PNG Department of Health

Child Morbidity and Mortality

13th Annual Report, 2022

PNG National Department of Health

Paediatric Society of Papua New Guinea

2022 Annual Report on Child Morbidity and Mortality

Produced by the members of the Paediatric Society of Papua New Guinea

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We gratefully acknowledge all paediatricians, nurses and other health care workers in all participating hospitals who reported their hospital's data.

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April 2023

2022 Annual Report on Child Morbidity and Mortality

FORWORD by the Chief Paediatrician

It gives me great pleasure to write the forward for this excellent Annual Report for 2022.

The Annual Reports on Child Morbidity and Mortality have been produced since 2010 and this report marks 13 years of this reporting through many versions to what we are up to now.

Thirteen years gives a lot of useful data of trends in morbidity and mortality and helps us in planning for areas for improvement.

We have improved over these years in reporting, with a handful of Provincial Hospitals reporting in 2009, this year with 17 health facilities participating. Some years we have been as high as 24 participating health centres, so it remains to try to increase this reporting.

Overall, our admissions have been increasing and our mortality rates have decreased gradually. Our case fatality rates for most diseases have generally improved, however this year showed some concerning trends – increase in CFR overall, especially for neonates, more hospitals with high CFR for severe malnutrition, increase in typhoid cases in some provinces.

Over the years, our plans for improvement have been guided by this data and the results in this report show that. The Paediatric Society of PNG has initiated programs to improve our outcomes, and many are proving successful. But there is much work to be done.

As a way forward, the Paediatric Society will achieve further improvement in our outcomes with a **Paediatric Quality Improvement Program** and the many initiatives described in the **Child and Adolescent Health Policy and Plan 2021-2030**. As a Society, we want to ensure that quality care is given even in resource limited settings to all children of this country.

Let me acknowledge all my fellow Paediatricians and colleague health workers who contribute to the data collection. Edilson Yano has been our constant worker supporting the PHR program and helping to put together the data yearly. Lastly but not the least, Prof Trevor Duke who edits and produces this report – our deepest appreciation for the continuous support and service you provide towards child health services in this country of ours.

I hope this report gives useful information to all health workers and administrators both in the province and nationally to improve child health services together with our second and revised Child Health Plan 2021-2030, that we launched in June last year. In our last CAHPP 2011-2020 and in the National Health Plan KRA 4 (Child Health), I believe we have achieved much and as we go forward with the new NHP 2021-2030 that the recommendations from this report can be the cornerstone for child health services in PNG.

Dr Cornelia Kilalang
Chief Paediatrician
National Department of Health

Executive summary

This report covers admissions and outcomes for children in 2022 from 17 hospitals.

2022 was the third year of the pandemic, and it had taken its toll on health care workers. It is possible that results are affected in 2022 by health care worker fatigue, and shortages of basic treatments, for example formula to manage severe malnutrition, and oxygen. So, in that difficult context, many results are very positive.

These data were compiled in this difficult environment, and it is a credit to the paediatricians, nurses, medical officers, and HEOs in charge of wards that they have kept these records at this time.

In 2023 there is a need to **get routine health services for children back on track**, including childhood immunisations, and all Maternal and Child Health (MCH) services.

Report key points:

- In 2022 overall, there were 24,967 admissions and 1800 deaths recorded (mortality rate 7.2%). This is an increase in overall case fatality rate, influenced most by a rise in newborn deaths (case fatality rate 10.8%). The children's ward case fatality rate remained at 5.3%.
- Changes in neonatal outcomes: in 2022 there was a fall in overall neonatal admissions, but a rise in both numbers of neonatal deaths and neonatal mortality rates. This is concerning as it suggests barriers to access to services in 2022, and gaps in quality. Either many mothers did not bring their newborns to be assessed, or there were insufficient beds to admit them, while those admitted babies were sicker and had a higher risk of dying. The death rate for very low birth weight babies increased compared with the last 5 years, over on-third of newborns 1-1.5kg died.
- Vaccine preventable diseases: there were 77 cases of whooping cough, 40 cases of acute flaccid paralysis, and 12 cases of tetanus. The number of these vaccine preventable diseases increased significantly in 2022, because of low vaccine coverage. Deaths from pertussis and tetanus are preventable. It is concerning that there will be another measles epidemic in the next few years unless improvements in vaccine coverage can be made.
- Pneumonia was again the most common reason for admission (4469, 17.9% of admissions). Pneumonia case fatality rates were 4% overall and 8.3% for severe pneumonia, comparable to recent years.
- Malnutrition: The case fatality rate for severe malnutrition was 11.6%, a little higher than in 2019-2021 (about 10% for those 3 years), but lower than in earlier years of the PHR reporting. Of more concern, were four hospitals that had severe malnutrition CFR >20%. This is a reversal of progress that had been made in years when there was a progressive reduction in mortality from severe malnutrition because of a systematic approach based on the WHO/UNICEF and Standard Treatment guidelines.
- In 2022 there were 151 children outside the neonatal period reported with severe sepsis or septic shock, and 95 deaths, making septic shock the illnesses with the highest death rate (62%). Improvements in recognition of septic shock, emergency care, quality of care including having an intensive care area in each

paediatric ward with monitoring and supportive care, and increases in immunization are needed to reduce deaths from septic shock.

- This year there were 1298 children admitted with chronic non-communicable illnesses – asthma, chronic lung disease, rheumatic and congenital heart disease, epilepsy and cerebral palsy, and cancer. There were 144 deaths; these conditions, although making up only 5% of paediatric hospital admissions, caused 8% of all paediatric deaths. More awareness of how to care for such children in hospitals and in communities is needed.

In response to the PHR results for 2022, the Paediatric Society of PNG has made the following recommendations:

To achieve further improvements, The Paediatric Society has initiated a **National Paediatric Quality Improvement Program**. Such programs exist in many countries and have been very successful. The components include:

- A quality improvement team in each provincial hospital
- Regular mortality and morbidity audits
- More paediatric nurses being trained
- Training on the care of seriously ill children, through the WHO Hospital Care for Children courses
- Establishment of 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 (see Appendix)
- Infection control and antibiotic stewardship
- Improved systems for managing children with chronic conditions
- Improved diagnostics, especially diagnostics to guide antibiotic use
- Continuing medical education (CME) for paediatricians and paediatric nurses

Tools for Quality Improvement are available at:
https://pngpaediatricsociety.org/quality-improvement/

Reducing **neonatal deaths** further requires improved access to skilled birth attendants, access to obstetric care and early essential newborn care. Essential newborn care includes *immediate and thorough drying*, which stimulates breathing and prevents hypothermia. *Sustained skin-to-skin contact* prevents hypothermia, reduces infection, calms the baby, and facilitates successful intake of colostrum and sustained breastfeeding. *Delaying cord clamping until cord pulsations stop* reduces the risk of anaemia in preterm infants, and other complications. *Exclusive breastfeeding and elimination of formula* can prevent a large proportion of neonatal sepsis deaths. *Avoid harmful practices*, such as separation of babies from their mothers in the first hours of life for bathing or unnecessary observation. To reduce deaths from neonatal sepsis, newborns should have 4% chlorhexidine applied to the umbilical cord.

Better care for very low birth weight babies, those with neonatal sepsis and birth asphyxia is needed. This includes the increased use of Kangaroo Mother Care (skin-to-skin contact), prevention and treatment of hypoxaemia, apnoea, hypoglycaemia, improved feeding with breast milk, more rational use of antibiotics, and careful use of IV fluids, using paediatric monitoring and response charts, audit, and ward organisation.

In many hospitals nosocomial infections are common, and some of these are resistant to multiple antibiotics. To prevent hospital-acquired infections, it is very important to adhere to hand hygiene and other infection control practices and reduce the use of unnecessary antibiotics.

Improved obstetric care is needed to reduce deaths from birth asphyxia. Improved use of partographs during labour is needed. Family planning would reduce many unwanted pregnancies.

Malnutrition also needs both prevention and treatment. Prevention of malnutrition at the community level is the best way to avoid children dying from malnutrition. Timely treatment of children with malnutrition is also essential and often poorly done in hospitals. Use of Mid Upper Arm Circumference (MUAC) measurement and plotting weights on a growth chart would identify children at highest risk. Children with severe malnutrition need special attention to feeding, prevention and treatment of infections, and close monitoring for complications. A step-by-step approach to the management of severe malnutrition should be followed; this is outlined in the Pocket Book of Hospital Care for Children and the PNG Standard Treatment Manual. Major problems in the management of malnutrition are inadequate feeding: starting feeds too late, not giving enough milk feeds and not frequent enough feeds. By addressing these steps, the CFR for severe malnutrition has come down from 18-24% to just 11% in 2022, an overall improvement in the last decade. However, 4 hospitals in 2022 had CFR for severe malnutrition over 20%, so extra attention on severe malnutrition is needed in some regions.

Tuberculosis caused 7.4% of all admissions in 2022. Every effort should be made to help children complete TB treatment. For many children this requires keeping them under supervision in a health facility for the 2 months of intensive phase, good education of parents to ensure adherence in the continuation phase, and active community-based follow-up. Identifying children early who may have multi-drug resistant TB is also very important and requires input from a paediatrician.

In the last 4 years there has been an encouraging decrease in the number of admissions of **children living with HIV**. This may reflect the improved treatments available with Dolutegravir-based antiretroviral therapy. More children living with HIV are remaining healthy and being treated as outpatients. However in 2022 64 children and adolescents died from HIV, this emphasises the need for prevention of parent to child transmission of HIV, and improved adherence to effective therapy and therapy monitoring.

There are more children with **chronic diseases**, including asthma, chronic lung disease, epilepsy, rheumatic and congenital heart diseases, cerebral palsy and neurodevelopmental problems, thalassaemia, and diabetes. These children need a long-term treatment plan, good follow-up by a paediatrician or skilled child health nurse, adherence with medications and a continued supply of essential medicines, addressing comorbidities such as vision and hearing loss, going to school regularly and having education about their condition. Increasingly important is adolescent health, including preventative and mental health issues.

The National Child Health Plan outlines a plan for improving child health for 2021-2030. Everyone involved in health care for children be familiar with the Plan, and Provincial and District Health officials should use it to formulate their Annual Activity Plans. This plan can be downloaded at http://pngpaediatricsociety.org/png-child-health

Introduction

The Paediatric Society of Papua New Guinea releases the 13th Annual Report on Child Morbidity and Mortality for 2022. The Society believes the data and recommendations contained in this report should be read by all health workers and health administrators. It is only by examining health outcomes that we can improve our services. The data are current, covering 2022, with some comparisons to data collected in the previous 13 years. The recommendations cover clinical and public health solutions that would result in many more children's lives being saved each year.

Paediatric Hospital Reporting System (PHR)

The Paediatric Hospital Reporting System enables hospitals to record admissions, calculate mortality rates and monitor trends in disease burdens and outcomes over time. When the data are compiled from all hospitals, this can highlight areas of high mortality where there is scope for improvement. The data are reported using standardised diagnostic criteria, consistent with clinical and public health practice in Papua New Guinea.

There have been several versions of the PHR, we are now up to V12.3, but not all hospitals were using the latest version in 2022. That is not a problem as the data for the common diagnoses are consistent between versions and therefore comparable. However, some less-common diagnoses only included in V12.3 are not reported by all hospitals. Version 12.3 is downloadable at: https://pngpaediatricsociety.org/hospital-reporting-program/

Version 12.3 has a maternal component. In future years we hope labour wards and obstetric departments will report summary data on outcomes for mothers and deliveries.

A note on the method of the graphs in this report: the graphs of case fatality rates per year are *weighted averages*, rather than proportions of the aggregate raw data for all hospitals combined for each condition. The use of weighted averages is more valid for looking at time trends in outcomes, as different hospitals report different numbers of cases and deaths, and different numbers of hospitals have reported data each year. Weighted averages take this into account and enables year-on-year comparison as smaller district hospitals or health facilities contribute PHR data in the future.

Mortality rates for common diseases

In 2022 overall, there were 24,967 admissions and 1800 deaths recorded (mortality rate 7.2%). This is a significant increase in overall case fatality rate, influenced most by a rise in newborn deaths (case fatality rate 10.8%). The children's ward case fatality rate remained at 5.3%. see figure 1 and table 1.

