17.2%	19.8%	18.4%	24.8%	23.8%	24.3%	21.6%	23.1%	22.4%
Base hospital	373	374	747	180	271	451	268	338	606	205	346	551
	23.1%	26.8%	24.8%	15.3%	24.9%	19.9%	23.6%	27.5%	25.6%	24.5%	32.1%	28.7%
Divisional hospital	0	2	2	0	8	8	0	0	0	0	0	0
	0.0%	0.1%	0.1%	0.0%	0.7%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Private hospital	0	0	0	0	0	0	2	4	6	0	0	0
	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.3%	0.0%	0.0%	0.0%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

Each year, the majority of PNDs were reported from teaching hospitals. This was followed by district general hospitals in 2014 and 2015 years and by base hospitals in 2017 and 2016 years. Across the years, there is no pattern in reporting by different types of hospitals, however, the reporting by base hospitals (from 23.1% to 28.7%) has increased from 2014 to 2017 years, while it had decreased for district general hospitals for the same period (from 28.6% to 22.4%).

3.5.2 By the maternal characteristics

Maternal characteristics such as ethnicity, gravida, parity, living children and maternal age were assessed over the 2014-2017 period.

a. Ethnicity

Table 3.6 : Distribution of the perinatal deaths by ethnicity of mothers

Ethnicity *	2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Sinhala	695	591	1286	724	695	1419	570	737	1307
	59.0%	54.3%	56.8%	63.6%	56.5%	59.9%	68.0%	68.3%	68.2%
Tamil	135	241	376	154	233	387	159	178	337
	11.5%	22.2%	16.6%	13.5%	18.9%	16.3%	19.0%	16.5%	17.6%
Muslim	117	122	239	140	154	294	89	130	219
	9.9%	11.2%	10.6%	12.3%	12.5%	12.4%	10.6%	12.0%	11.4%
Other (Burgher)	1	0	1	3	2	5	0	0	0
	0.08%	0.0%	0.0%	0.3%	0.2%	0.2%	0.0%	0.0%	0.0%
Not available	229	134	363	117	147	264	20	34	54
	19.5%	12.3%	16.0%	10.3%	11.9%	11.1%	2.4%	3.2%	2.8%
Total	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

Data on ethnicity were not collected during the year 2014, thus not available in the 2014 database (Table 3.6). As expected, majority of the deaths were babies of mothers of Sinhalese ethnicity. Across the years, the proportions of all three types of deaths (PND, FD and ENND) have increased among Sinhalese women. In contrast, in Tamil women, the FD proportions have been coming down over the years. Both these observations could reflect the 'not available' category decreasing across the years.

b. Gravida

Gravida indicates the number of times a woman is or has been pregnant, regardless of the pregnancy outcome.

Table 3.7 : Distribution of the perinatal deaths by gravida of mothers

Gravida *	2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
0	0	7	7	0	1	1	3	2	5
	0.0%	0.6%	0.3%	0.0%	0.1%	0.0%	0.4%	0.2%	0.3%
1	337	347	684	1	0	1	72	139	211
	28.6%	31.9%	30.2%	0.1%	0.0%	0.0%	8.6%	12.9%	11.0%
2	306	322	628	289	271	560	63	120	183
	26.0%	29.6%	27.7%	25.4%	22.0%	23.6%	7.5%	11.1%	9.5%
3	190	215	405	219	258	477	59	87	146
	16.1%	19.8%	17.9%	19.2%	21.0%	20.1%	7.0%	8.1%	7.6%
4	65	109	174	118	186	304	21	30	51
	5.5%	10.0%	7.7%	10.4%	15.1%	12.8%	2.5%	2.8%	2.7%
5	27	42	69	60	88	148	7	12	19
	2.3%	3.9%	3.0%	5.3%	7.1%	6.2%	0.8%	1.1%	1.0%
6	13	11	24	29	36	65	3	2	5
	1.1%	1.0%	1.1%	2.5%	2.9%	2.7%	0.4%	0.2%	0.3%
7	2	8	10	7	11	18	2	2	4
	0.2%	0.7%	0.4%	0.6%	0.9%	0.8%	0.2%	0.2%	0.2%
8	0	4	4	1	4	5	0	0	0
	0.0%	0.4%	0.2%	0.1%	0.3%	0.2%	0.0%	0.0%	0.0%
Not available	237	23	260	414	376	790	608	685	1293
	20.1%	2.1%	11.5%	36.4%	30.5%	33.3%	72.6%	63.5%	67.4%
Total	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

There were no data collected on gravida during the year 2014 (Table 3.7). During each other year, most of the deaths were of women who were gravid for the first, second or third time. Multi-gravid (more than five pregnancies) women were fewer in proportion (0.5%-3.7%). However, the reporting quality of this data is poor, as shown by the gravida reported as 0 and 'data not available' categories exceeding 30% for both ENND and FDs (except in 2015). Especially, 2017 data were not available by more than 60%. This is most likely due to poor understanding of the term gravid.

c. Parity

Parity indicates the number of pregnancies reaching viable gestational age (including live births and stillbirths).

Table 3.8 : Distribution of the perinatal deaths by parity of mothers

Parity *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
0	0	0	0	196	291	487	172	237	409	33	82	115
	0.0%	0.0%	0.0%	16.7%	26.7%	21.5%	15.1%	19.3%	17.3%	3.9%	7.6%	6.0%
1	573	498	1071	397	368	765	252	308	560	192	239	431
	35.5%	35.7%	35.6%	33.7%	33.8%	33.8%	22.1%	25.0%	23.6%	22.9%	22.2%	22.5%
2	501	431	932	230	254	484	170	197	367	138	211	349
	31.0%	30.9%	31.0%	19.5%	23.3%	21.4%	14.9%	16.0%	15.5%	16.5%	19.6%	18.2%
3	327	319	646	108	99	207	66	67	133	96	86	182
	20.2%	22.9%	21.5%	9.2%	9.1%	9.1%	5.8%	5.4%	5.6%	11.5%	8.0%	9.5%
4	114	84	198	28	36	64	27	21	48	41	37	78
	7.1%	6.0%	6.6%	2.4%	3.3%	2.8%	2.4%	1.7%	2.0%	4.9%	3.4%	4.1%
5	41	49	90	13	11	24	9	8	17	16	13	29
	2.5%	3.5%	3.0%	1.1%	1.0%	1.1%	0.8%	0.6%	0.7%	1.9%	1.2%	1.5%
6	11	5	16	1	4	5	2	2	4	3	0	3
	0.7%	0.4%	0.5%	0.1%	0.4%	0.2%	0.2%	0.2%	0.2%	0.4%	0.0%	0.2%
7	1	0	1	0	2	2	0	0	0	2	0	2
	0.1%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%
8	0	0	0	0	1	1	0	0	0	1	1	2
	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
Not available	47	9	56	204	22	226	440	391	831	316	410	726
	2.9%	0.6%	1.9%	17.3%	2.0%	10.0%	38.7%	31.8%	35.1%	37.7%	38.0%	37.9%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

In each year, most of the deaths were of women who were parous for the first or second time (Table 3.8). Multi-parous (more than five pregnancy deliveries) women were in the range of 0.2% to 0.5%. Though slightly better than that on gravida, the reporting quality of parity is poor, as shown by parity reported as 0 and 'data not available' categories exceeding 30% for both ENND and FDs in 2015-2017.

d. Living children

No data were available for 2015-2017.

Table 3.9 : Distribution of the perinatal deaths by living children of mothers

Living children *	PND status		Total
	ENND	FD	
None	611	576	1187
	37.8%	41.3%	39.4%
1	506	451	957
	31.3%	32.3%	31.8%
2	355	276	631
	22.0%	19.8%	21.0%
3	77	69	146
	4.8%	4.9%	4.9%
4	16	14	30
	1.0%	1.0%	1.0%
5	3	0	3
	0.2%	0.0%	0.1%
Not available	47	9	56
	2.9%	0.6%	1.9%
Total	**1615**	**1395**	**3010**

** In each category, the number is given in top row and its percentage in the bottom row.*

Based on 2014 data, majority of the deaths were of women having only one child or none (ENND-69.1%; FD-73.6% and PND-71.2%) (Table 3.9).

e. Maternal Age

Maternal age was assessed on the average value (mean), minimum and maximum age.

Table 3.10: Distribution of the perinatal deaths by maternal age

Maternal age (years)	ENND				FD				Total
	No. *	Mean (SD)	Min.	Max.	No. *	Mean (SD)	Min.	Max.	Mean (SD)
2014	1538	29.2 (5.7)	9	45	1334	29.3 (5.8)	14	45	29.3 (5.7)
2015	833	28.9 (6.2)	13	45	1014	29.7 (6.0)	16	48	29.4 (6.1)
2016	690	28.7 (5.9)	15	49	820	29.7 (6.0)	14	46	29.2 (6.0)
2017	534	29.5 (6.1)	17	48	709	29.4 (5.8)	14	48	29.4 (5.9)

** Missing data on maternal age*

Maternal age at the time of death of baby has remained around 29 years on average over the four years for ENND as well as FDs (Table 3.10). Minimum and maximum ages too seem to be similar between the years.

Table 3.11 : Distribution of the perinatal deaths by age of mothers

Maternal age groups *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Less than 20 years	48	43	91	54	43	97	38	34	72	27	26	53
	3.0%	3.1%	3.0%	4.6%	4.0%	4.3%	3.3%	2.8%	3.0%	3.2%	2.4%	2.8%
20-35 years	1210	1038	2248	651	793	1444	556	641	1197	406	563	969
	74.9%	74.4%	74.7%	55.3%	72.9%	63.8%	48.9%	52.1%	50.5%	48.4%	52.2%	50.5%
Over 35 years	280	253	533	128	178	306	96	145	241	101	120	221
	17.3%	18.1%	17.7%	10.9%	16.4%	13.5%	8.4%	11.8%	10.2%	12.1%	11.1%	11.5%
Not available	77	61	138	344	74	418	448	411	859	304	370	674
	4.8%	4.4%	4.6%	29.2%	6.8%	18.5%	39.4%	33.4%	36.3%	36.3%	34.3%	35.2%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row*

Each year, majority of the mothers were in 20-35-year age group (Table 3.11). This proportion was marginally decreasing across the years for both FDs and ENNDs. Among the over 35 age group, FDs were on a slow declining trend.

3.5.3 By the characteristics of pregnancy

Pregnancy characteristics such as period of gestation and mode of delivery were assessed over 2014-2017 period.

a. Period of gestation

Table 3.12 shows the distribution of FDs by their POG (in complete gestational weeks) at the time of death. This analysis did not consider the FDs occurring before completion of 28 weeks gestation, as the revision made on the inclusion of foetal deaths of POG of 22-27 completed weeks (refer Guidelines on the National Feto-infant Mortality Surveillance Mechanism 2016) was implemented only in late 2017.

Table 3.12: Distribution of the foetal deaths by period of gestation

Period of gestation of foetal deaths (completed weeks) [1]	2014 [2]	2015	2016	2017
28-31 weeks	381	277	321	308
	28.1%	25.5%	26.1%	28.5%
32-35 weeks	390	207	367	331
	28.8%	19.0%	29.8%	30.7%
36-39 weeks	420	519	444	315
	30.9%	47.7%	36.1%	29.2%
40-44 weeks	164	85	99	125
	12.1%	7.8%	8.0%	11.6%
Total	**1355**	**1088**	**1231**	**1079**

1 In each category, the number is given in top row and its percentage in the bottom row.

2 'FD-POG not known' category (n=40) that was included in the data for year 2014 was excluded from this analysis.

Most of the FDs had taken place during 36-39 completed weeks of gestation, ranging between 29.2% and 47.7% (Table 3.12). In addition, a substantial proportion (7.8%-12.1%) of deaths was noted in 40-44 complete weeks of gestation, with 44 weeks reported as the highest. Within each year, the proportion of FDs was not getting lesser towards term.

Post-term deliveries seem to have constituted a substantial proportion of foetal deaths, which needs attention at the decision-making stage on delivery.

Table 3.13: Distribution of the early neonatal deaths by period of gestation

Period of gestation of early neonatal deaths (completed weeks) *	2014	2015	2016	2017
< 28 weeks	161	229	192	60
	10.0%	19.5%	16.9%	7.2%
28 weeks or more	1389	906	789	750
	86.0%	77.0%	69.3%	89.5%
Not available / Not able to determine based on the recorded data	65	42	157	28
	4.0%	3.6%	13.8%	3.3%
Total	**1615**	**1177**	**1138**	**838**

** In each category, the number is given in top row and its percentage in the bottom row.*

As for ENNDs, majority of the deaths were of babies who had completed 28 weeks of gestation, ranging between 69.3% and 89.5% (Table 3.13). Further, the proportion of babies dying before completion of 28 weeks gestation, has not increased across the time period from 2014-2017. This may indicate either more premature babies surviving the first seven days of life or more premature babies dying as still births before being born alive.

b. Mode of delivery

Table 3.14 : Distribution of the perinatal deaths by mode of delivery

Mode of delivery *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Normal vaginal delivery	931	950	1881	492	684	1176	349	548	897	217	525	742
	57.6%	68.1%	62.5%	41.8%	62.9%	51.9%	30.7%	44.5%	37.9%	25.9%	48.7%	38.7%
Provider assisted delivery:												
• Assisted vaginal delivery	33	33	66	3	36	39	1	3	4	0	0	0
	2.0%	2.4%	2.2%	0.3%	3.3%	1.7%	0.1%	0.2%	0.2%	0.0%	0.0%	0.0%
• Forceps delivery	0	0	0	9	7	16	3	5	8	11	8	19
	0.0%	0.0%	0.0%	0.8%	0.6%	0.7%	0.3%	0.4%	0.3%	1.3%	0.7%	1.0%
• Vacuum delivery	0	0	0	8	3	11	17	5	22	7	4	11
	0.0%	0.0%	0.0%	0.7%	0.3%	0.5%	1.5%	0.4%	0.9%	0.8%	0.4%	0.6%
• Prostaglandin Induction	0	0	0	1	6	7	0	0	0	0	0	0
	0.0%	0.0%	0.0%	0.1%	0.6%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
• Syntocinon augmentation	0	0	0	0	4	4	0	0	0	0	0	0
	0.0%	0.0%	0.0%	0.0%	0.4%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
• Breech delivery	0	0	0	18	21	39	28	26	54	0	31	47
	0.0%	0.0%	0.0%	1.5%	1.9%	1.7%	2.5%	2.1%	2.3%	1.9%	2.9%	2.5%
• Elective LSCS	61	20	81	27	28	55	71	50	121	71	36	107
	3.8%	1.4%	2.7%	2.3%	2.6%	2.4%	6.2%	4.1%	5.1%	8.5%	3.3%	5.6%
• Emergency LSCS	546	306	852	257	135	392	313	158	471	244	138	382
	33.8%	21.9%	28.3%	21.8%	12.4%	17.3%	27.5%	12.8%	19.9%	29.1%	12.8%	19.9%
• LSCS (not classified)	0	0	0	161	86	247	9	13	22	0	0	0
	0.0%	0.0%	0.0%	13.7%	7.9%	10.9%	0.8%	1.1%	0.9%	0.0%	0.0%	0.0%
• Emergency Hysterotomy	0	0	0	3	9	12	15	9	24	10	4	14
	0.0%	0.0%	0.0%	0.3%	0.8%	0.5%	1.3%	0.7%	1.0%	1.2%	0.4%	0.7%
Not available	44	86	130	198	69	267	332	414	746	262	333	595
	2.7%	6.2%	4.3%	16.8%	6.3%	11.8%	29.2%	33.6%	31.5%	31.3%	30.9%	31.0%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

During all four years, the highest proportion among foetal as well as ENN deaths was following normal vaginal delivery (ranging from 25.9% to 68.1%) compared to each of the provider-assisted delivery methods (Table 3.14). However, across the years, vaginal delivery performed among ENNDs has drastically reduced (from 57.6% in 2014 to 25.9% in 2017), indicating the good standards of perinatal services available in hospitals for birth assistance.

The association between POG status (whether POG < 36 weeks or POG of ≥ 36 completed weeks) and mode of delivery (whether provider assisted delivery or normal vaginal delivery) was assessed (Table 3.15).

Table 3.15 : Association between the period of gestation and mode of delivery of perinatal deaths

Period of gestation (completed weeks) [1, 2]	Provider-assisted delivery [2]	
	Yes	No
Foetal deaths		
< 36 weeks	164	356
	31.5%	68.5%
≥ 36 weeks	171	328
	34.3%	65.7%
Total	**335**	**684**
Early neonatal deaths		
< 36 weeks	271	305
	47.0%	53.0%
≥ 36 weeks	202	174
	53.7%	46.3%
Total	**473**	**479**

[1] *In each category, the number is given in top row and its percentage (calculated for the row total) in the bottom row; Associations shown only for the year 2015.*
[2] *If mode of delivery (in PNDs) or POG (in ENNDs) was not available, such deaths were excluded from the analysis, thus FDs or ENNDs considered are less than the total for the given year*

Though the proportion of deaths delivered through provider-assisted delivery was slightly higher in deaths of late POG (POG ≥ 36 completed weeks) compared to those of POG less than 36 weeks, there was no statistically significant difference observed for both FDs and ENNDs (p> 0.05).

3.5.4 By the characteristics of baby

Baby's characteristics such as birth weight, sex, post-mortem done or not, age at the time of ENNDs were assessed over 2014-2017 period.

a. Timing of foetal deaths

Table 3.16: Distribution of the foetal deaths by timing of death

Type of death	2014 *		2015		2016		2017	
	No.	%	No.	%	No.	%	No.	%
FD-Antepartum	-	-	594	54.6	1021	82.9	827	76.6
FD-Intrapartum			125	11.5	67	5.3	73	6.8
FD-Not known			369	33.9	143	11.6	179	16.6
Total FD	**1395**	**100.0**	**1088**	**100.0**	**1231**	**100.0**	**1079**	**100.0**

* *In 2014, foetal deaths were not sub-divided as antepartum and intrapartum deaths.*

Of the FDs (Table 3.16), the majority took place during antepartum period. There was no declining trend observed on intrapartum FDs across the years, suggesting no apparent improvement made in such care. Further, FD-Not known group included the deaths reported as 'unable to classify' and those with no available data. A noteworthy proportion of FDs belonged to this group (33.9%, 11.6% and 16.6%).

b. Age at the time of early neonatal deaths (days)

Table 3.17 : Distribution of the early neonatal deaths by age at death

Age in days	2014		2015		2016		2017	
	No.	%	No.	%	No.	%	No.	%
1st day of life	617	38.2	429	36.4	389	34.2	107	12.8
2nd day of lie	259	16.0	166	14.1	189	16.6	47	5.6
3rd day of life	185	11.5	124	10.5	119	10.5	38	4.5
4th day of life	125	7.7	84	7.1	73	6.4	30	3.6
5th day of life	135	8.4	74	6.3	67	5.9	29	3.5
6th day of life	118	7.3	77	6.5	48	4.2	19	2.3
7th day of life	106	6.6	37	3.1	35	3.1	17	2.0
Not available / Not able to determine based on the recorded data *	70	4.3	186	84.4	218	19.2	551	65.8
Total	**1615**	**100.0**	**1177**	**100.0**	**1138**	**100.0**	**838**	**100.0**

** 2014=includes the 'NND-not known' category (n=70); 2015-2017=includes deaths reporting Item U as 'ENND' but Item T (age at death) not completed in the Summary Sheet of P-1 Format*

During each year, majority of the deaths took place within the first three days of life (Table 3.17). Across the years, the proportion of babies dying on the first day of life was declining from 38.2% in 2014 to 12.8% by 2017. A similar reduction was also noted in relation to deaths on the third day of life (from 11.5% to 4.5%).

c. Birth weight

Table 3.18: Distribution of the perinatal deaths by birth weight

Birth weight (in grams) *	ENND				FD			
	No.	Mean (SD)	Min.	Max.	No.	Mean (SD)	Min.	Max.
2014	1522	1885.5 (1399.4)	360	4670	1344	1936.15 (883.7)	140	5020
2015	1177	1692.2 (911.8)	200	4050	1088	1986.7 (960.6)	200	5500
2016	1134	1837.6 (983.7)	102	4800	1216	1810.9 (1022.2)	100	5100
2017	791	1950.9 (923.1)	200	5250	1044	2067.5 (1379.8)	100	2800

** Missing data on birth weight*

The average birth weight of babies ranged between 1692-1951g among the ENNDs and 1811-2068g among the FDs (Table 3.18). The weight did not seem to differ significantly between FDs and ENNDs. Minimum weight was as low as 100g and as high as 5500g.

It should also be noted that the recordings on birth weight were missing only for a minimal percentage in 2014 (ENND=5.7%; FD=3.7%); 2015 (none); 2016 (0.3%; 1.2%) and 2017 (5.6%; 3.2%), implying the importance given in ward settings to the recording of birth weight for both FDs and ENNDs.

d. Sex of baby

Table 3.19 : Distribution of the perinatal deaths by sex of baby

Sex *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Female	654	540	1194	460	421	881	456	537	993	345	468	813
	40.5%	38.7%	39.7%	39.1%	38.7%	38.9%	40.1%	43.6%	41.9%	41.2%	43.4%	42.4%
Male	854	684	1538	576	489	1065	585	551	1136	390	515	905
	52.9%	49.0%	51.1%	48.9%	44.9%	47.0%	51.4%	44.8%	48.0%	46.5%	47.7%	47.2%
Ambiguous	12	22	34	11	13	24	31	32	63	19	28	47
	0.7%	1.6%	1.1%	0.9%	1.2%	1.1%	2.7%	2.6%	2.7%	2.3%	2.6%	2.5%
Not available	95	149	244	130	164	294	66	111	177	84	68	152
	5.9%	10.7%	8.1%	11.1%	15.1%	13.0%	5.8%	9.0%	7.5%	10.0%	6.3%	7.9%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

During each year, majority of both ENN and foetal deaths were of male babies (Table 3.19). The detection of ambiguous sex was more prominent in 2016-2017 period than in 2014-2015 period.

e. Post-mortem of baby

Table 3.20 : Distribution of the perinatal deaths by conduct of post-mortem examination

Post-mortem of baby *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Done	173	60	233	95	66	161	95	92	187	15	6	21
	10.7%	4.3%	7.7%	8.1%	6.1%	7.1%	8.3%	7.5%	7.9%	1.8%	0.6%	1.1%
Not done	283	309	592	749	629	1378	508	461	969	103	115	218
	17.5%	22.2%	19.7%	63.6%	57.8%	60.8%	44.6%	37.4%	40.9%	12.3%	10.7%	11.4%
Not available	1159	1026	2185	333	393	726	535	678	1213	720	958	1678
	71.8%	73.5%	72.6%	28.3%	36.1%	32.0%	47.0%	55.1%	51.2%	85.9%	88.8%	87.5%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row.*

During each year, post-mortem examinations had been carried out in less than 11% of the ENNDs (1.8%-10.7%) and even lesser proportion among the FDs (0.6%-7.5%) (Table 3.20). More importantly, the information on whether post-mortem was done or not was missing in majority of the records sent to FHB on ENNDs (28.3% - 85.9%) and FDs (36.1% - 88.8%).

3.6 Cause of death

Classification of the causes of PND is complex due to complicated pathophysiological processes occurring in mother, foetus and placenta. By applying ICD-10 coding rules to perinatal deaths, the ICD-perinatal mortality (ICD-PM) system is developed. It initially classifies the COD of PNDs into 'ICD-PM groups' according to the time of death (Antepartum: A1-A6, Intrapartum: I1-I7 and Neonatal: N1-N11). This information is part of the minimum set of indicators that need to be collected on PNDs. Next, using a multi-layered approach, ICD-10 codes (A33, A50, P05-P96, Q00-Q99) are assigned to each ICD-PM group (WHO, 2016b). The ICD-PM groups (M1-M4) and ICD-10 codes are also applied to maternal conditions in PNDs. In this review, the COD of FDs and ENNDs, as per given according to the ICD-PM system was assessed for each year.

3.6.1 The availability of data on cause of death for further analysis

The availability of data on COD according to the ICD-PM system (Annexure 12) varied between the four years.

In the 2014 database, ICD-PM codes were not available for reporting the COD, as this classification was implemented from 2015 onwards. Despite this, the COD was available as a description for 1900 deaths (63% of the total PNDs reported in 2014). Of these, a considerable percentage was not in the form of a proper COD and could not be coded (e.g. COD given as IUD, macerated foetus, inquest ordered, etc). Such descriptions were re-categorized as 'COD not available' (N/A) while all other descriptions were coded according to the ICD-PM Groups. In many instances, there was more than one COD given for a single death, for which multiple codes were entered as it was not correct for the review team to decide on one COD out of the given causes.

From 2015 onwards, the COD was available according to the ICD-PM system and codes in the databases (i.e. In the P-2 Format, main group to be given as Item V-COD (ICD-PM group) and ICD-10 codes to be given as Item W-COD (Broad ICD-PM cause) and Item X-COD (ICD specific category)). However, all three datasets underwent a thorough cleaning and re-coding of the variables prior to analysis. If a death had only a description of the COD or only the specific cause (without any ICD-10 codes) available, coding of the COD was done by matching the description with the ICD-PM groups and ICD-10 codes. If the code and description were both available, the code was checked for accuracy against the description. Further, the available codes (and descriptions) were matched with the verified PND status (FD-intrapartum, FD-antepartum, ENND), so that any mismatching codes could be corrected. Especially in the 2017 dataset, some of the available COD descriptions were not proper CODs and could not be coded (e.g. IUD, Inquest ordered, macerated foetus) or were not meaningful against the PND status and were considered as 'code not available' (N/A).

Given below is a summary of the availability of COD after cleaning and coding of data according to the ICD-PM groups (Table 3.21).

Table 3.21 : Availability of the cause of death of perinatal deaths according to ICD-PM groups

ICD-PM group available or given as 'UTC' *	2014			2015			2016			2017		
	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND	ENND	FD	PND
Yes	1411	152	1563	933	333	1266	952	517	1469	535	488	1023
	87.4%	10.9%	51.9%	79.3%	30.6%	55.9%	83.7%	42.0%	62.0%	63.8%	45.2%	53.4%
No	204	1243	1447	244	755	999	186	714	900	303	591	894
	12.6%	89.1%	48.1%	20.7%	69.4%	44.1%	16.3%	58.0%	38.0%	36.2%	54.8%	46.6%
Total	**1615**	**1395**	**3010**	**1177**	**1088**	**2265**	**1138**	**1231**	**2369**	**838**	**1079**	**1917**

** In each category, the number is given in top row and its percentage in the bottom row; UTC=unable to classify*

In 2014, a COD was available for a majority (87.4%) of ENNDs. However, in FDs, a COD was reported only for a small proportion (10.9%).

In 2015, COD was available according to the ICD-PM groups (or given as unable to classify) in 43.7% of all PNDs prior to data cleaning. This percentage was improved to 55.9% after cleaning.

The corresponding percentage for 2016 (43.2%) was improved to 62%. In 2017, the ICD-PM groups or at least a description (e.g. even non-codable descriptions like IUD were considered as having a COD) were available in 46.7% of all deaths prior to data cleaning. This percentage was improved to 53.4%.

Despite intense efforts in training of medical staff island-wide, the recording of ICD-PM codes does not seem to have improved much across the years for both FDs and ENNDs.

3.6.2 Distribution of the perinatal deaths by ICD-PM groups

Tables 3.22 and 3.23 provide a summary of the FDs and ENNDs by their COD according to the ICD-PM groups (A, I and N) (Refer Annexure 12 for the nomenclature of A1-A6 and I1-I7).

