

# **MMed and DCH Lectures**

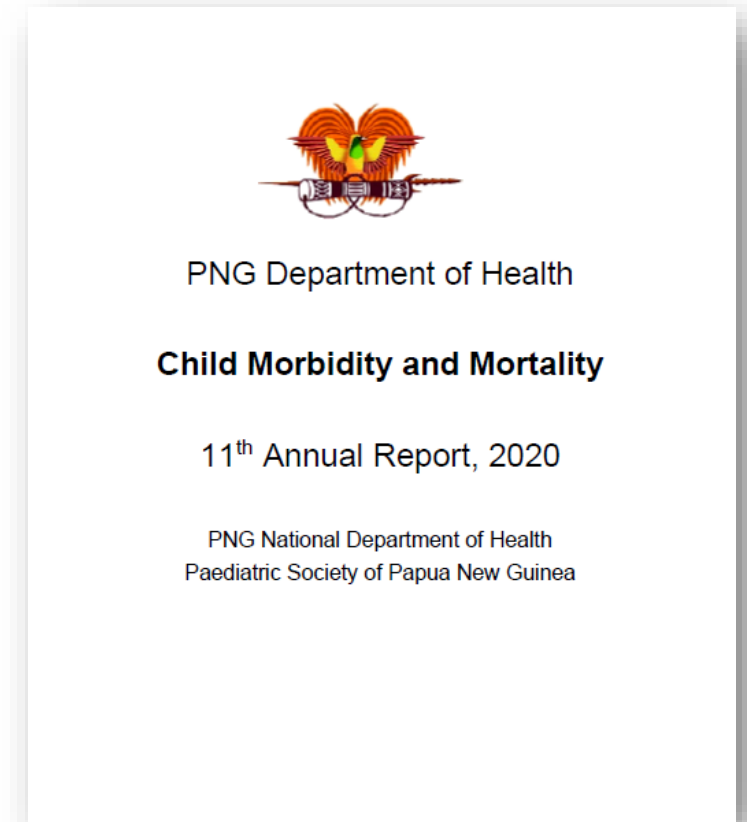
## **Paediatric Hospital Reporting (PHR): what can we learn from 2020?**

June 15<sup>th</sup>, 2021

Prof Trevor Duke

# Sources of data

- Paediatric Hospital Reporting Program (PHR)
  - Clinical data from 24 hospitals
  - Annual Child Morbidity and Mortality Report
  
- Demographic and Health Surveys (DHS)
  - Population-based data 2016-18



<https://pngpaediatricsociety.org/reports/annual-child-morbidity-and-mortality-reports/>

# Paediatric Hospital Reporting V12

## Data entry

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&lt;&lt; &lt;

ID 

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Patient information

Respiratory

Gastro/Nutrition

Acute fever/Rash

Malaria

Neuro/Meningitis

Tuberculosis

Emergency/Surgical

Renal/Haematology/Endocrine

Heart disease

Cancer

HIV

Child protection

Admission date

Hospital

Name

Hospital no

Date of birth

Calculated Age

Estimated Age

Sex

 M  F

Weight

 kg

Readmission

 Yes  No

Province

District

Village

Referred in

 Yes  No

Referred from

SpO<sub>2</sub>
 %

Anaemia

 Yes  No

HIV

 Negative  Positive  Not tested

Immunised

 Fully immunised for age  Partially immunised for age  Unvaccinated

Nutritional

 Weight for age greater than -2 standard deviations (good weight)

 Weight for age between -2 and -3 standard deviations (underweight)

 Weight for age less than -3 standard deviations (severely underweight)

Mid Upper Arm Circumference

 mm

Outcome

 Survived to hospital discharge

 Transferred out

 Died

 Absconded

Date of discharge / transfer / death

Complications

 Hospital Acquired Infection

 Intravenous complications

Complications other

# DHS: Definition of mortality rates

- Neonatal / infant / child mortality rates:

Number of deaths up to 28 days / 12 months / 5 years

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1000 live births

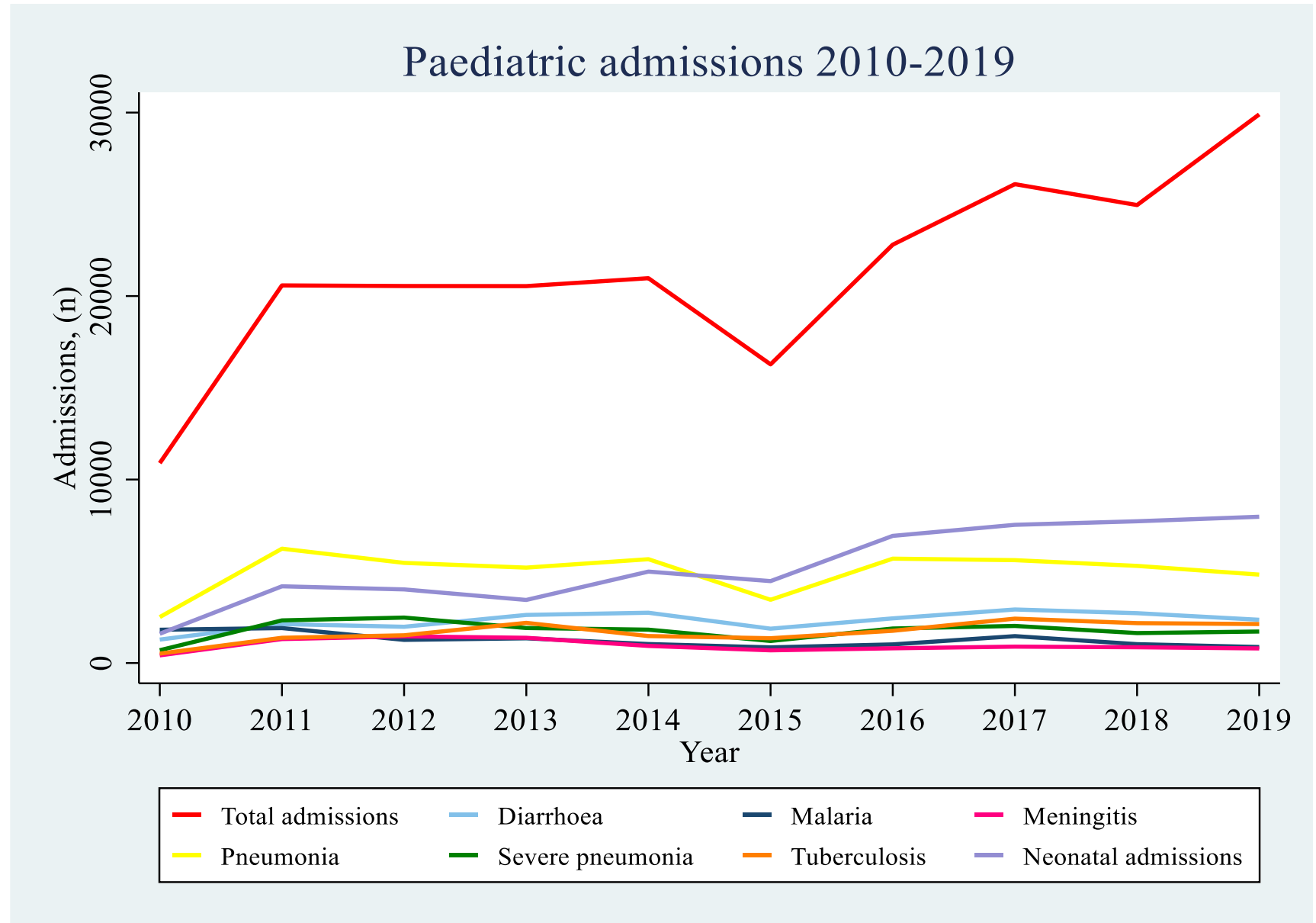
# Demographic and Health Survey (DHS)

	1991	1996	2006	2016-18
<b>Under 5 mortality rate</b>	133	94	75	49
<b>Infant mortality rate</b>	82	69	57	33
<b>Neonatal mortality rate</b>		30	29	20

