Monitoring and Analysing Perinatal Data

Day Two Session Three
Session Objectives

• Learn how to calculate, analyze perinatal mortality indicators
• Practice monitoring and analyzing trends in perinatal death audits at the facility level
• Learn how to identify and classify modifiable factors
Minimum Perinatal Data

The Every Newborn action Plan specifies a minimum set of six essential pieces of information to collect on each birth and death:

1. Maternal age
2. Place of delivery
3. Mode of delivery
4. Birth weight
5. Gestational age
6. Birth outcomes
Suggested Indicators for Review

• Numbers of normal vaginal, assisted and caesarean deliveries;
• Numbers of maternal deaths
• Numbers of antepartum (or macerated), intrapartum (or fresh) stillbirths
• Number of early neonatal deaths
• Neonatal mortality rates.
• The number of major complications during labour and birth,
• Indications for caesarean section
• Others can be added as per national context for example: birth weight, gestational age, PSBI rates
Data Analysis- 1

• Helpful to have an analysis plan for collected perinatal data

• **Goal:** To identify problems that may contribute to stillbirths and neonatal deaths, especially those that could have been prevented modified

• **Use both quantitative and qualitative methods** for data collection
  - Case notes are often limited so interviews will be helpful
  - Provides a comprehensive view
  - Help the review committee identify priorities for action
Data Analysis - 2

• **Qualitative and quantitative research methods:** Provides a more comprehensive picture

• **Quantitative:** Geographic location, maternal risk factors, which babies at highest risk, identify trends in mortality rates and medical causes of deaths

• **Qualitative:** contributing factors, barriers to care, insights into context of causes of perinatal deaths. For example:
  - Did the baby die because no one realized how sick the baby was or because the health centre was too far away?
  - Were the right medicines not administered or were they unavailable?
• **Summary statistics** can be compared against the expected numbers of stillbirths and neonatal deaths

• **Distribution of births and deaths** by their place of occurrence (home, hospital-public or private sector, level or type of hospital)

• **Trends over time**

• **Seasonality of deaths**

• **Clustering of deaths** (at night; week ends; times of holidays; timing of nurse rotation)

• **Geospatial analysis** - access (roads, rivers etc.) and socio-demographic factors
How does PPIP work in South Africa?

- Clinician driven
- All deaths discussed at review meetings
- Data entered into PPIP software electronically
- Open source software.
- Denominator uses district/geographical specific area information (rates per region and per hospital)
- >85% of total births in South Africa analyzed in PPIP
- Further details @ www.ppip.co.za
PPIP has an Easy interface to build a health pyramid
PPIP Example of results

• Can be visualized in tables or graphs within PPIP
• Or exported as PDF, Word or Excel files
• Raw data can be exported in Excel
• Generate reports from templates
Example: Total deliveries per weight category
Example: Mortality rates in SA

### Perinatal care indicators: January 2016 to December 2016

**Pyramid:** 2 SOUTH AFRICA  
**Data Set:** SOUTH AFRICA  
**Data used:** Lower levels included, Detailed Perinatal Death data  
**Dates:** January 2016 to December 2016