Case fatality rates vary widely, often related to the level of the health facility (smaller rural hospitals have much lower CFR, larger referral hospitals have higher CFR, related to referral bias and complexity). Differences in CFR can reflect many factors, including case mix (the types of illnesses seen in different hospitals), the severity of illness at the time of presentation (if children with severe illness present

late, they have a higher risk of death), the number of health care workers and other resources available to manage seriously ill children, and serious disease outbreaks. In some hospitals it may also reflect missing data. What matters are broad trends over time, and looking for signals where they may be problems. This year the rise in neonatal case fatality rates, the increased numbers of vaccine preventable diseases, the number of hospitals with severe malnutrition CFR >20%, and the rise in extrapulmonary and central nervous system TB case CFR are signals that indicate problems to be addressed.

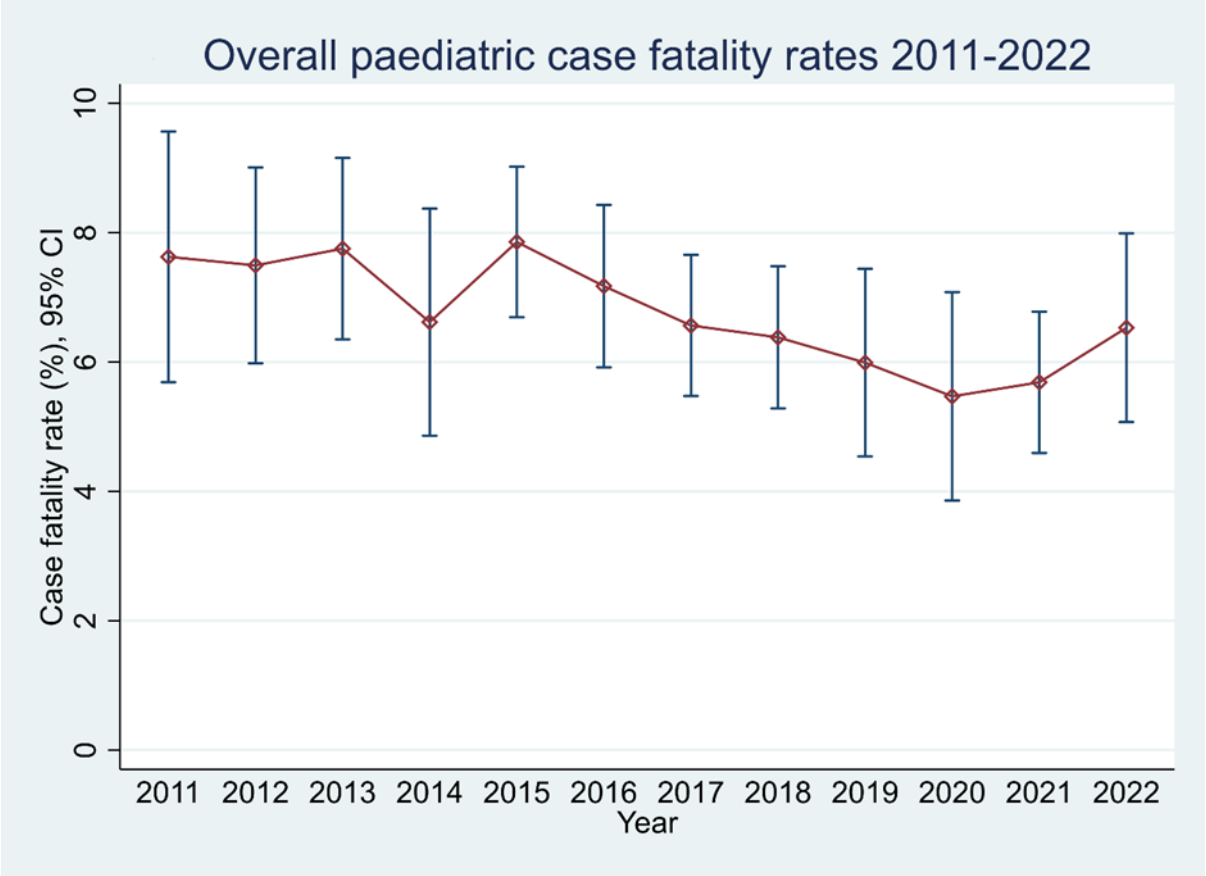

Figure 1. Overall paediatric case fatality rates 2011-2022 (weighted averages)

2020	**Paediatric admissions**	**Paediatric deaths**	**Case fatality rate**
Alotau	1278	49	3.83
Angau	879	48	5.46
Buka	425	63	14.82
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	1895	202	10.66
Kainantu			
Gumine			
Kavieng	627	37	5.90
Kimbe	1127	87	7.72
Kerema			
Kerowagi			
Koge			
Kompiam	990	58	5.86
Kundiawa	706	35	4.96
Kudjip			
Mabisanda			
Lorengau	342	17	4.97
Mendi			
Mingendi			
Modilon	1918	161	8.40
Mt Hagen	5779	191	3.31
Nonga	979	87	8.89
Popendetta			
Port Moresby	4935	588	11.91
Rumginae	241	8	3.32
Tari	893	39	4.37
Vanimo	805	38	4.72
Wabag			
Wewak	1148	92	8.01
Yampu			
Total	**24,967**	**1800**	**7.21**

Table 1. Summary of admission, death, and case fatality rates in participating hospitals in 2022

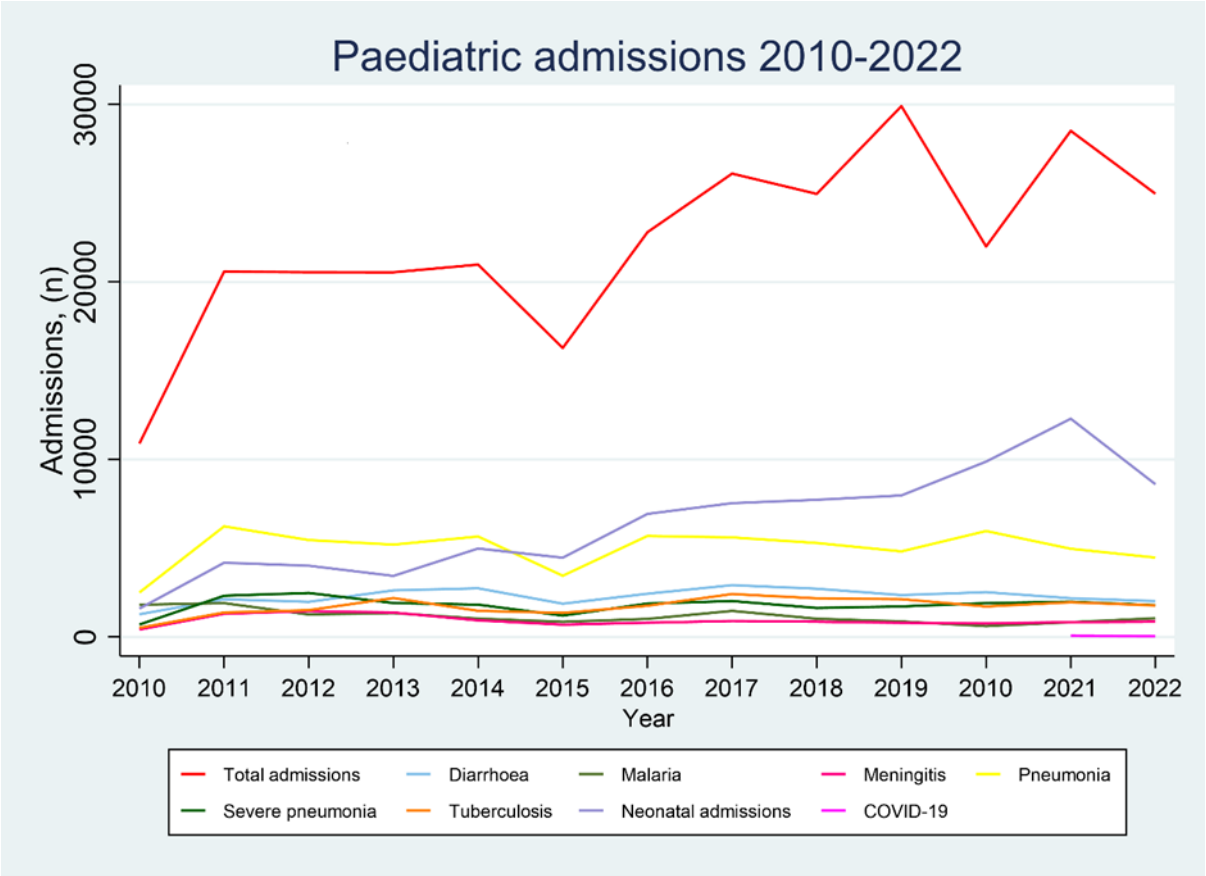

Figure 2. Admissions per year overall and for common conditions 2010-2022

Although the total number of admissions reported in the PHR has increased over the years, the number of cases of common conditions has remained relatively static; pneumonia, diarrhoea, malaria remain the common reasons for admissions to children's wards. The increased number of *other* conditions (thus the much higher total admissions) reflect the increased proportion of neonatal admissions over the last 8 years (although reduced in 2022), the rise in chronic non-communicable paediatric conditions over the last decade, and increased cases of severe sepsis.

Diagnoses	Admissions 2022	Deaths 2022	Case fatality rate 2022
All paediatric admissions	24967	1800	7.2
Neonatal conditions	8600	928	10.8
Pneumonia	4469	180	4.0
Severe pneumonia	1787	148	8.3
Diarrhoea	2018	87	4.3
Dysentery	357	9	2.5
Malaria	1053	40	3.8
Severe malnutrition	2111	244	11.6
Anaemia	1966	218	11.1
Typhoid	717	5	0.70
Tuberculosis	1840	167	9.1
Meningitis	861	107	12.4
Epilepsy	110	1	0.9
Developmental disability	188	18	9.6
HIV	281	64	22.8
Rheumatic heart disease	229	23	10.0
Congenital heart disease	422	51	12.1
Cancer	115	32	27.8
Measles	2	0	0.0
Tetanus	12	5	41.7
Acute flaccid paralysis	40	4	10.0
Whooping cough	77	2	2.6
Child protection	206	30	14.6
Trauma and injuries	328	4	1.2

Table 2. Most common causes of hospital admission and case fatality rates in children for 2022

Note: some diagnoses added recently, so CFRs do not reflect the complete 10 years of reporting.

Pneumonia

In 2022 as in all years, pneumonia was the second most common reason for admission (4469 cases: 17.9% of all admissions) after neonatal conditions. Pneumonia case fatality rates in 2022 were 4.0% overall (Figure 3), and 8.3% for severe pneumonia (Figure 4, showing weighted averages over time). A decade ago, the case fatality rate for severe pneumonia in most hospitals was higher than 10%.

This improvement over time is due to many things: better clinical care, use of oxygen concentrators and pulse oximetry, vaccines against *Haemophilus influenzae* type b and *Streptococcus pneumoniae*, and changes in epidemiology of pneumonia with more viral bronchiolitis.

Using the current version of the PHR in 2022 many hospitals reported bronchiolitis separate to pneumonia. In 2022 there were 518 cases of bronchiolitis, 4 deaths, for a CFR of 0.8%. So, the reduction in pneumonia CFR remains significant, as previously these cases of bronchiolitis would have been included in pneumonia numbers.