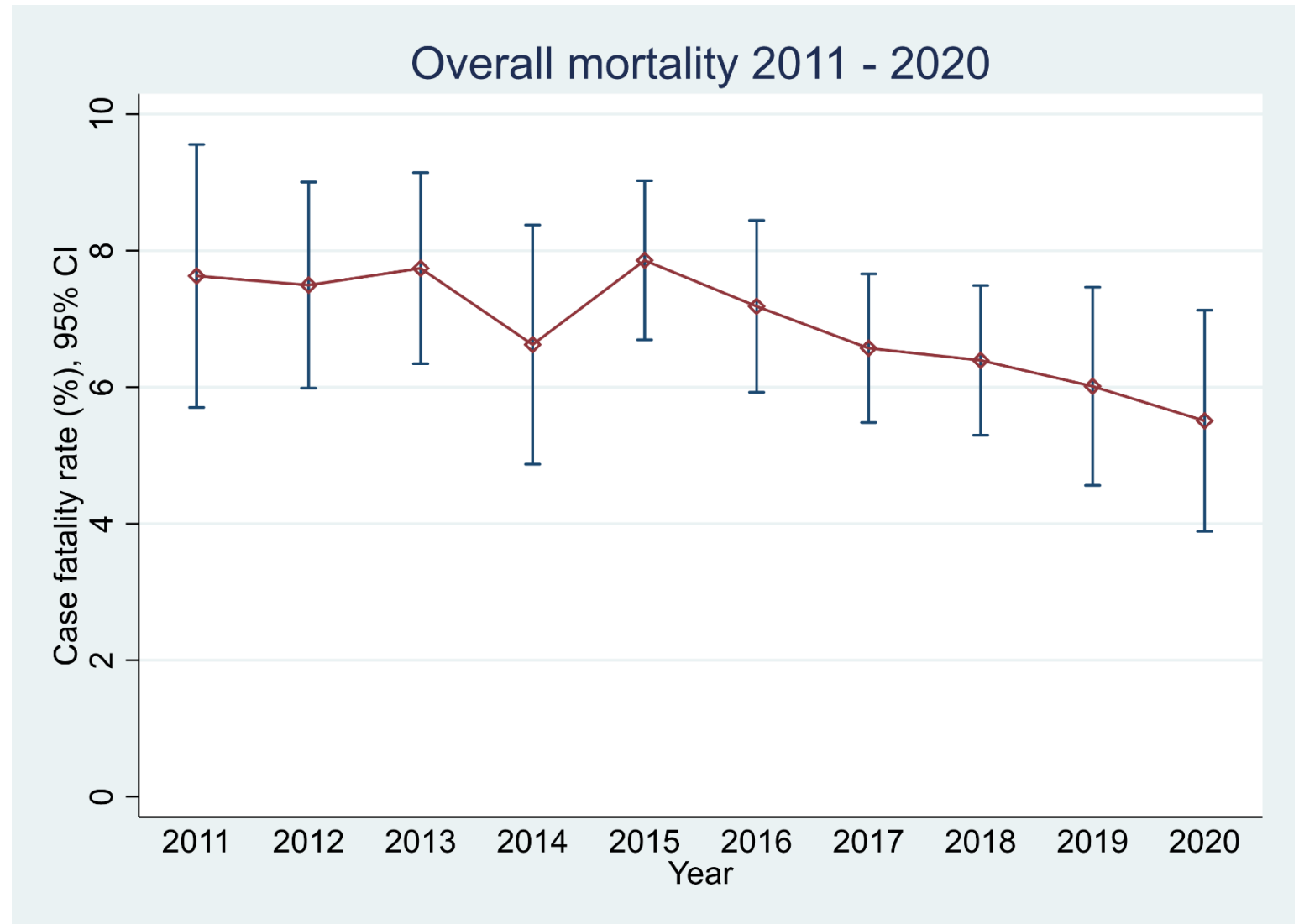
63% reduction in under-5 mortality rate between 1990-2016

24 hospitals

- 12 provincial hospitals
- 9 rural district hospitals
- 1 urban hospital
- 1 urban tertiary referral hospital.



- 32,755 paediatric admissions, 1927 deaths; mortality rate 5.88%.
- Significant improvement in paediatric mortality rate compared with 5-10 years ago.



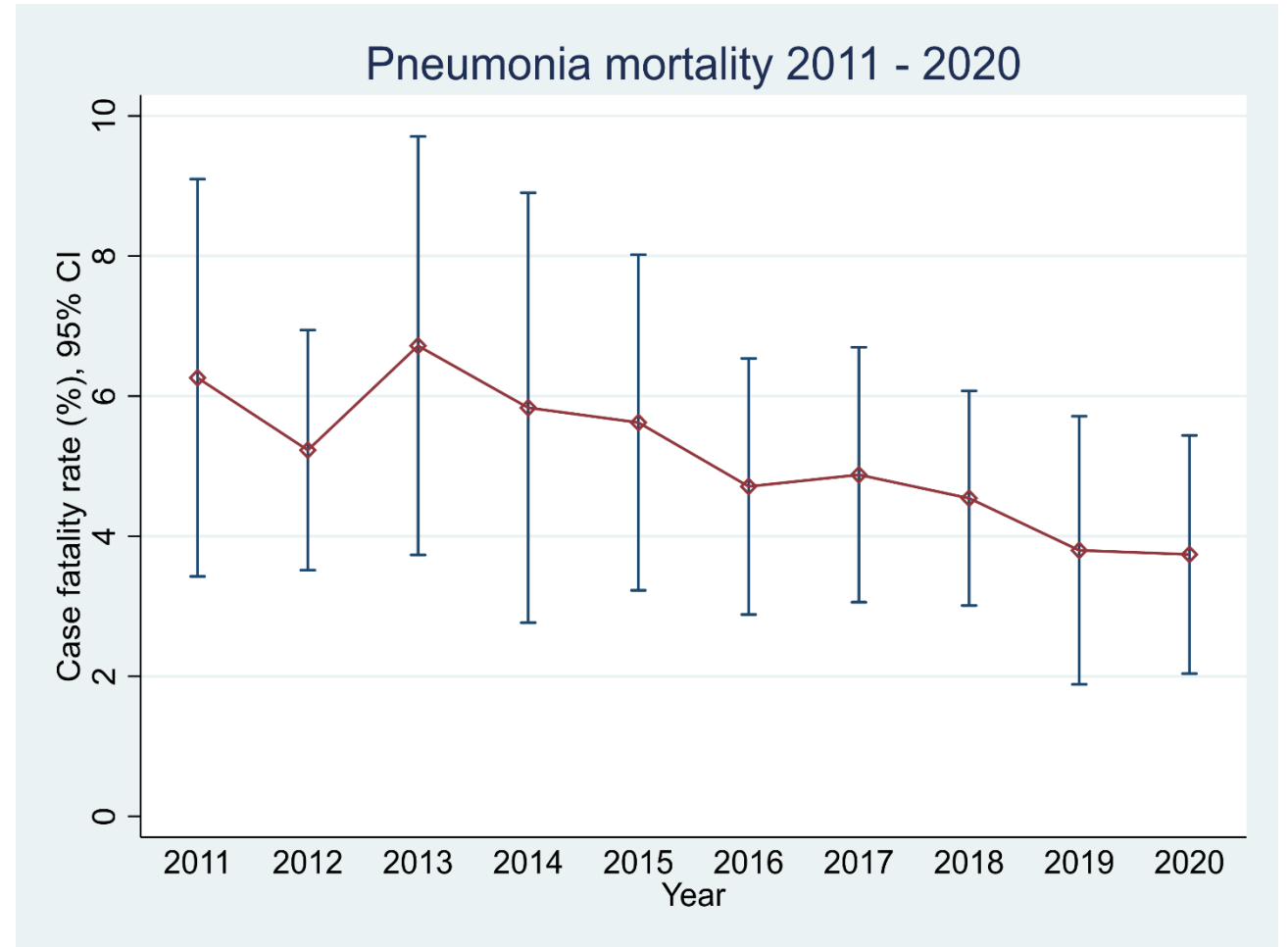
\* Mortality graphs show **weighted averages** and 95% CI, which are more valid when comparing different time periods than the percentages

<b>Diagnoses</b>	<b>Admissions 2020</b>	<b>Deaths 2020</b>	<b>Case fatality rate 2020</b>	<b>Average CFR 2009-2019</b>
<b>All paediatric admissions</b>	<b>32,755</b>	<b>1927</b>	<b>5.88</b>	<b>7.18</b>
Pneumonia	6217	190	3.06	4.70
Severe pneumonia	1955	151	7.72	11.16
Neonatal conditions	10024	534	5.33	9.48
Diarrhoea	2704	99	3.66	4.31
Malaria	617	32	5.19	4.38
Severe malnutrition	2377	257	10.81	17.08
Tuberculosis	1819	154	8.47	10.86
Meningitis	778	127	16.32	17.60
HIV	479	82	17.12	15.22
Anaemia	1750	227	12.97	12.90
Rheumatic heart disease	140	21	15.00	9.17
Congenital heart disease	421	79	18.76	19.02
Measles	4	0	0	2.97
Cancer	130	41	31.5	31.87
Tetanus	9	4	44.44	15.13
Acute flaccid paralysis	23	2	0.09	3.49
Whooping cough	28	0	0	1.27
Child protection	145	25	17.2	16.82
Trauma and injuries	394	5	1.27	4.70