<table>
<thead>
<tr>
<th>Birth Weight Categories</th>
<th>Perinatal Mortality Rate</th>
<th>Neonatal Mortality Rate</th>
<th>Early Neonatal Mortality Rate</th>
<th>Late Neonatal Mortality Rate</th>
<th>Stillbirth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>All deliveries</td>
<td>20.4 / 1.000</td>
<td>11.4 / 1.000</td>
<td>9.8 / 1.000</td>
<td>1.5 / 1.000</td>
<td>18.5 / 1.000</td>
</tr>
<tr>
<td>All 1,000g+</td>
<td>20.3 / 1.000</td>
<td>7.7 / 1.000</td>
<td>6.5 / 1.000</td>
<td>1.2 / 1.000</td>
<td>13.5 / 1.000</td>
</tr>
<tr>
<td>500 - 999g</td>
<td>663.5 / 1.000</td>
<td>491.2 / 1.000</td>
<td>430.3 / 1.000</td>
<td>52.9 / 1.000</td>
<td>401.0 / 1.000</td>
</tr>
<tr>
<td>1,000 - 1,499g</td>
<td>302.2 / 1.000</td>
<td>176.2 / 1.000</td>
<td>135.5 / 1.000</td>
<td>40.7 / 1.000</td>
<td>199.7 / 1.000</td>
</tr>
<tr>
<td>1,500 - 1,999g</td>
<td>122.4 / 1.000</td>
<td>413.1 / 1.000</td>
<td>347.1 / 1.000</td>
<td>67.7 / 1.000</td>
<td>101.3 / 1.000</td>
</tr>
<tr>
<td>2,000 - 2,499g</td>
<td>29.7 / 1.000</td>
<td>11.4 / 1.000</td>
<td>9.3 / 1.000</td>
<td>1.6 / 1.000</td>
<td>20.1 / 1.000</td>
</tr>
<tr>
<td>2,500g+</td>
<td>8.5 / 1.000</td>
<td>3.4 / 1.000</td>
<td>3.1 / 1.000</td>
<td>0.3 / 1.000</td>
<td>5.3 / 1.000</td>
</tr>
<tr>
<td>Multiple pregnancies</td>
<td>85.3 / 1.000</td>
<td>55.6 / 1.000</td>
<td>47.5 / 1.000</td>
<td>8.8 / 1.000</td>
<td>29.6 / 1.000</td>
</tr>
</tbody>
</table>

### Selected birth weight categories

- 500 - 999g
- 1,000 - 1,499g
- 1,500 - 1,999g
- 2,000 - 2,499g
- 2,500g+

### Other indicators

- Stillbirth / Neonatal death rate - all birth weights: 1.7 / 1.1
- Perinatal Care Index - all birth weights: 1.94
- Perinatal Care Index - <1,000g: 1.50
Example: Mortality rates - graphic
Example: Primary obstetric cause of deaths
Example: Modifiable factors
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stillbirth rate</td>
<td>number of stillbirths</td>
<td>Total births (stillbirths + livebirths)</td>
<td>1000</td>
</tr>
<tr>
<td>Percentage of stillbirths that are antepartum</td>
<td>Number of ante-partum stillbirths</td>
<td>Total number of stillbirths</td>
<td>100</td>
</tr>
<tr>
<td>Early neonatal mortality rate</td>
<td>Early neonatal deaths (1-7 days)</td>
<td>Number of live births</td>
<td>1000</td>
</tr>
<tr>
<td>Perinatal mortality rate</td>
<td>Number of stillbirths + early neonatal deaths (1-7 days)</td>
<td>Total births (stillbirths + livebirths)</td>
<td>1000</td>
</tr>
<tr>
<td>Neonatal Mortality Rate</td>
<td>Neonatal deaths (1-28 days)</td>
<td>number of live births</td>
<td>1000</td>
</tr>
</tbody>
</table>
## Indicators Definitions

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal mortality ratio</td>
<td>Maternal deaths</td>
<td>Number of live births</td>
<td>100,000</td>
</tr>
<tr>
<td>Caesarean section rate (all births)</td>
<td>Number of caesarean section deliveries</td>
<td>Total births (stillbirths + livebirths)</td>
<td>100</td>
</tr>
<tr>
<td>assisted deliveries rate (all births)</td>
<td>Number of assisted deliveries</td>
<td>Total births (stillbirths + livebirths)</td>
<td>100</td>
</tr>
<tr>
<td>Low birth weight rate</td>
<td>Number of babies being born weighing &lt; 2500 grams</td>
<td>Number of live births</td>
<td>1000</td>
</tr>
<tr>
<td>Preterm rate (live births)</td>
<td>Number of babies born before 37 weeks gestational age</td>
<td>Number of live births</td>
<td>100</td>
</tr>
</tbody>
</table>
• Modifiable factor is something that may have prevented the death if a different course of action had been taken.