Table 3.22: Distribution of the foetal deaths by cause of death according to ICD-PM groups

Cause of death – ICD PM group *		2014		2015		2016		2017	
		No.	%	No.	%	No.	%	No.	%
Antepartum	A1	58	38.2	52	15.6	74	14.3	66	13.5
	A2	8	5.3	6	1.8	8	1.5	3	0.6
	A3	54	35.5	38	11.4	50	9.7	46	9.4
	A4	7	4.6	20	6.0	16	3.1	12	2.5
	A5	11	7.2	55	16.5	18	3.5	26	5.3
	A6	13	8.6	116	34.8	296	57.3	287	58.8

Cause of death – ICD PM group *		2014		2015		2016		2017	
		No.	%	No.	%	No.	%	No.	%
Intrapartum	I1	-		4	1.2	8	1.5	1	0.2
	I2	-		-	-	-	-	-	
	I3	-		6	1.8	15	2.9	21	4.3
	I4	-		3	0.9	-	-	-	
	I5	-		-	-	1	0.2	-	
	I6	-		9	2.8	1	0.2	-	
	I7	-		4	1.2	22	4.3	8	1.6
Unable to classify		1	0.7	20	6.0	8	1.5	18	3.7
Total		**152**	**100.0**	**333**	**100.0**	**517**	**100.0**	**488**	**100.0**

** Deaths not reporting a cause of death are excluded from analysis. (Pl. refer Annexure 12 for the nomenclature of A1-A6 and I1-I7)*

Among FDs, the reporting of ICD-PM group was predominantly seen among antepartum deaths, of which A1 (congenital malformations, deformations and chromosomal abnormalities) and A6 (antepartum death of unspecified cause) have taken the lead. Across the years, the reporting of A1-A3 has decreased while the reporting of A6 has increased. The 'unable to classify' group has increased from 0.7% in 2014 to 3.7% in 2017.

Among the ENNDs, some deaths represented a combination of ICD-PM groups (Annexure 13). Such deaths were re-categorised into a single ICD-PM group, which considered the ICD-PM group appearing first in the combination. Following this, the distribution of ENNDs by ICD-PM groups was as follows (Refer Annexure 12 for the nomenclature of N1-N11). (Table 3.23).

Table 3.23 : Distribution of the early neonatal deaths by cause of death according to ICD-PM groups

Cause of death – ICD PM group *		2014		2015		2016		2017	
		No.	%	No.	%	No.	%	No.	%
Early neonatal	N1	437	31.0	263	28.2	335	35.2	201	37.6
	N2	30	2.1	18	1.9	24	2.5	16	3.0
	N3	1	0.1	3	0.3	8	0.8	9	1.7
	N4	88	6.2	55	5.9	58	6.1	38	7.1
	N5	30	2.1	14	1.5	25	2.6	4	0.7
	N6	255	18.1	117	12.5	110	11.6	56	10.5
	N7	224	15.9	97	10.4	128	13.4	71	13.3
	N8	35	2.5	23	2.5	14	1.5	15	2.8
	N9	291	20.6	309	33.1	222	23.3	84	15.7
	N10	6	0.4	3	0.3	14	1.5	2	0.4
	N11	13	0.9	25	2.7	12	1.3	37	6.9
Unable to classify		1	0.1	6	0.6	1	0.2	2	0.4
Total		**1411**	**100.0**	**933**	**1**	**952**	**100.0**	**535**	**100.0**

** Deaths reporting more than one ICD-PM group were re-categorised into a single group; Deaths not reporting a cause of death are excluded from analysis*
Pl. refer Annexure 12 for the nomenclature of N1-N11.

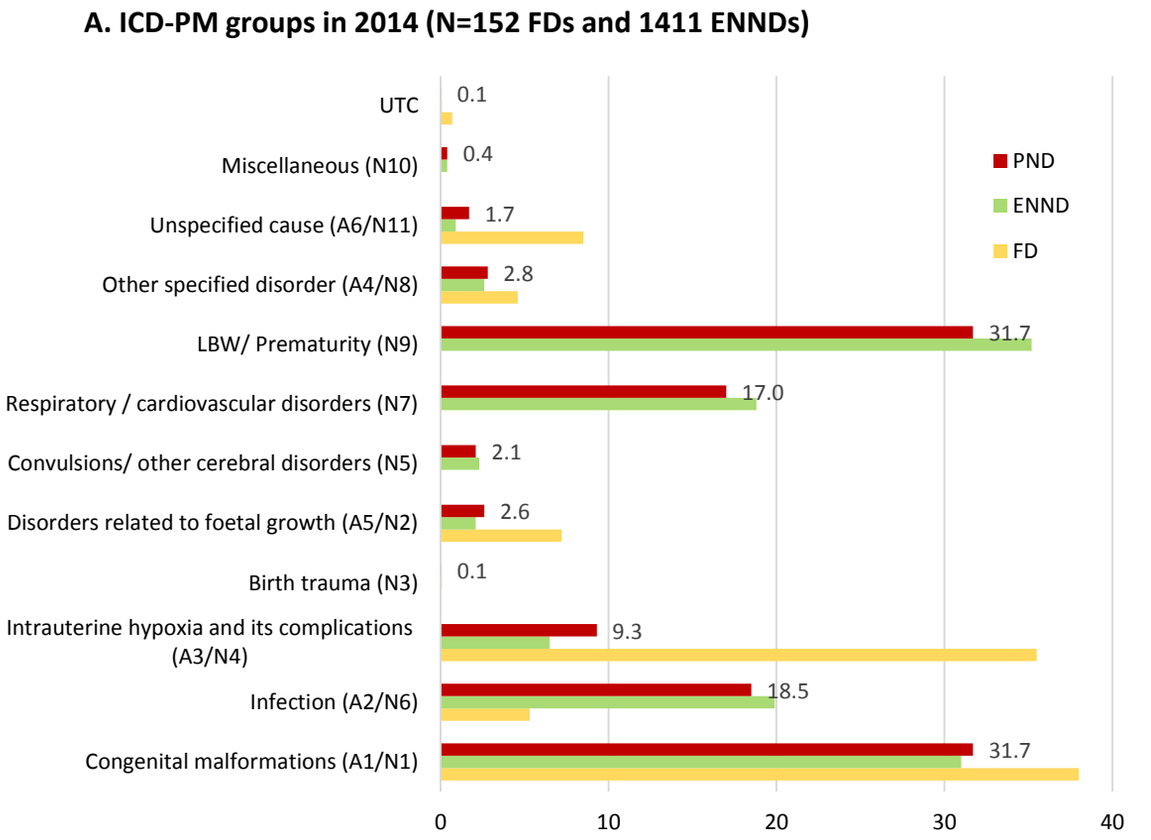
The most commonly reported ICD-PM group was N1 (congenital malformations, deformations and chromosomal abnormalities) and N9 (low birth weight and prematurity). The reporting of CODs did not show any trend across the years. The 'unable to classify' group ranged between 0.1% to 0.6%.

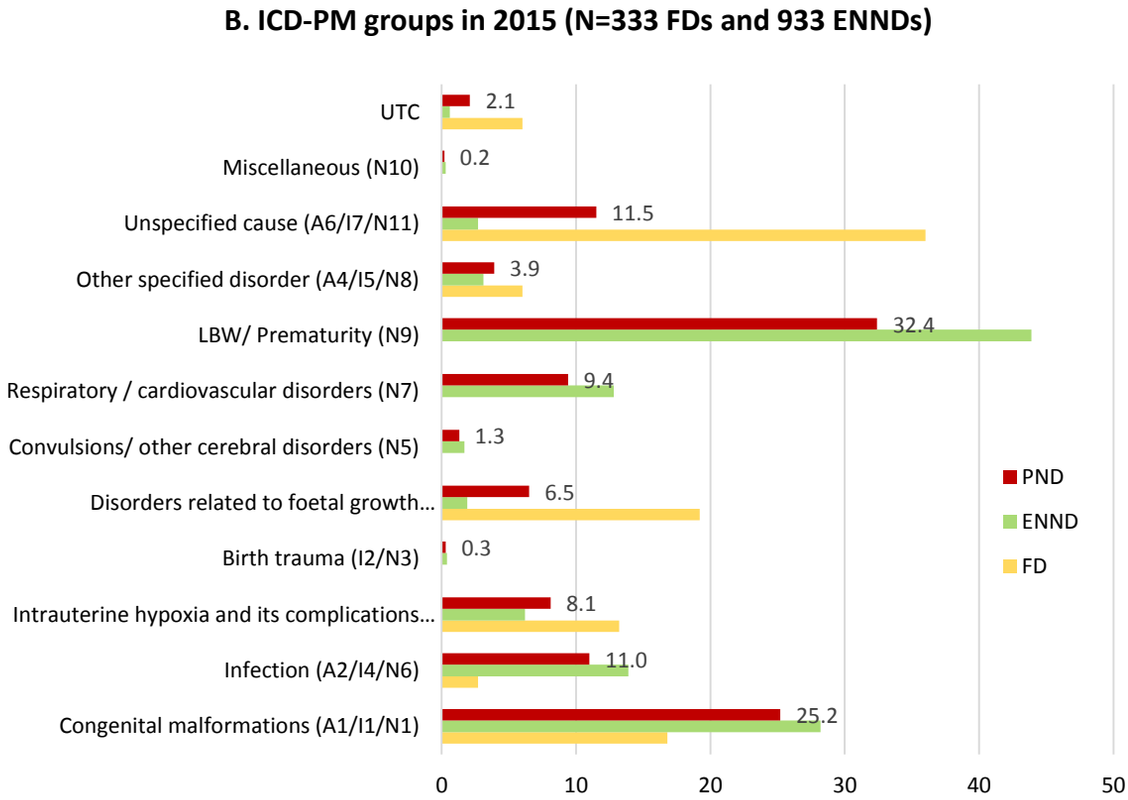
3.6.3 Distribution of the ICD-PM groups related to cause of death

Figures 3.12 A-D illustrate the distribution of ICD-PM groups. Here, the percentage of each group was calculated related to FDs, ENNDs and PNDs, out of the total deaths that had reported a COD for the given year. If a death reported more than one ICD-PM group, that death was added to all the relevant ICD-PM groups. Wherever relevant, the ICD-PM groups were further grouped, as most causes seemed common to FDs and ENNDs. For example, A1 represents congenital malformations in relation to FDs, whereas N1 represents the same for ENNDs, thus data of both groups were added together.

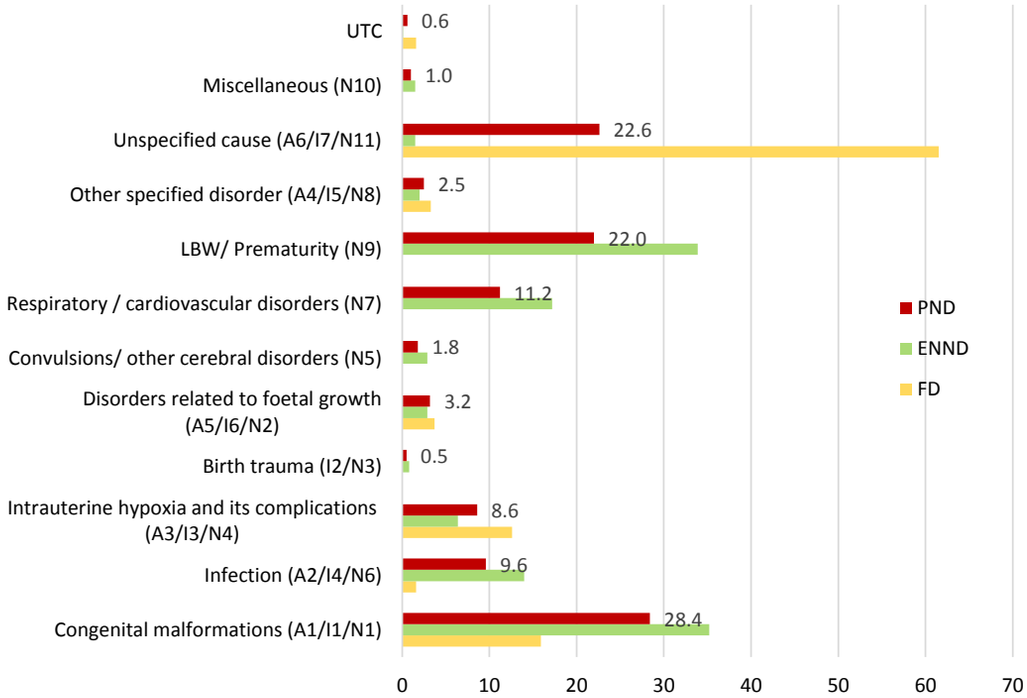
Figure 3.12: Distribution of the ICD-PM groups in 2014-2017 (A-D)

(Percentages calculated using the total number of deaths reporting a cause of death for the given year as denominator)

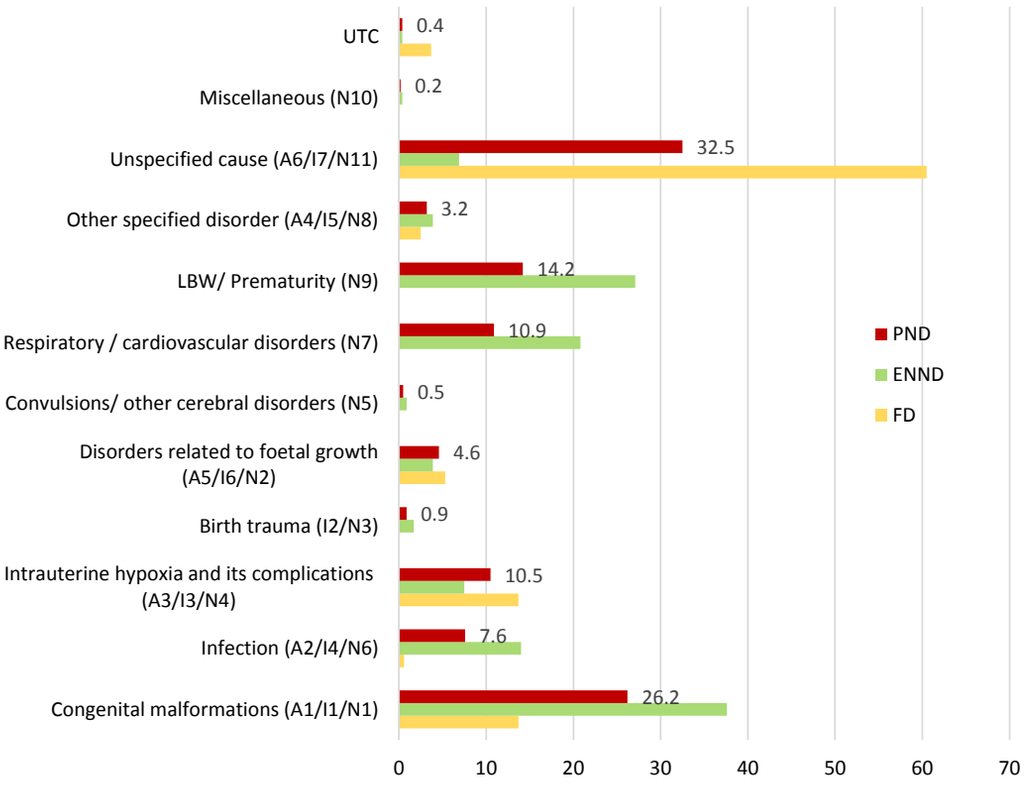




C. ICD-PM groups in 2016 (N=517 FDs and 952 ENNDs)



D. ICD-PM groups in 2017 (N=488 FDs and 535 ENNDs)



Among all PNDs, the most commonly reported COD was congenital malformations in the years 2014 (31.7%) and 2016 (28.4%), while it was low birth weight/ prematurity in 2015 (32.4%) and unspecified cause in 2017 (32.5%).

Among the foetal deaths, congenital abnormalities followed by intrauterine hypoxia and complications were the highest reported causes of death in 2014, while it was the unspecified causes followed by disorders related to foetal growth in 2015; and unspecified causes followed by congenital malformations in both 2016 and 2017.

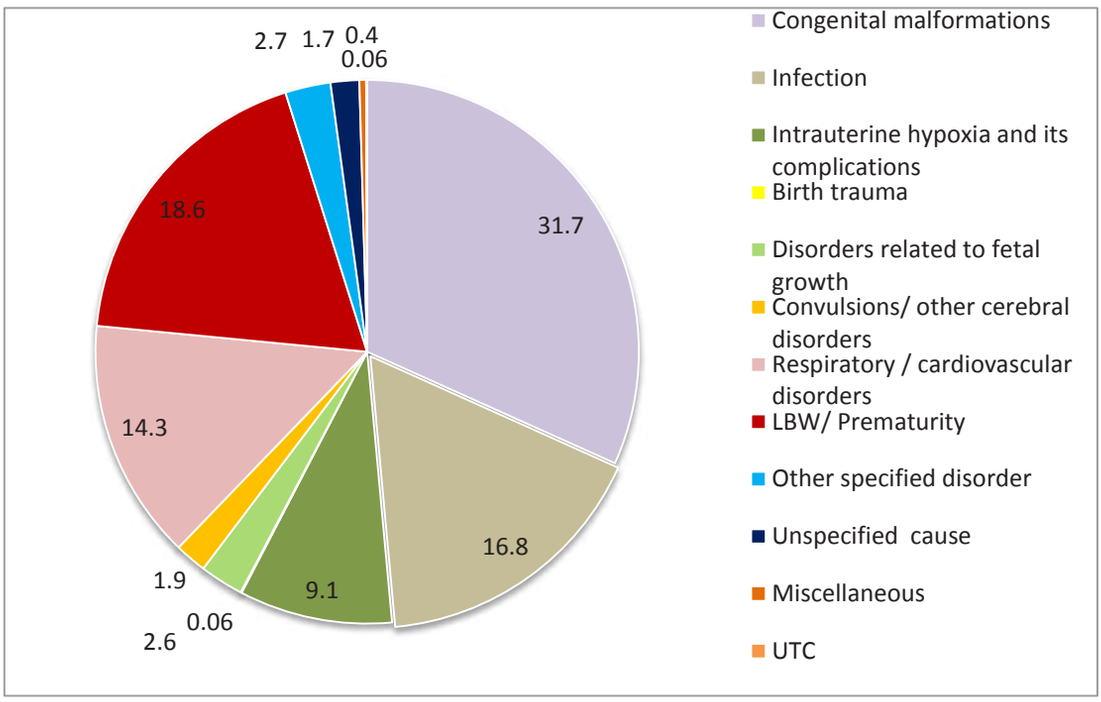
Among the ENN deaths, low birth weight/ prematurity followed by congenital abnormalities were the highest reported causes of death in both 2014, while it was the low birth weight/ prematurity followed by congenital malformations in 2015 and 2016; and congenital malformations followed by low birth weight/ prematurity in 2017.

3.6.4 Distribution of the perinatal deaths by single cause of death

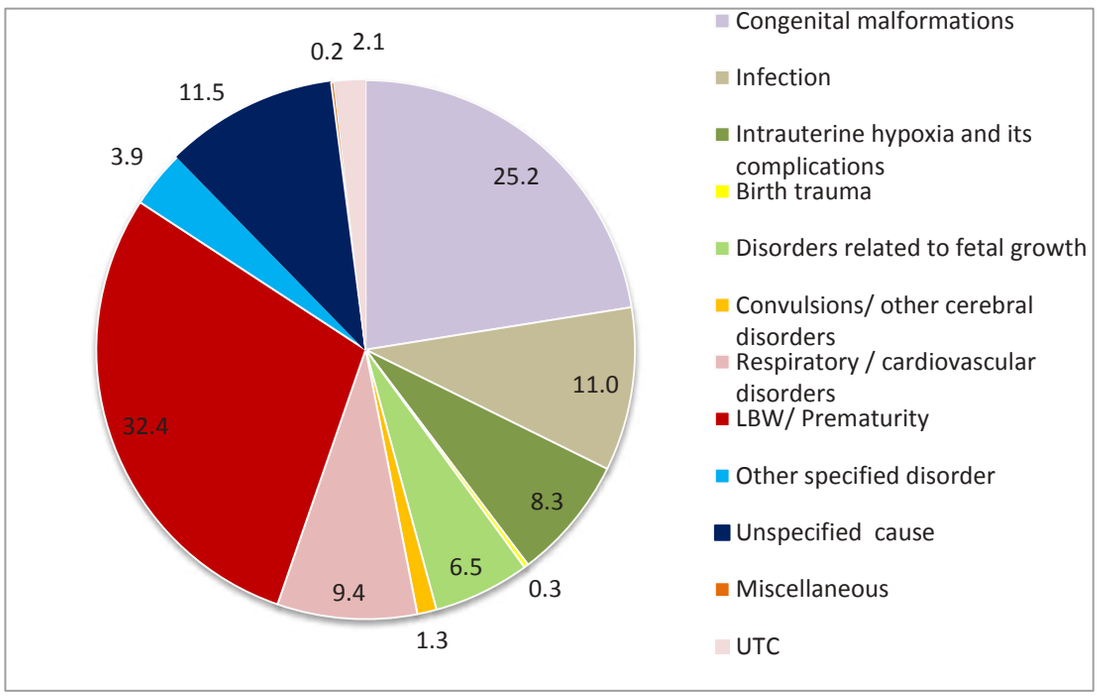
For those PNDs which reported more than one ICD-PM group, a single group was decided (as described in section 3.6.2). Also, the common ICD-PM groups were grouped together (as described in section 3.6.3). Accordingly, the distribution of PNDs by single COD is shown in Figure 3.13.

Figure 3.13: Distribution of the perinatal deaths by single cause of death in 2014-2017 (A-D)

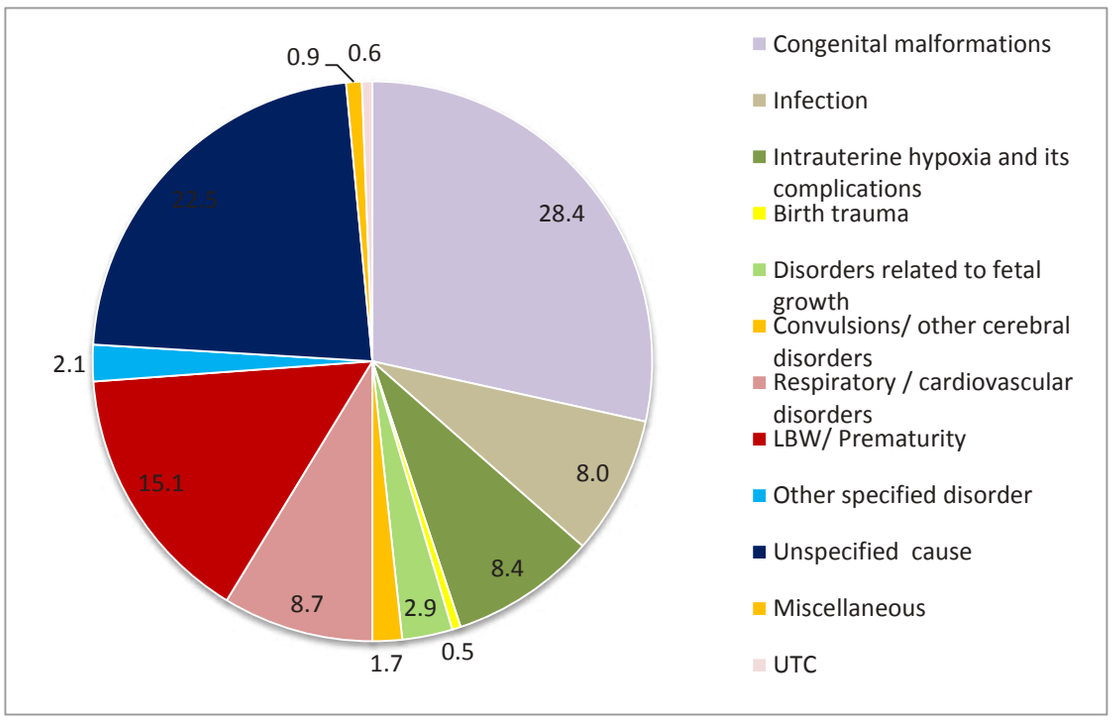
A. Cause of death in 2014 (N=1563)



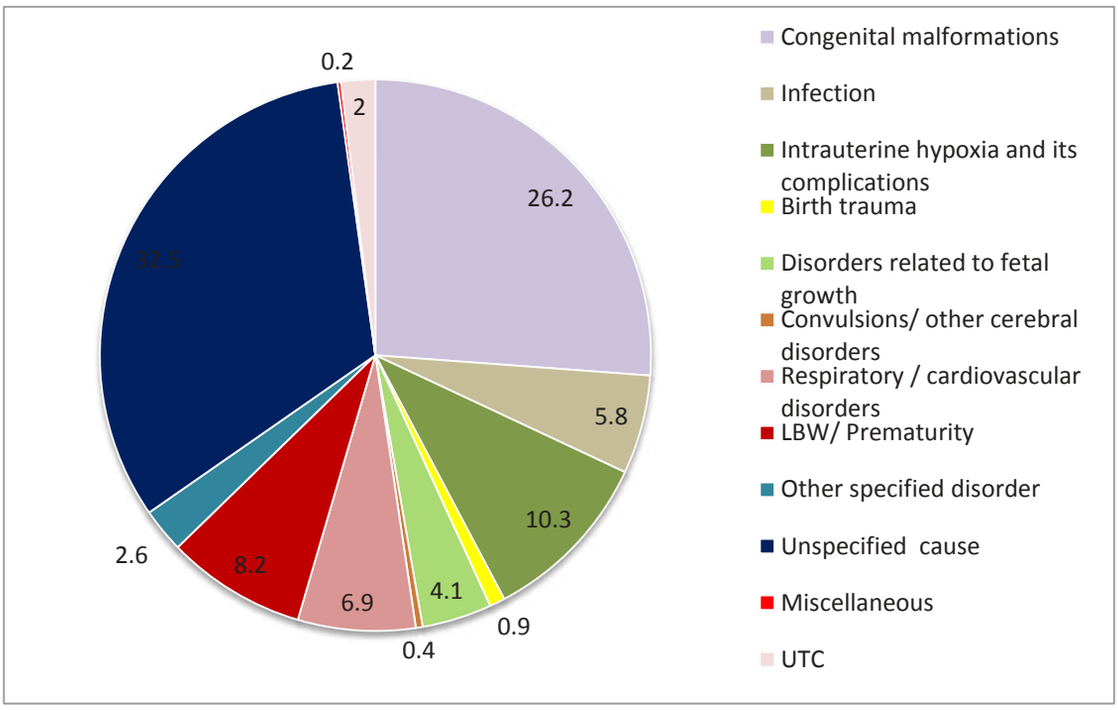
B. Cause of death in 2015 (N=1266)



C. Cause of death in 2016 (N=1469)



D. Cause of death in 2017 (N=1023)



The commonest cause of death related to PNDs was congenital malformations except in 2015, which was due to low birth weight/prematurity (32.4%). Respiratory/ cardiovascular disorder was below 15% in all four years, while infections were below 17%.

3.6.5 Trends in cause of death during 2014-2017

Figure 3.14 shows the trend in reporting of COD over the four-year period.