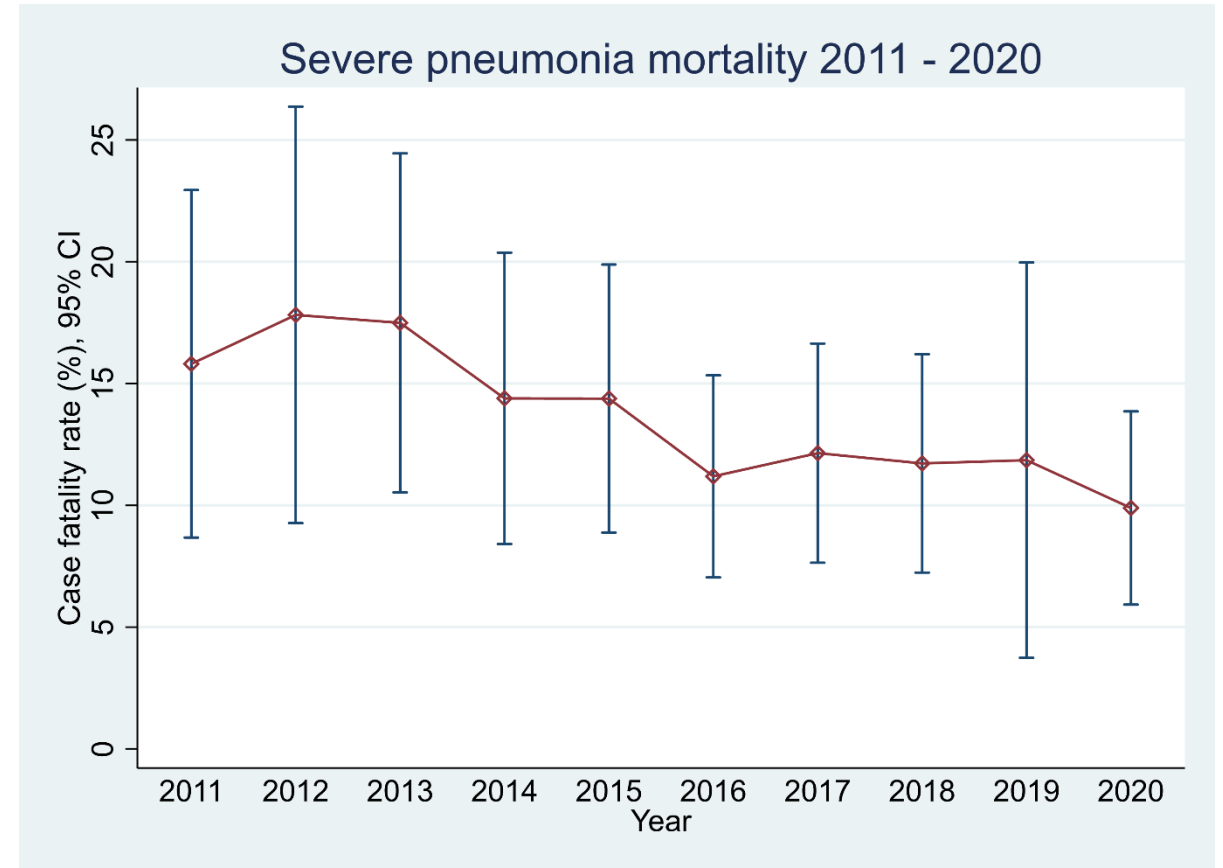
# Pneumonia

- 6217 cases: 18.9% of all admissions
- Pneumonia CFR: 3.1%



# Severe pneumonia

- Pneumonia with severe chest indrawing, inability to feed because of respiratory distress, hypoxaemia ( $\text{SpO}_2 < 90\%$ ) or cyanosis, or emergency sign
- Overall **CFR 7.7% for severe pneumonia**



# Pneumonia

- Why improved outcomes in pneumonia?
  - Better clinical care, use of oxygen concentrators and pulse oximetry
  - Vaccines against *Haemophilus influenzae* type b (Hib in Pentavalent) and *Streptococcus pneumoniae* (PCV)
  - Changes in epidemiology with more viral bronchiolitis

# Recommendations

Hospitals ensure that there is:

- System of triage and rapid treatment of the sickest patients in the emergency and outpatients' departments
- Part of the children's ward is properly equipped to provide intensive care and close monitoring 24 hours a day.
- Adequate oxygen supplies and staff trained in how to give oxygen.
- Appropriate stocks of antibiotics to treat pneumonia.
- Regular clinical monitoring, including pulse oximetry.
- Training for staff in the care of seriously ill children
- Sufficient nursing and medical staff to provide clinical care at all times.
- Supervision of nursing and medical care by senior clinicians.