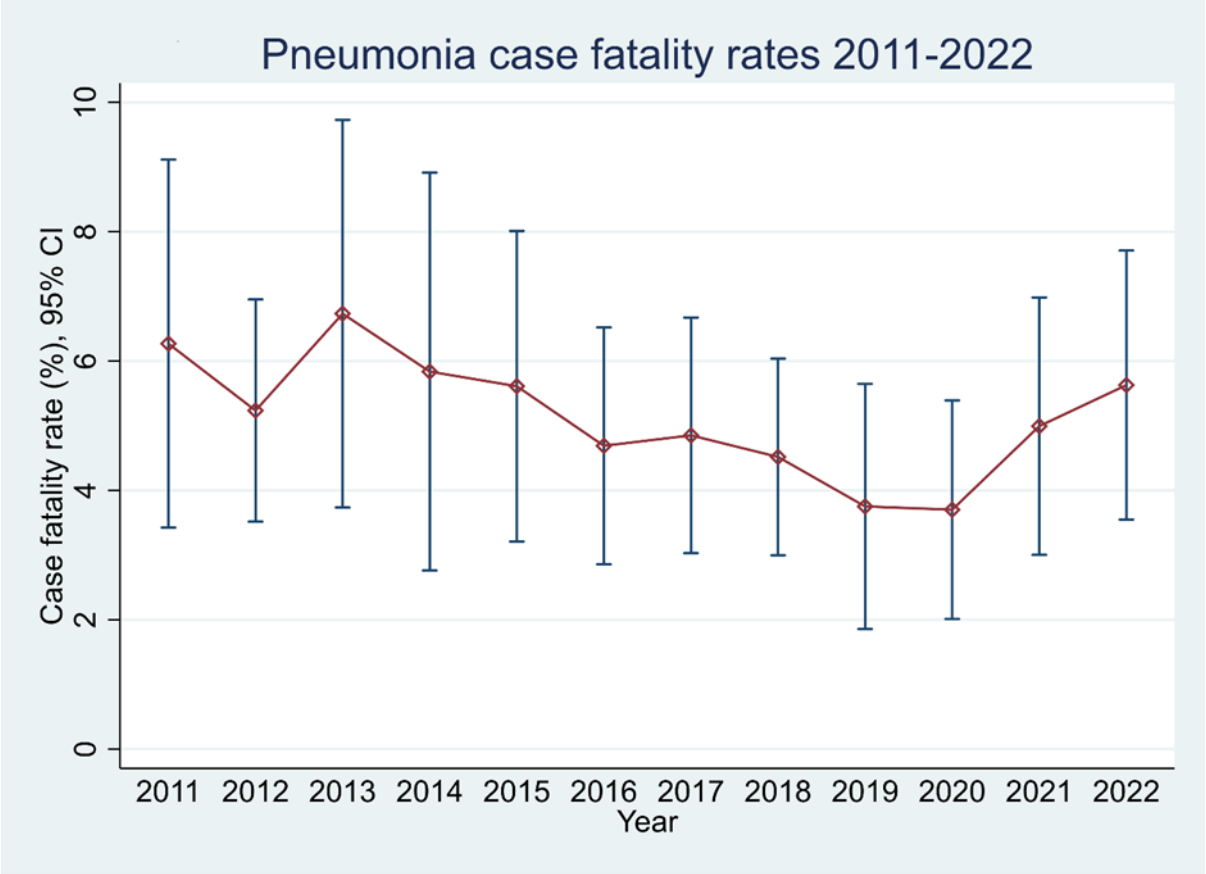

Figure 3. Pneumonia case fatality rates 2011-2022

Severe pneumonia case fatality rates, which are partly standardised for illness severity at the time of presentation, better reflect systems of practice, staff skills training and resources. High case fatality rates from severe pneumonia may occur if children present late, or are not recognised to be very unwell, if antibiotics and oxygen are not given promptly, or if children are not monitored closely.

The improvement cannot be assumed to continue, and this year there was an increased in the weighted average CFR for pneumonia and severe pneumonia, a signal that needs addressing with a re-emphasis of quality-of-care measures.

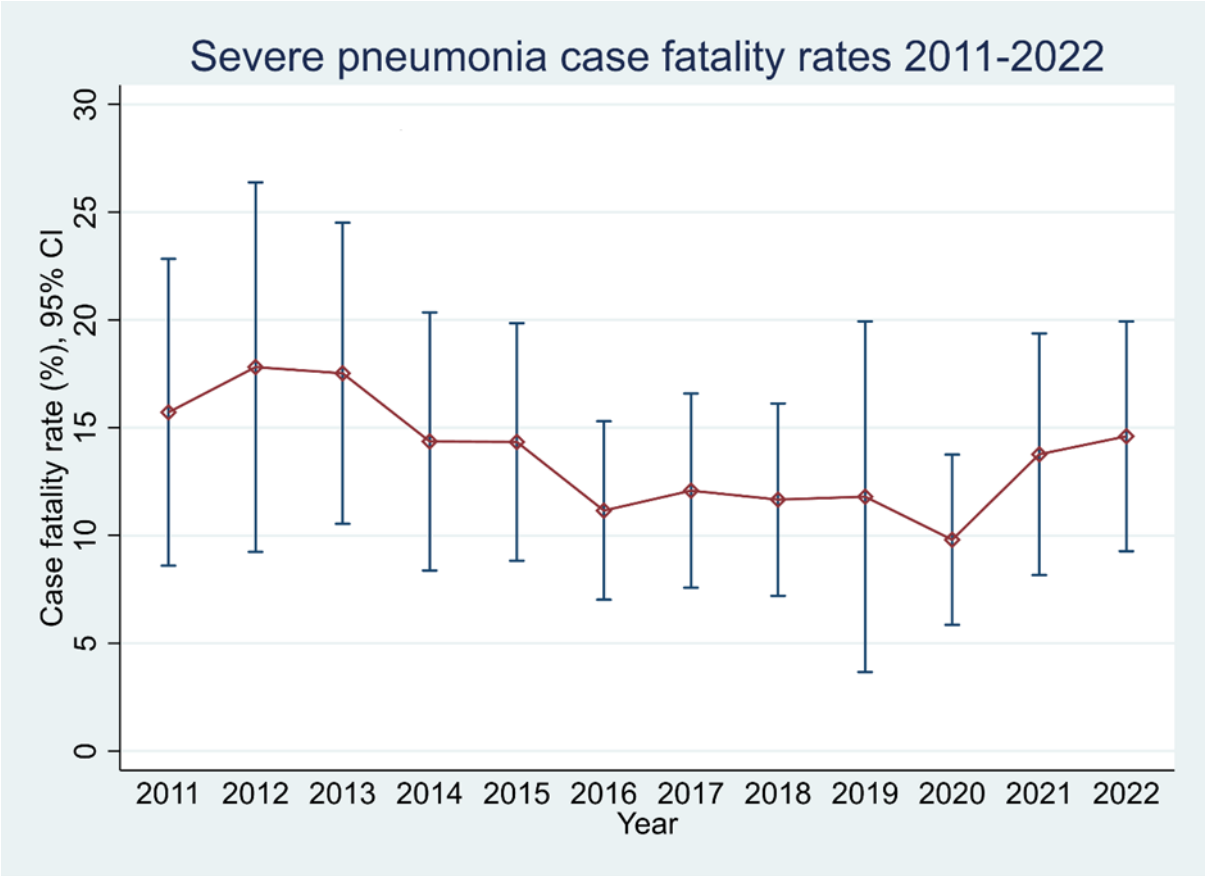

Figure 4. Severe pneumonia case fatality rates 2011-2022

Recommendations

It is recommended that hospitals ensure that there is:

- a system of triage and rapid treatment of the sickest patients in the emergency and outpatients' departments
- a part of the children's ward that is properly equipped and stocked to provide intensive care and close monitoring 24 hours a day.
- adequate oxygen supplies and staff trained in when and how to effectively give oxygen.
- appropriate stocks of antibiotics to treat pneumonia.
- regular clinical monitoring, including the use of pulse oximetry.
- training for staff in the care of seriously ill children
- sufficient nursing and medical staff to always provide clinical care
- supervision of nursing and medical care by senior clinicians

Deaths from pneumonia (180) and meningitis (107) combined account for 16% of all deaths. This emphasises the importance of *Hemophilus influenzae* type b vaccine (Hib) – given as part of Pentavalent vaccine, and the pneumococcal conjugate vaccine (PCV); both vaccines given at 1, 2 and 3 months. These vaccines are

preventing deaths and disability from bacterial meningitis and are reducing cases of pneumonia. So, coverage needs to be strengthened. And improving BCG coverage will reduce pneumonia and meningitis from tuberculosis.

However, there are other common causes of pneumonia, including viruses (particularly respiratory syncytial virus - RSV, influenza, and COVID-19) and bacteria (such as Group A streptococcus, *Staphylococcus aureus*, Chlamydia, Mycoplasma), and other causes of viral meningitis (enterovirus, and dengue and other mosquito-borne viruses), which are not all currently prevented by vaccines.

This means that these pneumonia and meningitis will continue to be a major cause of hospital admission for children in Papua New Guinea.

The best way to address this with a comprehensive approach. The National Child Health Plan 2021-2030 outlines a comprehensive approach to acute lower respiratory tract infections (ALRI).

This includes key areas to address:

Prevention

- Breast feeding and good balanced nutrition in the second 6 months of life and beyond, with growth monitoring.
- Helping parents be aware of the signs of pneumonia and bronchiolitis and when to seek care.
- Reduce indoor air pollution, keeping children away from smoke from cooking stoves, and never smoke in a child's presence.
- Handwashing
- Vaccines: measles, Hib, PCV, BCG, COVID-19
- Vector control measures will reduce the number of causes of mosquito-borne viral meningitis.

Treatment

- Improving hospital and health centre care of pneumonia through Hospital Care for Children training.
- Use of a paediatric monitoring and response chart to identify children who are deteriorating and escalate appropriately.
- Oxygen, pulse oximetry, careful monitoring, and supportive, intensive care
- Identification and treatment of comorbidities, including anaemia, malnutrition, HIV and tuberculosis if present.
- Improved infection control practices, particularly hand hygiene, and reducing unnecessary antibiotic usage.
- Outpatient or day-care treatment for moderate bronchiolitis, so that hospitals are not crowded by children who can safely be treated without hospitalisation.

Keeping rural community services going in Milne Bay Province

Mrs Judith Banaba (in blue dress) is a Community Health Worker, and the only health care worker looking after Divani health post, a level 1 health facility in Milne Bay Provincial Health Authority. She is doing a great job providing Maternal and Child Health Services at the community level. Mrs Banaba does not have a vaccine fridge; but has arrangements with Bubuleta community health centre to provide her with vaccines, so she is able to give immunisation at her health post on a weekly basis. She keeps her own records of vaccine cards for children in her catchment population. Children who are not up to date with vaccines; the ward health representative (lady in green) is informed to assist with reminders to parents. Mrs Banaba has a functioning referral pathway for sick children in place. She keeps excellent records of antenatal clinic for mothers and can do the simple deliveries for mothers who are not able to make it to the health centre or hospital and records these deliveries as well in the delivery book.

Diarrhoea

2018 cases and 87 deaths (case fatality rate of 4.3%) due to diarrhoea were reported in the 17 hospitals in 2022. Diarrhoea mortality rates are dependent on many factors - like those that influence severe pneumonia mortality rates: comorbidities, especially malnutrition, HIV, anaemia; late presentation; and outbreaks.

Deaths from diarrhoea can be due to (i) severe dehydration where the child does not have access to effective rehydration, (ii) from sepsis from bacillary dysentery, or (iii) other co-morbidity, such as severe malnutrition or immune deficiency.

Severe diarrhoea can be prevented by timely use of oral rehydration in the community, by parents bringing their child to a health facility if they have diarrhoea, by improved assessment of the severity of dehydration, the use of zinc as additional treatment, the appropriate use of antibiotics in bloody diarrhoea, and by reducing undernutrition.

Most watery diarrhoea in otherwise well children is due to viruses and does not require antibiotics. These children need ORS, zinc and nutrition (breast feeding in

infants). If children receive adequate rehydration and nutrition when they have watery diarrhoea, death is very unlikely.

Dysentery is bloody diarrhoea and is commonly due to a bacterium called *Shigella flexneri*. Studies in PNG found very high levels of resistance to amoxicillin and cotrimoxazole among *Shigella flexneri* isolates causing diarrhoea. The study confirmed that cotrimoxazole (Septrin) is ineffective, and that ciprofloxacin is needed to treat dysentery. Oral ciprofloxacin is currently recommended treatment by WHO for dysentery in a dose of 10-15 mg/kg twice daily for 5 days. If children are too sick to take oral medications, give ceftriaxone intravenously (IV) or intramuscularly (IM).

In 2022 there was a rise in cases of dysentery: 357 children were admitted with dysentery, and there were 9 deaths.

Recommendations

- Deaths from watery diarrhoea usually means the child did not receive sufficient fluids.
- Give ORS and zinc to all children with diarrhoea.
- Treat bloody diarrhoea (dysentery) with ciprofloxacin.
- Recognise the high risk of mortality among children with chronic or persistent diarrhoea.