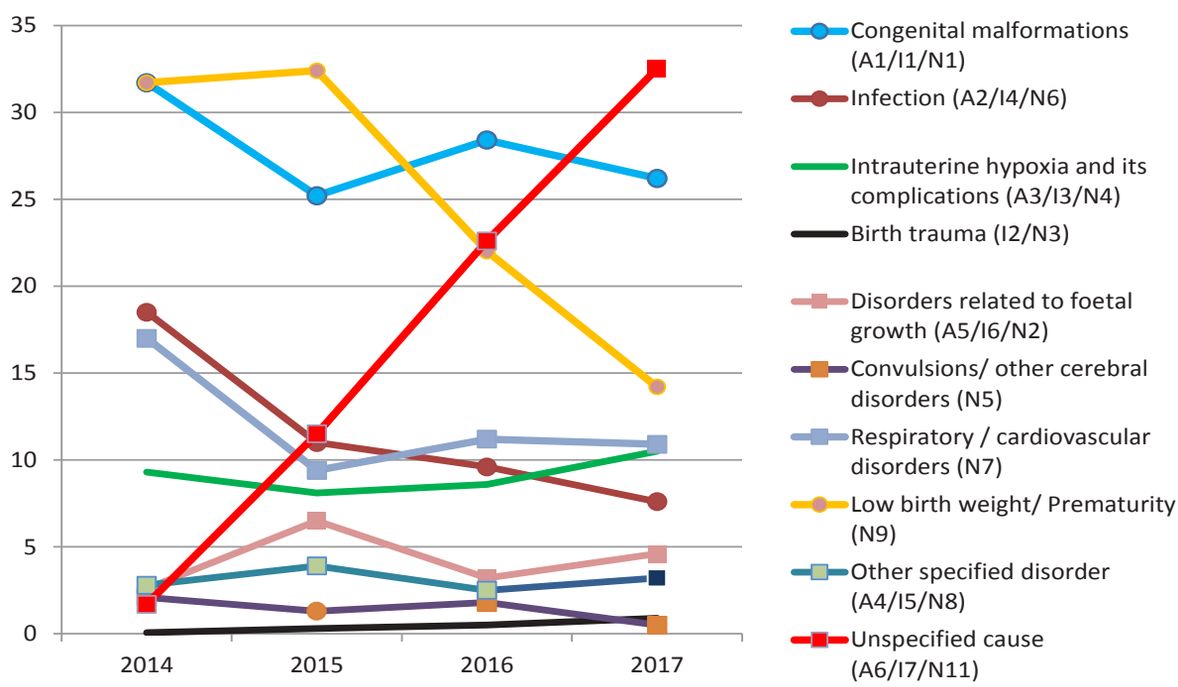


Figure 3.14: Trend in the cause of death 2014-2017

It is shown that over the years, reporting of congenital malformations, infections and low birth weight/prematurity have reduced in proportion (Figure 3.14). In contrast, the 'unspecified COD' group has drastically increased over the years. This may suggest that with the reporting formats becoming more complex over the years, there is a tendency for the medical officers to report the COD as 'unspecified'. Providing much simpler format for reporting and a quick reference guide to interpret the ICD-PM groups are strongly recommended.

3.6.6 Specific types of congenital malformations reported

Given below are different types of congenital malformations reported (Table 3.24).

Table 3.24: Specific types of congenital malformations reported

Type of malformation *	2014		2015		2016		2017	
	FD	ENND	FD	ENND	FD	ENND	FD	ENND
Brain & spinal cord related								
Anencephaly	21	22	13	10	20	10	3	2
Microcephaly/ brain atrophy	-	-	-	1	1	1	-	-
Encephalocele	-	4	-	3	-	3	-	-
Meningomyelocele	3	3	-	3	2	3	-	-
Hydrocephalus	1	10	1	3	2	11	-	1
Pituitary hypoplasia	1	-	-	-	-	-	-	-
Dandy Walker syndrome	-	-	-	-	-	1	-	-
Musculoskeletal system related								
Diaphragmatic hernia	1	43	1	23	2	26	-	1
Osteogenesis imperfect/ bone deformities	-	2	-	2	3	-	-	1
Arthrogryposis	-	-	-	1	-	-	-	-
Thanatophoric dwarfism	-	-	-	-	-	1	-	-
Gastroschisis/ omphalocele	-	4	-	3	2	-	-	-
Heart and great vessels related								
Congenital heart disease (Epstein anomaly/ patent ductus arteriosus (PDA)/ atrial septal defect (ASD)/ single ventricle/ dextrocardia / pulmonary hypertension (PHT)/ tetralogy of Fallot TOF)	3	127	3	49	-	69	-	5
Renal and urinary system related								
Renal anomalies/ Potter's syndrome	1	19	-	4	2	15	-	-
Gastro-intestinal system related							-	-
Imperforated anus	-	1	-	1	-	1	-	-
Oesophageal/jejunal/intestinal atresia	1	3	-	1	-	2	-	-
Liver/ biliary system anomalies	-	3	-	-	-	-	-	-

** Deaths reporting a specific congenital anomaly are included in the analysis; In all PNDs with congenital malformation, the type of malformation has not been given in the specific cause column*

Among the ENNDs, the commonest congenital malformations were due to heart & great vessel related anomalies followed by musculoskeletal system and brain & spinal cord related anomalies. As a single entity, the predominant anomalies were congenital heart disease followed by diaphragmic hernia, lung hypoplasia, anencephaly, renal anomalies/ Potter's disease and hydrocephalus.

Congenital anomalies in FDs were fewer in number compared to those in ENNDs, the commonest being anencephaly and Trisomy 21.

3.6.7 Association between maternal age and congenital malformation

Cross tabulation was done to see whether there is any association between maternal age and having a congenital anomaly in the year 2015. In all cases where maternal age was available, it was categorized as mothers < 35 years and >=35 years.

Table 3.25: Association between maternal age and congenital malformation

Maternal age (years)	Congenital malformations *	
	Present	Absent
Less than 35	164 (11.4%)	1277 (88.6%)
35 and above	56 (13.8%)	349 (86.2%)
Total	**220 (11.9%)**	**1626 (88.1%)**

** Maternal age was available only in 220 out of the 319 PNDs with congenital malformations and in 1626 out of the 1947 PNDs without congenital malformations*

The proportion of babies having congenital malformations was slightly higher among younger mothers compared to the older ones (Table 3.25). This difference was not statistically significant ($p>0.05$), giving a prevalence odds ratio of 0.8 (95% confidence interval: 0.57- 1.1).

3.7 Quality of the perinatal death surveillance databases

Databases 2014-2017 and record sheets maintained at the FHB were perused prior to data cleaning by the two independent reviewers, to assess their quality in terms of completeness, timeliness and accuracy of the variables reported.

3.7.1 Completeness of data

Revised Guidelines on the National Feto-infant Mortality Surveillance Mechanism 2016 provide guidance on how to complete the P-1 and P-2 Formats when reporting PNDs (Annexure 11).

Table 3.26 : Incompleteness (non-availability) of crucial data of the P-1 Format [1]

Item in P-1 Format	2014 (n=3013)		2015 (n=2760)		2016 (n=2687)		2017 (n=2077)	
	No.	%	No.	%	No.	%	No.	%
C. Ethnicity	-	-	491	17.8	388	14.4	60	2.9
F. Maternal age	-	-	558	20.2	1036	38.6	764	36.8
G. Type of death	3	0.1	209	7.6	95	3.5	46	2.2
H. Gravida	-	-	416	15.1	971	36.1	1407	67.7
I. Parity	59	2.0	369	13.4	1016	37.8	820	39.5
J. Type of pregnancy	-	-	517	18.7	434	16.2	556	26.8
N. Mode of delivery	133	4.4	428	15.5	908	33.8	680	32.7
O. POG at birth	108	3.6	126	4.6	393	14.6	115	5.5
P. Method of POG assessment	-	-	1428	51.7	1636	60.9	1095	52.7
Q. Birth weight	117	3.9	173	6.3	212	7.9	131	6.3
R. Sex of the baby	247	8.2	434	15.7	284	10.6	216	10.4
T. Age at ENND [2]	70	4.3	183	13.3	218	18.4	606	29.2
U. Timing of death	-	-	1005	36.4	350	13.0	251	12.1
V. COD (ICD-PM group)	-	-	1555	56.3	1525	56.8	1108	53.3
W. COD (Broad)	-	-	1569	56.8	2217	82.5	1599	77.0
X. COD (Specific)	-	-	1857	67.3	1569	58.4	1797	86.5
Y1. Maternal (Broad)	-	-	2082	75.4	1908	71.0	1760	84.7
Y2. Maternal (Specific)	-	-	2358	85.4	2426	90.3	1895	91.2

1 All deaths originally reported by the senders as perinatal deaths were considered for this analysis; Any recording made irrespective of its correctness was considered as 'availability' of data; No. indicates the missing data while the percentage indicates it as a proportion out of all records for the given year.

2 All deaths originally reported by the senders as NND were considered for this analysis (1615 deaths in 2014; 1379 in 2015; 1184 in 2016 and 908 in 2017).

As shown in Table 3.26, the completeness of data was satisfactory across the years for variables such as birth weight, sex of the baby, POG, ethnicity, type of death, timing of death and age at death. However, it was poor (>50% of the data) mainly for the cause of death (Items V-Y2) and method of assessment of POG during all years.

It should be noted that, although information on some variables was not available (owing to such data not being collected in the summarized H-26 Format used at the time), the completeness of variables in the 2014 database was almost 100%, compared to the 2015-2017 databases.

According to the revised guidelines circulated by the Ministry of Health, from 2015 onwards, all FDs greater than 22 completed weeks of gestation are to be reported to the FHB. To find out the reporting quality of such deaths, all deaths confirmed as FDs (using the criteria developed (Annexure 1) were considered for analysis by their POG and timing of death (Table 3.27).

Table 3.27: Reporting quality of the foetal deaths

Foetal deaths[1, 2]	**2015 (n=1178)**			**2016 (n=1409)**			**2017 (n=1139)**		
(completed weeks)	**FD-AP**	**FD-IP**	**FD-N/A**	**FD-AP**	**FD-IP**	**FD-N/A**	**FD-AP**	**FD-IP**	**FD-N/A**
POG ≥ 28 weeks	594	125	369	1021	67	143	827	73	179
	94.6%	96.9%	87.6%	87.4%	82.7%	89.4%	95.2%	100.0%	90.9%
POG 22-27 weeks	32	1	18	19	2	4	10	0	2
	5.1%	0.8%	4.3%	1.6%	2.5%	2.5%	1.2%	0.0%	1.0%
POG not known	2	3	34	128	12	13	32	0	16
	0.3%	2.3%	8.1%	11.0%	14.8%	8.1%	3.7%	0.0%	8.1%
Total	**628**	**129**	**421**	**1168**	**81**	**160**	**869**	**73**	**197**
Reporting rate of foetal deaths of less than 28 completed weeks of gestation		**4.3%**			**1.8%**			**1.1%**	

[1] *In 2014, foetal deaths only of POG ≥28 completed weeks were collected, thus not included; In 2015-2017, all foetal deaths confirmed according to the criteria-based flow diagram (Annexure 1) were included for analysis.*

[2] *AP=Antepartum; IP=Intrapartum; N/A=not available*

The reporting of FDs of 22-27 POG was extremely small in proportion, which had also declined across the years from 4.3% to 1.1%. This could be either due to poor reporting of FDs less than 28 completed weeks of POG or FDs truly occurring at higher POG.

There was a substantial proportion of FDs with non-availability of their timing (FD-N/A), which had lessened to some degree over the years (35.7% in 2015 (421/1178); 11.4% in 2016 (160/1409) and 17.3% in 2017 (197/1139)).

3.7.2 Timeliness of data

It was not possible to check for timeliness of the data sent from hospitals.

3.7.3 Accuracy of data

There are several important considerations related to the measurement of stillbirths and neonatal deaths within mortality audit systems (WHO, 2016a).

When perusing the individual record sheets collected at FHB, the accuracy of data of most of the variables included in the databases was found to be satisfactory, however a few issues were noted in relation to some crucial variables.

a. Inaccuracies of data in P-1 and P-2 Formats sent from hospitals

Inaccuracies of data were noted in the formats sent by doctors from hospitals.

- There was **lack of uniformity in the responses** provided to some of the questions in P-1 Format, thus requiring intense data cleaning.

  Example 1: antepartum, AP, antenatal

Example 2:

Responses recorded on type of death (Item G) in P-1 (2015 database)	No.	%
NND *	1375	47.9
FD *	953	33.2
IUD	137	4.8
PND	60	2.1
ND	27	.9
NVD	11	.4
Stillbirth	11	.4
ENND	2	0.1
IPD	1	.0
No response given	209	3.9
Total	**2760**	**100.0**

** The intended responses, as per guidelines on the completion of P-1 Format (Annexure 11)*

- **Lack of consistency** was noted in the terminology and calculations used, especially in relation to the timing of FDs and ENNDs.

  According to the WHO (WHO, 2006), when calculating the gestational age (POG) from the first day of last normal menstrual period (LMP), the first day is taken as day 0 and not day 1; days 0-6 therefore correspond to 'completed week zero'; days 7-13 to 'completed week one'; and the 40th week of gestation is synonymous with 'completed week 39' (WHO, 2006). According to a more recent WHO publication (WHO, 2016a), when calculating the age at death of a neonate, the first day of life (i.e. 24 hours following the birth) is typically called 'day 1'in clinical practice, or 'day 0' in surveys and vital registration (WHO 2016a).

- The recordings of age at death of NNDs (Item T in the summary sheet of P-1 Format) were poor in quality.

  - In neonatal deaths, the first day of life (under 24 hours) is to be recorded as D0+1H, D0+2H... D0+23H up to Do+23H. Instead, the first day of life of ENNDs was recorded as D1+..... in some. This data is extremely important to differentiate early NNDs (1-7 days of life) from late NNDs (8-28 days of life).

  - Age of NND was given in different formats (e.g. days + minutes).

  - Age at death is to be completed only for NNDs, although it was also completed for some foetal deaths as well, as D0 or in (days + hours).

- Though POG recordings were excellent in terms of completeness, the quality was in query, as the POG had been recorded using different methods (e.g. some in completed weeks and some in weeks + days).

It should be noted that Revised Guidelines on the National Feto-infant Mortality Surveillance Mechanism of Sri Lanka are compatible with the WHO nomenclature, in which deaths during the first day of life (day 0) are instructed to be recorded in completed hours of life. E.g. If baby died 2 hours after birth: 0 days + 2 hrs. However, the guidelines do not show clarity in describing the recording of age at death beyond day 0; and when describing the timing of ENND (E.g. the definition of ENND given as days 0-8 to be revised as either days 0-6 or days 1-7). Similarly, the guidelines should provide better guidance on the calculation of POG based on 'completed weeks since LMP' (E.g. the definition given of PND as '> 22 weeks POG or > 500g weight' to be revised as ≥ 22 completed weeks of gestation and/or ≥ 500g weight).

Revised Guidelines on the National Feto-infant Mortality Surveillance Mechanism 2016 should be further revised to incorporate uniform nomenclature according to the latest WHO communication (WHO, 2016a) for ascertaining the timing of ENNDs and POG of FDs

- There were **gross incompatibilities** between the responses given on the type of death (Item G-FD or NND), timing of death (Item U-AP, IP, ENND, unable to classify) and age at NND (Item T-D + H) in the summary sheet of P-1 Format. As a result, many had to be excluded from analysis as the FD/ENND status could not be verified.

Example 3:

Age at death (Item T)	Timing of death (Item U)										Total
	FD	IP	AP	AN	ENND	ENN	NND	LNN	UTC	N/A	
No response given	0	4	102	15	0	0	0	0	0	0	121
0	0	0	0	0	0	1	0	0	0	0	1
0d	0	0	0	0	0	1	0	0	0	0	1
1d	0	0	0	0	0	15	0	0	0	0	15
D0	0	3	48	3	0	11	0	0	1	4	70
D0+0.5H	0	0	0	0	0	2	0	0	0	0	2
D0+1/2H	0	0	0	0	1	0	0	0	0	0	1
D0+10H	0	0	0	0	0	4	0	0	0	2	6
D0+10MIN	0	0	1	0	0	0	0	0	0	1	2
D0+11H	0	0	0	0	1	4	0	0	0	0	5
D0+12H	0	0	0	0	0	13	0	0	0	2	15
D0+12H+30MIN	0	0	0	0	0	1	0	0	0	0	1
D0+13H	0	0	0	0	0	4	0	0	0	0	4
D0+14H	0	0	0	0	1	2	0	0	0	0	3
D0+14H+29MIN	0	0	0	0	0	1	0	0	0	0	1
D0+15H	0	0	0	0	1	4	0	0	0	1	6
D0+15MIN	0	0	0	0	0	0	0	0	0	1	1
D0+16H	0	0	0	0	0	4	0	0	0	0	4
D0+16MIN	0	0	0	0	0	0	0	0	0	1	1
D0+17H	0	0	0	0	0	5	0	0	0	0	5
D0+18H		0	0	2	0		0	0		0	2
D0+19H		0	0	2	0		0	0		0	2
1		0	0	14	0		0	0		4	18
1D+ 30MIN		0	0	2	0		0	0		1	3

Source: 2016 database

The following Table 3.28 further demonstrates the adequacy of original data for confirming the FD/ ENND status, when criteria (Annexure 1) were applied to the original data.

Table 3.28 : Adequacy of original data for confirming the PND status according to the criteria of operational definition (FD of POG ≥ 28 completed weeks and NND up to first week of life)

Criteria applied to original data [1]	2014 [2]		2015 [2]		2016 [2]		2017 [2]	
	No.	%	No.	%	No.	%	No.	%
G='NND' & U='ENND' & T=0-6 days	1545	95.7	861	73.2	919	80.8	280	33.4
G='NND' & U='ENND'			1045	88.8	1137	99.9	825	98.4
Early neonatal deaths	**1615**		**1177**		**1138**		**838**	
G='FD' & POG ≥ 28 weeks & U='AP' OR 'IP'	1365	97.8	522	48.0	640	52.0	607	56.3
G='FD' & POG ≥ 28 weeks			602	55.3	1084	88.1	921	85.4
Foetal deaths	**1395**		**1088**		**1231**		**1079**	

[1] Items (G, U and T) as given in P-1 Format for 2015-2017; For 2014, criteria used were type of death='FD' and POG ≥ 28 completed weeks for FDs, and type of death='NND' and age=less than 7 days for ENND
[2] Percentages represent the no. deaths compatible with each criterion out of the total confirmed FD/ ENNDs

The proportion of deaths compatible with all three criteria required to confirm an ENND was lowest (33.4%) for year 2017. As for FDs, the proportion of deaths compatible with three criteria required to confirm an FD (48%) was lowest for year 2015.

The following Table 3.29 depicts the re-classified deaths as a proportion of the data originally included in the database, to demonstrate the yield of original data in further analysis.

Table 3.29 : Yield of the original data of databases for further analysis

Deaths	2014 [2]		2015 [2]		2016 [2]		2017 [2]	
	No.	%	No.	%	No.	%	No.	%
Neonatal deaths								
NND reported in database	1615		1379		1184		908	
Reclassified NNDs	1615		1497		1186		901	
Re-classified ENNDs [1]	1615	**100.0%**	1177	**85.3%**	1138	**96.1%**	838	**92.3%**
Foetal deaths								
FD reported in database	1395		1172		1408		1123	
Re-classified FD (all)	1395		1178		1409		1139	
Re-classified FD (POG ≥ 28 weeks) [1]	1395	**100.0%**	1088	**92.8%**	1231	**87.4%**	1079	**96.1%**
Unclassified								
Reported in database	3		209		95		46	
Re-classified	3		85		92		37	

[1] Items (G, U and T) as given in P-1 Format for 2015-2017; For 2014, criteria used were type of death='FD' and POG ≥ 28 completed weeks for FDs, and type of death='NND' and age=less than 7 days for ENND
[2] Percentages represent the no. deaths conforming to the operational definition out of the total deaths reported in the original database

The re-classified ENNDs yielded 100%, 85.3%, 96.1% and 92.3% of the original data included in the database in the years 2014, 2015, 2016 and 2017, respectively. The corresponding values for the yield of FDs were 100.0%, 92.8%, 87.4% and 96.1%. The yield was therefore quite satisfactory, however more attention needs to be paid in future to data quality, as there was no apparent increase observed in the yield of both FDs and ENNDs across the years.

- There were incompatibilities in relation to the ICD-PM groups (antepartum, intrapartum and neonatal), their actual status of death (FD or ENND) and ICD-codes used.

b. Inaccuracies in data entry

- At hospital level, ineligible handwriting of the doctors who completed P-1 and P-2 Formats was apparent. With these, clarifications were impossible and thereby further analysis of the data was found to be difficult.
- At central level, there are trained persons recruited for data entry and processing. However, there was evidence on some errors made during the transfer of data from hard copies to the database, especially in relation to the variables containing medical terms (e.g. ICD-PM classification used in COD). Also, their knowledge appeared to be less adequate in identifying and resolving the incompatibilities of crucial variables.

c. Inaccuracies in the coverage of target hospitals

- Contribution from the private sector was limited to three hospitals (refer section 3.3), highlighting the need to improve this aspect. Though deliveries from the private sector represent only less than 5% of the total deliveries in Sri Lanka, this information on PNDs will be valuable as the underlying determinants may be different from those observed in government hospitals.
- Zero reporting was relatively low (3.8% in 2014; 28.2% in 2016 and 18.8% in 2017) except in 2015, where the majority of zero reporting was from divisional hospitals.
- The hospitals involved in PND surveillance during 2014-2017 ranged from 78 to 192 hospitals (refer section 3.3), which appears to be comprehensive in the coverage of all target hospitals (specialised institutions as well as non-specialised/ peripheral hospitals). However, it should be noted that there had been upgrading of some hospitals during this period, which is not well captured in the databases, thus difficulty in confirming the full coverage of hospitals during each year, in the absence of information on the hospitals considered eligible for surveillance during each year. For example, as shown below, when compared to the Medical Statistics Unit list of hospitals with at least one delivery within the year, the coverage of hospitals on PND surveillance during 2016 seemed to be different and poor.

Example:

Data source	No. of hospitals with ≥1 delivery per year	No. of deliveries	No. of stillbirths
Medical Statistics Unit data *	434	303,593	1823
PND surveillance data	192	180,868	1178

**Source: Annual Health Statistics Report, MSU, 2016*

There is much room at central level for further improvement of the quality of data as much as its completeness

3.8 Qualitative enquiry into the process of recording and reporting of perinatal deaths at hospital level

This qualitative enquiry focused on the recording and reporting process followed in hospitals, in relation to the formats used for reporting; obtaining accurate and timely information by medical officers; data entry conducted in ward settings; and timely dispatch of forms to the heads of institutions and FHB.

In 2014, the PND data (including the COD identified using Wigglesworth classification) were collected from specialised hospitals once a year using a summarized version of H-26. In 2015, ICD-PM system was introduced for ascertaining the COD. During this period, there had been visits to all the target hospitals by FHB to collect PND data. This active surveillance is commendable, as it improved the awareness among hospital staff on PND surveillance. In addition, a summary of all the individual PNDs during 2015 was requested from hospitals (including nil reporting). From 1st January 2016, the reporting formats changed to P-1 and P-2 followed by ad-hoc on-site training of staff on ICD-PM system. The database of 2016 had extracted data mainly from the P-2 Format which includes a monthly summary of the individual PNDs, whereas from 2017 onwards, data have been directly extracted from the P-1 Format which provides detailed case abstractions of individual deaths.

3.8.1 Formats used for reporting PND in hospitals

Information collected using the P-1 and P-2 Formats is comprehensive and adequate for ascertaining the PND status, COD and contributory factors. Further, these formats are compatible with the universal definitions of PND and cause of death, thus enabling international comparison of data as well as comparisons within the country. The revisions made in Guidelines on the Feto-infant Mortality Surveillance Mechanism and the circulars drawn in support of the formats are highly commendable.

A few areas for further improvement were identified during the qualitative enquiry.

a. Individual summary of perinatal deaths (P-1 Format)

P-1 Format has been designed for recording PNDs in ward settings (Annexure 6). It is in two parts: a summary sheet which also includes the COD (Items A-Z1), and a detailed case abstraction which also includes views of the investigation team on factors contributing to the PND, the lessons learnt and action taken (sections a-h).

- As the attending medical officer, this form is usually completed by house officers. For obtaining the large quantity of required information, the pregnancy record of mother is retained as a photocopy in some wards.
- Owing to the complexity of ICD-PM system, house officers in most instances face difficulties in arriving at the cause of death, which are usually resolved with a senior colleague (senior house officer/ medical registrar/ senior registrar). In some wards, when this support is minimal, the COD is left blank. There is no quick reference guide for ascertaining the COD in ward settings other than the guideline, which is also not readily available in the wards.
- The junior medical staff reported of close supervision by consultants-in-charge (or this responsibility delegated to a senior medical officer) of their recordings made in P-1 Formats, during which the recordings of P-1 Format would be verified; the factors contributing to PND, the lessons learnt and action to be taken are identified with the ward team; and

the completed P-1 Format is counter-signed for verification of the information provided. In some wards, there was less involvement noted of the senior medical staff including the consultant in data recording, which appeared to result in the attending house officer leaving these sections blank; signing the form himself; and placing the consultant's official seal. House officers were of the opinion, that they are less experienced to provide expert opinions on the proposed action.

- The nursing staff was observed to be familiar with the form used for certification of stillbirth (issued for every dead fetus of POG ≥ 28 completed weeks), as they consider it their sole responsibility, whereas some nurses showed less familiarity with the contents of P-1 Format, as they are not directly involved in the completion of this form in the event of a PND.
- In most wards, the availability of enough copies of P-I is ensured by the nurse-in-charge or ward sister (also supervised by the matron during ward rounds); however, in a few, the P-1 Format was not adequately available.
- There were several opinions about the form, when inquired from house officers:
- Design of the form is not user-friendly.
- The form is too long with information requested on too many intricate details about the antenatal, intrapartum and neonatal care, and on FDs of POG of 22 weeks upwards, which is found to be time consuming and tedious amidst other duties in the ward. Further, most of the information requested is not readily available from mother or baby, thus require obtaining detailed histories from mother and gathering information from BHT and mothers' pregnancy record, all of which would lead to delays and incomplete data.
- Most of the house officers were having negative attitudes about the purpose of collecting a vast amount of information, other than for its sole purpose of calculating PND rates for Sri Lanka. A few house officers admitted that reporting is done simply because it is forced upon; and that they do not consider it as a responsibility/ duty of a doctor especially working in a busy ward like obstetrics.

b. Monthly summary of the PND surveillance meeting (P-2 Format)

P-2 Format is designed for reporting on the monthly PND surveillance meeting of each hospital (Annexure 6). It is in four parts: summary statistics of the hospital (e.g. no. of deliveries, live births, FDs and ENNDs); the deficiencies/ problems identified, and solutions proposed at the meeting; list of participants of the meeting; and the monthly summary of individual PNDs.

- This form is to be completed by the head of institution or by an officer appointed to do this task. A few hospital administrators highlighted the difficulties faced in getting down the P-1 Formats from some wards (these are needed to complete the monthly summary in P-2 Format). As a solution, some larger hospitals have designed a summarized version of the P-1 Format on individual deaths. Though it is faster retrieval of data, some house officers found it quite discouraging to complete data in duplication (repetition of the main items in P-1 Format).
- The section on 'proposed action' is expected to be completed by the head of institution. However, some interviewed were of the opinion, that the quality of data would be better if completed by the attending consultants as they are the most familiar with ward practices. In most instances where they are not able to gather this information at the monthly surveillance meeting, this section is left blank.
- Summary statistics are collected on the total number of live births and deliveries of the hospital. However, the FHB does not rely on this data for establishing PND rates for each hospital, as every target hospital would not send the P-2 Format on a monthly basis (especially when there ae zero deaths) or this data is not recorded. Instead, the FHB relies

on the live birth and stillbirth data reported by the Medical Statistics Unit. However, it should be noted that unavailability of accurate routine delivery statistics at national level is an obstacle for calculating accurate rates.

- P-2 Format comprises a section on summary information of all PNDs reported for a given month, to ensure that at least the most essential variables are received by FHB in case the P-1 Format is either missing or not completed in hospital. However, since this is duplication of the information already collected using P-1 Format, it does not appear to be an efficient solution for the said purpose, but a burden on the hospital administrators.