# Paediatric monitoring and response chart

Name: Ratu Age: 11 months  
 Frequency of observations: 1-2 Hourly

Hospital: \_\_\_\_\_ Weight: 8.2 kg UR number: 267198

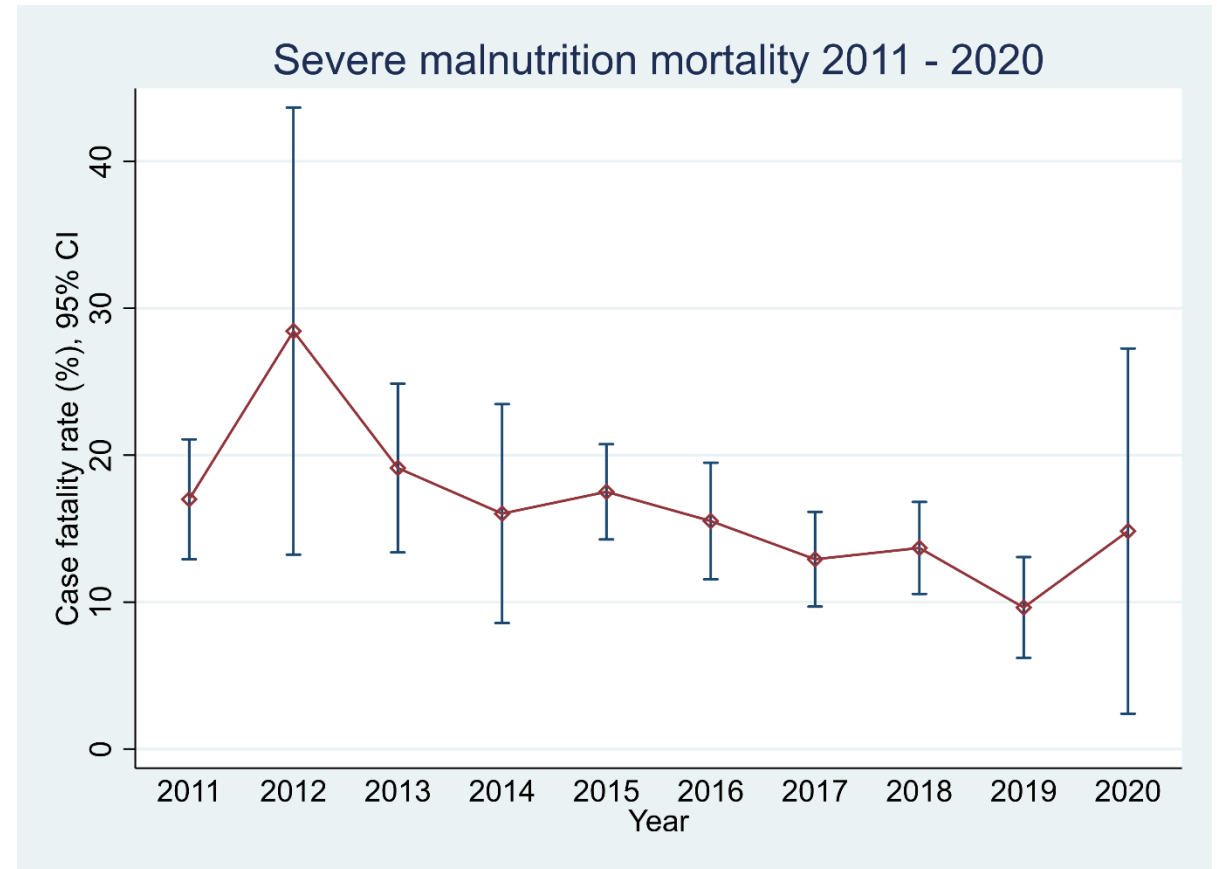


Date	15/4	16/4	17/4	18/4	19/4	20/4	21/4	22/4	23/4	24/4	25/4	26/4	27/4	28/4	29/4	30/4	31/4			
<b>Time</b>	0800	1000	1200	1400	1600															
<b>AIRWAY / BREATHING</b>	Temp °C	≥ 39																>39		
		38-38.9	37.7																38-38.9	
		36-37.9	38.8	38.8																36-37.9
		<36			37.4	37.4	37.4	36.8												<36
		≥ 80																		≥ 80
	Respiratory Rate (bpm)	70	X																	70
		60		X	X															60
		50				X	X	X	X	X										50
		40																		40
		30																		30
SpO <sub>2</sub> (%)	100																		100	
	90		X	X	X	X	X	X	X										90	
	80	X																	80	
	70																		70	
	<70																		<70	
Respirat distress	Oxygen L/min																		L/min	
	Severe	X	X																Severe	
	Mod.			X	X	X	X												Mod.	
	Mild					X	X												Mild	
	Normal						X												Normal	
<b>CIRCULATION</b>	Heart rate (bpm)	≥ 200																	≥ 200	
		190																	190	
		180	X																	180
		170		X	X															170
		160			X															160
		150				X	X													150
		140					X													140
		130																		130
		120																		120
		100																		100
Cap refill	≥ 3 secs																		≥ 3 secs	
	< 3 secs	X	X	X	X	X	X	X											< 3 secs	
	≥ 150																		≥ 150	
	140																		140	
	130																		130	
<b>DISABILITY</b>	Blood Pressure (mmHg) > < (systolic danger range)	120																	120	
		110																	110	
		100																	100	
		90																		90
		80																		80
	70																		70	
	60																		60	
	50																		50	
	Alert	X	X	X	X	X	X												Alert	
	Verbal																		Verbal	
Pain																		Pain		
None																		None		
Pain score (/10)																		Pain		
<b>OTHER</b>	Blood sugar	1.50																	BSL	
	Feeds given: volume																			

Oxygen  
 IV glucose  
 Antibiotics  
 Blood Transfusion  
 Feeds commenced (ML)

# Severe malnutrition

- Co-morbidity or main diagnosis
- 2377 children admitted with severe malnutrition
  - weight for age <3 SD below the median) or
  - severe wasting or
  - Kwashiorkor (nutritional oedema)
- 7.3% of all admissions, ↓ on previous years.



# Severe malnutrition

Year	Number admissions	Percentage of all admissions	Deaths	CFR	Number of hospitals with CFR >20%
2011	1544	7.50	287	18.6	3
2012	2590	12.61	604	23.3	4
2013	3379	16.50	524	15.5	4
2014	2861	13.64	455	15.9	4
2015	2338	14.36	438	18.7	4
2016	2635	11.56	438	16.7	4
2017	3049	14.0	483	15.8	2
2018	2548	10.21	315	12.4	3
2019	2411	8.06	250	10.4	1
2020	2377	7.27	257	10.8	1

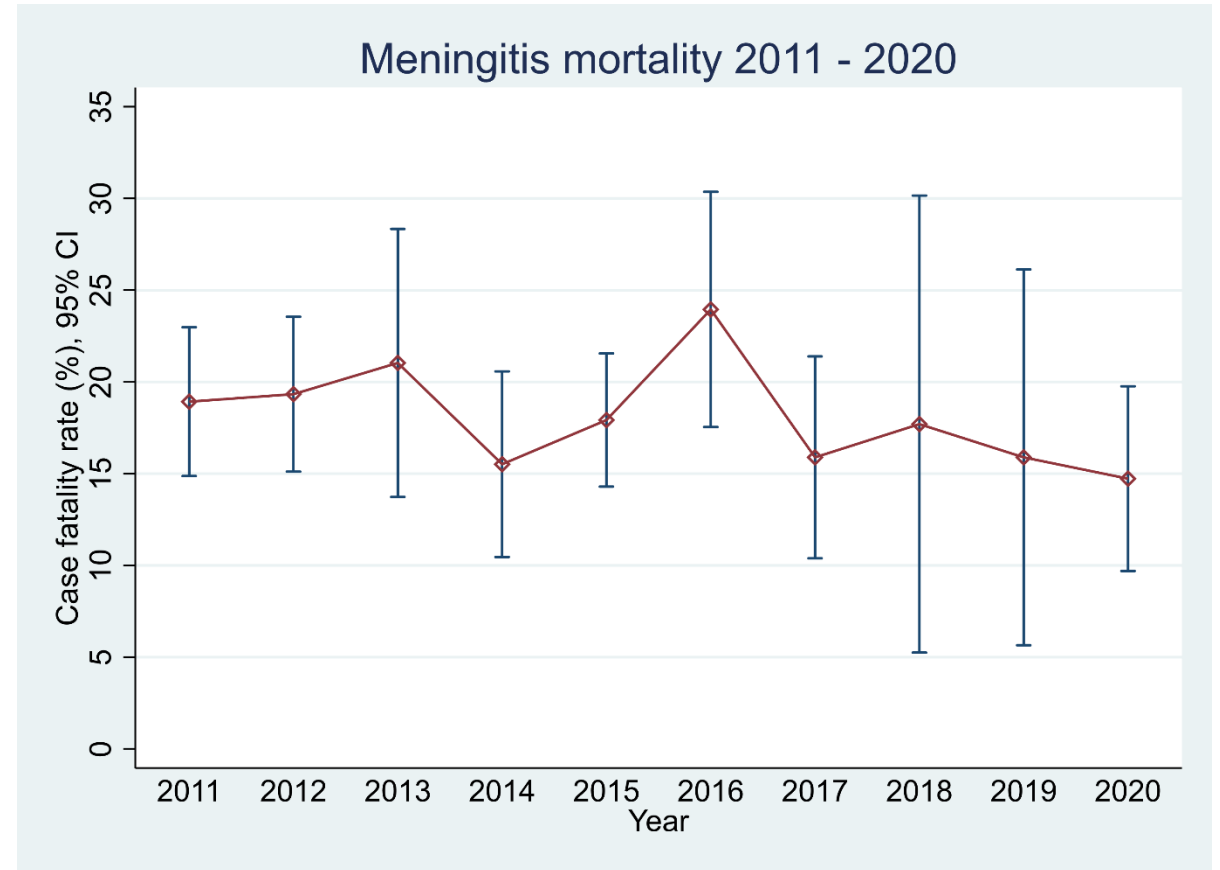
# Recommendations

- Early identification and treatment for children with severe and moderate malnutrition.
- Breast feeding should be strongly promoted, and mothers supported to breast-feed while their babies are in hospital.
- Growth monitoring should be a regular part of child health care.
- In the health facility: adequate formulas (F75 and F100 ideally), nutritious fresh fruits and vegetables and other fresh food, and ready-to-use therapeutic food (RUTF).
- The main problems in the management of malnutrition are inadequate feeding (starting feeds too late, not enough milk feeds and not frequent enough feeds).
- Guidelines for the management of malnutrition should be used in all wards.
- Children with severe acute malnutrition should be nursed in a high dependency area in the children's ward, where close monitoring and identification of complications can occur.
- Identify children early who will develop malnutrition: those with chronic illnesses: HIV, tuberculosis, osteomyelitis or chronic cardiac, respiratory or kidney disease should be provided with supplemental feeding.
- Zinc and vitamin A improved access and usage
- Staff training in the management of malnutrition.



# Meningitis

- 778 admissions and 127 deaths (16.3%).
- For every death from meningitis, many children survive with serious brain injury which will reduce their ability to gain a proper education or participate in the community.
- Preventable by vaccination and early presentation and treatment.