Typhoid

In 2022 there was a significant increase in reported cases of typhoid: 717 in total, with 5 reported deaths from typhoid. Most were from major highlands hospitals: Mt Hagen (501 cases) reported by far the most paediatric typhoid cases, followed by Goroka (76) and Kundiawa (71).

Multi-drug resistant typhoid has increased in countries throughout Asia in the last 10 years. Although there is limited resistance data from PNG, the recommended treatment for proven or suspected typhoid is fluroquinolones (ciprofloxacin). Third generation cephalosporins, and azithromycin are also options.

The rising incidence of typhoid being seen in the PHR data for 2022 especially in highlands provinces is concerning. Typhoid is often under-recognised in children because of lack of culture facilities and widespread availability of antibiotics means blood cultures are often negative – so the typhoid burden in other areas of PNG may be similar to that of the highlands. There is a new WHO approved Typhoid conjugate vaccine, which has longer-lasting immunity than the older typhoid vaccines and can be given as a single dose to children from the age of 6 months.[1] WHO recommends putting all the typhoid data for a country together in order to put in an application to introduce the vaccine.

Addressing typhoid in Goroka

Many children are admitted to the Goroka Provincial Hospital (GPH) in the past with clinical typhoid were treated with IV ciprofloxacin when available or IV ceftriaxone. Both these drugs are quite expensive and not always available so many patients were treated with chloramphenicol instead.

Since 2018 when blood culture facilities were made available in GPH, Salmonella typhi has been cultured by our hardworking microbiology staff. Salmonella typhi showed susceptibility to cotrimoxazole, ampicillin, ceftriaxone and ciprofloxacin. It has been resistant to chloramphenicol. Based on these susceptibility results typhoid patients have been treated with IV ceftriaxone when very sick and as soon as they are able to take oral treatment, they are given amoxicillin or cotrimoxazole. This has helped reduce the use of ciprofloxacin and ceftriaxone which should be reserved. The infection control team and public health team in GPH are aware of this burden of typhoid and are working to address it together with the wider provincial authorities.

The picture shows the microbiology team with pathologist Dr Chanoan together with paediatric team in the microbiology laboratory (L-R) Drs Villa Watch & Casparia Mond, Watson Toroi, Drs Whitney Ruape & Ruben Tokali, pathologist Dr Josephine Chanoan & Becky Max.

Malaria

In 2022 malaria accounted for 1053 admissions and 40 deaths (case fatality rate of 3.8%). This is an increase on last year, but still less than malaria case numbers that were reported in years before 2017. Cases of malaria may be increasing again, because of waning use of insecticide-treated bed nets and other public health protective measures.

Year	Cases	Deaths	CFR
2022	1053	40	3.8
2021	829	34	4.1
2020	617	32	5.2
2019	872	42	4.8
2018	1026	43	4.2
2017	1465	56	3.8
2016	1015	46	4.5
2015	852	44	5.2
2014	1033	67	6.5
2013	1347	70	5.2
2012	1263	69	5.5
2011	1904	61	3.2
2010	1814	50	2.8

Table 3. Malaria admissions and case fatality rates 2010-2022

PNG has established malaria treatment guidelines which include:

- Uncomplicated malaria: artemether-lumefantrine
- Severe or complicated malaria: artesunate as initial treatment, followed by artemether-lumefantrine.

It is important that health workers are familiar with these treatments. They are described in the Standard Treatment Book for Common Illnesses in Children, published in 2016.

Malnutrition

The PHR records malnutrition as either a co-morbidity or a main diagnosis, so even if it is not the main diagnosis it is still recorded. In 2022 in the 17 hospitals that

reported using the PHR, 2111 children were admitted with severe malnutrition (weight for age <3 SD below the median), or with severe wasting or kwashiorkor. This represented 8.5% of all admissions, the same as last year.

The case fatality rate for severe malnutrition was 11.6%, similar to 2019 (10.4%), 2020 (10.8%) and 2021 (10.1%), and much improved on earlier years of the PHR reporting (Figure 5 and Table 3).

In 2022, of more concern, was the number of hospitals that had severe malnutrition CFR >20%: Buka, Kavieng, Nonga, Wewak. This may be signal of a potential problem in some provinces. It may reflect several things: the breakdown in supply of essential commodities for managing severe malnutrition, late presentation of children with severe malnutrition and comorbidities, the need for an ongoing emphasis on a systematic approach to the management of severe malnutrition, better monitoring and feeding is unclear, but is worthy of further investigation.

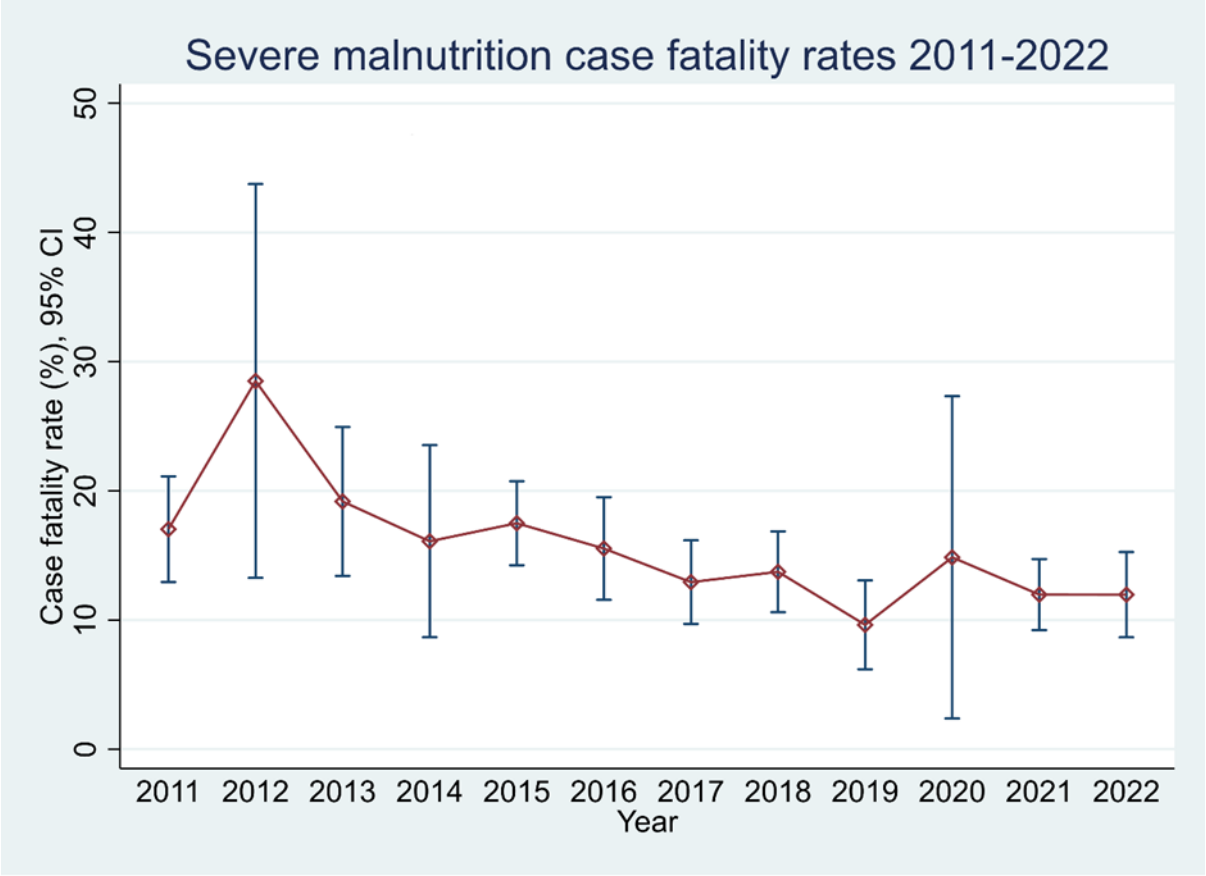

Figure 5. Severe malnutrition case fatality rate 2011-2022

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
2021	2514	8.52	256	10.1	0
2022	**2111**	**8.45**	**244**	**11.6**	**4**

Table 4. Cases and outcomes of children with severe malnutrition 2011-2022

In the last 4 years we also report moderate malnutrition, because as improvements occur, a greater focus is needed on other types of under-nutrition, including moderate malnutrition, under-nutrition in adolescents, nutritional anaemia.

In 2022 1070 children were reported with moderate malnutrition, and there were 70 deaths (CFR 6.6%), which is just higher than the death rate overall for children (5.3%). This will be an underestimate of the numbers of cases of moderate malnutrition, as moderate malnutrition will be an under-recognised condition because it is so common. However, recording a problem is a start to improving the recognition of it. Better approaches to children with moderate malnutrition will prevent more children developing severe malnutrition.

Recommendations

Health centres and hospitals need 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.
- There should be ready access in the health centre or hospital to adequate formulas (F75 and F100 ideally), nutritious fresh fruits and vegetables and other fresh food, and ready-to-use therapeutic food (RUTF). If F75 and F100 are not available, there are **recipes for making equivalent formula** at https://pngpaediatricsociety.org/treatment/ in the section: **Undernutrition – guidelines and tools for management**.

- 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. These include prevention and treatment of fatal complications such as sepsis, hypothermia, and hypoglycaemia.
- 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.
- Children with chronic illnesses that are likely to result in malnutrition, such as HIV, tuberculosis, osteomyelitis or chronic cardiac, respiratory, or renal disease should be identified and provided with supplemental feeding early in their admission.
- Zinc and vitamin A should be available.
- Staff should be trained in the management of malnutrition.

The *prevention* of malnutrition should have the highest priority. This requires improved rates of breast feeding and complementary (weaning) feeding. This will be helped by increased participation in education by girls and by greater economic independence for mothers. Mothers who have been educated to at least primary school completion are much more likely to breast feed their infants for longer, as well as more likely to seek care when their children are sick and be up to date with immunization.

The *management* of malnutrition is outlined in the PNG Standard Treatment Manual, the PNG Guidelines on Management of Severe Malnutrition, and the WHO Pocket Book of Hospital Care for Children, all available at: https://pngpaediatricsociety.org/treatment/

Many children in hospitals are inadequately supplied with food. Steps should be taken to improve the caloric intake of sick hospitalised children. Having trained paediatric nurses skilled in the management of malnutrition is essential to reducing the case fatality rates from malnutrition.

Meningitis

In the 17 hospitals, meningitis accounted for 861 admissions and 107 deaths. The case fatality rate for meningitis was 12.4%.