3.8.2 Obtaining accurate PND data

Accuracy of the data provided is extremely important for taking corrective action. The following instances where accuracy is at stake were identified.

a. Definition adopted for perinatal death

Although the Revised National Guidelines on Feto-infant Mortality Surveillance Mechanism 2016 issued by the FHB provides guidance on completing each variable, instructions have not been strictly adhered to in some instances. During the qualitative interviews, it was revealed that the medical staff and hospital administrators were aware of the inclusion of FDs and NNDs up to first week of life in the PND surveillance system, but were less certain (especially the house officers) of the following aspects:

- Whether to collect information on foetal deaths of POG ≥ 22 completed weeks or POG ≥ 28 completed weeks (Though guidelines specify to collect data from 22 weeks onwards, most of the wards were collecting data only from 28 weeks onwards).

  The enquiry also revealed a practical issue faced by the staff in reporting FDs of 22-27 POG. Obstetrics ward admits mothers only after 28 weeks of POG and whenever a PND takes place, a certificate of stillbirth is routinely completed by the nursing staff to which the completion of P-1 Format is also linked. Since there is no such registration of FDs before completion of 28 weeks, most of the deaths of POG 22-27 weeks taking place in gynaecology wards are over-looked.
- Whether to consider only the POG or weight of the fetus (more than 500g) or both criteria when identifying a foetal death. It was not well-known among the staff (especially house officers) that FD should fulfill the weight criteria first (birth weight ≥ 1000g), or if missing ≥ 28 completed weeks of gestation, or if missing, body length ≥ 35cm (as per given according to the International comparison definition-WHO) (WHO, 2016a).

  The staff (especially the house officers) claimed that they have not seen the guidelines or circulars sent by FHB on these definitions, nor has it been reinforced at the PND surveillance meetings. There were no quick reference guides available or this information displayed on the walls.

b. Verification of the weight of fetus

The practice of assessing the birth weight especially of dead-born feotus was found to be satisfactory and appeared to be well-maintained by ward nursing staff.

- Weighing of the dead fetus is routinely carried out by the attending nursing officer for any delivery irrespective of POG. This is also routinely recorded in a register maintained in the labour room.
- A special scale is used for weighing the foetus, which is available in the labour room.

Though of satisfactory coverage, the quality of birth weight data is questionable owing to

the wide variation of the measurements made by more than one person in ward settings. Whether weighing scales are calibrated prior to use, whether a person is designated and trained in carrying out this procedure and whether the procedure is being monitored regularly by nursing administrators are not yet identified as routine practices in the ward.

c. Ascertainment of POG

The practice of assessing the POG was found to be less uniform in ward settings.

- For example, when identifying a late FD, whether it should consider a death not less than POG of 28 completed weeks or a death during the 28th week of gestation
  When inquired at the qualitative interviews, most of the medical officers did not seem to be familiar with the definition used. The guidelines also lack clarity on this aspect.
- POG is expected to be verified based on the history obtained from mother on her last regular menstrual period and information recorded in mother's pregnancy record. When there is difficulty in verifying the POG, other methods such as ultrasound-scanning are to be used. However, since scanning is not routinely performed for every case, there is difficulty faced by doctors in verifying the ones with uncertain POG. In such situations, they are encouraged to record the 'best available estimate' of the POG.
- Especially in relation to the cases of uncertain POG, there are no attempts made to correlate the post-mortem findings of the dead fetus with the calculated POG or scanning findings to verify the dates.

d. Post-mortem findings

It was revealed that post-mortem findings would often be lacking due to several reasons. The main reason given was difficulty in obtaining parental consent (especially Muslim parents). The unavailability of post-mortem findings was seen more so for ENNDs than for still births. Other reasons identified were the reluctance of staff in promoting it among parents and not conducting them by the relevant staff citing various excuses. This observation on poor recording of post-mortem findings is despite the FHB facilitating the process by issuing guidelines, providing necessary equipment and training for performing post-mortems and on ascertaining the COD.

3.8.3 Timeliness of the data recordings

The delay in returning the completed P-1 Formats from wards has been posed as a major obstacle faced by the hospital administrators.

- According to the circular, P-1 Format should be completed in ward settings within 24 hours and returned to the head of institution. However, in most instances, this is not practised as per guidelines. According to the qualitative enquiry, house officers attending on the death find it difficult to do this task within such a short time, amidst their other duties in the ward that need urgent attention. Further, the length of P-1 Format is also a deterrent for timely dispatch. Owing to these, house officers tend to complete the form during their spare time.
- The post-mortem findings are also supposed to be included in the P-1 Format, which sometimes could get delayed.
- Hospital administrators making an extra effort to obtain the completed P-1 Formats from wards at least before the PND surveillance meeting and sending data to the FHB at least by one week after this meeting is commendable.
- In some hospitals, administrators were not keen on carrying out nil reporting of deaths, which is apparent in the current databases.
- Supervision provided by the consultants or senior ward staff on the timely dispatch of forms from ward to the head of institution was shown to vary widely.

3.8.4 Timely dispatch of data from hospitals to FHB

The delay in returning the completed P-1 and P-2 Formats every month has been posed as a major obstacle faced by the data entry operators at FHB. Delays in sending the completed P-1 Formats from wards as well as delays in conducting the PND surveillance meetings in hospitals (P-2 Format) were identified as some reasons preventing the timely dispatch of data to FHB.

3.8.5 Mechanisms in place for ensuring the quality of surveillance data

There are collective efforts and plans made by the hospital staff to improve the PND surveillance at hospital level. It is commendable. A few areas needing further improvement were identified during the qualitative enquiry.

- Although many hospitals visited had a list of indicators developed locally for assessing the quality of care, PND surveillance was not found to be incorporated into the quality assurance feedback forms of the hospital. There was no active role played by the MO-Quality and quality assurance cells maintained in hospitals.
- According to the guidelines, there is no formal mechanism in place for the nursing staff to get actively involved in death reporting, other than the ward sister/ nurse-in-charge of the unit ensuring that the format is completed by the relevant officers. It was revealed that in ward settings, the sister or matron during ward rounds are in the practice of supervising the dispatch of completed forms but were not used to recording the details of death in a separate ledger/register for further reference/ discussion among the nursing staff.
- Though many consultants are seen to be actively involved in the supervision of data recording, there is no formal mechanism in place to ensure the supervision of the entire procedure by administrative or senior ward staff, including the timely dispatch of data.
- There are one-day training sessions on data recording for the hospital staff, conducted at district level by medical teams led by the national programme manager of the Maternal & Child Morbidity and Mortality Surveillance Unit at district level, which is creditable towards improving the quality of data especially on COD. This training is well-organized and conducted ad-hoc (according to the need) especially in areas known to engage in less-efficient data reporting. The training targets consultants, senior house officers, house officer, nursing officers and matrons, which is usually well-attended by all. However, it would be practically difficult for the FHB to ensure that every house officer undergoes this training, owing to their rapid turn-over every six months. This may lead to missed training opportunities for house officers, though they comprise the most-needy group for training (as they are the ones who complete the forms). During interviews, it was revealed that house officers have not seen the national guidelines on PND nor have they been given any training on it by the hospital administration prior to assuming duties. Currently, there is no formal training included in the medical curriculum on how to complete P-1 and P-2 Formats.
- During the hospital interviews with medical and nursing staff, a feedback was obtained on the introduction of electronic formats preferably online. There was divided opinion among the house officers in this regard. Majority of them were in favour of going online, as it would enable faster and easier data entry, by having menu options to select from, mandatory checks on vital variables to be included and avoiding incompatible data entries, and convenience; while a few were concerned that it would still not lessen their paper work or might even over-burden as most of the information required for P-2 Format are to be collected at bedside

in written form from mother. Some were also concerned of not having good internet facilities in wards for online submission of data.

- Currently, the FHB does not provide any feedback on the data collected from hospitals over each year nor does it conduct PND surveillance meetings routinely at district level. Feedback of each hospital linked to incentives is not in practice.

Recommendations for improving the quality of perinatal death surveillance data

Data completion at ward settings

- Guidelines should be revised to make data completion within two days (not within 24 hours), considering the practical difficulties in ward settings.
- Shared responsibility is recommended for compiling the P-1 Format under the supervision of consultant/ senior registrar. In this regard, it is suggested that immediately after a foetal or neonatal death, the attending nursing officer attaches a P-1 Format to the BHT and makes an entry of the death (a brief description) in a register for perusal by the matron during night round (which could also be taken up for discussion at the daily review meetings of nurses). Further, the basic information of mother is suggested to be completed by the attending nursing officer and the rest by the attending medical officer.
- A mechanism should be in place for the senior medical staff to supervise the data entries made by the attending medical officer before commencement of the ward round on the following day. The completed forms should be verified for completeness and accuracy by senior house officer/ registrar/ senior registrar of the ward and endorsed by the consultant with his signature. Also, the deficiencies identified and proposed action should be completed by the consultant in discussion with his team. The matron/ sister in charge should ensure that the completed P-1 Format is sent within two days to the head of institution.
- Training should be undertaken by the FHB to make the hospital staff (both medical and nursing) aware of the PND surveillance process, forms to be completed and ascertaining especially the POG, COD and age at NND. During this training, one permanent staff member should be identified as the focal point to train others in PND surveillance. Further, this training can be handled by the peripheral staff led by the provincial and district level consultant community physicians under the guidance of central level.
- It is highly recommended that house officers be given hands-on training on data entry by the hospital consultants (or the trained focal point) for all house officers prior to assuming duties, so as to ensure the accuracy and uniformity of the responses given in P-2 Format.

Recommendations for improving the quality of PND surveillance data

Formats used for data entry

- A more simplified version of the P-1 Format is required to ensure completeness and accuracy of the data collected at ward settings. Restricting the variable number to the most essential, as given in the model format by WHO (WHO, 2016b) is highly recommended.
- To avoid gross discrepancies, completion of Items G, M, O, T and U in the summary sheet of P-1 Format should be made mandatory in order to verify the status of FDs and ENNDs.
- In order to verify the cause of death, completion of Items V-Y2 should be made mandatory. Before sending the forms to FHB, these should be checked and verified through a monitoring system involving the head of institution, consultant or matron in charge of the respective ward.
- Introducing an electronic data sheet would further ensure completeness as well as timeliness of data. Such a sheet will help overcome the delays in transfer of data from wards to FHB, gross discrepancies of variables, by facilitating mandatory entry of essential variables, drop-down menus of responses to choose from and restricting incompatible data entry combinations. All this will reduce the paper work (including ineligible recordings) of the medical staff.
- If an online system is introduced, logistics such as desk computers and internet facilities should be addressed and made available at a common place in hospital. In this regard, the review identifies nursing officers or staff at quality assurance cell in hospitals as a competent resource category to be trained in data entry.
- Introducing an online data sheet through mobile phone applications will further enable real-time data transfer to the head of institution and FHB. Such on-line data entry will also facilitate real-time data analysis at FHB as well as at hospital levels, which would help in local action and taking prompt corrective measures. If implemented, mechanisms should also be in place to safeguard data security and confidentiality.
- A quick reference guide on ICD-PM should be developed and a wall poster to be displayed in the wards.
- P-2 Format should be revised to avoid duplication of the information provided (e.g. summary information of the PNDs). Also, the summary statistics provided on live births and deliveries in this format should be removed as this information is redundant in calculating the PND rate.

The workshop done on pathological post-mortem examinations to improve the quality of cause of death. This two-day workshop was done with the participation of local and international experts.

3.9 Qualitative enquiry into the perinatal death surveillance at central level

Qualitative enquiry into the PND surveillance at central level included on the procedures followed in obtaining data from hospitals, facilities in place for data entry and processing, and data analysis and dissemination.

3.9.1 Procedures followed in obtaining data from hospitals

Since its initiation in 2006, there have been many initiatives by the FHB for getting down the data on time from hospitals.

From 2010, the Maternal & Child Morbidity and Mortality Surveillance Unit (MCMMS Unit) team led by its national programme manager have intensified quality improvement of the surveillance mechanism. There is evidence on visits paid to specialized hospitals by the FHB consultants to streamline and monitor the monthly PND surveillance meetings, and to encourage the hospital administrators to send minutes of these meetings to FHB. In 2014 and 2015, prior to the scaling-up stage, PND data were collected by the central level in a summary format as a one-time procedure (once every year), in which only a few important variables were collected, with reminders sent via verbal communications and in writing, and through visits paid to hospitals. All these helped in achieving a better yield. Despite the preliminary work undertaken by FHB to ensure a smooth transformation in data collection (pilot testing of the formats, training programs for hospital staff, developing circulars and guidelines), with the introduction of individual formats (which consist of a considerable number of variables) to collect data of approximately 2500-3000 individual deaths, the data quality suffered heavily initially. As such, the central level was faced with the challenge and tedious task of collecting comprehensive and timely data. There have been many initiatives by the FHB for obtaining the data on time from hospitals, such as several rounds of reminders sent out every month by telephone for obtaining the completed forms, to meet the stakeholders and personally reminding the directors at the hospital directors' meetings. To avoid delays in data entry at the central level, focus in 2016 had been mainly to get down the P-2 Format from hospitals on time. With the National PND Surveillance System in Sri Lanka reaching maturity, the current focus is on obtaining individual PND data mainly through P-1 Format.

> Despite achieving almost 100% coverage of target hospitals, reporting of PNDs at the timesstipulated in the circular is not well adhered to. Delays in the current reporting system are at ward level and at central level during data entry.

3.9.2 Data entry at central level

The MCMMS Unit receives nearly 3000 individual data formats each year. At central level, there are data operators for data entry and processing. They are recruited as apprentice trainees from technical colleges and are given an exposure and supervised training on data entry. Having such persons recruited on & off for a period of six months as apprentice trainees, is identified as a major drawback by the FHB officials involved in PND surveillance for maintaining the quality of databases.

3.9.3 Data processing at central level

At present, an excel sheet is used as the database for collecting PND data. Not having a quality database specially designed for data entry is posed as one reason for poor quality of data.

The current database is not strengthened by protocols that would provide guidance during data entry, which could improve the uniformity and accuracy of the data entered. This is important, considering the frequent turn-over of data entry operators. Also, there are no protocols developed to carry out dry-runs and random checks routinely on the databases by medical staff.

The medical officer assigned for PND surveillance does quality checks on the entered data from time to time, but not on routine basis. However, following the ad-hoc quality checks done on the entered data, the index hospitals are informed and updated to improve the data quality.

As a result of the limited staff at central level, temporary data entry operators also need to work on receiving data. Unavailability of qualified (e.g. MSc Community Medicine) medical officers poses challenges on systematic data entry, cleaning and regular meaningful data analysis. In such context, quality improvement seems to have been a challenge.

3.9.4 Data dissemination at central level

Currently, outcome of the yearly analysis of PND data is disseminated through the annual reports of FHB and Ministry of Health. Some of the issues highlighted in the monthly P-2 Formats are discussed at the Maternal & Child Health Technical Advisory Committee meetings and at the National Committee on Family Health and Hospital Directors Meeting to address them at the national level. The identified important issues and the remedial measures are discussed at the regional level Maternal and Child Health (MCH) review meetings with the regional staff in each district and at the national level in the bi-annual MO-MCH review meetings. Thus, the field level medical staff is updated regularly by FHB but not the curative sector. A few feto-infant mortality reviews had been conducted at district level by the FHB similar to maternal mortality reviews along with clinicians from the curative sector and preventive sector, but it had not been organized and held regularly in every district.

At central level, there are limitations mainly related to the logistics (human and material) identified in ensuring timely entry of accurate data and efficient data processing using a sophisticated database, quality checks and protocols developed for data entry.

3.10 Qualitative enquiry into the perinatal death surveillance meeting in hospitals

It was observed that the institution-based PND surveillance meetings are conducted regularly in hospitals in a methodical manner. The ground work done by the FHB to bring it to this level is highly commendable. A few aspects related to the conduct of PND surveillance meeting were identified during the observations made on such meetings and by interviewing the participants.

3.10.1 Conduct of the meeting

As per guidelines, the institution-based PND surveillance meetings should be conducted by

every specialised institution (including private sector) providing perinatal care once a month (may be second week) on a fixed date. It should be a no-fault finding exercise of the healthcare workers involved in the management of the pregnant mothers or infants. The whole process of the review should be confidential, and each participant of the institutional review should sign the confidentiality agreement (F-4) prior to the meeting.

The following observations were made on the procedure followed in hospitals (this refers to only government hospitals as this review did not include the private sector).

- As per guidelines, dates for the monthly surveillance meeting are usually scheduled for the entire year by hospital administrators and circulated to ward staff at the beginning of year; while timely reminders are sent to the relevant hospital staff as well as to the relevant field staff giving notice of the meeting. In some of the institutions, the dates are clearly displayed in the office of the Head of the Institution showing the importance given for meetings.
- Every measure is taken by hospital administrators to ensure the maximum participation of the field and ward staff. To facilitate this, dates for the meetings are all pre-scheduled and as practised in most hospitals, the scheduled date of each month is rotated among all units throughout the year, so that every unit gets an opportunity to participate (if not, it may exclude one unit from participation all the time).
- As per guidelines, organizing the meeting is the responsibility of the head of institution with consultants (obstetricians, paediatricians, neonatologists). In most hospitals, this task of organizing the meeting would be delegated to a medical officer (MO-Public Health or deputy director). Some administrators/ medical officers complained that organizing this meeting, getting the participation of all concerned especially the consultants is challenging.
- In most instances, the previous minutes are circulated at the meeting. A file containing a summary of the cases is given to each attendee. For this purpose, the required P-1 Formats are usually obtained before the meeting. However, it was revealed that in some large hospitals, the P-1 Formats are sent late and therefore, only 50% would be available at the time of the review.
- Incentives such as lunch or refreshments are given for attending the meeting, which is arranged by sponsors. However, hospital funds are not routinely utilized/ allocated for this purpose.
- Guidelines do not specify the person who should chair this meeting (other than specifying the persons who should organize). In most instances, the meeting is chaired by the person organizing the meeting.
- Lack of an agenda for the meeting was a major deficiency identified, as it prevented in re-visiting the follow-up action taken for previous cases.

3.10.2 Attendance

As per guidelines, participation of the following categories of health care teams is mandatory: head of the institution, obstetrician, paediatrician, neonatalogist and other relevant specialists, MOs from obstetric and neonatal units, MO-MCH and MOH from the catchment area, MO-Preventive Health, JMO, grade I nursing officer/ nursing officer in charge of the ward/ labour room and MRO.

- As per guidelines, the case is to be presented by a medical officer attached to the relevant unit, and this would usually be the house officer who attended on the death. However, there is no provision in the guidelines for this person to be released from his routine duties at the time, thus leading to poor fact finding during the review, with any other less familiar with the case. Consultants would usually attend if the cases are from their wards.

- Though not specified in the guidelines, attendance of the nursing staff of the units presenting cases (including the matron and sisters) is satisfactory.
- If available, the neonatologist and registrars in histopathology would attend the meeting to present the PM findings.
- In some instances, only a few field-based staff (MO-Public Health, MO-MCH, MOH staff) would attend the meeting, especially if it clashes with their routine monthly conference or routine duties.

3.10.3 Discussion of the cases

Several strengths as well as areas for improvement were identified during observations on the case presentation and discussion.

- As per guidelines, the cases should be discussed in detail based on the three-delay model in order to identify deficiencies associated with seeking medical care, reaching the hospital and management of the mother and/or neonate at the hospital. In some units, these objectives were shown to be well-achieved, where there had been instances that had led to changes in clinical practice e.g. incorporating the provision of CTG facility at night into hospital guidelines. However, in some units, the process followed during case presentations was not predominantly focused on a fact-finding mission but done more as an academic exercise.
- As per guidelines, the same format that collected data (i.e. the P-1 Format) should be used for presenting data at the meeting. Despite this, the P-1 Format was not referred to during the discussion or its data re-visited for verification of the data presented, thus the P-1 Format not utilized to its optimal potential during discussion. It was also not used to cross-check the quality of the data recorded.
- Cases were often presented as medical cases, focusing mainly on the clinical parameters of mother and foetus. The quality of the data obtained, COD and predisposing factors were therefore less discussed.
- Pathological findings were well-presented by the registrars in histopathology to arrive at a suitable COD. However, no discussion was usually generated from these findings, and were not assessed for its compatibility with the original COD given.
- When presenting a case, it was presented as individual presentations (on the ward events, PM findings and the neonatologist's report), showing lack of coordination between the presenters, leading to repetition of information.
- No uniform format was followed for presenting PM findings.
- Guidelines do not specify having a chairperson or a moderator to lead a discussion at the end of every case. Usually, it was the head of institution or a senior consultant who chaired the meeting and moderated an active discussion. At instances where no such active moderation took place, the following deficiencies were identified.
  - The meetings lacked active discussions taking place with the participation of all in the audience, especially discussions generated among the hospital staff, field staff and hospital administrative staff after each case presentation.
  - There was no summarization of each case or any learning points highlighted.
  - There were less inputs given by the consultants/senior staff attending the meeting and fewer suggestions or a positive feedback given for improvement.
  - No collective decisions were taken based on the deficiencies/defaults identified.
- There was no opportunity given to the attending nursing officers to present cases or contribute their opinions and suggestions to the discussion. Barriers identified were:
- The discussions were too medicalized, where

the deaths were presented as medical cases (history, examination and findings). This made it difficult for the nursing staff to contribute or follow the case.

- Language barriers were present. The discussion was held in English medium.
- Most of the nurses who attended on the death had forgotten the case by the time the meeting is held, as they do not actively record details of the case, thus no document to refer to.

3.10.4 Follow-up action taken

This is one of the most important outcomes of the PND surveillance meeting. There was evidence on collective decisions taken by the hospital administration for improving the human and physical resources at hospital level, based on the findings of the PND surveillance meeting. A few areas for improvement were noted as follows:

- The guidelines do not specify on an agenda to follow during the meetings, thus action proposed and decided upon at previous meetings are not followed-up. This is a major flaw in the guidelines.
- As per guidelines, the review process should focus on establishing if circumstances represent system problems that require change, developing recommendations for change and assisting in the implementation of change at hospital level and field level. Most meetings are not geared towards these objectives, thus whether the main purpose of the meeting is fulfilled is questionable.
- A major deficiency was not giving a feedback by the FHB to hospitals at the end of each year on the PNDs reported by each hospital.

Chapter Four

CONCLUSIONS & RECOMMENDATIONS

4.1 Evolution of the Perinatal Death Surveillance System of Sri Lanka

Registration of deaths initiated during 1640-1798 in Sri Lanka has come a long way strengthened by many legal enforcements but falls short in collecting statistics on perinatal deaths (stillbirths at or after 28 completed weeks of gestation and neonatal deaths in the first seven days of life). As the focal point for maternal & child health in Sri Lanka, the FHB had taken the lead in collecting such data from the entire island through its field reproductive health data system. In addressing a key shortcoming of this system related to the collection of PND data especially stillbirths from their points of origin, the hospital-based National PND Surveillance System and Institutional Reviews was initiated in 2006. The ground work done by the relevant professional colleges and the Perinatal Society in Sri Lanka under the leadership of FHB, which was initiated long before the WHO call for establishing mechanisms to develop information systems on PNDs is quite impressive. It stands out as the first-ever national PND surveillance system operational in South Asia. The National PND Surveillance System in Sri Lanka, which was originally designed to provide data for conducting the monthly institution-based PND surveillance meeting has evolved into a standalone data collection process, along with the introduction of comprehensive data collection formats and well-organised data flow to FHB.

Since 2014, more leg work has been carried out to incorporate foetal deaths after 22 weeks of gestation; data reporting within 24 hours from both specialised and non-specialised hospitals; and COD ascertained using ICD-PM system by 2016. The currently used data collection formats have undergone many revisions and are well-supported by circulars and guidelines. There is evidence on commendable commitment of the FHB staff for ensuring smooth flow of data and institutional reviews. The dataflow enables calculation of reliable PND rates for Sri Lanka and is further evolving in relation to the quality of data.

- The National PND Surveillance System in Sri Lanka initiated by the Family Health Bureau sets an example on implementing a relatively efficient mechanism, well-supported by data collection formats, guidelines and circulars.
- Evolution of the National PND Surveillance System is highly recommended as a model to be adopted by other countries in the region.

4.2 Quality of the perinatal death surveillance data

Almost over one decade, an arduous amount of work has been undertaken by the FHB for improving the quality of PND data. This work should by no means be undermined, considering the difficulties faced at central level in collating information routinely on a monthly basis from all specialised hospitals in Sri Lanka. The commitment of the hospital staff has also been tremendous, resulting in routine dataflow of relatively complete and accurate data. The system is well-structured for further improvement in term of the quality of data. To this end, the following strengths, weaknesses and recommendations are identified.

- Information collected using the P-1 and P-2 Formats is found to be comprehensive and

adequate for ascertaining the PND status, COD, contributory factors and identifying the changes required and proposed action to be taken at local level. Given the efficiency demonstrated at central level in maintaining a well-structured system, the quality of data in terms of accuracy could be further improved. Completeness of data is satisfactory for many variables but not for the COD. Discrepancies and incompatibility of some variables, which are crucial for determining the FD/ ENND status as well as COD are many, diminishing the usefulness of the data collected for statistical analysis. Lack of uniformity of the responses provided is also a deterrent during data entry at central level.

- It is recommended that the database maintained at the central level is regularly updated with data received; and undergoes a thorough data cleaning every six months. Further, a basic analysis needs to be carried out every year to verify the accuracy of data and especially when formats are revised, or new definitions are introduced. This will also enable to provide a feedback to every hospital involved in PND surveillance.
- An electronic data format, preferably with a mobile phone application is highly recommended for overcoming the common problems related to the accuracy and timeliness of data at both hospital and central levels. Drop-down menus for responses, mandatory data entry, cross checks for verification of data available in such electronic formats will prevent the incompatibility of data provided. It will also be efficient for analysing real time data and for the FHB to provide frequent feedbacks to each hospital. However, the logistics and security of such data flow needs to be addressed and piloted extensively before its initiation.

- The National Guidelines on Feto-infant Death Surveillance Mechanism have been in place since around 2006 including further revisions in 2016, which is impressive for providing guidance for medical staff on data collection and entry. These guidelines however lack clarity on ascertaining some of the crucial variables, such as type of death (applying one or both criteria on weight and POG for identifying PND), timing of death, age at neonatal death and period of gestation (calculating the weeks of gestation, age in days and hours). There is less uniformity in the responses provided for some variables and ineligible writing.

- Guidelines need to be strengthened on providing further guidance on these aspects. In the summary sheet of P-1 Format, completing the variables on type of death (T), Timing of death (U), Age of neonatal death (V), POG (O) and COD (V-Y2) need further guidance in the guidelines.
- Developing quick reference guides and posters displayed on ascertaining COD are highly recommended.
- The task of data entry by hospital medical staff should be made easier, by introducing electronic formats which provide built-in error messages and guidance whenever inaccurate or incompatible data are entered. In this regard, information on the time of death (which is almost 100% reliable in hospital settings) is suggested to be used as the link data for identifying such errors.

- Some of the variables collected such as live births and deliveries are redundant in use while detailed case abstraction (which includes maternal history, antenatal care, intrapartum care and neonatal care) require obtaining data not readily available in the BHT, which leads to delays in wards in completing the P-1 Formats and completeness of data. There is also duplication of the information given on deaths in P-1 Format as the summary of each case and the summary information given on P-2 Format of all deaths during the month. Further, despite collecting a wealth of information, only the most essential data items are included in the database, thus the usefulness of other data collected using detailed case abstraction is questionable. Ineligible hand writing of doctors was also apparent in the formats received by FHB.

  - It is suggested to develop a more simplified version of P-1 Format, with variables limited to the most essential information (as requested in the summary sheet of P-1 Format), in accordance with the model format recommended by the WHO (WHO, 2016b). Once the quality of data in databases is certified, introduction of the detailed case abstraction can be attempted. Summary information of all PNDs reported in the P-2 Format should be removed as it is accompanied by P-1 Format of each death, when sending to FHB.
  - Given its importance, the POG of a foetal death given by mother should be corroborated with the US scans done and post mortem findings presented at review meetings.