# Recommendations

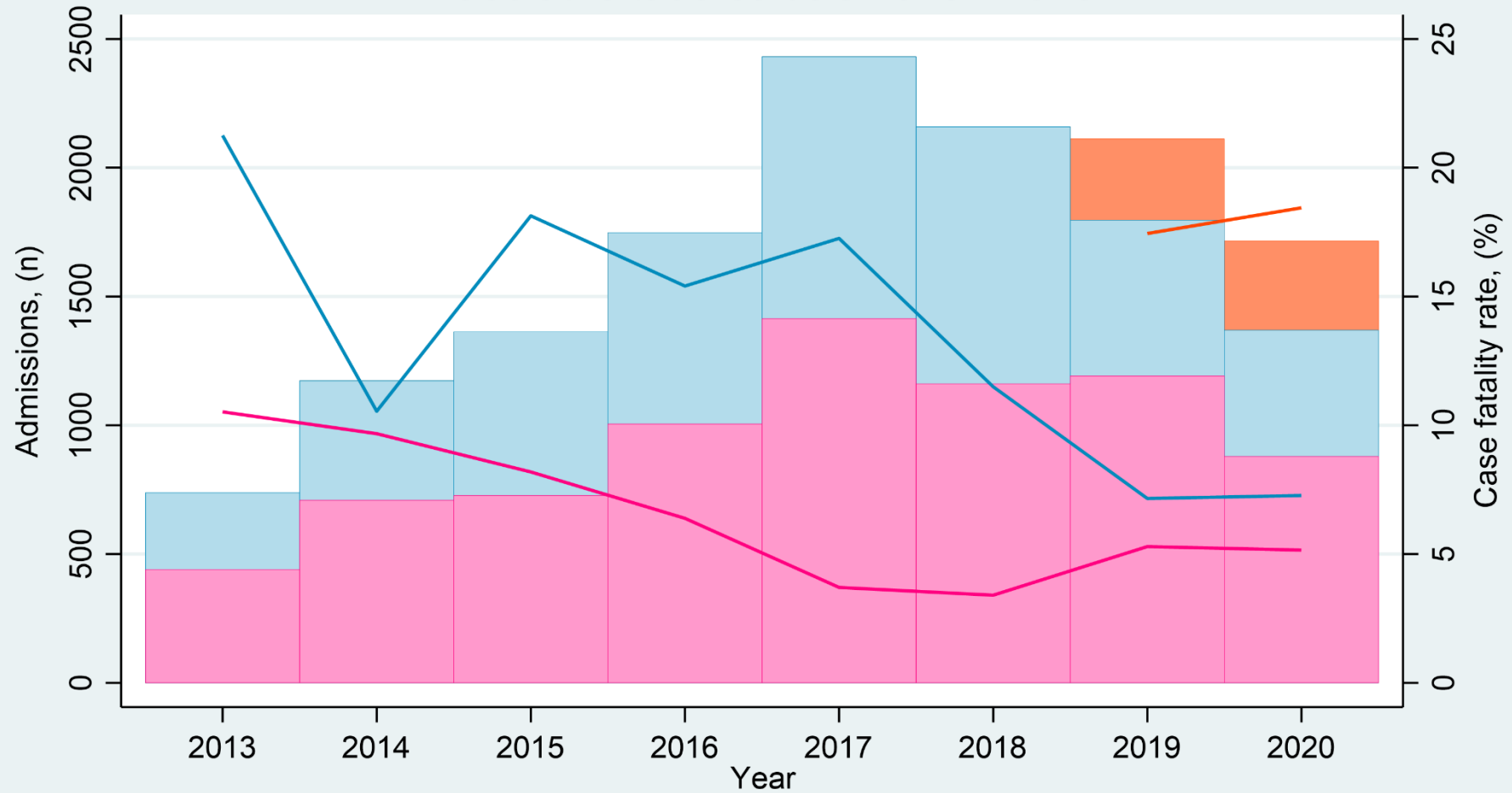
- All children should receive Pentavalent and PCV vaccines at 1, 2 and 3 months of age.
- All children with suspected meningitis should have a lumbar puncture if it is safe to do so. If the CSF is cloudy or has cells on microscopy, **treat with ceftriaxone 50mg/kg twice daily IV or IM for 10 days.**

# Recommendations

- **Supportive care of children with meningitis:**

- Nurse in a high dependency or intensive care section of the ward.
- 30° head up (elevate the head of the bed, or nurse on a pillow) to reduce the risk of aspiration and to reduce intracranial pressure.
- Monitor with pulse oximetry to detect hypoxaemia, and give oxygen if SpO<sub>2</sub><92%
- Monitor the blood glucose and prevent hypoglycaemia.
- Monitor the Glasgow Coma Scale
- Monitor the blood pressure and ensure it is in the normal range (avoid both severe hypertension and hypotension, both are bad for children with meningitis). Monitor the pulses and peripheral circulation.
- Close observation for convulsions, and prompt treatment with a preventative anticonvulsant if the child has convulsions.
- Do not give too much IV fluid, this leads to brain swelling and poor outcomes, maintain enteral nutrition via a nasogastric tube.
- Change position to prevent pressure sores.
- Physiotherapy to prevent limb contractures.
- Consider TB meningitis if a child is not improving, or if the history is suggestive (prolonged history, malnutrition, contact with a case of active TB). If uncertain, refer, or commence TB treatment.
- Do a CT scan if you can if the child remains poorly conscious after 48 hours of treatment.

# Paediatric tuberculosis 2013 - 2020



# Tuberculosis

Year	Cases of TB	Total admissions	% of admissions
2017	2417	23272	10.4%
2018	2175	24960	8.7%
2019	2125	29901	7.1%
2020	1819	32755	5.6%

# Recommendations

- Make every effort to help children complete TB therapy, this will require 2 months of hospitalisation to ensure adherence, and active community follow-up.
- Case detection / family screening: If there is a person with sputum smear positive PTB in the household, child contacts should be screened. If they are asymptomatic, they should be commenced on Isoniazid Preventive Therapy. If they have symptoms of TB, do a TB score. If the score is  $>7$ , register them and commence TB treatment.
- The most effective way to prevent transmission of TB to children is by identification and treatment of adults in the community with infectious sputum smear positive PTB.
- BCG immunization is effective in preventing severe and disseminated forms of TB in young children.
- Early identification and treatment of children with TB disease will reduce the numbers of child deaths and complications (such as bronchiectasis and cerebral palsy).
- In remote areas, where chest x-ray and acid-fast bacilli staining is not possible, it is valid to diagnose TB clinically, based on symptoms, signs and the TB score. It is better to treat and closely monitor response than to have children deteriorate because diagnostic tests were not available.

# Recommendations

- GeneXpert test can help diagnose TB and multi-drug resistant TB. Do not rely on Xpert to exclude TB: TB is a clinical diagnosis based on the history of contact, the clinical features, radiology, sputum or gastric aspirate for acid fast bacilli, and other tests such as GeneXpert.
- GeneXpert testing should be done on all children who are:
  - Contacts of known MDR cases or suspected MDR cases
  - Relapsed or re-treatment cases
  - HIV positive
  - Failing treatment despite supervised treatment and proven adherence.

# Recommendations

- Do not discharge patients with TB too early: keep children in hospital for the duration of their intensive phase treatment (2 months) if this is feasible. To do this child and family friendly health facilities are needed, where children can go to school while they receive supervised treatment, and parents can receive appropriate education on how to care for their child with TB and receive proper family screening and treatment themselves if they have TB.
- TB programs that are successful in achieving good treatment completion rates have nurse outreach services for supervision of DOTs providers, checking of adherence, nutritional, social and economic support, and follow-up in the home.



# HIV

- 473 children with HIV admitted, 82 known HIV-related deaths (17.3%).
- No progress in 5 years

Year	Admission of children with HIV	Deaths in children with HIV
2016	532	86
2017	545	89
2018	547	87
2019	389	48
2020	479	82

# Recommendations

- Many children with HIV are failing anti-retroviral (ART) therapy because they are still on Nevirapine-Lamivudine-Zidovudine (NVP/3TC/AZT) combination therapy.
- High levels of drug-resistance to non-nucleoside reverse transcriptase inhibitors (NNRTIs), such as Nevirapine. This leads to poor treatment outcomes on NNRTI-based ART among infants and young children.
- More effective therapy using Lopinavir/ritonavir, Abacavir and Lamivudine, is available.
- New HIV care and treatment guidelines: <https://pngpaediatricsociety.org/wp-content/uploads/2020/03/PNG-HIV-care-and-treatment-guidelines-2019.pdf>

# HIV

- Early infant diagnosis of HIV with PCR testing. Children who have HIV confirmed by early infant diagnosis and start on effective anti-retroviral therapy (ART) *before* they become symptomatic have a much better chance of healthy life than children diagnosed later because they have AIDS-defining infections.
- Children diagnosed with HIV should see a paediatrician regularly, for starting on antiretroviral therapy and follow-up.
- **Children on ART need to have their treatment monitored, with regular testing of viral load, or CD4 count.**
- Children with HIV need prophylaxis with cotrimoxazole and isoniazid, treatment of other infections and good nutrition.