• Can be missed opportunities within the health system.

• They represent potential for positive change.

• Documenting and analyze these modifiable factors.

• Highlight critical delays and modifiable factors, that can be targeted with appropriate interventions.
Identifying and classifying modifiable factors-2

• What could actually be done to prevent a critical delay or avoidable factor?

• Discussed in terms of delays in care and in levels of system failure.

• Many ways to identify modifiable factors

• Often analysed using a root cause analysis

• Fishbone diagrams (different levels of the health system, health system building blocks, People, Place, procedure, policy and NHS template)
The Swiss Cheese Model

- Constant tension of defenses versus failures
- What is our standard care and did we achieve that?
- Latent failures versus active failures
- Was our case based on national guidelines?
- Resist jumping to conclusions?
- Question how things are supposed to work versus how they actually worked?
- Reveal vulnerabilities

Ref: Reason JT (1990)
Three delays model

Delay 1: Delay in the decision to seek care.
• For e.g.: a woman may labour at home for too long because she and/or her family are afraid to come for care, are concerned about the cost of care, or do not recognize developing problems.

Delay 2: Delay in reaching care.
• For e.g.: a labouring woman may not be able to find or afford expedient transportation to a health-care facility.

Delay 3: Delay in receiving adequate care.
• For e.g.: a labouring woman may arrive at a hospital without any clinicians available to provide care to her, or transfer between lower and higher-level facilities may take too long to provide effective care and prevent stillbirth.
Family level:
- Did the family of a victim of neonatal death not understand when to seek care for their infant? Should families in their community be targeted with an educational campaign or provided with resources to help them get to care sooner?

System level:
- Was transfer between lower- and higher-level facilities inhibited by administrative barriers? Was there a stock-out of any needed medicines or equipment?

Provider level:
- Was a health-care provider unable to give adequate resuscitation? Are there needs for additional training or resources for providers?
If a baby dies of congenital syphilis, and the mother did not attend antenatal care, then the modifiable factor would most likely have been related to family- or patient level factors.

However, if the mother attended the antenatal clinic but the health worker failed to screen her for syphilis or failed to collect the result and treat her, then the avoidable factor would have been provider-related.

Finally, if the mother attended antenatal clinic, and the health worker wanted to screen her for syphilis but either transport or the facilities to perform the test were not available, then the modifiable factor would have been system-related.
Root cause analysis

- Define the event
- Identify contributing factors
- Consider each contributing factor
- If contributing factor large or too complex sub-categories are needed
- Create an action plan
Follow these steps:

1. Record the event at the head
2. Brainstorm contributing factors
3. Record the contributing factors at the end of the bones in a box
4. Brainstorm contributing causes within each contributing factors
5. Record contributing causes on the veins
6. Brainstorm contributing sub-causes on the sub-veins (break down larger contributory causes into sub-causes)
7. Create action targets and develop actionable solutions (circle factors are within their sphere of influence-action targets)
8. Create action spears (who, what, when action)
Examples: Fishbone Diagrams

Fish Bone – Identify Contributory Factors
NHS National Patient Safety Agency

- **Patient factors:** Clinical condition, physical factors, social factors, mental factors, interpersonal relationships
- **Individual (staff) factors:** Guidelines, procedures, protocols, decision aids
- **Task factors:** Verbal, written, non-verbal
- **Communication factors:** Management, support, cultural factors
- **Team factors:** Role congruence

**Education + training factors:** Competence, supervision, availability, accessibility, appropriateness

**Equipment + resources:** Displays, integrity, positioning, usability

**Working condition factors:** Administrative, design of physical environment, staffing, workload and hours, time

**Organisational + strategic factors:** Organisational structure, priorities, externally imposed risks, safety culture

Also available in a grid format: [http://www.nrl.npsa.nhs.uk/resources?entrid=157605](http://www.nrl.npsa.nhs.uk/resources?entrid=157605)
5 “Why’s” Approach

Simple brainstorming approach that can help QI teams identify the root cause(s) of a problem.