- Though it is the house officer who is almost always involved in the completion of formats, there is no known training targeting them at hospital level other than the ad-hoc training provided by the FHB in every district especially on ascertaining the COD. As such, their awareness on the guidelines, circulars and ICD-PM system seem to be poor. Further, medical undergraduate training is also not geared for this, all of which leading to incomplete data.

  - Providing a training session for all house officers in each hospital prior to assuming duties as house officers is highly recommended. For this purpose, identifying and training a permanent medical officer (e.g. MO-public health, MO-quality assurance) as a trainer in addition to the consultants is an efficient method to ensure training.
  - The FHB should train consultant community physicians at provincial level to take over the training under their guidance.
  - Such training should be incorporated into quality assurance protocols and CPD assessments.
  - Knowledge on the PND surveillance should be reinforced at monthly PND surveillance meetings.

- Timely dispatch of the P-1 Formats from wards and P-2 Formats from hospitals has been an issue throughout. The main reason identified has been the length of formats requiring not so readily available information. On the other hand, notifying deaths to heads of institutions within 24 hours does not seem to serve a specific purpose, other than as a sensitive indicator of timely data reporting, considering the less-urgency in this information for prompt action.

- Extending the period of notification of deaths to the head of institutions to 48 hours is suggested in view of improving the quality of hospital data.

- Hospitals differ in their supervision carried out in ensuring quality data in terms of completeness, accuracy and timeliness. Data entry in ward settings is mostly carried out by house officers, some under close supervision of consultants and some with less supervision.

- A formal mechanism should be introduced to efficiently supervise the whole process involved in data flow within hospitals (including the deaths of POG 22-27 weeks taking place in gynaecology wards) and timely dispatch at hospital level. In this regard, the following are suggested:
- The quality assurance cell maintained in hospitals may play a pivotal role in improving the quality of data, by incorporating the PND surveillance as an indicator in the quality assurance systems in hospitals.
- Introduction of data quality checks in hospitals at strategic points (e.g. nursing officer, house officer, senior medical officer, consultant-in-charge and head of the institution) is suggested for ensuring the accountability of every stakeholder of the hospital-based PND surveillance system. Guidelines should be further strengthened on this aspect, especially on verification of the data provided in P-1 Format by the attending consultant before it is sent out from the ward, and also by the hospital administrator before it is dispatched from the hospital.

- At central level, a close monitoring system should be developed to ensure the timeliness and accuracy of the data entered by data operators. In this regard, data quality checks should be carried out prior to data entry (throughout) as well as after (at regular intervals), by the data operator and by immediate line manager.it is also suggested to design a computer-based system to identify the data gaps, as well as to generate reports on the performance of each hospital on data quality at regular intervals.

- Replacing Wigglesworth classification with ICD-PM classification as early as in 2015 is highly commendable. Training that is being carried out by the FHB in every district is also appreciated in improving the quality of such data. However, the conduct of pathological post-mortems and documenting such findings lack completeness in most instances owing to issues pertaining to promotion, consent and not being performed.

- Obtaining post-mortem findings need to be improved as much as possible. In this regard, a strong campaign should be launched for promoting PMs on dead foetus and neonates, starting from midwife, nursing staff and medical staff including the obstetrician/ gynaecologist, physician, neonatologist and pathologist.

- There is no defined task allocated in the guidelines to be performed by the attending nursing staff during data collection other than weighing the dead foetus.

  - It is suggested that National Guidelines on PND Surveillance System be strengthened to expand the role played by the nursing staff, to contribute to PND surveillance actively, by maintaining a necessary stock of formats, assist the house officer in extracting the required data from pregnancy records and scans (producing photocopies), carry out data quality checks, counsel parents and promote post-mortem examinations and contribute actively at the PND surveillance meetings. Such involvement can be extended to ward midwives as well.
  - It is highly recommended that the attending nurse maintains a register providing a brief description of the death so that it could be taken up for discussion during rounds with supervisory staff. This information could also be revisited at the monthly PND surveillance meeting.
  - The attending nursing officers should be given opportunities for raising their concerns at the monthly PND surveillance meeting.

- Data entry lapses have been noted at central level, with errors made during transfer of data (especially variables involving medical terminology) from formats to the database, owing to the poor medical knowledge of the data entry operators.

  - Recruitment of a designated permanent data entry operator or a similar category for the MCMMS unit, who is also trained in bio-medical data processing will be a sound investment for improvement of the databases. Their training should also incorporate managing online data systems.
  - The logical framework developed in this review for confirming the FD/ ENND status of deaths reported by hospitals, can be utilised by data entry operators in determining uncertain deaths.
  - At central level, a formal mechanism should be in place at FHB for maintaining databases of high quality. The following recommendations are made:
  - A dedicated area with adequate seating and ICT, including space for storage of records
  - Assign a dedicated intermediary qualified medical officer to oversee the PND surveillance system maintained at FHB, from the receipt of completed record sheets all the way up to generating timely reports and data dissemination for contributors and policy makers
  - Introduce an on-going data monitoring mechanism to check for receipt of quality data, which includes dry runs and random checks at regular intervals by medical officers.
  - Develop protocols and guidelines to provide guidance for data entry operators
  - Develop a sophisticated database using ICT for databases, preferably with an online application to receive data directly from hospitals (paper-less system).
  - Design an on-line application for generating automated reminders to be sent out to hospitals requesting for data (including zero reporting) at end of every month

- Monitor the data entry process routinely by assigned medical officers and national programme managers
- Initiate a regular in-service PND training for selected hospital staff (nursing officers, matrons, MO-Public Health, deputy directors)
- Acknowledge the receipt of formats sent from hospitals
- Introduce a mechanism to translate lessons learnt into action at central level (as for maternal deaths)
- Increase the involvement of related professional colleges at regular intervals
- Facilities for timely dissemination of findings

- The surveillance system covers a substantial number of target hospitals in the state sector but requires improvement in data collection from the private sector. Inclusion of non-specialised primary health care institutions (divisional hospitals where complicated cases are most often transferred to larger hospitals for care) do not seem to have an added value for completeness of data.

- Nil reporting and reporting from the private sector hospital need improvement.
- Excluding non-specialised hospitals from PND surveillance is suggested.
- The list of hospitals including non-specialised hospitals providing perinatal care should be updated every year and readily available at the FHB to be used for statistical analysis.

- Currently, the FHB does not provide a feedback on the data received from hospitals or statistics collated for each year; nor does it conduct PND review meetings routinely at district level.

- Feedback reports generated using real time data analysis at yearly or 6 monthly intervals by the FHB is highly recommended, and this task would be made easier with the introduction of electronic formats with online application.
- Conducting review meetings to provide a feedback on the data quality, findings based on the data collected and collective action taken should be a regular activity of the FHB, targeting representatives (hospital administrators, consultants) from all districts.

- Completion of the P-2 Format is satisfactory with regards to the summary information given on all the PNDs reported during the given month, however the section on deficiencies/ problems identified and the proposed solutions needs further attention.

- It is suggested to complete this section at the monthly PND surveillance meeting in discussion with the consultants, ward and field staff, and include it specifically in the guidelines.
- An agenda on the follow-up activity is highly recommended to be included as a mandatory item in the minutes of the monthly PND surveillance meeting, so that follow up action could be re-visited the next month.

4.3 Quality of the monthly perinatal death review meeting at hospital level

Despite many logistics and challenges faced by hospital staff, the regular conduct of PND review meeting is highly commendable. Guidelines providing information on its conduct is also well-acknowledged. In further improvement, some areas that require attention are identified.

- Cases are expected to be discussed in detail based on the three-delay model in order to identify deficiencies associated with seeking medical care, reaching the hospital and management of the mother and/or neonate at the hospital. In some instances, the purpose of this meeting is found to deviate from its fact-finding mission to an academic exercise.
- Presentation of cases need to be based on the P-1 Format information provided, however it may not be so all the time, so that opportunities for verifying the facts provided in P-1 Format and also the facts presented at the meeting are most often lost.
- Learning points/ deficiencies at the end of each case presented may not be identified.
- Lack of an agenda and a moderator to generate an active discussion are major obstacles for generating discussions on a no-fault finding mission and conducting follow-up action.

- These aspects should be supported by explicit instructions given in the guidelines.
- Introduction of a generic presentation format with mandatory parameters on the case (minimum slides) is recommended for ensuring that the PND surveillance meeting serves its intended purpose.
- Appointing a moderator for the PND surveillance meeting (e.g. consultant, hospital director, MO-public health) who is identified as the focal point for PND surveillance and trained in the same by FHB is an effective strategy. The responsibility of the moderator should be clearly specified in the guidelines, including their responsibility in achieving the main purpose of the meeting (identify system problems that require change, develop recommendations for change and assist in the implementation of change at hospital level and field level) and generating an active discussion and the discussion not being too medicalised.

- The PND surveillance meeting should encourage the participation of all who attend in order to critically identify the issues in field and hospital settings.

4.4 Review and feedback of data generated through PND surveillance

The database derived PND rates and trends on contributory factors and COD compatible with that of previous years in Sri Lanka and the current rates of the region, highlighting the usefulness of maintaining the PND surveillance database. However, considering the issues related to the complexity and quality of the data collected, cautious interpretations are needed on the trends and factors identified.

- It is suggested that updates on PND rates and trends are disseminated to the policy makers/ managers at regular intervals in order to identify the areas needing further attention in perinatal care services in hospitals.
- Currently the PND surveillance is only hospital-based. Considering the ample opportunity available and the quality achieved in RH-MIS, it is high time to envisage on a population-based stillbirth register at MOH level.

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Annexure 1: Logical framework to re-classify the reported deaths according to the operational definitions of foetal death and early neonatal death

A. Early neonatal deaths

COMBINATION	**1**	**2**		**3**	**4**			**5**				**6**		
Item G (FD/NND)	**NND**	**NND**		**NND**	**NND**			**NND**				**N/A**		
Item U – Timing (AP/IP/ENND/UTC)	ENND	NND		NND	N/A or UTC			IP or AP				N/A		
Item T (Age at death)	>D0 or D0 or N/A	>D0 (0-6 d)	>D0 (7-13 d)	N/A	>D0 (0-6 d)	>D0 (7-13 d)	N/A or D0	>D0 (0-6 d)	>D0 (7-13 d)	N/A or D0		>D0 (0-6 d)	>D0 (7-13 d)	N/A
DECISION	ENND	ENND	LNND	NND-not known	ENND	LNND	NND-not known	ENND	LNND	FD-IP	FD-AP	ENND	LNND	N/A

B. Foetal deaths (POG >28 weeks of gestion were only considered)

COMBINATION	**1**	**2**	**3**				**4**				**5**	**6**	**7**
Item G (FD/NND)	**FD**	**FD**	**FD**				**FD**				**N/A**	**N/A**	**N/A**
Item U – Timing (AP/IP/ENND/UTC)	IP	AP	UTC or N/A or IUD				ENND				1-4 WEEKS	AP/IP	N/A
Item T (Age at death)	-	-	D0	>D0 (0-6 d)	>D0 (7-13 d)	N/A	>D0 (0-6 d)	>D0 (7-13 d)	N/A	D0	N/A	N/A	N/A
DECISION	FD-IP	FD-AP	FD-IP	ENND	LNND	FD-not known	ENND	LNND	FD-not known	FD-IP	NND-not known	FD-not known	N/A

N/A= not available; FD-IP=intrapartum foetal death; FD-AP=antepartum foetal death; ENND= early neonatal death; LNND= late neonatal death; FD-not known=cannot determine whether it is AP or IP; NND-not known= cannot determine whether it is early or late; UTC= unable to classify; IUD= intrauterine death

Annexure 2: Circular No. 01-05/2006

General Circular No: 01 - 05/2006

My No: FHB/ED/20/2005 P
Director General of Health Services,
Ministry of Healthcare and Nutrition,
"Suwasiripaya", 385,
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Colombo 10.
03/01/2006

To all Provincial Directors of Health Services,
Deputy Provincial Directors of Health Services,
Director/ NIHS,
Heads of Institutions.

Surveillance on Perinatal Mortality

Surveillance is systematic collection, analysis, interpretation and dissemination of data regarding a health related event for use in public health action to reduce morbidity and mortality and to improve health. Ministry of Health has decided to implement surveillance on perinatal mortality as described below to assess and improve perinatal care in the country.

Perinatal deaths include all foetal deaths occurring after the 28th week of period of gestation and all neonatal deaths occurring within the first 7 days of birth. Perinatal mortality rate is a measure of socio economic development in fields such as education, social and public health as well as nutritional status, obstetric care and neonatal care of a country.

Data regarding perinatal deaths is very important to improve the quality of perinatal care in the institutions.

It has been decided to collect information on perinatal deaths by introducing the format attached herewith (Annex I) and regular conduction of perinatal mortality surveillance meetings as described below. This format was developed by Family Health Bureau with representatives from Ministry of Health, Perinatal Society of Sri Lanka, Sri Lanka College of Paediatricians and Sri Lanka College of Obstetricians and Gynaecologists. This has been pilot tested in selected institutions and necessary modifications made.

1

Procedure:

Perinatal mortality surveillance meetings should be conducted by every specialised institution providing perinatal care, with the following objectives.

- To identify all perinatal deaths.
- To identify technical as well as managerial deficiencies (including deficiencies in service provision), that contributed to perinatal deaths.
- To implement corrective actions in institutions and the field in order to improve quality of perinatal care services.

A) Procedure to conduct perinatal mortality surveillance meetings is as follows:

I. All specialised institutions providing perinatal care services should conduct perinatal mortality surveillance meetings.

II. It should be organized by the Director/MS/Head of the Institution.

III. Obstetricians, Paediatricians, MO.MCH, MOOH from the catchment area of the hospital, MOO attached to obstetric and neonatal units, Nursing in Charges of relevant units and Medical Record Officer should participate in this meeting. DPDHSs should ensure participation of MOO.MCH and MOOH.

IV. MO.MCH/ MO.Preventive Health of the institution should be the Secretary of the meeting.

V. The meeting should be conducted on a fixed day of each month where all officers can participate without difficulty.

VI. Each death should be discussed in detail and corrective action to be identified and implemented at institutional level.

VII. Data should be collected through the format attached herewith (Annex I).

VIII. The same format should be used for presenting the data at the meeting by the Medical Officer attached to the relevant obstetrics unit or SCBU/NICU.

IX. Under the guidance of the Head of the Institution, MO.Preventive Health or Medical Record Officer should maintain minutes and attendance register of the meeting and other relevant documents within the institution. Copies of the minutes should be sent monthly to the Family Health Bureau, DPDHS of the area, Obstetricians and Paediatricians.

2

B) How to fill the format:

1. The form (Annex I) should be filled for all the perinatal deaths that occur in specialised institutions. Instructions to fill selected variables of the form are attached as Annex II.

2. Officer confirming the perinatal death should initiate filling this form,
(E.g.: foetal death - Obstetrics Registrar/SHO/RHO
neonatal death - MO/ SCBU or NICU).

3. This form has to be filled within 2 days of occurrence of the death.

4. Sister in Charge of the unit where the death occurred should inform all perinatal deaths to the Head of the Institution using a register. Under the guidance of the Head of the Institution, Medical Record Officer should maintain a register/ electronic file on perinatal deaths in the institution.

5. It is the responsibility of the Sister in Charge of the unit where the death occurred to ensure that the format is completed by the relevant officers. She should forward the completed forms to the Head of the Institution within 7 days of the death and maintain a file of photocopied forms in the ward.

6. Information to fill this form may have to be obtained from more than 1 unit. In the case of foetal deaths, only Part I of the form should be filled by MO/ obstetric team. In the case of neonatal death, Part II should be filled by MO/ neonatal care unit and Part I should be filled by MO/obstetric team. Therefore each unit should maintain a register regarding forms sent to and received from other units which have been involved in management of the mother and/or neonate.

7. **Completed forms on foetal deaths should be filed by Sister in Charge/ obstetric unit. Completed forms on neonatal deaths should be filed by Sister in Charge/ NICU or SCBU.**

8. For filling the section on 'classification of death', Wigglesworth classification (Annex III) should be used. This should be laminated and displayed in all the units involved in auditing of perinatal deaths.

Head of the institution is responsible for and should ensure efficient functioning of perinatal mortality surveillance within the institution. He/she should also ensure regular conduction of perinatal mortality surveillance meetings with the participation of Paediatricians, Obstetricians and other relevant staff and implement corrective actions in the institution. In each meeting it is mandatory to identify corrective actions and discuss the implementation of them in the next meeting.

All Provincial Directors of Health Services, Deputy Provincial Directors of Health Services and Heads of institutions are kindly requested to bring to the notice of the relevant staff the contents of this circular and conduct perinatal mortality surveillance in their institutions.

I trust that all officers concerned would comply with the above instructions and make this process of perinatal mortality surveillance a success.

Dr. H.A.P. Kahandaliyanage,
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Addl.Secretary/ Medical Services,
All Provincial Secretaries of Health,
All Deputy Director Generals of Health Services,
Director/ Family Health Bureau,
Director/ Tertiary Care Services,
Director/ Medical Services,
President/ Sri Lanka College of Medical Administrators
President/ Sri Lanka College of Paediatricians
President/ College of Community Physicians of Sri Lanka
President/ Sri Lanka College of Obstetricians and Gynaecologists
President/ Perinatal Society of Sri Lanka
President/ Government Medical Officers Association.

4

Annexure 3: H-26 Form

H :26-ISS.02.01

CONFIDENTIAL

Audit on Perinatal Death

Information in this format is meant to be used for review purposes only, but not for any type of inquiry.

(Please tick against the appropriate box(es))

Part I *(To be filled by MO/obstetric team)*

Ward No :

Information of Mother:

Age:

Ethnicity

Code no.of MOH Area

Antenatal Care Provider: Same unit | Different unit | MOH | DH/PU/RH | GP | PHM | Shared care | Other | None

Place of Delivery: Home | Transit | PU | DH | BH | GH | TH | Other

Gravid:

Parity

Children

POA at delivery (weeks)

Obstetric complications: PIH, GDM, APH, Multiple pregnancy, Other (specify):

Antenatal medication: Dexamethasone; Other (specify)

Past obstetric history (if relevant)

Quality of antenatal care: Staff | Examinations | I_X | R_X | Risk factor identification

Intrapartum care:

Presentation at delivery

FHS on admission: + | -

Labour: Spontaneous, Augmented, Induced, Not applicable

Intrapartum complications: Lack of progress, Delayed 2nd stage, Obstructed labour, Foetal hypoxia; Meconium, Caput, Moulding, Other (specify):

Mode of delivery: AVD (Head / Breech / Twins); Instrumental (Forceps / Vacuum); LSCS (Emergency / Elective)

Partogram maintained: Yes | No | Not applicable

If "No", reasons.....

Quality of Intrapartum care satisfactory (including infection control procedure in the labour room/ operation theatre): Yes | No

If "No", reasons:.....

.....

Medications given (within 4 hours): Pain relief (GA/SA, Epidural, Pethidine); Antibiotics; Others:

Foetal complications: Prematurity | Congential abnormalities | Growth restriction | Infection | Other

Specify:.....

.....

Part II *(To be filled by MO/Neonatal Unit)*

Information of Baby:

	Date	Month	Year	
Date & time of birth				_____ am/pm
Date & time of death				_____ am/pm

Birth weight (g) ____ ____ ____ ____ Not recorded

Sex	Male	Female	Ambiguous genitalia

Maturity (Weeks)	< 28	28 - 32	33 - 36	≥ 37

Mode of admission LR ☐ OT ☐ PN ward ☐ Transferred ☐ Self ☐ Other ☐

Classification of type of death:
How this death can be defined?

1. IUD → a. Antepartum ☐ b. Intrapartum ☐
2. Early neonatal death → a. <2h ☐ b. 2h- < 24h ☐ c. 24hrs - < 48h ☐ d. 48hrs - 6 days ☐

APGAR	Colour	HR	Tone	Activity	Resp.	Total
1 Min						
5 Min						

Resuscitation
Not needed ☐
Nasopharyngeal suction ☐
Bag & mask ☐
O_2 ☐
Intubation ☐
CPR ☐
Medications ☐

Clinical details
a. Prematurity ☐
b. Septicaemia ☐
c. IRDS ☐
d. Meconium ☐
e. Hypothermia ☐
f. Post asphyxial encephalopathy ☐
g. CHD ☐
h. Birth trauma (specify):.....
Other (specify):.....

Cause of death : *(as in the International Classification of Diseases)*

Disease or condition directly leading to death :.....
Antecedent causes: .....
Other significant conditions contributing to the death: .....

Classification of death *(As stated in the modified Wigglesworth classification. Details given in the annexed page)*

1. Ante partum foetal death/Macerated still birth ☐
2. Congenital malformations ☐
3. Conditions associated with immaturity ☐
4. Asphyxial conditions developing at labour and delivery ☐
5. Specific condition other than the above (please specify) ☐

Post mortem: Done | Not done — If done, important findings:.....
.....

Preventive strategies to be implemented at institutional level to prevent future deaths:.....
.....

Date and time of filling the form: Date ..... Time .....am/pm

Instructions to fill selected variables-

Section - 1) Information of mother -1.1) Antenatal care

Variable -

1) Unit - Whether antenatal care has been received from the clinic of the same antenatal ward or a different ward.
2) Shared care - Whether the mother has received antenatal care from both specialists and primary health care staff.
3) Other - Includes antenatal care received from private sector as well.

-1.2) Quality of antenatal care - Please decide from the history and pregnancy record and other documents whether the quality of services received with respect to each component is on par with the standards for the hospital/area.

Section - 2) Intrapartum care -

Variable - Labour -

1) Spontaneous - No intervention done.
2) Augmented - Interventions done to stimulate the uterus to begin labour.
3) Induced - Interventions done to stimulate the uterus to increase the frequency, duration and strength of contractions.

Other variables to be filled are self explanatory.

Modified Wigglesworth Classification

1. **Antepartum fetal deaths/ macerated stillbirths**

   This group will include all normally formed macerated stillbirths. These macerated stillbirths are assumed to have occurred prior to the onset of labour, unless there is clear clinical evidence to the contrary. Antepartum deaths with major congenital malformations will be excluded from this group.

2. **Congenital malformations**

   This group should have a major congenital malformation that would have resulted in death or severe morbidity, or should have multiple minor malformations involving more than one system making a syndrome diagnosis likely.

3. **Conditions associated with immaturity**

   This group will include all live births less than 37 weeks gestation that die of complications of immaturity such as intraventricular haemorrhage, necrotizing enterocolitis, pulmonary haemorrhage etc. Infants weighing less than 1000gms will be presumed to belong to this group irrespective of time of death. Larger preterm infants weighing > 1000 gms who die at less than 4 hours of age will be excluded from this group as they are likely to have suffered from birth asphyxia .Thus such preterm infants will be included in group 4 unless a specific condition is present.

4. **Asphyxial conditions developing during labour and delivery**

   This group will include all fresh stillbirths and macerated stillbirths where there is clinical evidence that death occurred during labour. Live births weighing 1000gms or more dying at less than 4 hours of age will be included in this group. In addition all infants surviving for more than 4 hours in whom there is clinical and / or pathological evidence of birth trauma or asphyxia will be included in this group. Fetal deaths occurring during intervention such as caesarian section in the absence of labour will also be included.

5. **Specific conditions other than above**

   This will include specific causes such as Rhesus isoimmunisation, specific infections and mature babies dying of disorders normally associated with prematurity such as intraventricular haemorrhage.

Annexure 4: Summarized version of H-26 (2014)

Perinatal Mortality Data - 2014

Name of Hospital :
Number of deliveries (2014) :
Number of Obstetric Units: ( ) Availability of LR beds: ( ) No of Midwives: ( ) No of Nurses : ( ) No of MO / SHO / HO: ( )
Availability of SCBU: (Y / N) Neonatal ICU: (Y / N)
Availability of clinicians: Paediatricians ( ) Neonatologists ( ) Obstetricians ( ) *Please put number within brackets*

Note :*If a baby is live born even before 28 weeks of POA and died later (before 7 days), all such deaths should also be included and counted as perinatal deaths.(Only fetal deaths with POA < 28 weeks are not considered as perinatal deaths). FD = Foetal Death NND = Neonatal Death PM = Post-mortem*

BHT No.	Name of Mother /Baby	Address	MOH area	Parity	POA at birth or death *(weeks)*	FD or NND	Mode of delivery *(NVD / LSCS /other)*	Birth weight *(grams)*	Sex *(Male / Female / Ambiguous)*	Date of death *dd/mm/yy*	Age at death *(for NND)*	Cause of Death	PM done ? *(Yes /No)*

Name & Signature of Head of Institute: **Date:**

Annexure 5: Special summary format used in 2015 (ICD-PM system included)

Perinatal Mortality Data - 2015

Name of Hospital:

Total number of deliveries (2015)		Total number of Early Neonatal Deaths (< 7 days old)	
Total number of live births (2015)		Total number of births *(live births + foetal deaths > 28 wks)*	
Total number of Foetal Deaths > 22 wks (or birth weight >500g)		Total number of Perinatal Deaths *(Foetal Deaths > 28 wks + Early Neonatal Deaths)*	
Total number of Foetal Deaths > 28 wks (or birth weight >1000g)		Perinatal Mortality Rate for the hospital 2015 *(Perinatal deaths / total births) x 1000)*	

Note : *If a baby is live born even before 28 weeks of POA and died later (before 7 days), such deaths are considered as early neonatal deaths and should be included and counted as perinatal deaths.*

WHO recommends the inclusion of fetuses and live born neonates weighing between 500 g and 1000 g in national statistics both because of its inherent value and also it improves the coverage of reporting at 1000 g and over.
Therefore, all fetuses and infants weighing at least 500 g or > 22 weeks of POG at birth, whether alive or dead, should be included in the statistics.
However data on fetal deaths with POA < 22 weeks (500g) are only for information and not considered in statistical calculations).