# Chronic non-communicable diseases: 1079 children in 2020

<b>Chronic condition</b>	<b>Admissions</b>	<b>Deaths</b>
Asthma	110	0
Rheumatic heart disease	140	21
Congenital heart disease	421	79
Cerebral palsy / developmental disability	170	124
Epilepsy	108	3
Cancer	130	41

# Recommendations

- Children with chronic diseases, regardless of the type, have some common health care needs, including:
  - a long-term treatment plan
  - good follow-up by a trusted doctor or paediatric nurse
  - going to school regularly and having schools informed about their condition.
  - a regular supply of medicines on time, and good adherence
  - optimal nutrition
- Children with chronic illnesses can understand their condition, as young as 4 or 5 years they can start to understand. This helps them manage their illness as they get older.

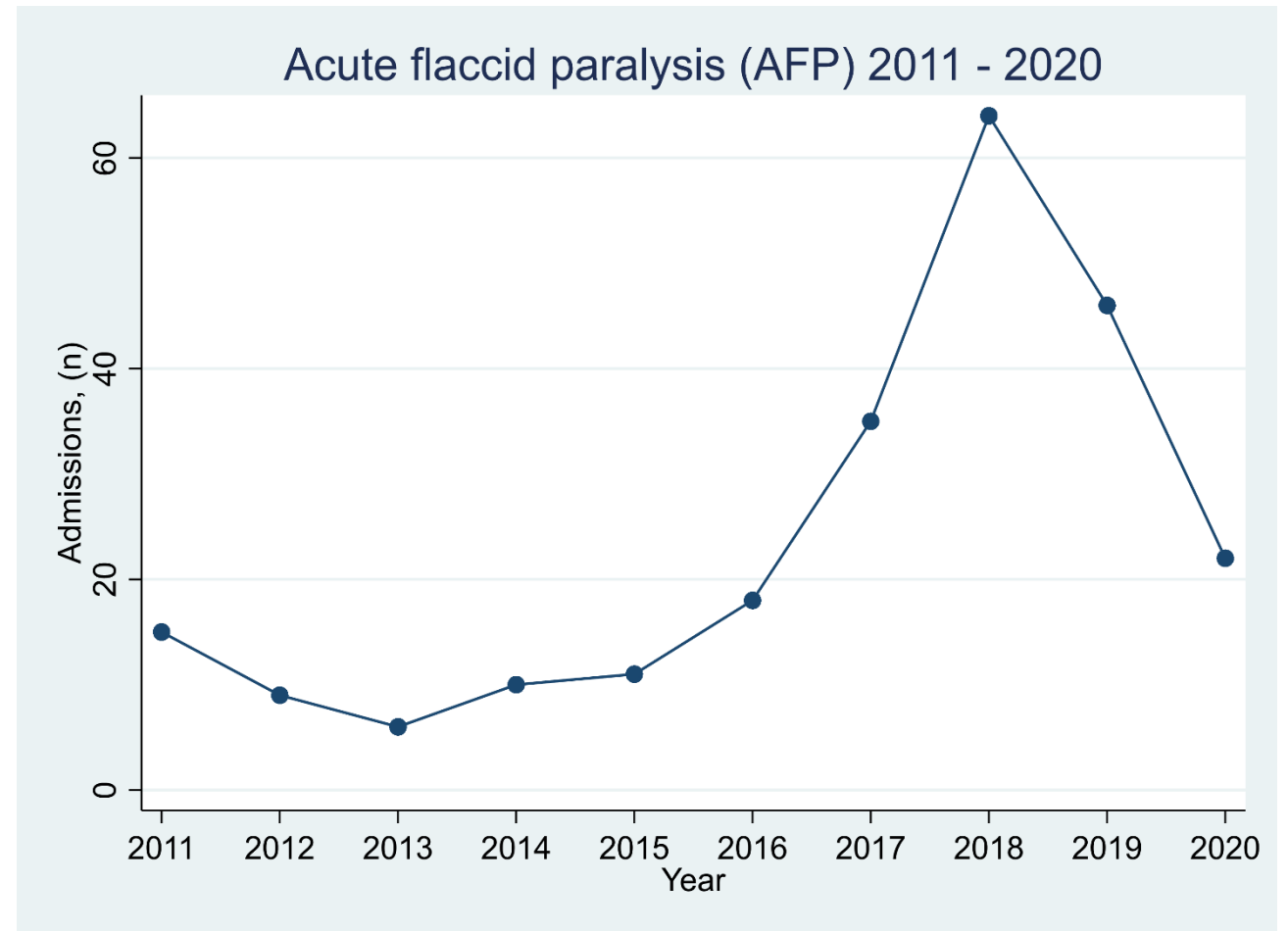
# Recommendations

- There are high rates of deaths from cerebral palsy when children are hospitalised, mostly these will be children with severe disability, but many children with cerebral palsy are not so severely affected. They can live healthy and happy lives.
- Some children with chronic illness have problems with hearing and vision, which can be addressed to make their lives better, and some have motor and mobility problems that can be addressed with physiotherapy, regular exercise and aids such as wheelchairs or walking frames.
- Programs are needed that better support children with chronic illness. These children are at risk of dying from acute infections and malnutrition, so prevention is vital.

# Vaccine preventable diseases

- 23 acute flaccid paralysis (AFP) (2 deaths).
- 9 tetanus (4 deaths)
- 28 whooping cough
- 4 measles
- 2 rubella

Vaccination coverage is far too low, and it is likely that there will be another measles epidemic



# Vaccine coverage DHS

Vaccine	Coverage (%) at 12-23 months		
	1996	2006	2016-18
BCG	90.7	89.5	69.4
OPV3	46.5 #	68.3	42.2
DTP3	46.5 #	66.8	41.7
Hep B3	57.4	64.5	57.5
<b>Measles</b>	<b>75.6 *</b>	<b>81.5</b>	<b>58.7 **</b>
<b>All vaccines</b>	<b>39</b>	<b>52</b>	<b>35</b>