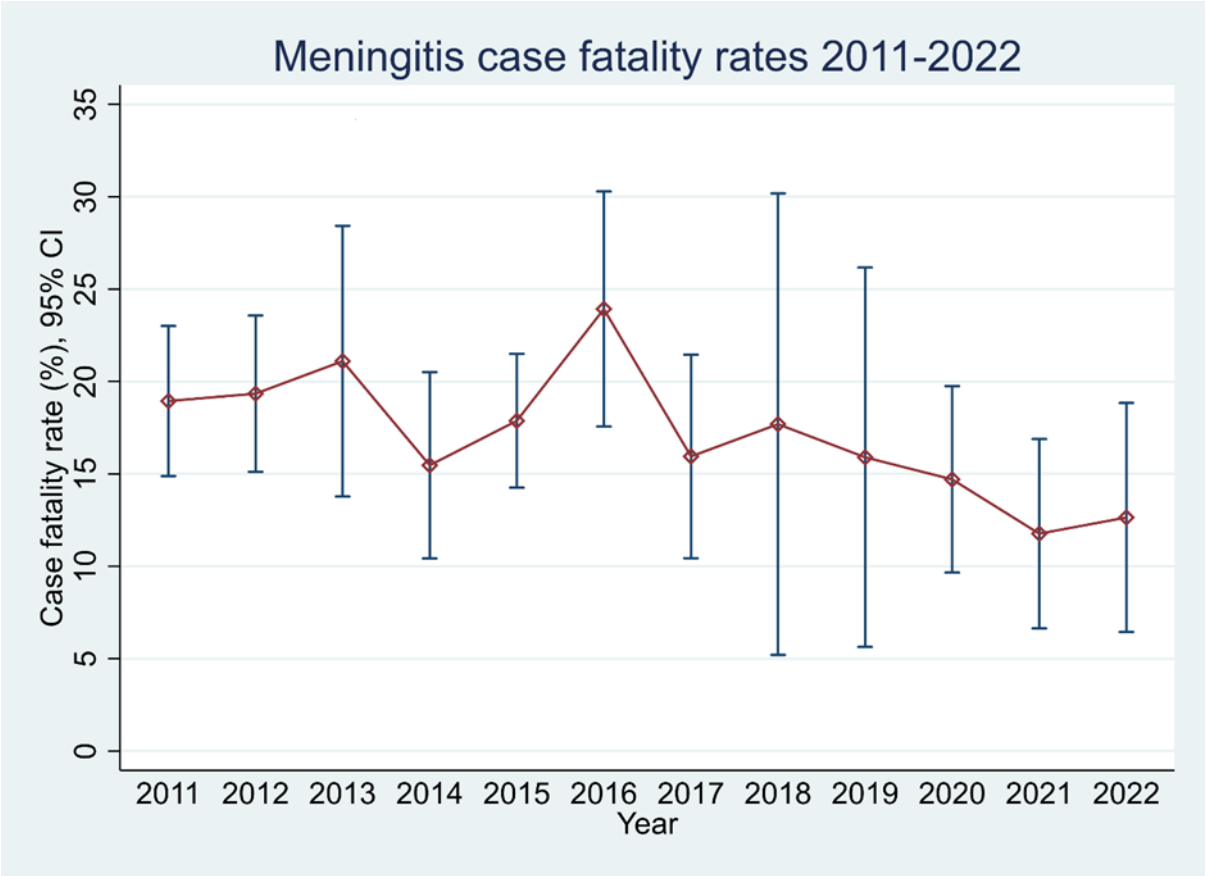

Figure 6. Meningitis case fatality rates 2011-2022

For every death from meningitis, many children survive with serious brain injury which will reduce the child's ability to gain a proper education or participate in the community or workforce. This tragedy is often preventable by vaccination and early presentation and treatment.

The best method of preventing meningitis is the use of conjugate Hib (Pentavalent) and pneumococcal (PCV) vaccines. Cases of Haemophilus influenza and pneumococcal meningitis are still being reported in 2022, which indicates that the vaccines are not yet reaching all children.

Most Hib and *Streptococcus pneumoniae* causing meningitis are resistant to chloramphenicol, so do not use chloramphenicol for children with suspected meningitis. Ceftriaxone or cefotaxime is needed for true meningitis.

There are many causes of the syndrome of febrile encephalopathy that are not bacterial meningitis. The other causes of febrile encephalopathy include viral encephalitis, including enterovirus, dengue, Japanese encephalitis, herpes viruses, and influenza. TB meningitis also causes febrile encephalopathy. A careful history should be taken to determine if the child has been unwell for several weeks prior to presentation: weight loss, chronic fever, chronic cough, and examination finding of wasting, lymphadenopathy, and enlarged liver suggest a more chronic process than occurs with bacterial or viral meningitis, and TB should be considered early.

All patients with febrile encephalopathy or meningitis require good supportive care and monitoring.

Recommendations

All children should receive Pentavalent and PCV vaccines at 1, 2 and 3 months of age.

Pentavalent contains the Hib vaccine and protects against diphtheria (a throat infection), tetanus, pertussis (whooping cough) and hepatitis B (a liver infection which eventually can cause liver cancer in adults). PCV protects against the other most common cause of meningitis.

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.

Supportive care of children with febrile encephalopathy (seizures and / or acute coma) includes attention to the following:

- Nurse all children with meningitis or unconsciousness in a high dependency or intensive care section of the ward.
- Nurse the child 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_2<92%
- Monitor the blood glucose and prevent hypoglycaemia.
- Monitor the Glasgow Coma Scale
- Monitor the blood pressure and ensure it is in the upper normal range to optimise cerebral perfusion. 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 body and brain swelling and results in poor outcomes, maintain enteral nutrition via a nasogastric tube.
- Check electrolytes and correct if sodium <130mmol/L or >150mmol/L.
- Change position to prevent pressure sores.
- Physiotherapy to prevent limb contractures.
- Consider the diagnosis of 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 for bacterial meningitis.

Severe sepsis and septic shock

In 2022 there were 151 children outside the neonatal period reported with severe sepsis or septic shock, and 95 deaths, making septic shock the illness with the highest death rate (62%).

It is very important that health workers recognise the signs of septic shock, and know how to give emergency management.

There should be a system of Triage in every emergency or outpatient department to enable prompt identification of seriously ill children.

The **general signs of severe sepsis** include:

- High fever
- Vomiting everything
- Fast breathing and respiratory distress
- Heart rate >160 with pulses that are difficult to feel.
- Cold skin of arms and legs
- Low blood pressure
- Slow capillary refill (>3 seconds)
- Pallor
- Lethargy or unconsciousness

There may be **localising signs** suggesting meningitis:

- Severe headache
- Neck stiffness
- Severe vomiting
- Repeated convulsions
- Bulging fontanelle
- Extreme irritability or high-pitched cry

There may be a rash, different types of rashes suggests different causes:

Purpura (red or black spots on the skin) – suggests a Gram-negative septic shock (Neisseria meningitidis, E. coli, Klebsiella)

Scarlet fever-like red rash (widespread red rash on face, trunk, limbs) – suggests a Gram positive septic shock (Group A Streptococcus, Staphylococcus aureus).

There may be other **signs of Staphylococcal infection:**

- Skin sepsis: boils, pustules, abscess, infected scabies or infected skin sores, cellulitis.
- Swollen red, hot, tender, and painful joint.

- Empyema (pus in the chest)

The **emergency treatment for severe sepsis** should be known by all health workers. This includes:

- If the child is unconscious or convulsing, nurse on the side and keep the airway clear.
- Give oxygen if there is severe respiratory distress, cyanosis, poor conscious state or the oxygen saturation is <92%
- Measure blood pressure and assess the circulation for signs of shock
- If the child has signs of shock (several signs: lethargy or drowsiness, low volume pulses, heart rate >160, cold skin or low blood pressure), give an IV bolus of Normal Saline or Hartmann solution, 20ml/kg, then reassess.
- Give antibiotics urgently: ceftriaxone 50mg/kg *plus* flucloxacillin 50mg/kg intravenously
- Monitor in a high dependency or ICU section of the ward. Monitor with pulse oximetry to detect hypoxaemia.
- Check blood glucose. Give a bolus of glucose if the blood sugar level (BSL) is low.
- Seek assistance from an experienced doctor.
- Look up further treatment recommendations in the PNG Standard Treatment Book for Children, and the WHO Pocketbook of Hospital Care for Children.

Improving critical care monitoring and care in children's wards

In Madang hospital, a new vital sign monitor and 10 L/min oxygen concentrator is helping monitor and care for the most critically ill children. On this day, Sr. Sabina So'on (paediatric specialist nurse and acting paediatric ward officer-in-charge) and Dr Flocie Simai (service registrar) used our monitor for the first time, after reading through the manual. In this first patient, who had pneumonia and sepsis, the monitor alerted the staff to persistent hypothermia and fall in respiratory rate, which they promptly attended to.

Tuberculosis

Tuberculosis made up 7.4% of admissions. In the 17 hospitals in 2022 there were 1840 children admitted with tuberculosis, and 167 deaths and a case fatality rate of 10.1%. (Figure 7).

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%
2021	1953	29485	6.6%
2022	**1840**	**24967**	**7.4**

Table 5. Cases of TB as a proportion of all admissions 2017-2022

The case fatality rates for both paediatric pulmonary is stable, but central nervous system TB (CNS TB or TB meningitis) and extrapulmonary TB were higher in 2022 than in other years (Figure 7).

305 children had central nervous system TB, which has the highest case fatality rate (70 deaths, 23%).

There were 39 cases of MDR TB reported, again an underestimate as not all hospitals are testing or reporting, but it is important in the future we record this accurately. There were only 3 deaths from the 39 cases reported of MDR TB, which shows that it can be treated successfully if identified and the resources are available to treat.

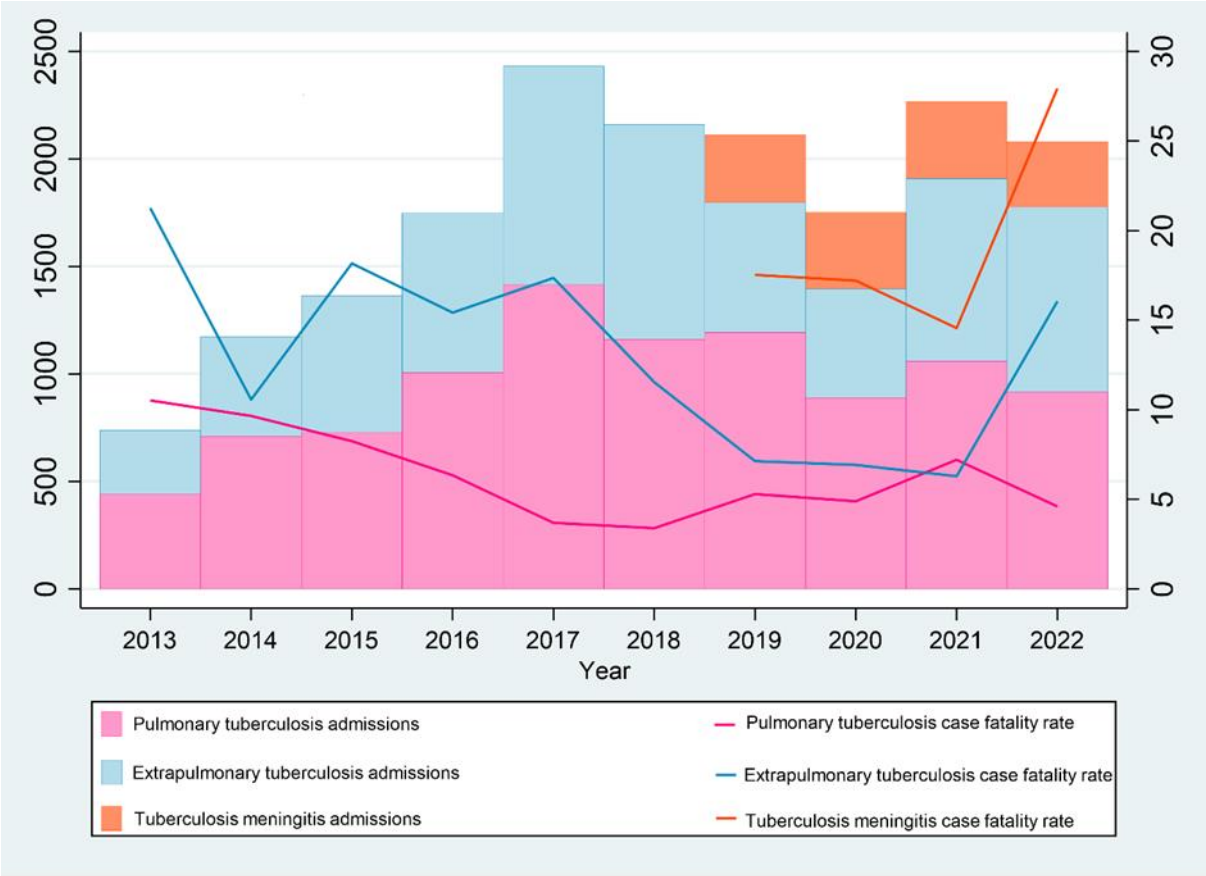

Figure 7. Pulmonary and extra-pulmonary tuberculosis admissions and case fatality rates 2013-2022

This numbers represented in this report may be a small proportion of the children with TB in PNG, given that many cases are diagnosed by other hospitals or health facilities or remain undiagnosed in the community.

Recommendations

Every effort should be made to help children complete TB therapy, and for many children this will require 2 months of hospitalisation to ensure adherence, and active community follow-up.

It is important to screen all family members (particularly children) of adult patients who are known to have sputum smear positive PTB.

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 (see paediatric Standard Treatment Manual). 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 early identification and treatment of those people in the community with infectious TB, usually adults and older children with PTB, especially sputum smear positive PTB.

BCG immunization is effective in preventing severe and disseminated forms of TB (such as miliary TB and TB meningitis) in young children.

Early identification and treatment of children with TB disease will reduce the numbers of childhood deaths and complications (such as bronchiectasis and cerebral palsy) due to TB.