Name of Head of Institute:

Signature:

Date:

Official Stamp:

You may request a soft copy of the data format from; Phone: 0112692745 / kapjay613@gmail.com OR download from the Family Health Bureau website - http://fhb.health.gov.lk/

Please send the completed data format to:
Director (Maternal & Child Health)
Family Health Bureau
231, De Saram Place
Colombo 10
OR email the soft copy to: *kapjay613@gmail.com*

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Serial No:	BHT No.	Name of Mother / Baby	Ethnicity Sinhalese Tamil Muslim Other	Residential Address	District & MOH area	Maternal Age (Years)	Type of Death (FD or NND)	Gravida	Parity	Type of Pregnancy Singleton Twin Multiple	Date of Birth (ddmmyy)	Place of Delivery	Time of Delivery HH:MM	Mode of delivery
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														

O	P	Q	R	S	T	U	V	W	X	Y1	Y2	Z
POG at birth *(wks)*	*Method of POG* *Assessment* *(LRMP / USS / Other)*	Birth weight *(grams)*	Sex *(Male / Female / Ambiguous)*	Date of death *dd/mm/yy*	Age at death *(for NND)* *(days + hours)*	Timing of death Antenatal Intrapartum Early neonatal	Cause/s of Death *(ICD-PM Group)*	Cause/s of Death *(Broad ICD-PM Cause)*	Cause of Death *(ICD specific category)*	Maternal condition/s *(ICD-PM Group)*	Maternal condition/s *(ICD-PM specific group)*	PM done ? *(Yes / No)*

Annexure 6: P-1 and P-2 Format

Ministry of Health

P - 1

Perinatal Death Documentation Format

Hospital and Unit:		Fetal Death ☐	Early Neonatal Death ☐

Summary Sheet

A	Clinical Record / BHT No:	Mother:	Baby:
B	Name of Mother / Baby		
C	Ethnicity of mother	☐ Sinhalese ☐ Tamil ☐ Muslim ☐ Other: _____	
D	Residential Address		
E	MOH Area	| PHM Area |	District / RDHS |
F	Age of mother	___ Years	NIC No:
G	Type of Perinatal Death	☐ Foetal ☐ Early Neonatal Death	Contact Phone/s |
H	Gravida		I. Parity: ___ | T___ P___ A___ L___
J	Type of Pregnancy	☐ Singleton ☐ Twin ☐ Higher___	K. Date of Delivery / Birth: DD / MM / YYYY
L	Place of Delivery		M. Time of Delivery: HH:MM
N	Type of Delivery	☐ Normal Vaginal ☐ Breech ☐ Forceps ☐ Vacuum ☐ Elective CS ☐ Emergency CS ☐ Hysterotomy ☐ Laparotomy for rupture uterus ☐ Other: _____	
O	POG at birth	_____ Weeks _____ days	P. Method of assessment: ☐ LMP ☐ USS ☐ other
Q	Birth Weight	_____ grams	R. Sex : ☐ Male ☐ Female ☐ Ambiguous
S	Date of death	DD / MM / YYYY	T. Age at death (for ENND): ___ days ___ hrs
U	Timing of death	☐ Antepartum ☐ Intrapartum ☐ Early neonatal ☐ Unable to classify timing	

Cause/s of Death

		Antepartum	Intrapartum	Early neonatal
V	ICD-PM Group *The group of main disease or condition that lead to death in fetus or infant*	A1_Congenital_malformations_and_chromosomal_abnormalities A2_Infection A3_Antepartum_hypoxia A4_Other_specified_antepartum_disorder A5_Disorders_related_to_fetal_growth A6_Fetal_death_of_unspecified_cause Unable_to_classify	I1_Congenital_malformations_and_chromosomal_abnormalities I2_Birth_Trauma I3_Acute_intrapartum_event I4_Infection I5_Other_specified_intrapartum_disorder I6_Disorders_related_to_fetal_growth I7_Intrpartum_death_of_unspecified_cause Unable_to_classify	N1_Congenital_malformations_and_chromosomal_abnormalities N2_Disorders_related_to_fetal_growth N3_Birth_trauma N4_Complications_of_intrapartum_events N5_Convulsions_and_disorders_of_cerebral_status N6_Infection N7_Respiratory_&_cardiovascular_disorders N8_Other_neonatal_conditions N9_Low_birth_weight_and_prematurity N10_Miscellaneous N11_Neonatal_death_of_unspecified_cause Unable_to_classify
W	Broad ICD-PM Cause	*The broad cause of death selected from Broad ICD codes. (Please refer to guidelines & codes)*		
X	ICD specific category	Specific cause/s of death		

Maternal conditions contributing to death

Y1	ICD -PM Group (Main maternal disease or condition affecting fetus or infant)	*M1_Complications_of_placenta_cord_and_membranes* *M2_Maternal_complications_of_pregnancy* *M3_Other_complications_of_labour_and_delivery* *M4_Maternal_medical_and_surgical_conditions* *M5_No_maternal_condition*
Y2	ICD -PM specific group (Specific maternal condition/s affecting fetus or infant)	

Post-mortem Details

Z	Pathological / Forensic Record No:_____	Done ☐ Not done ☐ Details:
Z1	Death Registration Information	Certificate of Still Birth (B22) / Declaration of Death (B 33) filled ? ☐ Yes ☐ No **Death Certificate No:**

Page 1

Detailed Case Abstraction

a	**Maternal History**				
1	Marital Status	☐ Unmarried ☐ Married ☐ Living together ☐ Widowed ☐ Divorced			
2	Personal History	☐ Smoking ☐ Alcohol ☐ Betel Leave Chewing ☐ Consanguinity *If 'Yes' give details*			
3	Past Medical Illnesses				
4	Previous Still Births or ENNDs	*Please indicate POG at birth & possible causes*			
5	Previous preterm / LBW babies	*Please indicate POG at birth & possible causes*			
6	Previous pregnancy complications	☐ *Chronic hypertension* ☐ *Preeclampsia* ☐ *Gestational hypertension* ☐ *Abruption placentae* ☐ *Preeclampsia superimposed in hypertension* ☐ *diabetes mellitus* ☐ *GDM* ☐ *Other*_____			
b	**Ante-natal care**				
1	POG at booking		2	BMI at booking	_____ Kg/M^2
3	No of antenatal visits		4	ANC Last visit	On DD / MM / YYYY at ____ Wks
5	Place of ANC	☐ Field ☐ Specialist Hospital ☐ Specialist (Private)	6	Last visit seen by	☐ PHM ☐ PHNS ☐ MOH ☐ MO ☐ Registrar ☐ VOG
7	Quality of AN care: ☐ Satisfactory ☐ Unsatisfactory *If 'Unsatisfactory' give details*				
	Hospital Inward Management			**8.** Date Admitted	DD / MM / YYYY | Time: HH:MM
9	Referred to hospital	☐ Self ☐ Other:_____		**10.** FHS on admission	☐ Present ☐ Not present
11	Reason for admission / Presenting complaints / conditions:				
	Antepartum complications				
12	**Anemia**	Mild / Moderate / Severe / Very severe	13	**APH**	Placenta Praevia / Abruptio
14	**Infection**	Syphilis/ HIV /hyperpyrexia, others:_____	15	**Preterm labor**	
16	**Hypertension**	Chronic/Gestational/ PE/ Eclampsia	17	**PROM**	PT/ Term/ Chorioamnionitis
18	**Diabetes**	Type I/Type II/GDM	19	**Cholestasis**	
20	**IUGR**	Mild/Severe	21	**Trauma**	RTA/ Fall / domestic violence
22	**Others**				
	Antenatal Investigations			Prenatal Screening	
23	Hb (gm/dl)		30	Dual marker	
24	Urine albumin /glucose Microscopy		31	US for Nuchal translucency & nasal bone	
25	VDRL / TPHA		32	Triple test	
26	Blood group & Rh if negative ICT		33	Anomaly scan (Level 2 ultrasound)	
27	GTT/ GCT/HbA1c/ FBS		34	Latest Growth scan	
28	HIV		35	Other	
29	Other				
36	Antenatal medications	☐ Dexamethasone ☐ Antibiotics: (☐ Oral ☐ IV) _____ ☐ Other:_____			
c	**Intrapartum care**				

Page 2

1	Type of labor	☐ Spontaneous ☐ Induced	2	Partograph used	☐ Yes ☐ No ☐ N/A
3	Indication/s for Induction of Labor		4	Fetal Monitoring intrapartum	☐ Manual ☐ CTG ☐ Both
5	Method of induction of labor	☐ Oxytocin ☐ Misoprostol ☐ Prostaglandins ☐ Foley's catheter ☐ ARM	6	Last CTG/ Manual record prior to FD or delivery	☐ Hours prior
7	Comment on Foetal wellbeing:				
8	Intrapartum complications: ☐ Non progress of labor ☐ Prolonged second stage ☐ Fetal distress ☐ Obstructed labor ☐ Cord complications ☐ Fever ☐ Rupture uterus ☐ Chorioamnionitis ☐ Abruptio ☐ Eclampsia ☐ Others_____				
9	Type of Delivery	☐ *Normal Vaginal* ☐ *Breech* ☐ *Forceps* ☐ *Vacuum* ☐ *Elective CS* ☐ *Emergency CS*			
10	Indications for cesarean / instrumental delivery:				

11	Decision to delivery interval	____ Min.	12	Duration of stages	1st: ___Hrs 2nd: ____Min 3rd: ___Min
13	Duration of rupture membranes	____ Hrs	14	Delivery conducted by	☐ Midwife ☐ Nurse ☐ HO ☐ SHO ☐ Registrar ☐ SR ☐ VOG
15	Maternal outcome	☐ Alive and well ☐ Alive but with serious morbidity ☐ Death			

Placental Examination

16	Weight	_____ (gm)	17	Chorionicity of Multiple Pregnancy	☐ DADC ☐ DAMC ☐ MAMC
18	Morphology	☐ Normal ☐ Abnormal	19	Membrane Culture	☐ Positive ☐ Negative ☐ Not done
20	Infarct	☐ Yes ☐ No	21	Cord Insertion	☐ Normal ☐ Abnormal
22	Histopathaology: ☐ Done ☐ Not done Suggestive of syphilis ☐ Yes ☐ No		*Report:*		

d Baby details

1	Delivery outcome	☐ Live birth ☐ Fresh stillbirth ☐ Macerated stillbirth			
2	Birth Weight	_____ *grams*	3	OFC: _____cm	4. Length: _____cm
5	Maturity at Birth	_____ wks	6	Apgar score	1 min ☐ 5 min ☐ 10 min ☐
7	Congenital Abnormalities present ?	☐ Yes ☐ No	8	Description of congenital abnormalities	☐ Isolated ☐ Multiple ☐ Syndromic
9	Describe the Congenital Abnormalities present:				

Investigations of baby

10	Cord blood ☐ Done ☐ Not done ☐ Not available	Blood group & Rh : _____ Hb: ____ (gm /dl) Bilirubin: ____ (mg %) DCT :_____ VDRL: _____ TPHA: _____ Rubella: _____ Toxoplasma: _____ CMV: _____ Parvovirus: _____ Karyotyping: ☐ Positive ☐ Negative Others (specify):_____
11	Infantogram (whole body x-ray) ☐ Done ☐ Not done ☐ Not available	*Describe:*

e Neonatal Care

1	Mode of Admission	☐ Within same hospital ☐ Transferred (from:_____) ☐ Self ☐ Other: _____
2	Date of Admission	DD / MM / YYYY | Time: HH:MM
3	Presentation / Complications at birth / during neonatal period :	
4	Whether resuscitation needed at birth ? ☐ Yes ☐ No If 'yes', resuscitated by a trained person ? ☐ Yes ☐ No Modes of resuscitation: ☐ Nasopharyngeal Suction ☐ Bag & Mask ☐ Oxygen ☐ Intubation ☐ Ventilation (☐ CPAP ☐ Other: _____) ☐ Other:_____	
5	Were there any reasons for special care (SCBU /ICU)? **Yes** ☐ **No** ☐ *(If 'Yes', please give details)*	

Page 3

6	Medications	☐ Surfactant ☐ Antibiotics: (☐ Oral ☐ IV) _____ ☐ IV Fluids:_____ ☐ Other:_____			
7	Kangaroo Mother Care	☐ Given ☐ Not given	8	Breastfeeding	☐ Initiated within 1 hr ☐ Later: ____
f	View of the investigation team on factors contributing to infant death				
1	Any avoidable factors relating to seeking medical care or mother's /guardian's compliance :				
2	Difficulties in reaching the health facility: *(Communication / Transport / Ambulances):*				
3	Any avoidable factors identified at field health care (MOH / PHM):				
4	Any avoidable factors identified at the first health encounter by GP/MO-OPD:				
5	Any avoidable factors in the clinical management or deficiencies in attitude / negligence / judgment:				
6	Lack of /non availability of health personnel, facilities and other logistics: *(eg. PBU /ICU/ Ventilators /OT /laboratory services/ Blood /Medications)*				
7	Deficiencies in hospital administration:				
g	Overall view of the investigation team				
1	Can you think of any steps / actions, which if taken earlier, might have prevented this death ?				
2	If you were treating this case again what changes would you make that will help to avoid such deaths ?				
h	Lessons learnt & actions taken				
1. Describe the lessons learnt out of the index death & actions already taken to rectify the identified deficiencies.					
2. Date FD/ENND notified	DD / MM / YYYY	3. Date of hospital death review conducted	DD / MM / YYYY		
i	Names & Designations of the investigation team:				
Name	*Designation*	*Name*	*Designation*		

Name of Clinician: Dr. _____ **Signature:** _____ **Date:** DD / MM/ YYYY

Designation: _____

Please prepare this report in duplicate and send one copy to Hospital Head and keep the other for your documentation.

Page 4

P - 2

Ministry of Health

Monthly Report - Hospital Perinatal Mortality Surveillance Meetings

Name of Hospital :	Reference Month	Year

Total number of deliveries		Total number of Early Neonatal Deaths (< 7 days old)	
Total number of live births		Total number of births *(live births + foetal deaths > 28 wks)*	
Total number of Foetal Deaths > 22 wks (>500g)		Total number of Perinatal Deaths *(Foetal Deaths > 28 wks + Early Neonatal Deaths)*	
Total number of Foetal Deaths > 28 wks (>1000g)		Perinatal Mortality Rate for the hospital *(Perinatal deaths / total births) x 1000)*	

Summary Information of Perinatal Deaths: Please complete the annexure and attach all individual Perinatal Death Documentation Formats to this report.

: If a baby is live born even before 28 weeks of POA and died later (before 7 days), such deaths are considered as early neonatal deaths and should be included and counted as perinatal deaths.
(Data on fetal deaths with POA 22 - 28 weeks are only for information and are not considered in statistical calculations).

Deficiencies / Problems Identified and the proposed solutions made at the meeting

	Deficiencies /Problems Identified	Proposed Solutions	Responsibility	Time Frame

Please use additional sheets if necessary to describe actions taken.

1

Date of the Meeting: **Venue:**

List of participants:

Staff from the hospital

	Designation	No. Participated	Remarks
1	Director /Medical Superintendent		
2	Deputy Director /Deputy MS		
3	Consultant Paediatricians		
4	Consultant Neonatologist		
5	Consultant Obstetrician & Gynaecologists		
6	MO-Planning		
7	Registrar- Paediatrics		
8	Registrar-Obs & Gynae		
9	SHO/MO-Special Care baby Units		
10	SHO-Paediatric Units		
11	SHO-Obs &Gynae Units		
12	Other MOs including HOs		
13	Matrons		
14	Nursing Officers -NICU		
15	Nursing Officers -SCBU		
16	Nursing Officers-Labour room		
17	Nursing Officers -Ante natal wards		
18	Nursing Officers -Post natal wards		
19	Midwives		
20	MRO		
21	Nursing Officer-Health education		
22	Nursing Officer-Infection Control		
23	Other officers		
	Sub Total		

Staff from other Institutions

	Designation	No. Participated	Remarks
24	MOMCH		
25	MOH		
26	PHNS		
27	PHMs		
28	Other		
	Sub Total		
Total Number Participated			

Name of Head of Institute:

Date: **Signature:**
Official Stamp:

The completed data format should be sent to:
Director (MCH), Family Health Bureau, 231 De Saram Place Colombo 10.

Summary Information of Perinatal Deaths

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Serial No	BHT No.	Name of Mother / Baby	Address	MOH area	Type of Death (FD or NND)	Date of Birth (dd/mm/yy)	Place of Delivery	POG at birth (Weeks)	Birth weight (grams)	Sex (Male, Female, Ambiguous)	Date of death (dd/mm/yy)	Age at death for NND: days - hours	Timing of death (Antepartum / Intrapartum)	Causes of Death
1														
2														
3														
4														
5														
6														
7														
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20														

You may use additional sheets if necessary.
Please attach all Individual Perinatal De) Do nentation Formats relevant to above dec ...s tc is report

3

Annexure 7: DGHS letter No. FHB/EH/12/2015 dated 24.02.2016

දුරකථන / தொலைபேசி / Telephone	) 011 2669192 , 011 2675011) 011 2698507 , 011 2694033) 011 2675449 , 011 2675280	මගේ අංකය / எனது இல / My No.	) FHB/EH/ 12 /2015
ෆැක්ස් / பெக்ஸ் / Fax	) 011 2693866) 011 2693869) 011 2692913	ඔබේ අංකය / உமது இல / Your No. :	)
විද්‍යුත් තැපෑල / மின்னஞ்சல் முகவரி / e-mail	) postmaster@health.gov.lk	දිනය / திகதி / Date	) 2016.02.24
වෙබ් අඩවිය / இணையத்தளம்	) www.health.gov.lk		

සුවසිරිපාය
சுவசிரிபாய
SUWASIRIPAYA

සෞඛ්‍ය, පෝෂණ සහ දේශීය වෛද්‍ය අමාත්‍යාංශය
சுகாதார, போசணை மற்றும் சுதேச வைத்திய அமைச்சு
Ministry of Health, Nutrition & Indigenous Medicine

All Provincial Directors of Health Services
All Regional Directors of Health Services
All Heads of the Health Institutions
All Heads of the Private Health Institutions
Director – National Institute of Health Sciences
Chief Medical Officer - Colombo Municipal Council

Implementation of the National Feto-infant Mortality Surveillance System

With the reduction of maternal mortality and infant mortality to lower levels and a majority of the infant deaths are concentrated in the early neonatal period, feto-infant mortality surveillance plays a crucial role in improving maternal and child health service delivery and also in further reduction of infant mortality. It also contributes to the availability of quality feto-infant mortality data.

Surveillance of feto-infant deaths involves the ongoing, systematic collection, analysis, and interpretation of data related to feto-infant deaths, essential to the planning, implementation and evaluation of public health practice, closely integrated with the dissemination of these data to those who need to know and linked to prevention and control of such deaths. Ministry of Health has introduced a feto-infant mortality surveillance mechanism, with Family Health Bureau (FHB), as the national nodal point.

The objectives of the surveillance is to make available quality feto-infant mortality data, to utilize such data effectively at different levels (field, hospital, district and national levels) and to translate lessons learnt in to practice by dissemination to all stakeholders of maternal & child health.

The implementation of the feto-infant surveillance will commence with immediate effect both in the hospitals and the field levels. All feto-infant deaths that occurred both in the field and hospitals since 1st January 2016 should be included in the feto-infant mortality surveillance.

The feto-infant surveillance mechanism is described in detail in the Guidelines on National Feto-infant Mortality Surveillance (Annexure I).

Key components of the surveillance mechanism are as follows;

1. *Feto-infant deaths in all hospitals (both government and private sector) and in the field are subjected to feto-infant surveillance*

385, පූජ්‍ය බද්දේගම විමලවංශ හිමි මාවත, කොළඹ 10. 385, வணக்கத்துக்குரிய பத்தேகம விமலவன்ச தேரோ மாவத்தை, கொழும்பு 10.
385, Rev. Baddegama Wimalawansa Thero Mawatha, Colombo 10, Sri Lanka.

2. *All fetuses and infants weighing > 500 g or >22 weeks of POG at birth, whether alive or dead at birth (and later died), should be included in perinatal death surveillance at hospital level.*
3. *All **perinatal deaths** (>22 weeks POG or > 500g weight upto 7 days after birth) of both government and private hospitals should be notified to the head of the institute by the medical officer confirming the death (at obstetric or paediatric unit) using the **Perinatal Death Documentation Format** within 24 hours. (Filling of H-26 is no longer necessary).*
4. *All **Infant deaths** (excluding early neonatal deaths which are covered under perinatal deaths) of both government and private hospitals should be notified to the head of the institute by the medical officer confirming the death using the form Hospital Infant Death Notification Form within 24 hours. A fact-finding institutional infant death review should be conducted within 14 days and completed **Hospital Infant Death Investigation Form*** should be sent to *Director (MCH) by the head of the institute.*
5. ***Monthly Hospital Perinatal Mortality Surveillance Report** should be sent along with all individual Perinatal Death Documentation Formats within one week after conducting the Hospital Perinatal Mortality Surveillance meeting to Director (MCH) by the head of the institute.*
6. *The Certificate of Still Birth (B22) for all foetal deaths > 28 weeks of POG and the Declaration of Death (B 33) for all live borns (irrespective of the POG) and later died should be filled by the medical officer confirming the death.*
7. *All **Infant deaths** reported from the **field** should be notified within 24 hours and a fact-finding field infant death review should be conducted within 14 days and completed **Field Infant Death Investigation Form*** should be sent to *Director (MCH) by the head of the institute. (Filed Infant Death Investigation conducted by PHM/PHNs and reporting in H678 is no longer required).*

All heads of all levels of hospitals (both in the government & private sector) and all medical officers of health (MOOH) are advised to facilitate the implementation of feto-infant mortality surveillance by establishing the information flow with the help of relevant staff involved. You are also advised to make sure the availability of all data collecting formats at each level.

You are instructed to copy this letter and attached Guidelines on National Feto-infant Mortality Surveillance to all relevant officials and/or institutions for the successful implementation of the system.

I trust that all officers concerned would comply with the guidelines and make every effort to successfully implement the National Feto-infant Mortality Surveillance System in the entire country.

Dr. P. G. Mahipala
Director General of Health Services
Ministry of Health, Nutrition & Indigenous Medicine
"Suwasiripaya"
385, Ven. Baddegama Wimalawansa Thero Mw
Colombo 10.

Dr. PG Maheepala
Director General of Health Services

Cc: Secretary Health – Ministry of Health
Additional Secretary – Medical Services & Public Health Services
DDGs – Medical Services I & II, ET & R
DDG – PHS II
Directors (MCH / TCS / MS / Private Health Sector Development / Nursing)
Presidents - Sri Lanka College of Obstetricians & Gynecologists/ Sri Lanka College of Pediatricians / College of Community Physicians of Sri Lanka / Sri Lanka College of Forensic Pathologists / Perinatal Society of Sri Lanka / Sri Lanka College of Pathologists / Sri Lanka College of Administrators / Sri Lanka Medical Association

385, [illegible] 10. 385, [illegible] 10.
385, Rev. Baddegama Wimalawansa Thero Mawatha, Colombo 10, Sri Lanka.

Annexure 8: DGHS letter No. FHB/EH/12/2016 dated 20.05.2016

Telephone) 011 2680102 , 011 2679011
) 011 2696307 , 011 2694033
) 011 2675449 , 011 2675280
Fax) 011 2693866
) 011 2693868
) 011 2692913
e-mail) postmaster@health.gov.lk
website) www.health.gov.lk

සුවසිරිපාය
சுவசிரிபாய
SUWASIRIPAYA

My No. FHB/EH/12/2016

Date 20/05/2016

සෞඛ්‍ය, පෝෂණ සහ දේශීය වෛද්‍ය අමාත්‍යාංශය
சுகாதார, போஷணை மற்றும் சதேச வைத்திய அமைச்சு
Ministry of Health, Nutrition & Indigenous Medicine

All Provincial Directors of Health Services
All Regional Directors of Health Services
All Heads of the Specialized Hospitals
All Obstetricians & Gynaecologists
All Paediatricians / Neonatologists
All Heads of the Private Health Institutions
Director – National Institute of Health Sciences

Implementation of the National Feto-infant Mortality Surveillance System
-Hospital Perinatal Mortality Surveillance

The implementation of the feto-infant surveillance commenced both in the hospitals and at the field levels from 1st January 2016 as instructed in DGHS letter No: FHB/EH/12/2015 dated 24.02.2016.

Further emphasizing the instructions given in Guidelines on National Feto-infant Mortality Surveillance, you are instructed to implement following steps with regard to perinatal deaths in your hospital;

1. *All fetuses and neonates (up to 7 days of age) weighing > 500 g or >22 weeks of POG at birth, whether alive or dead at birth (and later died), should be included in perinatal death surveillance at hospital level.*
2. *All perinatal deaths (>22 weeks POG or > 500g weight up to 7 days after birth) of both government and private hospitals should be notified to the head of the institute by the medical officer confirming the death (at obstetric or paediatric unit) using the Perinatal Death Documentation Format (P 1) within 24 hours.*
   (Filling of H-26 is no longer necessary).
3. *All hospitals with specialized units (Obstetrics and/or Paediatric/Neonatological) should conduct monthly Hospital Perinatal Mortality Surveillance Meetings.*
   The participation of the relevant officers at this meeting is mandatory.
4. *After the meeting, Monthly Report - Hospital Perinatal Mortality Surveillance Meeting (P - 2) should be sent within one week to Director (MCH) by the head of the institute. All individual Perinatal Death Documentation Formats of the month should be attached to the Monthly Report.*
5. *The Certificate of Still Birth (B22) for all foetal deaths > 28 weeks of POG and the Declaration of Death (B 33) for all live borns (irrespective of the POG) and later died should be filled by the medical officer confirming the death.*

385, පූජ්‍ය කිරිබත්ගොඩ ධම්මානන්ද මාවත, කොළඹ 10. 385, வணக்கத்துக்குரிய கிரிபத்கொட தம்மானந்த மாவத்தை, கொழும்பு 10.
385, Ven. Kiribathgoda Wimalananda Thero Mawatha, Colombo 10. Sri Lanka

6. *Disposal of the dead bodies should be undertaken only after the registration of the death with the area Death Registrar.*

All heads of all levels of hospitals (both in the government & private sector) are advised to facilitate the implementation of *Perinatal Mortality Surveillance* by establishing the information flow with the help of relevant staff involved.

You are instructed to copy this letter and attached formats (P -1 & P – 2) to all relevant officials and/or institutions for the successful implementation of the system.

Dr. P. G. Mahipala
Director General of Health Services
Ministry of Health, Nutrition & Indigenous Medicine
"Suwasiripaya",
385, Rev Baddegama Wimalawansa Thero Mawatha,
Colombo 10.

Dr. PG Maheepala
Director General of Health Services

Cc: Secretary Health – Ministry of Health
Additional Secretary – Medical Services & Public Health Services
DDGs – Medical Services I & II, ET & R
DDG – PHS II
Directors (MCH / TCS / MS / Private Health Sector Development / Nursing)
Presidents - Sri Lanka College of Obstetricians & Gynecologists/ Sri Lanka College of Pediatricians / College of Community Physicians of Sri Lanka / Sri Lanka College of Forensic Pathologists / Perinatal Society of Sri Lanka / Sri Lanka College of Pathologists / Sri Lanka College of Administrators / Sri Lanka Medical Association

385, රෙව. බදේගම විමලවංස ස්ථවිර මාවත, කොළඹ 10. 385, வண.பத்தேகம விமலவங்ச தேரர் மாவத்தை, கொழும்பு 10.
385, Rev. Baddegama Wimalawansa Thero Mawatha, Colombo 10, Sri Lanka.