Once a general problem has been recognized, use the Fishbone Diagram to ask ‘why’ questions to drill down to the root causes.

Allows teams to move beyond obvious answers and reflect on less obvious explanations.

For example: A woman undergoing a caesarean-section did not receive antibiotic prophylaxis.

- **WHY?** The antibiotic was not available in the theatre.
- **WHY?** The physician did not write a prescription.
- **WHY?** The physician was unaware of the current protocol.
- **WHY?** The physician was new and had not been oriented to the clinical protocols.
- **WHY?** The facility does not have an orientation programme for new physicians.
## Dummy Data for Group Work

<table>
<thead>
<tr>
<th></th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Number of deliveries</td>
</tr>
<tr>
<td>B</td>
<td>Number of live births</td>
</tr>
<tr>
<td>C</td>
<td>Number of stillbirths</td>
</tr>
<tr>
<td>D</td>
<td>Number of intrapartum stillbirths</td>
</tr>
<tr>
<td>E</td>
<td>Number of antepartum stillbirths</td>
</tr>
<tr>
<td>F</td>
<td>Early neonatal deaths (0–7 days)</td>
</tr>
<tr>
<td>G</td>
<td>Neonatal deaths (0–28 days)</td>
</tr>
<tr>
<td>H</td>
<td>Maternal deaths</td>
</tr>
<tr>
<td>I</td>
<td>Number of caesarean section deliveries</td>
</tr>
<tr>
<td>J</td>
<td>Number of assisted deliveries</td>
</tr>
<tr>
<td>K</td>
<td>Number of babies born weighing &lt; 2500 g</td>
</tr>
<tr>
<td>L</td>
<td>Number of babies born &lt; 37 weeks gestational age</td>
</tr>
</tbody>
</table>
Group work

Please calculate the following

1. Stillbirth rate
2. Percentage of antepartum stillbirths
3. Early neonatal mortality rate
4. Perinatal mortality rate
5. Neonatal mortality rate
6. Maternal mortality ratio
7. Caesarean section rate (for all births)
8. Assisted delivery rate (for all births)
9. Low birth weight (live births)
10. Preterm rate (live births)
<table>
<thead>
<tr>
<th>Metric</th>
<th>Formula</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stillbirth rate</td>
<td>((C/A)\times 1000)</td>
<td>20.0</td>
</tr>
<tr>
<td>Percentage of stillbirths that are antepartum</td>
<td>((D/C)\times 100)</td>
<td>60%</td>
</tr>
<tr>
<td>Early neonatal mortality rate</td>
<td>((F/B)\times 1000)</td>
<td>15.9</td>
</tr>
<tr>
<td>Perinatal mortality rate</td>
<td>(((C+F)/A)\times 1000)</td>
<td>34.0</td>
</tr>
<tr>
<td>Neonatal mortality rate</td>
<td>((G/B)\times 1000)</td>
<td>20.5</td>
</tr>
<tr>
<td>Maternal mortality ratio</td>
<td>((H/B)\times 100,000)</td>
<td>227.3</td>
</tr>
<tr>
<td>Caesarean section rate (all births)</td>
<td>((I/A)\times 100)</td>
<td>15%</td>
</tr>
<tr>
<td>Assisted delivery rate (all births)</td>
<td>((J/A)\times 100)</td>
<td>10%</td>
</tr>
<tr>
<td>Low birth weight rate (live births)</td>
<td>((K/B)\times 1000)</td>
<td>23%</td>
</tr>
<tr>
<td>Preterm rate (live births)</td>
<td>((L/B)\times 100)</td>
<td>16%</td>
</tr>
</tbody>
</table>