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.

The GeneXpert test can help diagnose TB and drug resistant TB. This is available in some provincial hospitals. However, it should not be relied upon to diagnose TB: the diagnosis of TB is a clinical diagnosis based on the history of contact, the clinical features, and where available radiology, sputum or gastric aspirate for acid fast bacilli, and other tests such as GeneXpert. If uncertain refer to the PNG Standard Treatment Guidelines on TB and to your provincial paediatrician; more details are also in the National Child Health Plan.

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.

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 identification and supervision of DOTs providers, checking of adherence, nutritional, social, and economic support, and follow-up in the home.

HIV

In 2022 there were 281 children with HIV admitted to the hospitals, and 64 known HIV-related deaths (case fatality rate of 22.7%).

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
2021	384	61
2022	**281**	**64**

Table 6. Cases and deaths of paediatric HIV 2016-2022

The numbers represent only cases that were admitted to hospitals and may be an underestimate of new cases in the population, as some children are diagnosed as outpatients or through Prevention of Parent to Child Transmission (PPTCT) programs.

In the past children living with HIV were failing anti-retroviral (ART) therapy because they are still on Nevirapine-Lamivudine-Zidovudine (NVP/3TC/AZT) combination therapy. In PNG as in many countries there are 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.

Recommendations

- **Effective therapy using Dolutegravir (DGV)-based therapy is available, and other recommended drugs Lopinavir (LPV)/ritonavir, Abacavir and Lamivudine are now also available.**
- **All children living with HIV should be on DGV-based or LPV-based regimens. This is described in the new HIV care and treatment guidelines:** https://pngpaediatricsociety.org/wp-content/uploads/2020/03/PNG-HIV-care-and-treatment-guidelines-2019.pdf
- Mothers who are diagnosed with HIV during or after pregnancy are now treated with three antiretroviral drugs for life, not just for shorter periods to prevent transmission to the baby.
- Early infant diagnosis of HIV with PCR testing is now available (including rapid point-of-care testing using GeneXpert in some hospitals).
- 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.

- All children living 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.**
- All children living with HIV need prophylaxis with cotrimoxazole (Septrin or Bactrim) and isoniazid, treatment of other infections and good nutrition.

Teach children who are living with HIV about their condition. They are more likely to take their ART reliably if they understand more, and even young children have a right to this knowledge. Educational resources are available to teach children who are living with HIV about their condition in ways that are age appropriate.

Chronic non-communicable diseases in children

There are increasingly children with **chronic diseases**, involving respiratory, cardiac, neurological systems, and cancer. These are under-estimates of the true burden of these conditions. The PHR has just started reporting these conditions, and more awareness on the care of these patients is needed. Individually the conditions are less common than acute problems, for example, pneumonia, diarrhoea, or malaria, however together they are increasingly common. In 2022, 1298 patients with these chronic conditions were admitted to these 17 hospitals (Table 4), making up 5.1% of all admissions, and 8% of all deaths. The other common chronic disease seen in many coastal provinces is thalassaemia.

Chronic condition	Admissions	Deaths
Asthma	172	0
Rheumatic heart disease	229	23
Congenital heart disease *	484	70
Cerebral palsy / developmental disability	188	18
Epilepsy	110	1
Cancer	115	32
Total	**1298**	**144**

Table 7. Common chronic diseases reported in 2022

* Includes paediatric admissions plus babies born with congenital heart disease.

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 must understand their condition well. Children as young as 4 or 5 years can start to understand. This is empowering and helps them manage their illness as they get older.

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 in every province that better support children with chronic illness. These children are most at risk of dying from acute infections and malnutrition, so preventative measures are vital.

Guidelines for the management of common cancers are available at www.pngpaediatricsociety.org (under Treatment Guidelines, Cancer Protocols), and assistance is available from Dr Gwenda Anga, oncology paediatrician at Port Moresby General Hospital.

Child protection

Data on child physical, sexual, and other forms of abuse are now being collected by the PHR. There were 206 child protection cases and 30 deaths reported in 2022. These under-estimates the true burden of child abuse, maltreatment, and neglect, but it is a start at systematic gathering of data on this problem. Social issues are also a frequent root cause of malnutrition and its disease risks.

More awareness of child protection is needed, and more resources, including a child social worker in each hospital to deal with the range of common social issues.

Vaccine preventable diseases

The number of cases of whooping cough, acute flaccid paralysis (AFP) and tetanus have increased significantly in 2022. There were 77 cases of whooping cough, 40 cases of acute AFP (4 deaths), 12 cases of tetanus (2 deaths), 2 reported case of measles and 1 of rubella in 2022 (Figure 8).

Vaccination coverage in PNG is still far too low, and it is inevitable that there will be another measles epidemic in the next few years unless action is taken.

The coverage rate for measles vaccine throughout PNG is about 60%. At least 90% coverage is needed to prevent outbreaks of measles. Every child we vaccinate is another child protected. The most at-risk children are those who do not come to get vaccines, so we have to go to their homes and communities to immunise them.

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.

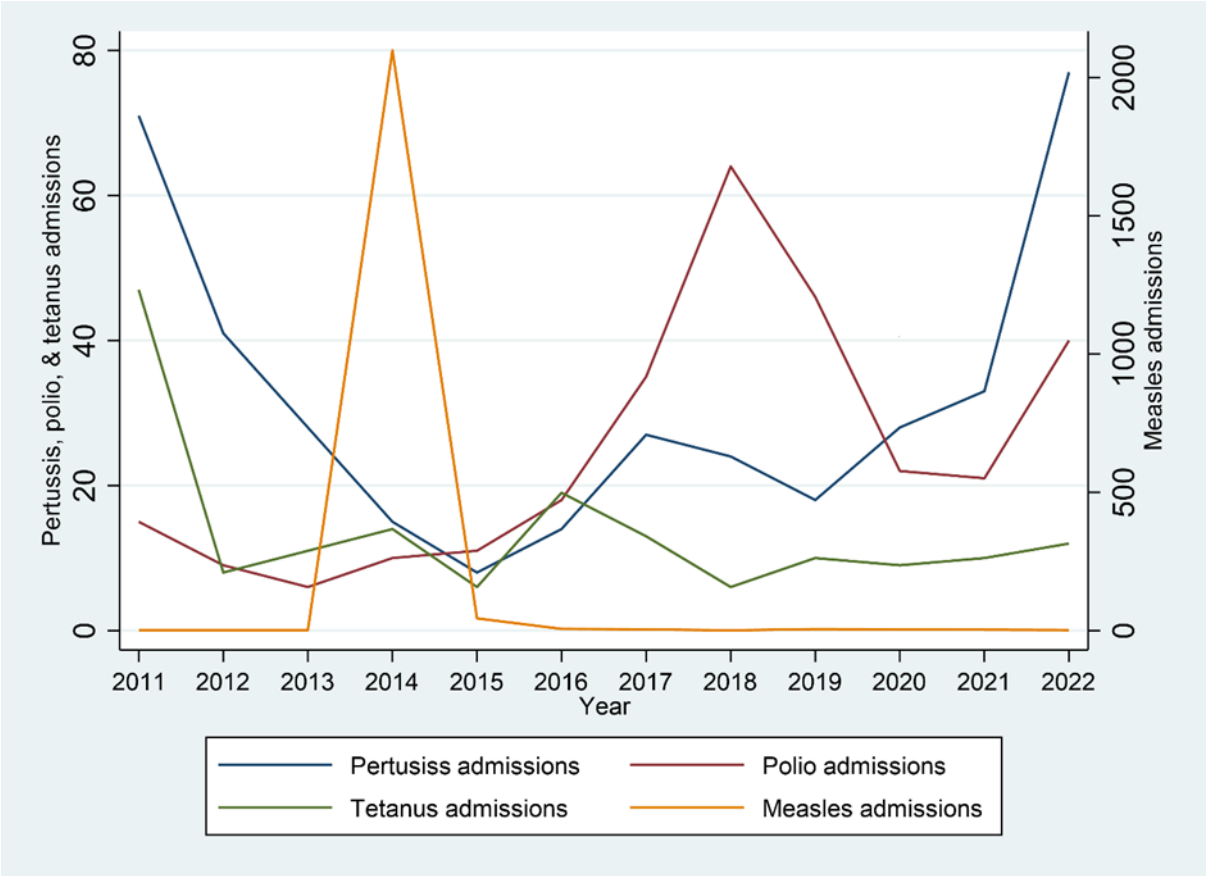

Figure 8. Cases of vaccine preventable diseases reported in 2011-2022

The peak of measles in 2014 represents the measles outbreak of that year, the peak of AFP cases in 2018 reflects the polio outbreak, and this year's peak in pertussis, and persistence of tetanus cases reflects low baseline coverage of all vaccines. The uptick in AFP cases may reflect better reporting of AFP, or increase in cases of Guillain Barre cases seen during and after the Covid pandemic.[2]

Neonatal care

Neonatal admissions made up 8600 (34.4%) of all 24,967 paediatric admissions to the 17 hospitals in 2022. There were 928 neonatal deaths reported (mortality rate 5.0), an increase in neonatal CFR from previous years (Table 8).

Year	Neonates admitted	Neonatal deaths	Mortality rate
2015	4461	394	8.8
2016	6930	556	8.0
2017	7534	687	9.1
2018	7725	643	8.3
2019	7971	679	8.5
2020	10024	534	5.3
2021	12292	726	5.9
2022	**8600**	**928**	**10.8**

Table 8. Neonatal admissions and deaths 2015-2022

The fall in neonatal admissions reported (Table 8 and Figure 1) but a rise in neonatal deaths and neonatal mortality rates (Figure 9) is concerning as it suggests barriers to access of services in 2022. It is possible that many parents did not bring their newborns to be assessed, or there were insufficient beds to admit them, but those admitted babies were sicker and had a higher risk of dying, or that there were gaps in quality of care.

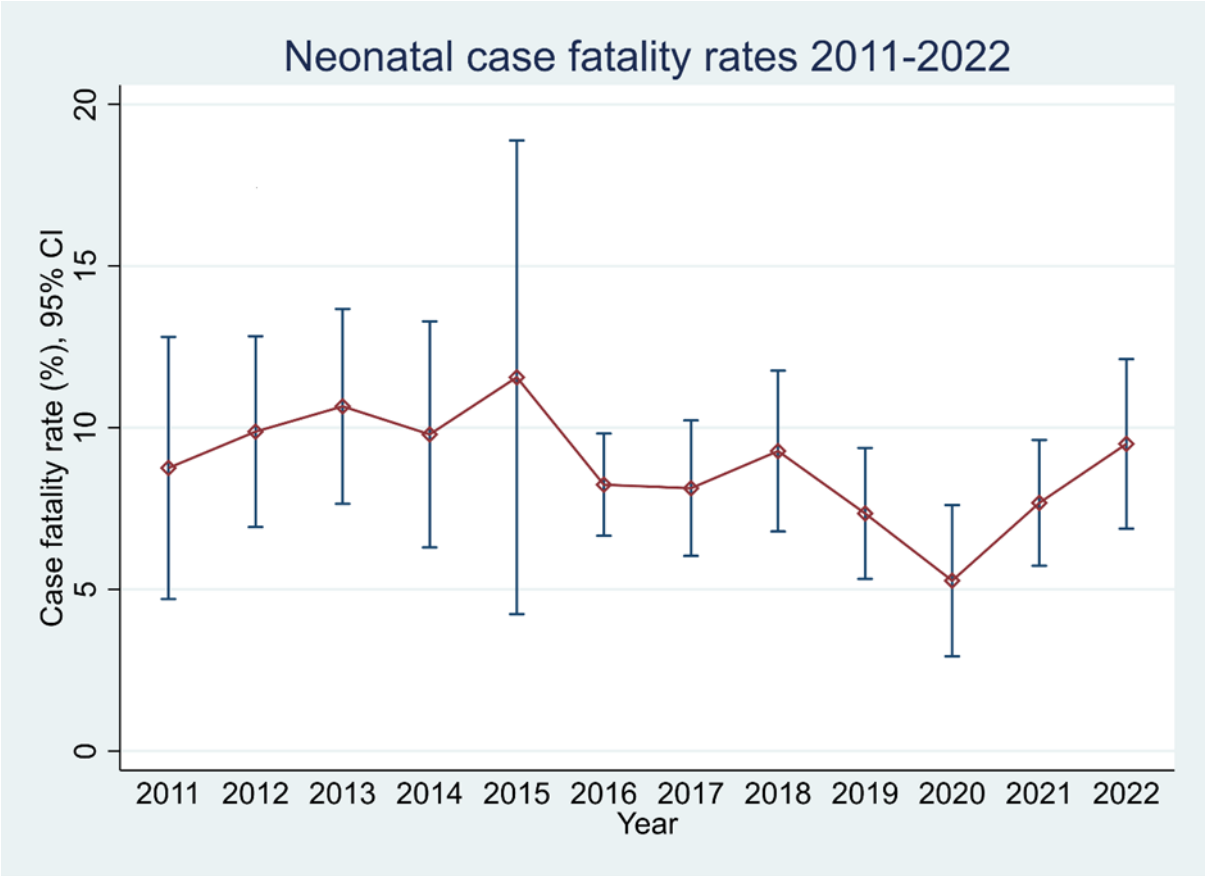

Figure 9. Overall neonatal mortality rates in Special Care Nurseries 2011-2022

Neonatal infections

4186 of all neonatal admissions were associated with infections (n=48.7). Neonatal infections included pneumonia, meningitis, cord sepsis, skin sepsis and diarrhoea. Because of comorbidity, infections may occur in babies with other diagnoses, including low birth weight.