# OPV3 and DTP3 reported together in 1996

\* One dose of measles vaccine in 1996

\*\* First dose of measles vaccine = 58.7%; second dose coverage = 40.1%

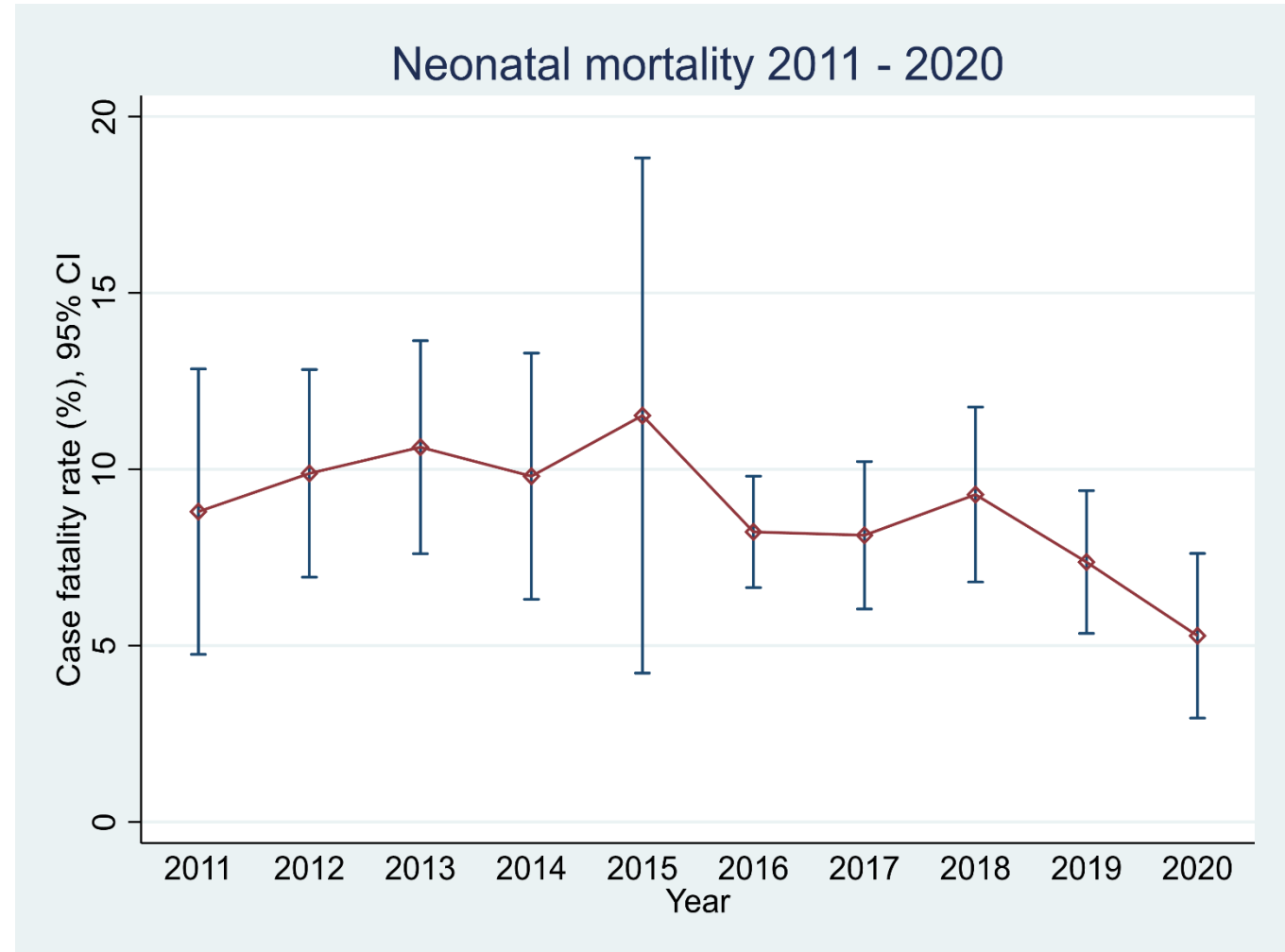


# Recommendation

- Report any suspected case of acute flaccid paralysis, acute fever and rash, tetanus, or whooping cough to the Provincial or National Disease Control Officer for evaluation and specimen collection for laboratory confirmation.

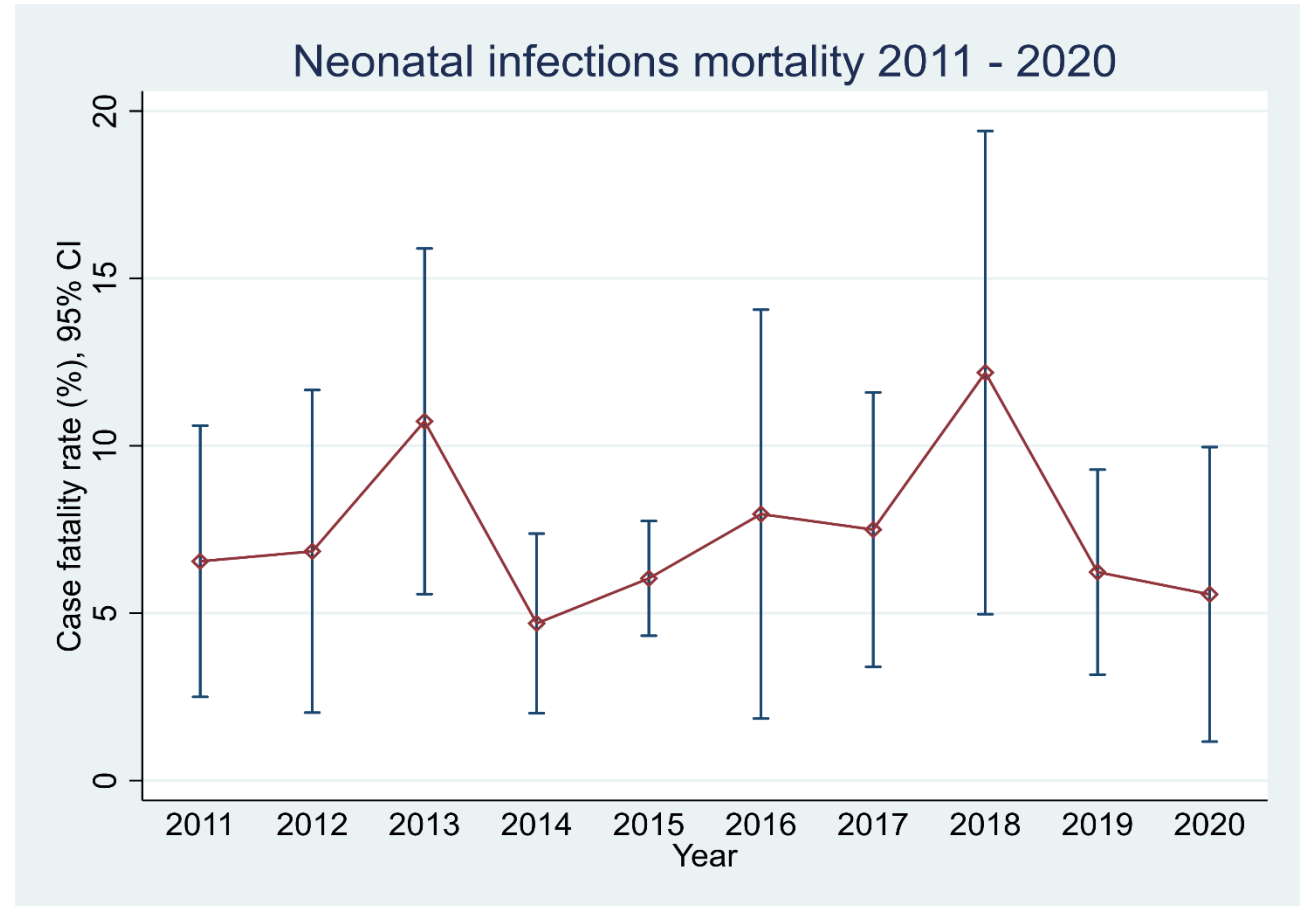
# Neonatal mortality

- Neonates made up 9876 (31%) of all paediatric admissions in 2020.
- 526 neonatal deaths (mortality rate 5.33)
- Lower CFR than has been seen previously.