Annexure 9: Revised P-1 Format

P-1

Ministry of Health- Perinatal Death Documentation Format

Hospital and Unit:		**Fetal Death** ☐	**Early Neonatal Death** ☐

Summary Sheet

A	Clinical Record /BHT No:	Mother:	Baby:
B	Name of Mother / Baby		
C	Ethnicity of mother	☐*Sinhalese* ☐ *Tamil* ☐ *Muslim*☐ *Other:* _____	
D	Residential Address		
E	MOH Area	|PHM Area|	District / RDHS|
F	Age of mother	___ Years	NIC No:
G	Type of Perinatal Death	☐*Foetal* ☐ *Early Neonatal Death*	Contact Phone/s|
H	Gravida		**I.** Parity:____ | **T**___ **P**___ **A**____ **L**____
J	Type of Pregnancy	☐*Singleton* ☐ *Twin* ☐ *Higher*____	**K.** Date of Delivery / Birth: DD / MM / YYYY
L	Place of Delivery		**M.** Time of Delivery: HH:MM
N	Type of Delivery	☐*Normal Vaginal* ☐ *Breech* ☐ *Forceps* ☐ *Vacuum* ☐ *Elective CS* ☐ *Emergency CS* ☐ *Hysterotomy* ☐ *Laparotomy for rupture uterus* ☐ *Other:*_____	
O	POG at birth	_____ *Weeks* _____ *days*	**P.** Method of assessment: ☐*LMP* ☐ *USS* ☐*other*
Q	Birth Weight	_____ *grams*	**R.** Sex : ☐*Male* ☐ *Female* ☐ *Ambiguous*
S	Date of death	DD / MM / YYYY	**T.** Age at death(*for ENND*):___*days* ___*hrs*
U	Timing of death	☐*Antepartum* ☐ *Intrapartum* ☐ *Early neonatal* ☐ *Unable to classify timing*	

Cause/s of Death

V1	ICD-PM Group *The group of main disease or condition that lead to death in fetus or infant*	***Antepartum***	***Intrapartum***	***Early neonatal***
		A1_Congenital_malformations_and_chromosomal_abnormalities **A2**_Infection **A3**_Antepartum_hypoxia **A4**_Other_specified_antepartum_disorder **A5**_Disorders_related_to_fetal_growth **A6**_Fetal_death_of_unspecified_cause Unable_to_classify	**I1**_Congenital_malformations_and_chromosomal_abnormalities **I2**_Birth_Trauma **I3**_Acute_intrapartum_event **I4**_Infection **I5**_Other_specified_intrapartum_disorder **I6**_Disorders_related_to_fetal_growth **I7**_Intrpartum_death_of_unspecified_cause Unable_to_classify	**N1**_Congenital_malformations_and_chromosomal_abnormalities **N2**_Disorders_related_to_fetal_growth **N3**_Birth_trauma **N4**_Complications_of_intrapatum_events **N5**_Convulsions_and_disorders_of_cerebral_status **N6**_Infection **N7**_Respiratory_&_cardiovasular_disorders **N8**_Other_neonatal_conditions **N9**_Low_birth_weight_and_prematurity **N10**_Miscellaneous **N11**_Neonatal_death_of_unspecified_cause Unable_to_classify
V2	Broad ICD-PM Cause	*The broad cause of death selected from Broad ICD codes. (Please refer to guidelines & codes)*		
V3	ICD specific category	Specific cause/s of death		

Maternal conditions contributing to death

W1	ICD-PM Group (Main maternal disease or condition affecting fetus or infant)	***M1**_Complications_of_placenta_cord_and_membranes* ***M2**_Maternal_complications_of_pregnancy* ***M3**_Other_complications_of_labour_and_delivery* ***M4**_Maternal_medical_and_surgical_conditions* ***M5**_No_maternal_condition*
W2	ICD-PM specific group (Specific maternal condition/s affecting fetus or infant)	

Post-mortem Details

X	Pathological / Forensic Record No:_____	*Done* ☐ *Not done*☐*Details:*
Y	Death Registration Information	Stillbirths >28 wks: Certificate of Still Birth (B22)filled ? ☐Yes ☐No Early Neonatal Deaths (irrespective of POG) Declaration of Death (B 33)filled ? ☐Yes ☐No

a	**Maternal History**				
1	Marital Status	☐ Unmarried ☐ Married ☐ Living together ☐ Widowed ☐ Divorced			
2	Maternal Risk Factors	☐ Smoking ☐ Alcohol ☐ Betel Leave Chewing ☐ Consanguinity ☐ Other_____			
3	POG at booking	____ Wks	**4**	BMI at booking	____ Kg/M^3
b	**Hospital Inward Management**				
1	Date Admitted	DD / MM / YYYY | Time: HH:MM	**2.** FHS on admission to hospital	☐ Present (Rate:____) ☐ Not present	
3	Reason for admission / Presenting complaints / conditions:				
4	Details of Prenatal Screening :		**5**	Antenatal Investigations:	
6	Antepartum complications:				
c	**Intrapartum care / Labour Room Care**				
1	FHS on admission to labour room	☐ Present ☐ Not present	**2.** Rate *(if present)*:		
3	Type of labor	☐ Spontaneous ☐ Induced	**4**	Partograph used	☐ Yes ☐ No ☐ N/A
5	Indication/s for IOL		**6**	Fetal Monitoring intrapartum	☐ Manual ☐ CTG ☐ Both
7	Method of induction of labor	☐ Oxytocin ☐ Misoprostol ☐ Prostaglandins ☐ Foley's catheter ☐ ARM			
9	Intrapartum complications: ☐ Non progress of labor ☐ Prolonged second stage ☐ Fetal distress ☐ Obstructed labor ☐ Cord complications ☐ Fever ☐ Rupture uterus ☐ Chorioamnionitis ☐ Abruptio ☐ Eclampsia ☐ Other_____				
10	Type of Delivery	☐ *Normal Vaginal* ☐ *Breech* ☐ *Forceps* ☐ *Vacuum* ☐ *Elective CS* ☐ *Emergency CS*			
11	Indications for cesarean / instrumental delivery:				
12	Decision to delivery interval	___ Min.	**13**	Duration of stages	**1st** : __Hrs **2nd** :___ Min **3rd** :__ Min
14	Duration of rupture membranes	___ Hrs	**15**	Delivery conducted by	☐ Midwife ☐ Nurse ☐ HO ☐ SHO ☐ Registrar ☐ SR ☐ VOG
16	Maternal outcome	☐ Alive and well ☐ Alive but with serious morbidity ☐ Death			
d	**Placental Examination**				
1	Weight	____ (gm)	**2**	Chorionicity of Multiple Pregnancy	☐ DADC ☐ DAMC ☐ MAMC
3	Morphology	☐ Normal ☐ Abnormal	**4**	Cord Insertion	☐ Normal ☐ Abnormal
5	Infarcts	☐ Yes ☐ No	**6**	Membranes	☐ Complete ☐ Incomplete ☐ Uncertain
7	Histopathaology: ☐ Done ☐ Not done		**8.** *Report:*		
e	**Baby details**				
1	Delivery outcome	☐ Live birth ☐ Fresh stillbirth ☐ Macerated stillbirth			
2	Birth Weight	_____ *grams*	**3**	OFC: ____cm	**4.** Length: ____cm
5	Maturity at Birth	____ wks	**6**	Apgar score	1 min ☐ 5 min ☐ 10 min ☐
7	Congenital Abnormalities present ?	☐ Yes ☐ No	*Describe:*		
f	**Neonatal Care**				
1	Mode of Admission	☐ Within same hospital ☐ Transferred (from:_____) ☐ Self ☐ Other: _____			
2	Date of Admission	DD / MM / YYYY | Time: HH:MM			
3	Presentation / Complications at birth / during neonatal period :				
4	Whether resuscitation needed at birth ? ☐ Yes ☐ No If 'yes', resuscitated by a trained person ? ☐ Yes ☐ No Modes of resuscitation: ☐ Nasopharyngeal Suction ☐ Bag & Mask ☐ Oxygen ☐ Intubation ☐ Ventilation (☐ CPAP ☐ Other: _____) ☐ Other:_____				
5	Were there any reasons for special care (SCBU /ICU)? **Yes** ☐ **No** ☐ *(If 'Yes' , please give details)*				
6	Medications	☐ Surfactant ☐ Antibiotics: (☐ Oral ☐ IV) _____ ☐ IV Fluids:_____ ☐ Other:_____			
7	Kangaroo Mother Care	☐ Given ☐ Not given	**8**	Breastfeeding	☐ Initiated within 1 hr ☐ Later: ___
Date FD/ENND notified		DD / MM / YYYY	Date of hospital death review conducted		DD / MM / YYYY

P - 2

Ministry of Health

Monthly Report - Hospital Perinatal Mortality Surveillance Meetings

Name of Hospital :	Reference Month	Year

Total number of deliveries		Total number of Early Neonatal Deaths (< 7 days old)	
Total number of live births		Total number of births *(live births + foetal deaths > 28 wks)*	
Total number of Foetal Deaths > 22 wks (>500g)		Total number of Perinatal Deaths *(Foetal Deaths > 28 wks + Early Neonatal Deaths)*	
Total number of Foetal Deaths > 28 wks (>1000g)		Perinatal Mortality Rate for the hospital *(Perinatal deaths / total births) x 1000)*	

Summary Information of Perinatal Deaths: Please complete the annexure and attach all individual Perinatal Death Documentation Formats to this report.

Note : *If a baby is live born even before 28 weeks of POA and died later (before 7 days), such deaths are considered as early neonatal deaths and should be included and counted as perinatal deaths.*
(Data on fetal deaths with POA 22 - 28 weeks are only for information and are not consideredin statistical calculations).

Deficiencies / Problems Identified and the proposed solutions made at the meeting

	Deficiencies /Problems Identified	Proposed Solutions	Responsibility	Time Frame

Please use additional sheets if necessary to describe actions taken.

Date of the Meeting: **Venue:**

List of participants:

Staff from the hospital

	Designation	**No. Participated**	**Remarks**
1	Director /Medical Superintendent		
2	Deputy Director /Deputy MS		
3	Consultant Paediatricians		
4	Consultant Neonatologist		
5	Consultant Obstetrician & Gynaecologists		
6	MO-Planning		
7	Registrar- Paediatrics		
8	Registrar-Obs & Gynae		
9	SHO/MO-Special Care baby Units		
10	SHO-Paediatric Units		
11	SHO-Obs &Gynae Units		
12	Other MOs including HOs		
13	Matrons		
14	Nursing Officers -NICU		
15	Nursing Officers -SCBU		
16	Nursing Officers-Labour room		
17	Nursing Officers -Ante natal wards		
18	Nursing Officers -Post natal wards		
19	Midwives		
20	MRO		
21	Nursing Officer-Health education		
22	Nursing Officer-Infection Control		
23	Other officers		
	Sub Total		
Staff from other Institutions			
	Designation	**No. Participated**	**Remarks**
24	MOMCH		
25	MOH		
26	PHNS		
27	PHMs		
28	Other		
	Sub Total		
Total Number Participated			

Name of Head of Institute:

Date: **Signature:**
Official Stamp:

The completed data format should be sent to:
Director (MCH), Family Health Bureau, 231 De Saram Place Colombo 10.

Summary Information of Perinatal Deaths

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Serial No:	BHT No.	Name of Mother / Baby	Address	MOH area	Type of Death (FD or NND)	Date of Birth (ddmmyy)	Place of Delivery	POG at birth *(wks)*	Birth weight *(grams)*	Sex *(Male / Female / Ambiguous)*	Date of death *dd/mm/yy*	Age at death *(for NND) (days + hours)*	Timing of death *(AN/IP/EN)*	Cause/s of Death
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20														

You may use additional sheets if necessary.
Please attach <u>all</u> individual Perinatal Death Documentation Formats relevant to above deaths to this report

Annexure 10: DGHS Circular No. 02-155/2015

Circular Letter Number: 02 - 155 /2015

My number: HP/HI/Dir/AW/2015-04
Ministry of Health, Nutrition and Indigenous Medicine,
No 385,
Rev. Baddegama Wimalawansa Thero Mawatha,
Colombo – 10.
12.11.2015

All Deputy Director Generals of Health Services,
Director (Tertiary Care Services),
Director (Medical Services),
Director (Maternal and Child Health),
All Provincial Directors of Health Services,
All Regional Directors of Health Services,
All Directors /Medical Superintendents / Medical Officers In Charge of Hospitals,
All Heads of Private Hospitals

Registration of Still Births

With the reduction of infant mortality in the country and high proportions of perinatal deaths, counting still births has assumed a priority. Currently registration of still births is limited to proclaimed areas and as such Registrar General's Department is unable to provide national statistics of still births. Considering the data need of the country, it was decided to facilitate the registration of all still births that occur in all hospitals including private hospitals. Inputs were obtained from the Registrar General's Department and at the Hospital Directors Meetings in this regard.

A "Still Birth" is a death prior to complete expulsion or extraction from its mother of a product of conception which has had a duration of not less than 28 weeks of gestation, death being indicated by the fact that after such separation, the foetus does not breathe or show any other evidence of life such as beating of the heart, pulsation of the umbilical cord or definite movement of voluntary muscles" - *Births and Deaths Registration Act.*

You are instructed hereby to fill the form "Declaration of Still Birth" (B22) in triplicate for each still birth occurring in your institution and to hand over the first copy to parents, the second copy should be sent to Registrar General's Department and the third copy to be kept as the office copy in your institution.

The required B22 forms will be sent to your institution by the Registrar General's Department.

You are informed of the clauses included in the *Births and Deaths Registration Act;* No person shall bury, cremate or otherwise dispose of, or cause to be buried, cremated or otherwise disposed of, the body of a still-born child delivered in a hospital unless there has been obtained a certificate from the appropriate registrar or relevant authority, stating that the occurrence of the still-birth was notified.

Dr. P. G. Mahipala
Director General of Health Services
Ministry of Health, Nutrition & Indigenous Medicine
"Suwasiripaya"
385, Ven. Baddegama Wimalawansa Thero Mw.
Colombo 10.

Dr. P.G. Mahipala
Director General of Health Services
Ministry of Health, Nutrition and Indigenous Medicine

Copy – Registrar General – For your information and to take necessary actions

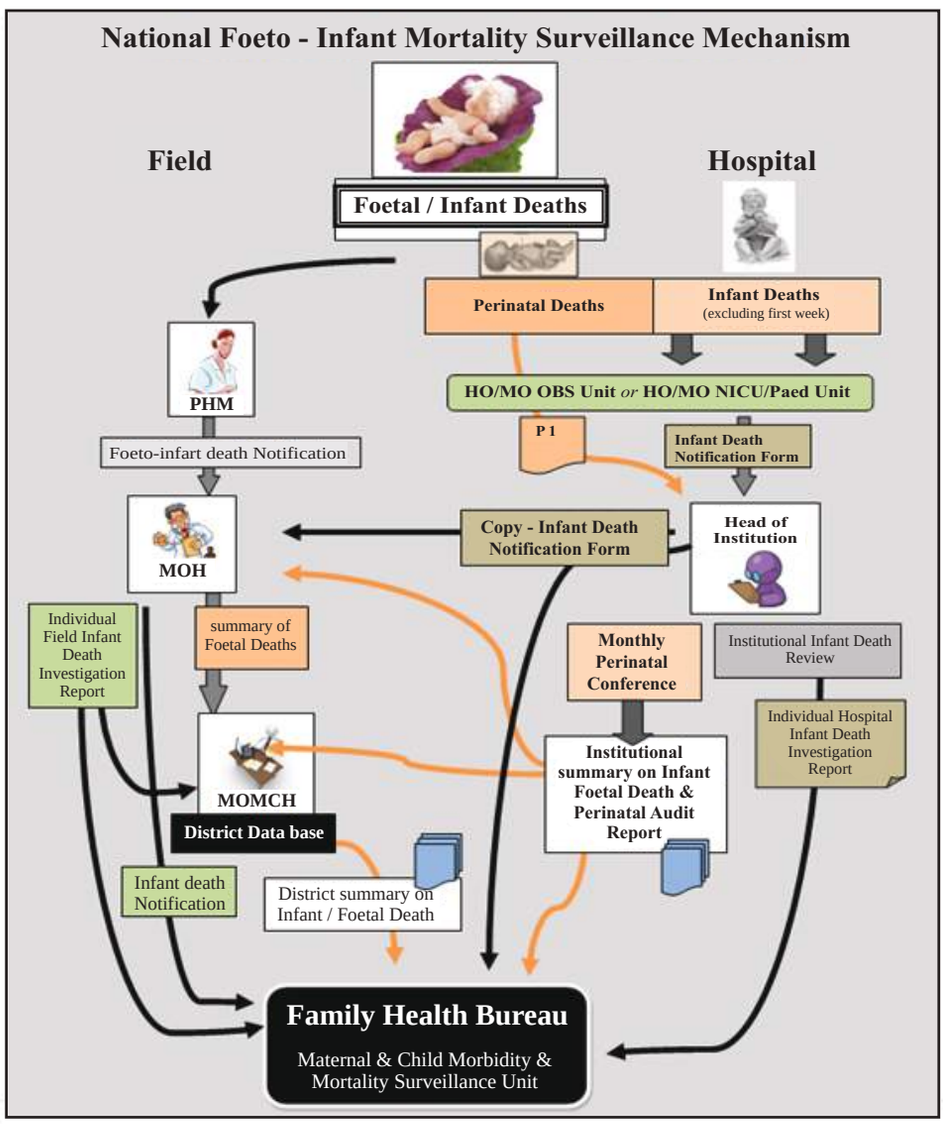
Annexure 11: Revised Guidelines on National Feto-infant Mortality Surveillance Mechanism 2016

Ministry of Health – Sri Lanka

Guidelines
NATIONAL FETO-INFANT MORTALITY SURVEILLANCE MECHANISM

With the reduction of maternal mortality and infant mortality to lower levels and a majority of the infant deaths are concentrated in the early neonatal period , feto-infant mortality surveillance plays a crucial role in improving maternal and child health service delivery and also further reduction of infant mortality. It also contributes to the availability of quality feto-infant mortality data.

Surveillance of feto-infant deaths involves the ongoing, systematic collection, analysis, and interpretation of data related to feto-infant deaths, essential to the planning, implementation and evaluation of public health practice, closely integrated with the dissemination of these data to those who need to know and linked to prevention and control of such deaths. Ministry of Health has introduced a feto-infant mortality surveillance mechanism, with Family Health Bureau (FHB), as the national nodal point. The following diagram schematically depicts the national feto-infant mortality surveillance mechanism.

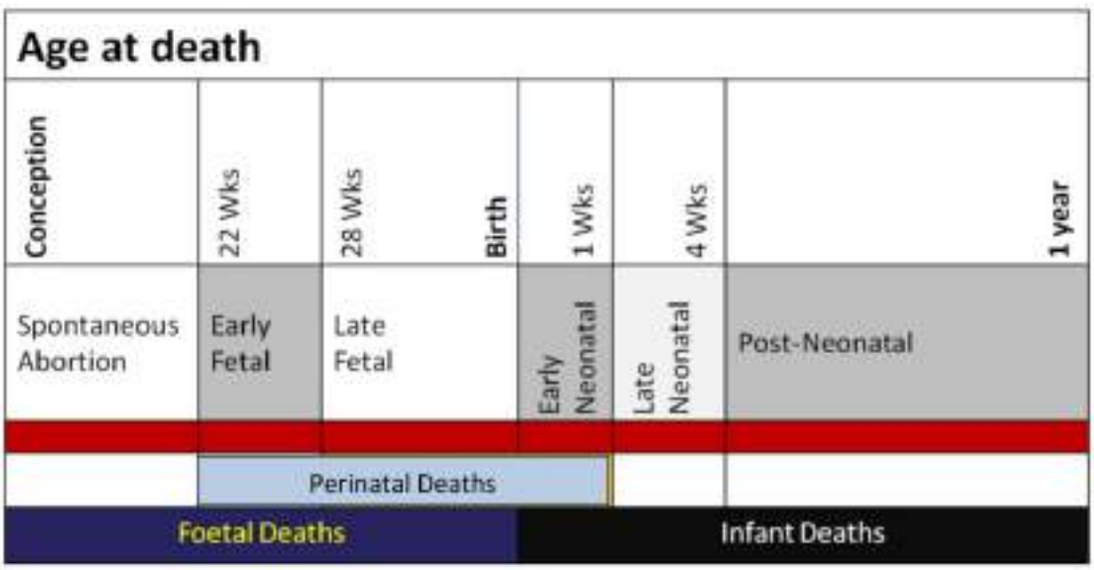


1 | Page

The objectives of the surveillance is to make available quality feto-infant mortality data, to utilize such data effectively at different levels (field, hospital, district and national levels) and to translate lessons learnt in to practice by dissemination to all stakeholders of maternal & child health.

1.0 Feto-Infant Death Classification and definitions:

Following definitions are used in the surveillance system;



1.1 **Fetal deaths** are those that occur after 22 weeks gestation in which the developing fetus dies either in utero or upon delivery. They are classified as early (22-27 weeks gestation) or late (28 weeks gestation or more).
This definition of fetal death avoids the confusion arising from the use of terms such as "stillbirth" and "miscarriage."

1.2 **Infant deaths** are those that occur during a child's first year (i.e. measured from birth, day 0 to day 365). Infant deaths include both neonatal and postneonatal deaths.
Determination of Age:
Day 0 – the day of birth *(from the time of birth till midnight same day)*
Day 1 – the next day following birth

1.3 **Neonatal deaths** occur during the first 28 days of life. Neonatal deaths are further categorized as "early" (0 - 7 days) or "late" (8 -28 days).

1.4 **Post-neonatal deaths** occur from day 29 through day 365 after birth.

1.5 **Perinatal deaths** include fetal deaths at 28 weeks gestation or more (*weighing >1000 g*), and infant deaths of less than 7 days (early neonatal deaths).
Note: *WHO recommends the inclusion of fetuses and live born neonates weighing between 500 g and 1000 g in national statistics both because of its inherent value and also it improves the coverage of reporting at 1000 g and over. Therefore, all fetuses and infants weighing at least 500 g or >22 weeks of POG at birth, whether alive or dead, should be included in the statistics. (However, data on fetal deaths with POA < 22 weeks (500g) are only for information and not considered in statistical calculations).*

2.0 Notification of feto-infant deaths

2.1 Hospitals (Government and private hospitals)

2.1.1 Perinatal deaths

All **perinatal deaths** (>22 weeks POG or > 500g weight up to 7 days after birth) of both government and private hospitals should be notified to the head of the institute by the medical officer confirming the death (at obstetric or paediatric unit) using the **Perinatal Death Documentation Format** (P-1) within 24 hours. A copy of the P-1 should be kept with the Obstetrician or the Paediatrician/Neonatalogist (in specialized institutes) or the highest level of medical officer (in non-specialized / peripheral hospitals) for future reference and to be used at monthly hospital perinatal death audits. Original copy should be sent to *Director (MCH), Family Health Bureau* attached to the **Monthly Hospital Perinatal Mortality Surveillance Report** (P-2) every month.

Sister / Nurse in Charge of the unit where the death occurred, with the instructions from the Consultant in charge of the unit, should ensure that the format is completed by the relevant officers.

2.1.1.1 Instructions on completing **Perinatal Death Documentation Format** (P-1)

This data collection format complies with the WHO Application of ICD-10 to Perinatal Deaths: ICD-Perinatal Mortality (ICD-PM). The objective is to facilitate the consistent collection, analysis and interpretation of information on perinatal deaths across hospitals and countries. It focuses on the mother-baby dyad and provides information to translate outcomes into policies, programs and actions.

Please see below for specific instructions in completing the each column (A – Z) of the data format;

A	BHT Number / Number of the clinical record
B	Name of Mother / Baby
C	Ethnicity –Please select from Sinhalese / Tamil / Muslim / Other
D	Residential address of the mother
E	Medical Officer of Health (MOH) area where the mother was cared for
F	Age of mother in years
G	Foetal (FD) or Neonatal death (NND)
H	Gravida –number of pregnancies
I	Parity – number of births (either still or live)
J	Type of Pregnancy -Singleton, Twin, Multiple
K	Date of Birth of the baby. Please put in (*ddmmyy*) format
L	Place of Delivery –place (hospital / home) where the birth took place
M	Time of Delivery –Please put in HH:MM format eg. 16:41
N	Mode of delivery –Please select from -Normal Vaginal / Breech / Forceps / Vacuum / Destructive Operation / Elective CS / Emergency CS / Hysterotomy / Laparotomy for rupture uterus
O	POG at birth (wks) –best estimate of period of gestation
P	Method of POG Assessment –based on LRMP / USS / Other
Q	Birth weight –weight of the baby measured at birth in grams
R	Sex -(Male / Female / Ambiguous)

S	Date of still birth (foetal death) or neonatal death in *dd/mm/yy* format
T	Age at death(only for ENND) - During the first day of life (day zero) should be recorded in units of completed hours of life. For the second (day 1), through 7 completed days of life, age at death should be recorded in days. Please put (days + hours) –eg. If baby died 2hrs after birth: 0 days + 2 hrs
U	Timing of death – Antepartum / Intrapartum* / Early neonatal / Unable to classify timing ** Intra-partum deaths: Deaths of babies those who had FHS on taking to the labour room (or theatre for caesarean section) and dead on birth*
V	Cause/s of Death (ICD-PM Group) – You may put either relevant ICD codes or write the group of main disease or condition that lead to death in fetus or infant (not maternal). Please select codes for the groups of disease conditions from the annexure-1 based on the timing of death (A1 – A6, I1 – I7, N1 – N11) or 'unable to *You may put other diseases of conditions, if there is any, apart from the main cause.* **See notes below.**
W	Cause/s of Death (Broad ICD-PM Cause) – Please select the broad cause from broad ICD codes (A33, A50, P05-P96, Q00-Q99) – You may put either relevant ICD codes or write broad cause. Please refer to annexure - 1 **See notes below.**
X	Cause of Death (ICD specific category) – If you have further specific details on cause of death, please include here. (No ICD codes provided). **See notes below.**
Y1	Maternal conditions (ICD-PM Group) - Please put relevant ICD code or write group of main maternal disease or condition affecting fetus or infant. M1_Complications_of_placenta_cord_and_membranes M2_Maternal_complications_of_pregnancy M3_Other_complications_of_labour_and_delivery M4_Maternal_medical_and_surgical_conditions M5_No_maternal_condition *You may put other diseases of conditions of mother, if there is any, apart from the main cause.* **See notes below.**
Y2	Maternal conditions (ICD-PM specific group) – Please select the specific maternal condition/s from ICD-PM Maternal condition specific group (P00-P04) – Please refer to annexure - 2 **See notes below.**
Z	Whether a forensic or pathological post-mortem was done or not
Z1	Filling of Certificate of Still Birth (B22) for foetal deaths >28 weeks of POG or Declaration of Death (B 33) for all babies born live and later died (irrespective of POG) is compulsory. Please give relevant details.

NB: Each ICD PM group or maternal conditions has a limited number of ICD codes that fit in to each group. If you cannot find clinical conditions related to the case, you can write them freely in any cause of death or maternal conditions cell (U,V,W,X,Y).

Example 1: Still birth at 32 weeks due to congenital rubella

For this select 'Antenatal' for timing of death (T), from Annexure 1, 1.1- ICD-PM group for cause of perinatal death, under 'Antepartum' column, select 'A2_Infection'(U). Then refer to 1.2 Broad ICD codes for cause of perinatal death, search for A2 and find 'P35_Congenital_viral_diseases' (V). Since you have further details in W, you may put 'Congenital Rubella Syndrome'.

As mother gives a history of febrile illness in first trimester, for X, select 'M4_Maternal_medical_and _surgical_conditions' from Annexure – 2 relevant ICD-PM

Maternal condition specific groups under M4 –'
P00.2_Fetus_and_newborn_affected_by_maternal_infectious_and_parasitic_diseases'.

Please see below examples for further clarifications;
Example 2: Still birth at 29 weeks due to IUGR and maternal PIH
Example 3: Early neonatal death on day 2 due to Tetralogy of Fallot's

	T	U	V	W	X	Y
	Timing of death Antepartum Intrapartum Early neonatal	Cause/s of Death *(ICD-PM Group)*	Cause/s of Death *(Broad ICD-PM Cause)*	Cause of Death *(ICD specific category)*	Maternal condition/s *(ICD-PM Group)*	Maternal condition/s *(ICD-PM specific group)*
1	Antepartum	A2_Infection	P35_Congenital_viral_diseases	Congenital Rubella Syndrome	M4_Maternal_medical_and_surgical_conditions	P00.2_Fetus_and_newborn_affected_by_maternal_infectious_and_parasitic_diseases
2	Antepartum	A5_Disorders_related_to_fetal_growth	P05_Slow_fetal_growth_and_fetal_malnutrition	light for gestational age	M4_Maternal_medical_and_surgical_conditions	P00.0_Fetus_and_newborn_affected_by_maternal_hypertensive_disorders
3	Early neonatal	N1_Congenital_malformations_deformations_and_chromosomal_abnormalities	Q20_Congenital_malformations_of_cardiac_chambers_and_connections	Tetralogy of Fallot's	No maternal condition	

Note: *All cages where relevant depending on the case (foetal death or early neonatal death OR transferred in from outside hospital) should be filled. Completing officer may leave cages blank if required data is not available. However, sending the format should not be delayed due to unavailability of few data variables.*

Prematurity *-It is preferable to only accept the diagnosis of 'prematurity' as the main disease or condition in the baby if further evidence, for example gestation <28 weeks and no other pathology present.*

2.1.2 Infant Deaths

Infant deaths *(excluding early neonatal deaths which are covered under perinatal deaths)* should be notified to the head of the institute by the medical officer confirming the death using the form Hospital Infant Death Notification Form (F-1) within 24 hours.
A copy of the form (F-1) should be kept with the Paediatrician / Neonatalogist (in specialized institutes) or the highest level of medical officer (in non-specialized / peripheral hospitals) for future reference.

Sister / Nurse in Charge of the unit, with the instructions from the Consultant in charge of the unit / the highest level of medical officer, where the death occurred should ensure that the format is completed by the relevant officers.