Measures to prevent neonatal infections are described below in early essential newborn care.

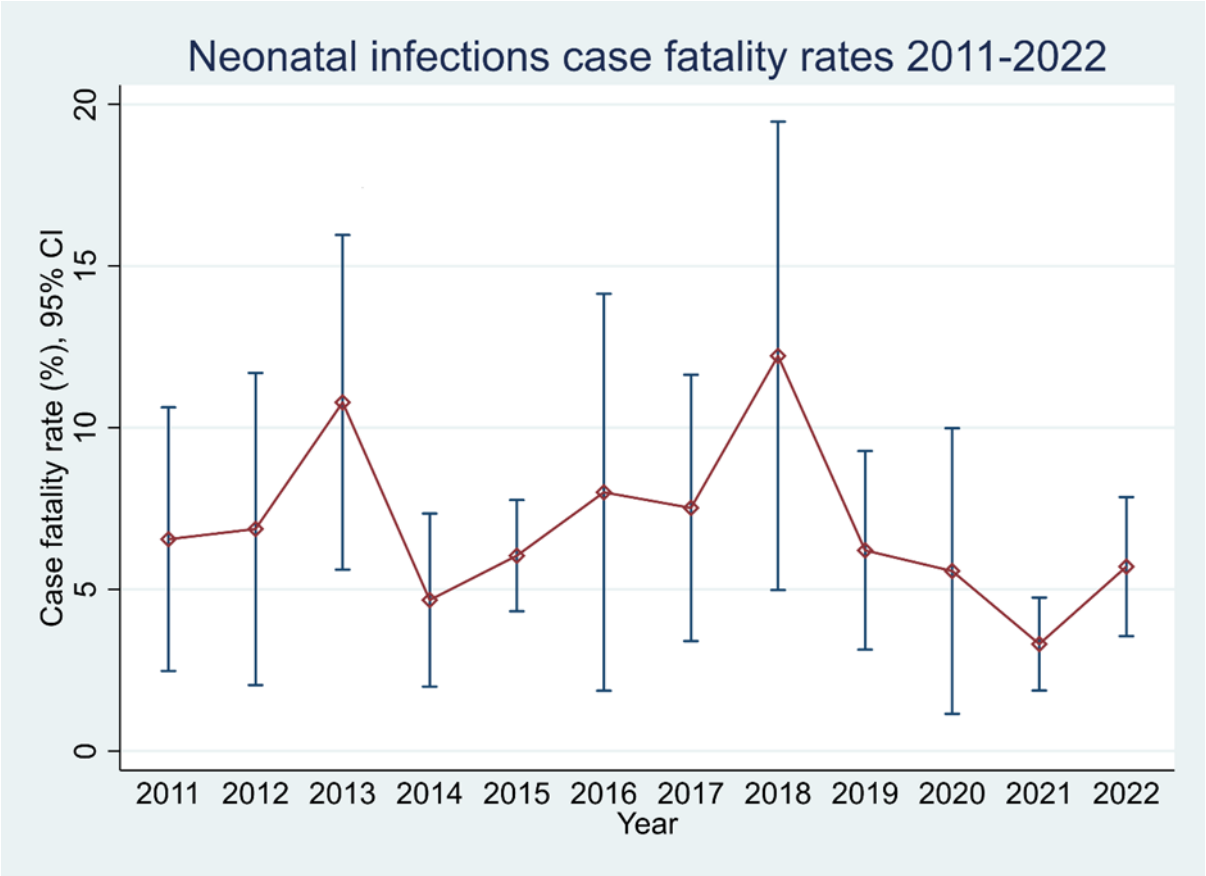

Figure 10. Neonatal infection case fatality rates in Special Care Nurseries 2011-2022

Birth asphyxia

Birth asphyxia is lack of oxygen at or around the time of birth. Many babies survive without serious damage, but the consequences for some children are severe brain injury or death. In 2022 there were 1973 cases reported of birth asphyxia, and 231 babies died (case fatality rate 11.7%). 25% of neonatal deaths were due to perinatal asphyxia or associated with it. The number of deaths from birth asphyxia (more than 4 per week) is unchanged over the last 7 years suggesting that the problem is not adequately addressed by current interventions.

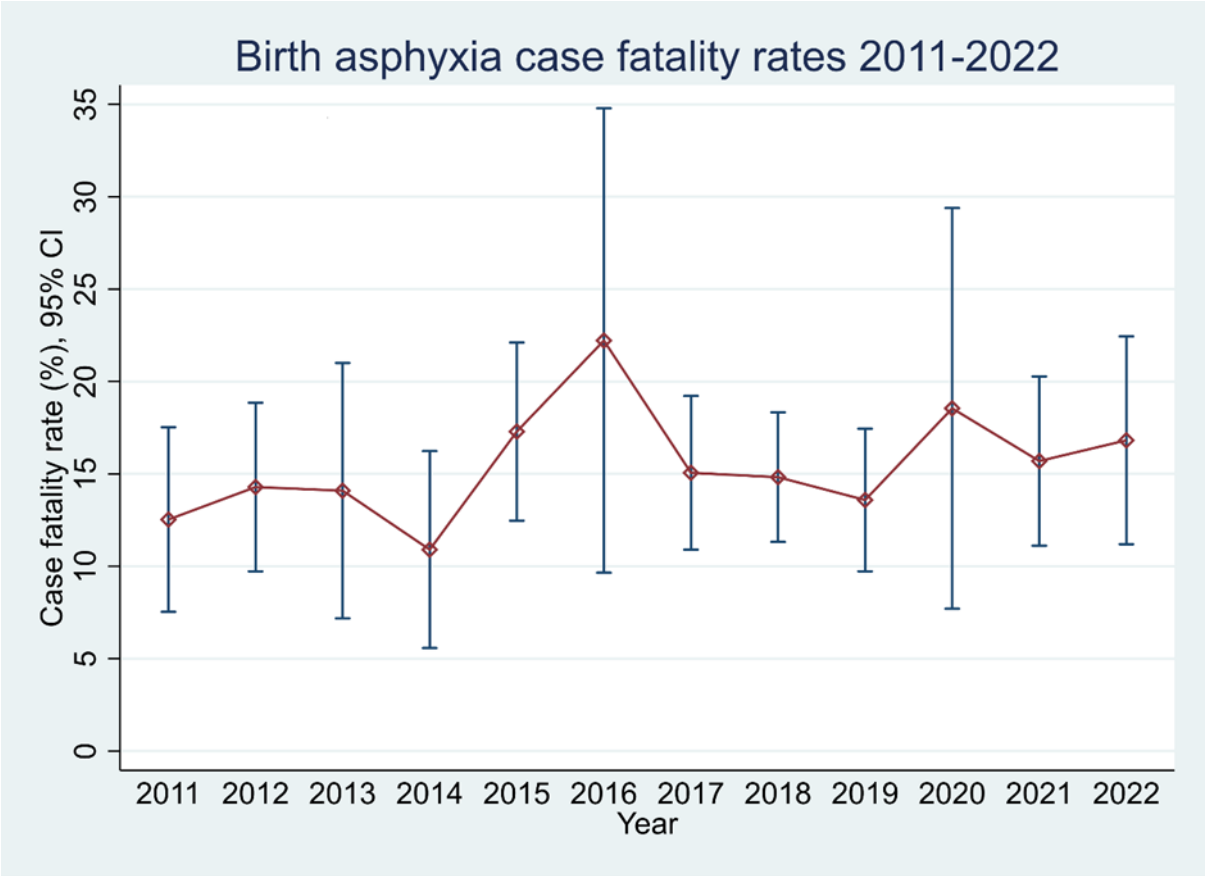

Figure 11. Case fatality rates for newborns with birth asphyxia 2011-2022

Year	Birth asphyxia	Birth asphyxia as a percentage of all newborn admissions	Deaths caused by birth asphyxia (% of all newborn deaths)	Case fatality rate
2015	1335	29.9%	198 (50%)	14.8%
2016	1478	21.3	285 (51%)	19.2%
2017	1892	25.15	280 (41%)	14.8%
2018	1812	23.5%	245 (38.1%)	13.5%
2019	1473	18.5%	218 (32.1)	14.8%
2020	2134	21.3%	204 (38.2%)	9.5%
2021	1909	15.5%	240 (33.1%)	12.6%
2022	**1973**	**22.9%**	**231 (24.9%)**	**11.7%**

Table 9. Birth asphyxia cases as a proportion of all newborn admissions and deaths 2015-2022

The developmental implications for many surviving children are significant: cerebral palsy, intellectual disability, blindness, and seizures are common. Even mild or moderate forms of birth asphyxia can have long-term developmental consequences. Perinatal asphyxia can be reduced with supervision with supervision by a skilled midwife, identification of delays in labour, active management of labour, and close communication between obstetric / midwifery services and paediatric services. Providing immediate newborn care - described below - can also prevent some cases of asphyxia, as babies are stimulated to initiate breathing early by drying. Training in neonatal resuscitation for nurses and doctors can also reduce the number of babies with birth asphyxia.

Very low birth weight

Very low birth weight is a birth weight between 1000 and 1499g. There were 464 very low birth weight admissions in the 17 hospitals. In 2022, 167, or 36% of VLBW newborns died, a concerning increase on recent years.

Year	VLBW cases	VLBW deaths	Case fatality rate
2015	267	100	37.5
2016	356	120	33.7
2017	491	198	40.3
2018	536	217	40.5
2019	419	140	33.4
2020	262	79	30.2
2021	459	113	24.6
2022	**464**	**167**	**36.0**

Table 10. Very low birth weight cases and deaths 2015-2022

These surviving babies are at high risk of complications and need close follow-up and care in the first year of life.