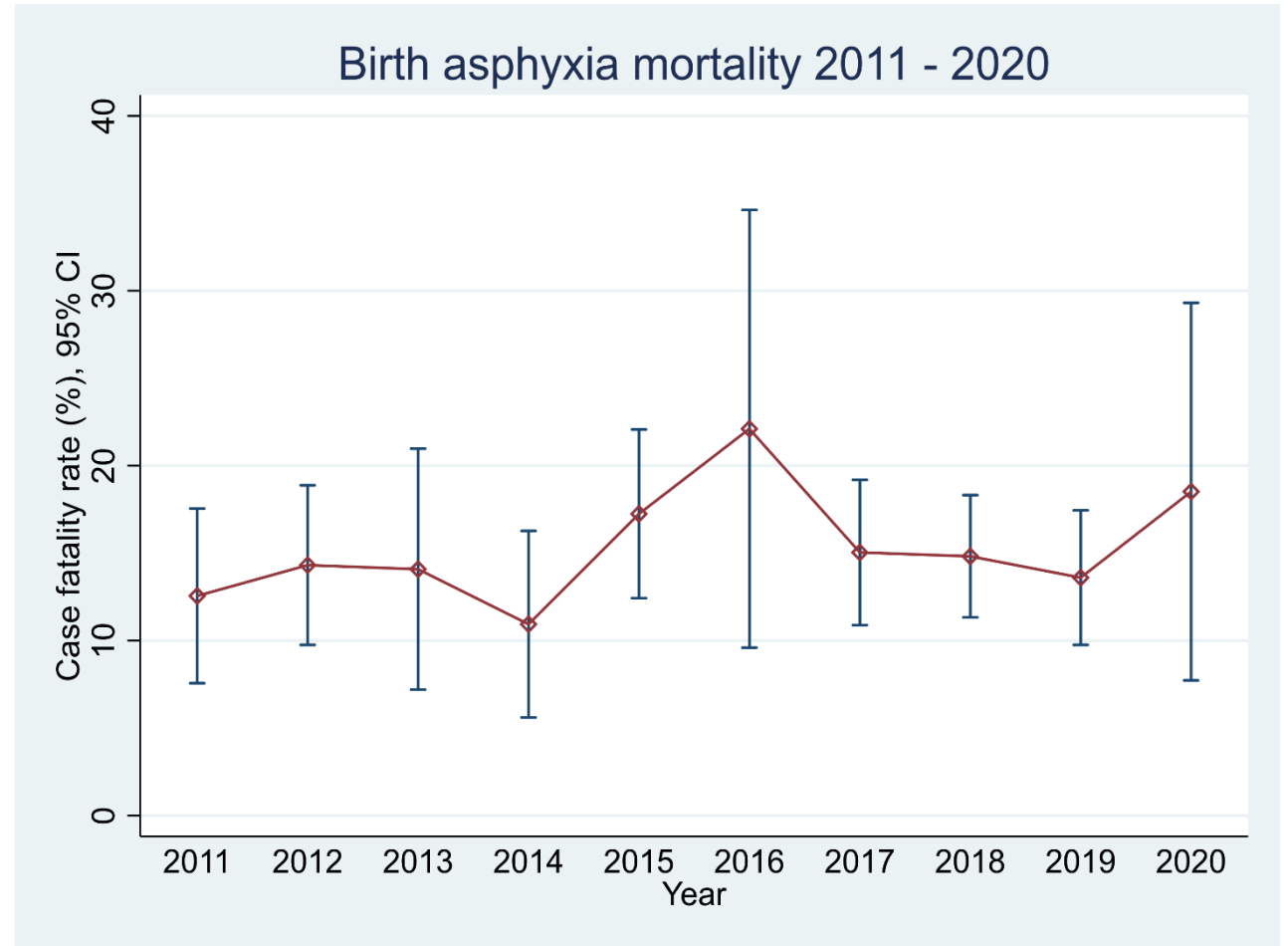
# Neonatal infections

- 51% of all neonatal admissions were infections (n=5006).
- Neonatal infections include
  - pneumonia
  - meningitis
  - cord sepsis
  - skin sepsis
  - diarrhea.



# Birth asphyxia

- 2134 hospital admissions due to birth asphyxia, and 204 babies died (CFR 9.6%).
- 38% of neonatal deaths were due to perinatal asphyxia.
- Cases and deaths from birth asphyxia have not improved

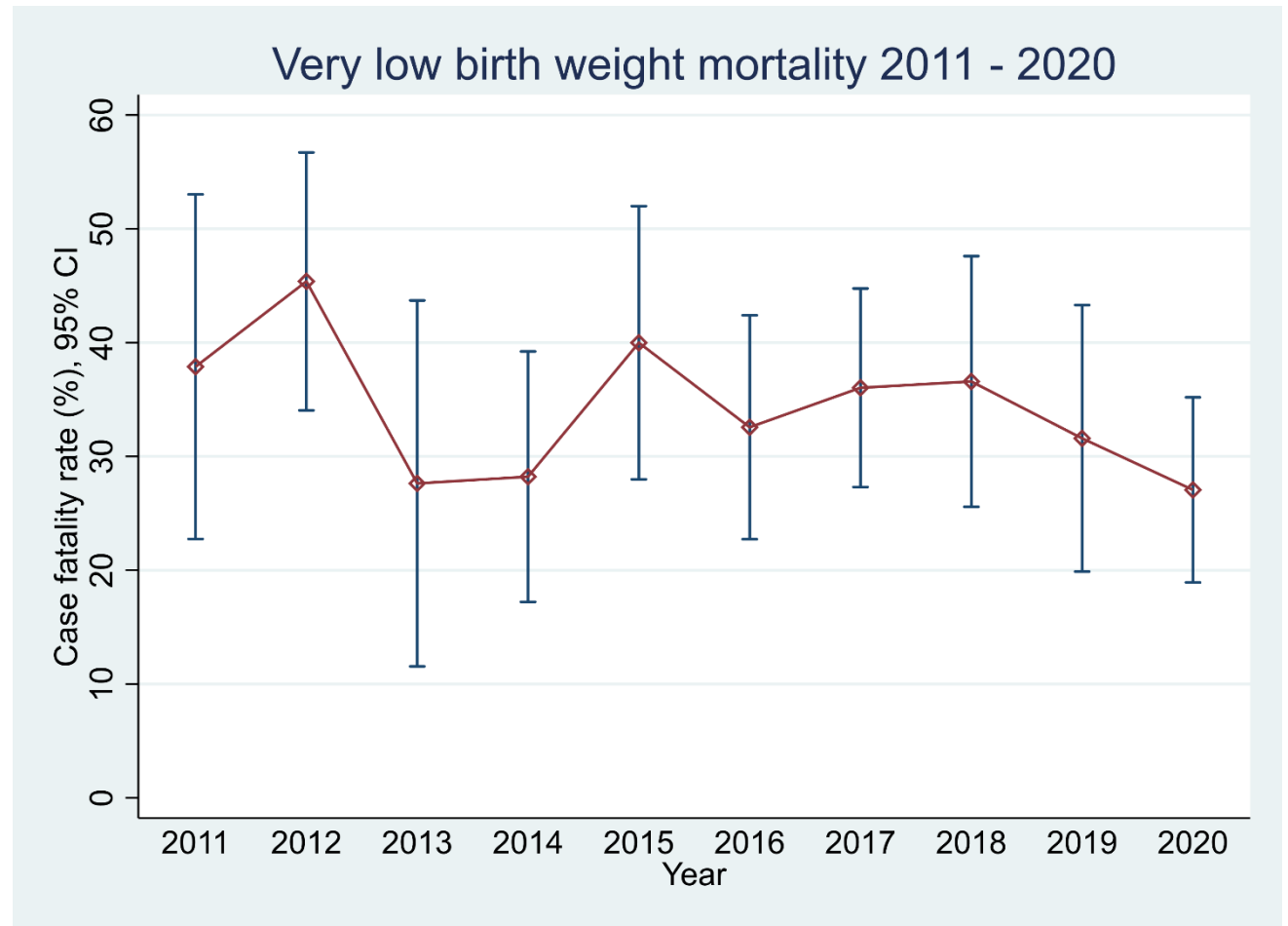


# Very low birth weight

Year	VLBW cases	VLBW deaths	Case fatality rate
2015	267	100	37.5
2016	356	120	33.7
2017	491	198	40.33
2018	536	217	40.49
2019	419	140	33.41
2020	262	79	30.15

# Very low birth weight

- VLBW is a sensitive index of quality of neonatal care
- New information on the benefits of kangaroo mother care



# Neonatal Recommendations

- Early essential newborn care can have a big impact on reducing neonatal sepsis, birth asphyxia and other complications.
- All newborns need the following:
- Immediate and thorough drying stimulates breathing and prevents hypothermia.
- Sustained skin-to-skin contact with the mother prevents hypothermia, initiates colonization of the newborn with maternal flora (as opposed to hospital flora which often includes multi-resistant bacteria), calms the baby, allows breastfeeding, and reduces mortality.

# Neonatal Recommendations

- Delaying cord clamping until cord pulsations stop, typically around one to three minutes after birth, reduces anaemia in all babies, and intraventricular haemorrhages in preterm infants.
- Avoiding harmful practices, such as separation of babies from their mothers in the first hours of life for bathing or unnecessary observation. Separation reduces the chance that babies will breast feed successfully and means they are less likely to receive colostrum, which contains antibodies that protect against infection.



# Neonatal Recommendations

- 2-3% of newborns do not breathe at birth. Bag and mask resuscitation for babies who are not breathing within 1 minute of birth reduces neonatal mortality.
- All hospitals should have neonatal areas that reach a minimum standard to care for babies who require a higher level of care, and newborn care practices should be as non-invasive as possible
- Babies should spend as much time as possible with their mothers having skin-to-skin warming and breast feeding, to protect hypothermia, hypoglycaemia, apnoea, and infection.

# Paediatric Quality Improvement Program

- Paediatric QI programs have been very successful in many countries. The components include:
  - Quality improvement team in each hospital
  - Regular mortality and morbidity audits
  - Quality Checklist [Quality check list for paediatrics](#)
  - Training on the care of seriously ill children, through the WHO Hospital Care for Children program
  - Continuing professional development for paediatricians and paediatric nurses
  - Intensive care areas in the paediatric wards for the care of the sickest children
  - Paediatric monitoring and response charts with early warning indicators and escalation processes [Paediatric monitoring and response chart 2019](#)
  - Infection control and antibiotic stewardship
  - Improved systems for managing children with chronic conditions.
  - Improved diagnostics, especially to guide antibiotic use.
- Tools for Quality Improvement are available at:  
<https://pngpaediatricsociety.org/quality-improvement/>

# Acknowledgements

- Mr Edilson Yano, Paediatric Surveillance Officer
- Paediatricians, nurses and HEOs in all participating hospitals