The head of the institution should notify all infant deaths (excluding early neonatal deaths which are covered with perinatal deaths) within 24 hours by telephone, telegram, fax or email to the following officers;

Director – MCH (Family Health Bureau)
PDHS and RDHS (where the institution located)
PDHS and RDHS (of deceased residence)
MOH (deceased residence)
Head/s of the previously managed institution/s

(Residence of the mother of the deceased infant is taken as the residence of the infant.)

A copy of the completed & signed Hospital Infant Death Notification Form (F-1) (by fax/email/mail) should be sent to the area MOH and Director (MCH) by the head of the institute within 24 hours.

2.2 Field

2.2.1 Foetal deaths

All foetal deaths (> 22 weeks of gestation or >500g) and infant deaths should be notified to the respective medical officer of health (MOH) by the area Public Health Midwife (PHM) or acting PHM using the form Feto-Infant Death Notification Form (F-2) within 24 hours.

2.2.2 Infant deaths

The MOH should notify all infant deaths (0 – 365 days of age) within 24 hours by telephone, telegram, fax or email to the following officers;

Director – MCH (Family Health Bureau)
Head/s of the previously managed hospital/s
PDHS and RDHS (where the institution located)
PDHS and RDHS (of deceased residence)

(Residence of the mother of the deceased infant is taken as the residence of the infant.)

Note: Please refer Section 4.0 for further details.

3.0 Feto-infant Death Surveillance at Institutional Level

3.1 Custody of documents related to management

Once a fetal or infant death is reported in an institution (Government or private hospital), all the Head/s of the Institution/s where the index case was managed should take the custody of the bed head ticket (BHT), investigations, transfer forms and all other documentation related to the mother and/or infant. All the pages should be numbered and the original document should be made available for perusal of relevant officers (clinicians, JMOs and area MOH).

All relevant documents should be made available for the investigation procedures and review meetings. The BHT should not be reproduced. BHT should not be taken out of the office of the Head of the Institution and extraction of information from the BHT should be done within the office premises of the head of the institute only.

3.2 Conducting post mortems or pathological post mortems

A post mortem or pathological post mortem should be conducted wherever possible in cases of infant deaths when the cause of death could not be accurately determined.

Note: Please refer to the Guidelines on Conducting Pathological Post-mortems.

3.3 Foetal deaths

I. The placenta should be examined and findings should be documented in the BHT. It should be sent to the pathologist or JMO for further reporting.
II. A Certificate of Still Birth (B22) should be filled by the medical officer confirming the death in triplicate for each foetal death > 28 weeks of gestation to hand over the first copy to parents, the second copy to Registrar General's Department and the third copy to be kept as the office copy in your institution.

III. The head of the institute should send Registrar General's copy of the Certificate of Still Birth (B22) to the *Vital Statistics Unit, Registrar General's Department, Denzil Kobbekaduwa Mawatha, Battaramulla*

No person shall bury, cremate or otherwise dispose of, or cause to be buried, cremated or otherwise disposed of, the body of a still-born child delivered in a hospital unless there has been obtained a certificate from the appropriate registrar or relevant authority, stating that the occurrence of the still-birth was notified.

3.4 Hospital Perinatal Mortality Surveillance Meetings

These meetings should be conducted by every specialised institution (including private sector) providing perinatal care once a month (may be second week) on a fixed date.
Head of the institution with consultants (Obstetricians, Pediatricians, Neonatologists) should organize the meetings.
The participation of following categories of health care teams is mandatory with relevant information;

Head of the Institution
Obstetrician, Pediatrician, Neonatalogist and other relevant Specialists
Medical Officers from Obstetric and Neonatal Units
MO /MCH and MOOH from the catchment area
MO/Preventive Health
Judicial Medical Officer
Grade I Nursing Officer /Nursing Officer in Charge of the ward/ labour room
MRO

Data of the index cases should be collected through the P - 1 format. The same format should be used for presenting the data at the meeting by the Medical Officers attached to the relevant obstetrics unit or SCBU/NICU.

The index cases should be discussed in detail based on three-delay model in order to identify deficiencies associated with seeking medical care, reaching the hospital and management of the mother and/or the neonate at the hospital.

The perinatal death audit process should be a no-fault finding exercise of the healthcare workers involved in the management of the pregnant mothers or infants. Whole process of the review should be confidential and each participant of the institutional review should sign the confidentiality agreement (F-4) prior to the review meeting.

The review process should focus on establishing if circumstances represent system problems that require change, developing recommendations for change and assisting in the implementation of change at hospital level and field level.

3.4.1 Reporting of Perinatal Mortality Surveillance meetings

The completed **Monthly Hospital Perinatal Mortality Surveillance Report** (P-2) should be sent along with all Perinatal Death Documentation Formats (P-1) within one week after conducting the meeting to Director (MCH) by the head of the institute.

National Program Manager (Child Morbidity & Mortality Surveillance) will compile all perinatal death data and maintain a database at Family Health Bureau.

3.5 Institutional review procedure of infant deaths (Government and private hospitals)

- For all infant deaths (Born alive and later died, irrespective of the POG), a **Declaration of Death (B 33)** form should be filled by the medical officer confirming the death.
- A fact-finding institutional infant death review should be performed by the all institutions involved in the management of the deceased infant for each infant deaths *(excluding early neonatal deaths)*.
- The review should be conducted within 14 days of the occurrence of an infant death as this would enable to identify precisely the circumstances that led to the death with fresh information. The circumstances of the death should be discussed in detail with the intention of identifying preventive measures.
- Conducting the institutional death review is the responsibility of the Head of the Institution. All clinicians (neonatologists or paediatricians), other clinicians and medical officers involved in the management of the case should comply with the instructions of the head of the institution.
- The review should be carried out as a team which should comprise of the following officers with relevant information;

  - Head of the Institution (Director/MS/DMO/MO-IC) as the team leader
  - Consultant Paediatrician / Neonatalogist or the relevant specialist (eg. Surgeon) of the hospital unit in which the death occurred (acting consultant in his/her absence) and all other relevant consultants who managed the mother & the infant (Obstetrician, Surgeon, Anaesthetist, Pathologist, Microbiologist etc)
  - Medical officer/s who attended the deceased infant (DMO, MO/IC, senior house officer, MO-PBU, MO-NICU, house officer etc.)
  - Judicial Medical Officer / Forensic Pathologist
  - Grade I Nursing Officer /Nursing Officer In Charge of the ward/ labour room - when relevant
  - Heads and relevant clinicians of the hospitals where the patient was managed before the transfer
  - Medical Officers Maternal and Child Health (MO-MCH) of the districts where the mother is resident and where the hospital is situated
  - Medical Officer of Health from the mother's area of residence
  - Public Health Midwife from the mother's area of residence

  Participation of the above categories of the healthcare workers at the review meeting is mandatory.
- All original documents related to the healthcare services delivered or clinical management of the index infant from both field and hospital/s and postmortem or necropsy reports should be reviewed at the death investigation.
- The index case should be reviewed in detail based on three-delay model in order to identify deficiencies associated with seeking medical care, reaching the hospital and management of the infant at field and hospital level. Efforts should be taken to establish if circumstances represent system problems that require change, develop recommendations for change and assist in the implementation of change at hospital level and field level.
- The investigation process should be a no-fault finding exercise of the healthcare workers involved in providing filed health services or clinical management of the infant.
- Whole process of the review should be confidential and each participant of the institutional review should sign the confidentiality agreement (F-4) prior to the investigation.
- The institutional death investigation should be coordinated by the medical officer (preventive health) or a medical officer designated by the head of the institution.

- The Head of the Institution is responsible to ensure the implementation of the corrective actions within the hospital without delay as decided at the institutional review.

3.5.1 Reporting the infant death institutional review

- The information obtained during the investigation and the death review should be entered in the Hospital Infant Death Investigation Form (F-5) in triplicate (Office Copy / RDHS / FHB)
- Consultant Paediatrician / Neonatologist or the relevant specialist of the hospital unit in which the death occurred and/or Head of the Institution should ensure the completeness of the format.
- The completed and signed report of F-5 should be sent to the Director (MCH) within 14 days of occurrence of the infant death.

4.0 Feto-Infant Death Surveillance at Field Level

4.1 Notification procedure of feto-infant deaths to be followed at field level

When a notifiable fetal or infant death occurs in her area, the area PHM should immediately notify it to the MOH using the Field Feto-Infant Death Notification Form (F-2).

The MOH may also receive an infant death notification directly from the head of the institution at which the death occurred or from the RDHS/MOMCH of the district to whom the death was notified.

MOH should notify all infant deaths within 24 hours by telephone, telegram, fax or email using the Field Feto-Infant Death Notification Form (F-2) to the Director (MCH) and RDHS.

- In case of the death of a mother who is temporarily resident in a MOH area, the area MOH should notify the death to the MOH of the area from where the mother came from (& where she was registered as an eligible female)
- In cases of deaths within one week of discharge from a hospital, the MOH should notify the death to head/s of the previously managed institution/s
- MOH should also ensure that all deaths are reported through H 509 (Quarterly Maternal and Child Health Return).

4.2 Custody and safety of infant death documentation

All the relevant records of mother & infant (H512A, H512 B, Child Health Development Record - CHDR) should be taken over & kept safely in the MOH office till the investigations & review meetings are over.

- The MOH is responsible for the safe custody of the all the documentation related to all infant deaths
- MOH should hand over all the documents related to infant death investigations and reviews to the next MOH appointed on his/her transfer or retirement.

4.3 Field infant death investigation procedure for Infant deaths

- The purpose of the field infant death investigation is to understand how a wide array of social, economic, health, educational, environmental and safety issues relate to the infant loss on a local level and in turn utilize that information to improve community resources and systems of care to reduce fetal and infant mortality.
- MOH (of the area where the mother is registered in the eligible family register or the MOH area where the deceased infant mostly received field care) is the responsible officer for the field death

review. In case of an absence of the relevant MOH, the acting MOH/AMOOH or MO-MCH should take the responsibility of conducting the field infant death investigation.

- The investigation should be done as a team comprising of MO-MCH, MOH, all AMOOH, all PHNS, all SPHM and PHM/acting PHM of the area. MO-MCH and MOH should jointly investigate the infant death.
  Note: *The investigation done previously by PHM or PHNS and filling of Infant Death Investigation Form (H678) is no longer required.*
- Investigation should commence as early as possible and should be completed within fourteen (14) days of the occurrence of the infant death.
- The field health staff should contact parents through phone calls and/or home visits soon after the infant death. The staff should provide emotional support, information, and referrals to other services that assist parents and families where necessary prior to the death investigation.
- Record review: The team should visit the office of the PHM and examine all the relevant documents starting from the eligible family register, pregnant mother's register, pregnancy records (H512B), family planning field records, Birth & Immunization register, Hospital Records, CHDR, PHM diary, weighing records, notes on home visits, advance programme, previous supervision reports on the area PHM etc. The team should also review birth and death certificates, post-mortem / coroner's reports, and records from other health and social service agencies.
- Maternal (or guardian) interview -After family support has been initiated, the mother (or the guardian) should be invited to participate in an interview. The interview should allow the mother's voice to be heard and provides her with the opportunity to share her experiences before, during and after the pregnancy and the infant death. Other family members may also be interviewed by the investigation team in order to obtain relevant information.
- The care received by the mother (antenatal, postnatal) and the infant prior to the admission to the hospital should be assessed. The case should be reviewed in detail based on three-delay model in order to identify deficiencies associated with seeking medical care, reaching the hospital and management of the infant at field and hospital level. Efforts should be taken to establish if circumstances represent system problems that require change, develop recommendations for change and assist in the implementation of change at field level and also at hospital level.
- The investigation process should be a no-fault finding exercise of the healthcare workers involved in providing filed health services or clinical management of the infant. Whole process of the investigation should be confidential and each participant of the field investigation should sign the confidentiality agreement (F-4) prior to the death review.
- In the case of a hospital death, MOH should participate as a member in the hospital investigation team. If the institutional investigation is delayed, the MOH should visit the hospital and obtain relevant information from the hospital (from health care staff and the BHT) with the permission of the head of the institution.
- After the field infant death investigation, the MOH should implement the necessary corrective actions at field level, and the implementation of these should be discussed at the next monthly conference.
- A collective supervision of the area PHM by all the supervisory staff (MOH, AMOH, PHNS, SPHM) and should follow up the work of the PHM until the deficiencies (if any) at field level are rectified.
- If the infant death investigation has been done by the previous MOH, the present MOH should do a fresh field visit to the PHM office and the home of the deceased infant and be thorough with the details.

4.4 Reporting the field investigation and foetal deaths

- The information obtained during the field death investigation should be entered in the Field Infant Death Investigation Form (F-6) in triplicate (Office Copy / RDHS / FHB)

- On completion, the report should be sent to the RDHS and Director (MCH) within 14 days of occurrence of the infant death.
- A quarterly summary of all foetal deaths (obtained from the Pregnant Mother's registers of all PHM) occurred in the MOH area should be sent to the RDHS/MO-MCH and FHB
- MOH are advised not to delay sending the F-6 just because few data are not available. Format could be sent pending such data and they can be sent separately in a letter once they are available.

4.5 Role of the MO-MCH

- The Medical Officer – MCH at district level should compile all feto-infant mortality data received from area MOOH and hospitals (Notifications / death investigation reports / post-mortem reports / perinatal death audit reports).
- He /she should maintain a feto-infant mortality database at district level
- A quarterly summary of all foeto-infant should be sent to the PDHS and FHB
- Should participate at field and hospital infant death investigations
- Should organize the district and national feto-infant mortality review meetings
- Should ensure that corrective actions are taken under the guidance of RDHS

5.0 District and National Feto-Infant Mortality Reviews (DFIMR / NFIMR)

At the end of each half year, the MOMCH should prepare a summary of Feto-Infant deaths notified during each half year and send the same to the Director (Maternal and Child Health) and PDHS.

National Program Manager (Child Morbidity & Mortality Surveillance) will also prepare a feedback summary of the deaths notified from each district and institution at the Family Health Bureau at the end of each quarter and annually. These data will be disseminated to each district and institution for verification.

District and National Feto-Infant Mortality Reviews are an important aspect of Feto-Infant mortality surveillance since it provides a forum to discuss and learn lessons out of Feto-Infant deaths at the district level. It also gives an opportunity to identify service deficiencies and to formulate preventive strategies to further reduce Feto-Infant deaths taking local contexts of the district in to consideration. Data gaps with regard to each death could be filled at DFIMRs. Each reported death should be discussed at these reviews with the aim of identifying circumstances of death in order to prevent such deaths in future. The circumstances which led to the death should be identified at the district review using three delay model.

Two half yearly District Reviews should be organized by MO-MCH on behalf of RDHS according to the following schedule.

First half yearly review	-2nd week of July
Second half yearly review	-2nd week of January (following year)

District Feto-Infant Mortality Review Team should comprise of the following officers;

PDHS/ RDHS (chairperson)
Provincial or District Consultant Community Physician/s
All Head/s of the Institution/s in the district (including peripheral hospitals)
MO-MCH
All Paediatricians/ Neonatologists /VOGG and other relevant consultants
Judicial Medical Officers
Pathologists

Senior registrars / SHOO / MOO —who were involved in the management of the deceased infant or the pregnant mother
All MOOH, all AMOOH, all PHNS, SPHM, relevant area PHMM

The participation of all relevant officers is compulsory at DFIMR.

The preventive strategies should be generated to improve the availability, accessibility, utilization & quality of field health care services and essential newborn/ paediatric /obstetric services and steps should be taken to initiate the preventive activities which could be implemented at the district level.

At the end of the review the MOMCH should prepare a minute (deficiencies identified and action to be taken/ already taken) and it should be sent to the following health authorities by RDHS.

PDHS
Director (Maternal and Child Health)
Heads of Institutes / Clinicians (Paediatricians/ Neonatologists /VOGG)
Sri Lanka College of Paediatricians / Sri Lanka College of Obstetricians & Gynaecologists
MOOH

These minutes should be taken for discussion to assess the progress at the next district review of Feto-Infant deaths.

6.0 National Feto-Infant Mortality Review (NFIMR)

National Feto-Infant Mortality Review is a process that brings together key stakeholders of the healthcare community from both national and district level to review data on fetal and infant deaths in order to identify factors associated with those deaths, establish if they represent system problems that require change, develop recommendations for change, assist in the implementation of change at national and district levels.

Annual reviews are conducted on a district basis to review all the deaths which occurred in a particular district in the previous year with the participation of experts from the national level.

Director/Maternal and Child Health (D/MCH) in collaboration with the Provincial Director of Health Services will organize the annual review of Feto-Infant deaths in a district with the participation of representatives from professional colleges including Sri Lanka College of Obstetricians & Gynaecologists, Sri Lanka College of Paediatricians, Sri Lanka College of Community Physicians, Sri Lanka College of Forensic Pathologists and Sri Lanka College of Pathologists.

Director General of Health Services (DGHS) or in his absence the PDHS will chair this meeting. In the absence of the DGHS, a ministry official nominated by the DGHS should participate at the NFIMR to represent the DGHS.

The participation of following categories of health care teams is mandatory at the NFIMR;

PDHS, RDHS and Deputy RDHS
Provincial and District Consultant Community Physician/s
All Head/s of the hospitals in the district
MO-MCH
All MOOH, all AMOOH, all PHNS, SPHM, relevant area PHMM
All Paediatricians/Neonatologists &VOGG and other relevant consultants
Judicial Medical Officers
Pathologists
Senior registrars / SHOO / MOO –who were involved in the management of the pregnant mothers &/or deceased infants

The RDHS, MOMCH, RSPHNO, all Paediatricians/Neonatologists, all VOGG, MOOH and AMOOH, all heads of the institutions and the relevant consultants, all the DMOO / MOO-IC of the district hospitals and peripheral units (whether or not Feto-Infant deaths occurred in their institutions) should participate at the annual review.

All the reported deaths for the year are taken for discussion by an expert panel consisting of the DGHS (or a representative of the DGHS), PDHS, Director/Maternal & Child Health, other relevant officials from the Ministry of Health, representatives of the SLCOG, SLCOP and other professional bodies.

The relevant presentation of the Feto-Infant death should be done by the MOMCH (District Statistics), Head of Institutions (Institutional statistics), VOG (Obstetric Unit statistics and details) Paediatrician/Neonatologist (Neonatal unit & Paediatric unit statistics and details) and MOH (field care) based on the presentation formats prepared by the FHB.

Following the review, minutes will be prepared by Director (Maternal and Child Health) / National Program Manager (Child Morbidity & Mortality Surveillance). Such minutes will be sent to the relevant national, district and provincial officers. The RDHS will then duplicate these minutes and send the copies to the relevant curative institutions and MOOH.

Final decisions regarding the type of death, preventability, preventive measures that should be taken at the national level will be decided during the annual review by the panel of experts.

6.1 Follow up action to NFIMR

Following the NFIMR the MOMCH should organize a meeting for all MOOH/ heads of institutions and other relevant officers to implement the corrective actions decided at the NFIMR. This meeting will be chaired by the RDHS.
Head of the institution should call for a separate meeting at the institutional level to discuss these minutes with the relevant consultants/ SHOO/ and other relevant staff in order to implement these activities.

MOMCH should report the progress of these activities after 3 months to the DGHS/ PDHS/ RDHS/ D/MCH. At the annual review of the next year the MO/MCH should present the status of implementation of preventive measures suggested at the previous years annual review

Director (Maternal and Child Health) should carry out regular discussions with the DGHS, relevant DDGG and other officials regarding issues which need departmental intervention. Issues identified at NFIMR should be taken up at Advisory Committees on Child & Newborn Health, Maternal care & Family Planning and National Committee on Family Health.

7.0 National Feto-infant Mortality database

All the important variables of feto-infant mortality information are entered in a National Feto-Infant Mortality Database maintained at Maternal and Child Morbidity and Mortality Surveillance Unit. Director – Maternal and Child Health and National Program Manager on Child Morbidity & Mortality Surveillance act as database custodians.

When all the NFIMR meetings are over, the national statistics on Feto-Infant mortality should be compiled and issued by the Family Health Bureau before the end of the next year.

Annexure 12: ICD-PM system on perinatal causes of death and ICD-10 codes

Summary and tabulation of ICD-PM

In summary, perinatal deaths are classified in a three-step process:

1. Deaths are first grouped according to timing – whether the death occurred in the antepartum period (prior to the onset of labour), intrapartum or in the neonatal period (early neonatal: up to day 7 of postnatal life; or late neonatal: days 8–28 of postnatal life).
2. The main cause of perinatal death is assigned and grouped according to the new ICD-PM groupings.
3. The main maternal condition at the time of perinatal death is assigned and grouped according to the new ICD-PM groupings.

Following these steps, the perinatal cause of death and the maternal condition are tabulated in a way that highlights the linkages between the two (see Table 3).

Table 1: The ICD-PM system: perinatal causes of death and linked ICD-10 codes, separated by timing of death, and maternal condition at the time of perinatal death*

Main perinatal cause of death ICD-PM groups

	Antepartum death (A)	ICD-10 codes
A1	Congenital malformations, deformations and chromosomal abnormalities	Q00–Q99
A2	Infection	P35, P37, P39, A50
A3	Antepartum hypoxia	P20
A4	Other specified antepartum disorder (including codes specific to the antepartum period from haemorrhagic and haematological disorders of fetus and newborn)	P50, P52, P55, P56, P60, P61, P70, P75, P77, P83, P96.4, Misc.
A5	Disorders related to fetal growth	P05, P08
A6	Antepartum death of unspecified cause	P95
	Intrapartum death (I)	
I1	Congenital malformations, deformations and chromosomal abnormalities	Q00–Q99
I2	Birth trauma	P10–P15
I3	Acute intrapartum event	P20
I4	Infection	P35, P37, P39, A50
I5	Other specified intrapartum disorder (including codes specific to the intrapartum period from haemorrhagic and haematological disorders of fetus and newborn)	P50, P52, P55, P56, P60, P61, P70, P96, Misc.
I6	Disorders related to fetal growth	P05, P07, P08
I7	Intrapartum death of unspecified cause	P95

Main maternal condition ICD-PM groups

	Maternal condition	ICD-10 codes
	Complications of placenta, cord and membranes	P02
	Maternal complications of pregnancy	P01
	Other complications of labour and delivery	P03
	Maternal medical and surgical conditions	P00
	No maternal condition	

* Miscellaneous: While a perinatal death is most often coded to P05–P96 or a Q code, there are cases where codes from several other sections of ICD-10 should be used. For an extensive list, see ICD-10 (4) and ICD-10 volume 2: instruction manual (5).

Maternal condition	M1: Complications of placenta, cord and membranes	M2: Maternal complications of pregnancy	M3: Other complications of labour and delivery	M4: Maternal medical and surgical conditions	M5: No maternal condition identified	Other	Total (%)
Intrapartum death (I)							
I1: Congenital malformations, deformations and chromosomal abnormalities							
I2: Birth trauma							
I3: Acute intrapartum event							
I4: Infection							
I5: Other specified intrapartum disorder							
I6: Disorders related to fetal growth							
I7: Intrapartum death of unspecified cause							
Total (%)							
Neonatal death (N)							
N1: Congenital malformations, deformations and chromosomal abnormalities							
N2: Disorders related to fetal growth							
N3: Birth trauma							
N4: Complications of intrapartum events							
N5: Convulsions and disorders of cerebral status							
N6: Infection							
N7: Respiratory and cardiovascular disorders							
N8: Other neonatal conditions							
N9: Low birthweight and prematurity							
N10: Miscellaneous							
N11: Neonatal death of unspecified cause							
Total (%)							

[4] In order to group and tabulate a perinatal death, the user needs information on the timing of the perinatal death (antepartum/intrapartum/neonatal) as well as the ICD-10 cause of death code. The information provided about the cause of death and the maternal condition should meet the ICD-10 coding rules for assigning a specific code before any tabulation can be undertaken. The table above is indicative for tabulation of data; for coding deaths, the current version of ICD-10 [4] and ICD-10 volume 2: instruction manual [5] should be utilized.

Annexure 13: Distribution of the early neonatal deaths by cause of death according to ICD-PM Broad Groups – single and combined

	Cause of death –	2014		2015		2016		2017	
	ICD PM Group*	No.	%	No.	%	No.	%	No.	%
Early neonatal	N1	397	28.1	233	25.0	278	29.2	156	29.2
	N2	13	0.9	16	1.7	17	1.8	9	1.7
	N3	1	0.07	2	0.2	7	0.7	5	0.9
	N4	72	5.1	41	4.4	48	5.0	31	5.8
	N5	27	1.9	14	1.5	23	2.4	2	0.4
	N6	148	10.5	60	6.4	65	6.8	26	4.9
	N7	144	10.2	69	7.4	93	9.8	55	10.3
	N8	33	2.3	22	2.4	13	1.4	14	2.6
	N9	291	20.6	309	33.1	221	23.2	84	15.7
	N10	6	0.4	3	0.3	14	1.5	2	0.4
	N11	13	0.9	25	2.7	12	1.3	37	6.9
	N1 & N2	-	-	-	-	3	0.3	3	0.6
	N1 & N3	-	-	1	0.1	-	-	-	-
	N1 & N4	4	0.3	1	0.1	-	-	2	0.4
	N1 & N5	1	0.07	1	0.1	1	0.1	-	-
	N1 & N6	11	0.8	6	0.6	12	1.3	7	1.3
	N1 & N7	7	0.5	6	0.6	14	1.5	15	2.8
	N1 & N8	-	-	1	0.1	2	0.2	1	0.2
	N1 & N9	17	1.2	10	1.1	16	1.7	10	1.9
	N1 & N2 & N7	-	-					2	0.4
	N1 & N2 & N9	-	-	-	-	1	0.1	-	-
	N1 & N4 & N6	-	-	-	-	1	0.1	-	-
	N1 & N4 & N7	-	-	-	-	1	0.1	-	-

N2 & N7 & N9	1	0.07	-	-	1	0.1	-	-
N3 & N6	-	-	-	-	-	-	1	0.2
N3 & N7	-	-	-	-	-	-	1	0.2
N3 & N9	-	-	1	0.1	1	0.1	-	-
N3 & N6 & N9	-	-	-	-	-	-	1	0.2
N3 & N7 & N9	-	-	-	-	-	-	1	0.2
N4 & N5	1	0.07	1	0.1	1	0.1	-	-
N4 & N6	3	0.2	4	0.4	2	0.2	3	0.6
N4 & N7	2	0.1	1	0.1	4	0.1	1	0.2
N4 & N8	-	-	1	0.1	-	-	-	-
N4 & N9	9	0.6	6	0.6	1	0.1	1	0.2
N4 & N5 & N7	1	0.07	-	-	-	-	-	-
N4 & N6 & N9	-	-	1	0.1	1	0.1	1	0.2
N4 & N7 & N8	-	-	-	-	-	-	1	0.2
N4 & N7 & N9	-	-	-	-	1	0.1	-	-
N5 & N6	1	0.07	-	-	-	-	1	0.2
N5 & N7	1	0.07	-	-	-	-	-	-
N5 & N9	1	0.07	-	-	-	-	1	0.2
N5 & N11	-	-	-	-	1	0.1	-	-
N5 & N6 & N8	-	-	-	-	1	0.1	-	-
N6 & N7	18	1.3	5	0.5	7	0.7	5	0.9
N6 & N8	1	0.07	3	0.3	1	0.1	-	-
N6 & N9	79	5.6	40	4.3	34	3.6	17	3.2
N6 & N7 & N8	-	-	-	-	-	-	1	0.2
N6 & N7 & N9	9	0.6	8	0.9	3	0.3	5	0.9
N6 & N8 & N9	-	-	1	0.1	-	-	2	0.4
N7 & N9	80	5.7	28	3.0	35	3.7	16	3.0
N8 & N9	2	0.1	1	0.1	1	0.1	1	0.2