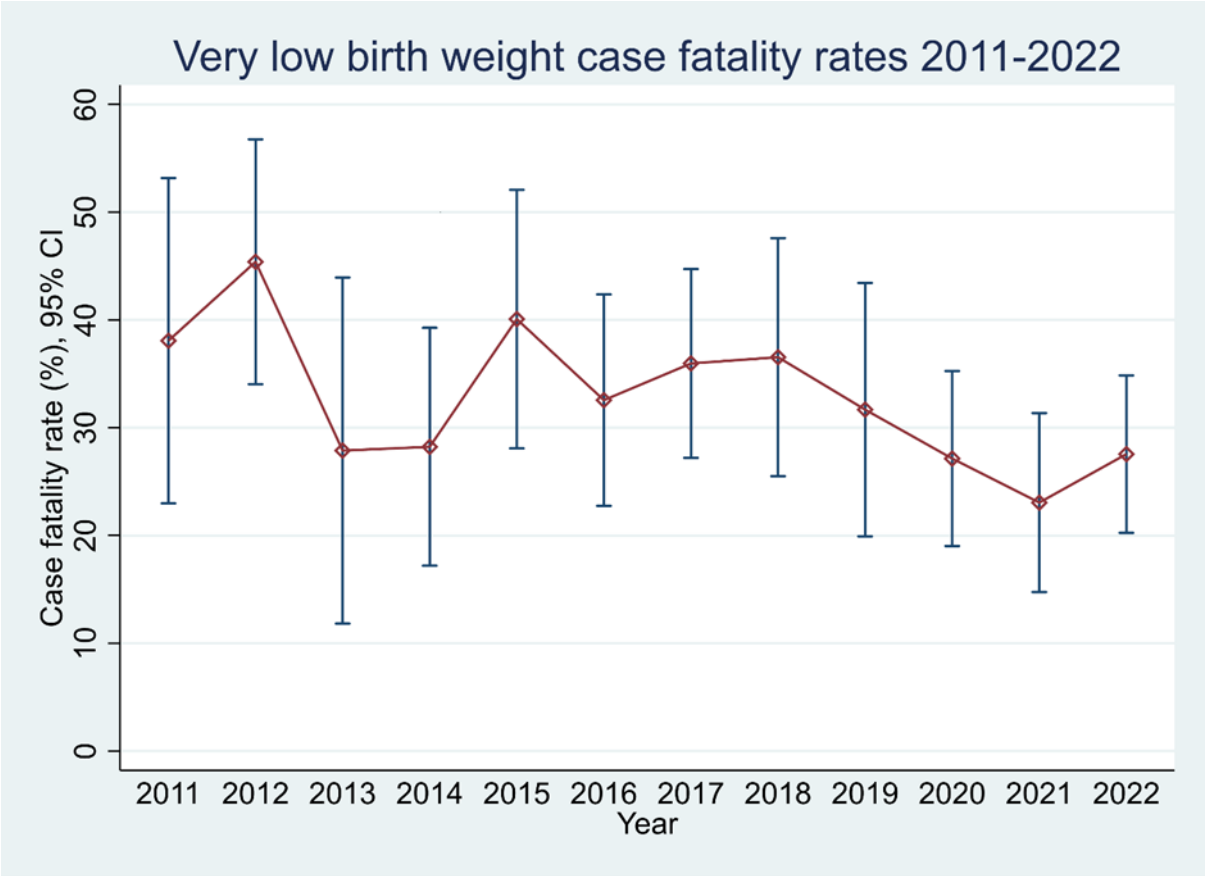

Figure 12. Case fatality rates for very low birthweight newborns 2011-2022

First-time fathers helping with Kangaroo mother care (KMC) in Alotau Special Care Nursery

With support from nursing staff and paediatricians in the special care nursery at Alotau Hospital, fathers have learnt to practice KMC in the nursery, allowing mothers to take a break while KMC continues.

Congenital malformations

338 newborns were reported to have congenital malformations, of 83 died (case fatality rate 24.5%). Cases included 62 newborns with congenital heart disease, 34 with congenital gastrointestinal anomalies (including anorectal malformations / imperforate anus, diaphragmatic hernia, and gastroschisis), 8 newborns were reported with microcephaly, and 70 with multiple congenital anomalies.

Congenital or intrauterine infections

There were 44 cases of congenital syphilis (4 deaths) and 11 cases of congenital malaria. No case of congenital rubella was reported in 2022.

Recommendations for improving neonatal care

Provision of early essential newborn care and keeping newborns with their mothers has 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 which can threaten newborns with delayed foetal-to-newborn circulatory adjustment, acidosis, hyaline membrane disease, coagulation defects, infection, hypoglycaemia, and brain haemorrhage. In some studies, the number of babies who do not breathe at birth was found to decrease by more than half once immediate and thorough drying was instituted.
- ***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 and facilitates successful intake of colostrum and sustained breastfeeding.
- ***Delaying cord clamping until cord pulsations stop***, typically around one to three minutes after birth, reduces the risk of anaemia and the risk of intraventricular haemorrhages in preterm infants.
- ***Exclusive breastfeeding and elimination of formula*** can prevent a large proportion of neonatal sepsis deaths.
- ***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.

Babies who require resuscitation or special care

Despite thorough drying, 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. However in a Special Care Unit it is vital that newborn care practices are as non-invasive and as natural as possible, and that babies are not separated from their mothers having skin-to-skin warming and breast feeding.

Maintain skin-to-skin contact with the mother to protect babies from hypothermia, hypoglycaemia, apnoea, and infection.

Improved care for sick neonates includes early essential newborn care, *plus*:

- Keeping babies warm, best done using Kangaroo Mother Care (KMC). KMC is even safe for many very low birth weight babies, unless they are also very sick with danger signs such as apnoea, cyanosis, or severe hypoxaemia.
- Supplemental oxygen administration and pulse oximetry. Because many neonates do not have clinical signs of hypoxaemia, use of protocols for supplemental oxygen administration based on monitoring of pulse oximetry is recommended.
- Detecting and treating apnoea. Apnoea is a major cause of neonatal mortality among premature neonates and also among babies with sepsis and birth asphyxia. The use of apnoea monitors, aminophylline for premature neonates and close observation of all very sick babies are recommended.
- Prevention and treatment of hypoglycaemia. Hypoglycaemia complicates many neonatal conditions, particularly low birth weight and sepsis. Early breast feeding and close contact with the mother immediately after birth prevents hypoglycaemia – this is best achieved by early skin-to-skin contact and KMC. Hypoglycaemia occurs because neonates have insufficient glycogen stores in the liver, inability to feed or separation from the mother, and increased glucose metabolism during illness. The clinical signs are non-specific, and regular blood glucose monitoring of high-risk ill neonates is required. Contact with the mother is essential for most sick babies. Ensure careful correction of hypoglycaemia using breast feeds in babies who can suck, or nasogastric expressed breast milk feeding or IV glucose in babies too sick to feed.
- Ward organisation to ensure close observation of the most seriously ill and highest risk ill babies.
- Safe use of intravenous fluids in seriously ill neonates. In very low birth weight neonates, expressed breast milk by a nasogastric tube is ideal. However large volumes of enteral feeding in the first day or two of life is often not well tolerated. Artificial formula feeding is not recommended at any time in low-birth-weight babies. For babies less than 1.5 kg, slow increases in expressed breast milk with cautious intravenous fluids to maintain hydration and prevent hypoglycaemia in the first few days of life is recommended. Babies on IV fluids are at risk of overhydration and nosocomial infection through the IV drip site.
- Antibiotics. Although many seriously ill neonates have bacterial infections, the inappropriate use of broad-spectrum antibiotics will lead to colonization of babies, and of neonatal units, with bacteria that are resistant to standard antibiotics. Standard treatment of neonatal sepsis is benzylpenicillin (or ampicillin or amoxicillin) and gentamicin, which are effective against most bacteria causing sepsis. *Staphylococcus aureus* is another common cause of infection in young infants in some hospitals, and resistant enteric gram-negative bacilli are a common cause of neonatal death. Flucloxacillin or cloxacillin should be used if there are signs Staphylococcal infection, such as purulent umbilical cord, skin pustules or purulent conjunctivitis.

- Prevention of neonatal sepsis. Strict hand washing and other basic infection control measures are strongly recommended. There is good evidence now that prolonged antibiotics lead to colonisation of the newborns. gastrointestinal tract with pathogenic bacteria that are likely to be invasive, rather than the protective bacteria that comes from the mother. So, avoiding antibiotics in babies who do not have serious infections is very important to protect them against infection. Ceasing antibiotics after 24 or 48 hours if the baby is well will also reduce colonisation with pathogenic or highly-resistance bacteria and reduce infections in babies.
- Birthing facilities, nurseries, and post-natal wards can be involved in educating mothers on warning signs for newborns e.g. poor feeding, fits or twitching, yellow discoloration, fever, too sleepy, wet cord, etc. Such education on warning signs can help improve health seeking for sepsis, where it is not uncommon for symptoms to have been present for a couple of days.
- Auditing of practice. It is only by keeping accurate records of all admissions and outcomes that patterns of adverse events will be identified. Clinical audit is essential to reduce neonatal mortality.
- Training of nurses in early essential newborn care and neonatal high-dependency care

Summary

This Annual Report and the Paediatric Hospital Reporting System in 2022 has highlighted sustained progress in several areas, but also some signals where the outcomes in 2022 were not as good as in previous years. The Paediatric Society asks that all health workers and hospital administrators play their part to address ongoing problems, adopt the recommendations in this report, and see these results improve in the coming years.

Appendix table 1. Pneumonia (all types of severity)

Hospitals	Pneumonia admissions	Pneumonia deaths	Pneumonia CFR
Alotau	373	6	1.61
Angau	233	14	6.01
Buka	85	9	10.59
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	376	24	6.38
Kainantu			
Gumine			
Kavieng	61	4	6.56
Kimbe	176	17	9.66
Kerema			
Kerowagi			
Koge			
Kompiam	198	5	2.53
Kundiawa	242	9	3.72
Kudjip			
Mabisanda			
Lorengau	41	2	4.88
Mendi			
Mingendi			
Modilon	392	14	3.57
Mt Hagen	1044	16	1.53
Nonga	168	14	8.33
Popendetta			
Port Moresby	623	20	3.21
Rumginae	48	1	2.08
Tari	217	5	2.30
Vanimo	116	9	7.76
Wabag			
Wewak	76	11	14.47
Yampu			
TOTAL	**4469**	**180**	**4.03**

Appendix table 2. Severe pneumonia

2020	Severe pneumonia admissions	Severe pneumonia deaths	Severe pneumonia CFR
Alotau	23	5	21.74
Angau	54	11	20.37
Buka	20	7	35.00
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	222	22	9.91
Kainantu			
Gumine			
Kavieng	13	4	30.77
Kimbe	103	16	15.53
Kerema			
Kerowagi			
Koge			
Kompiam	81	6	7.41
Kundiawa	195	9	4.62
Kudjip			
Mabisanda			
Lorengau	11	2	18.18
Mendi			
Mingendi			
Modilon	89	13	14.61
Mt Hagen	674	16	2.37
Nonga	70	12	17.14
Popendetta			
Port Moresby			
Rumginae	17	1	5.88
Tari	144	5	3.47
Vanimo	32	9	28.13
Wabag			
Wewak	39	10	25.64
Yampu			
TOTAL	**1787**	**148**	**8.28**

Appendix table 3. Diarrhoea

Hospital	Diarrhoea admissions	Diarrhoea deaths	Diarrhoea CFR
Alotau	36	1	2.8
Angau	169	9	5.3
Buka	32	5	15.6
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	209	10	4.8
Kainantu			
Gumine			
Kavieng	35	1	2.9
Kimbe	88	1	1.1
Kerema			
Kerowagi			
Koge			
Kompiam	158	3	1.9
Kundiawa	98	7	7.1
Kudjip			
Mabisanda			
Lorengau	21	1	4.8
Mendi			
Mingendi			
Modilon	216	7	3.2
Mt Hagen	370	7	1.9
Nonga	90	3	3.3
Popendetta			
Port Moresby	312	21	6.7
Rumginae	19	2	10.5
Tari	88	4	4.5
Vanimo	52	2	3.8
Wabag			
Wewak	25	3	12.0
Yampu			
TOTAL	**2018**	**87**	**4.3**

Appendix table 4. Malaria

Hospitals	Malaria admissions	Malaria deaths	Malaria CFR
Alotau	61	2	3.3
Angau	93	1	1.1
Buka	30	2	6.7
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	24	0	0.0
Kainantu			
Gumine			
Kavieng	61	2	3.3
Kimbe	178	11	6.2
Kerema			
Kerowagi			
Koge			
Kompiam	21	1	4.8
Kundiawa	10	0	0.0
Kudjip			
Mabisanda			
Lorengau	51	2	3.9
Mendi			
Mingendi			
Modilon	206	3	1.5
Mt Hagen	11	0	0.0
Nonga	84	4	4.8
Popendetta			
Port Moresby	65	3	4.6
Rumginae	15	1	6.7
Tari	2	0	0.0
Vanimo	69	4	5.8
Wabag			
Wewak	72	4	5.6
Yampu			
TOTAL	**1053**	**40**	**3.8**

Appendix table 5. Severe malnutrition

Hospitals	Severe malnutrition admission	Severe malnutrition deaths	Severe malnutrition CFR
Alotau	91	12	13.2
Angau	244	28	11.5
Buka	63	18	28.6
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	215	28	13.0
Kainantu			
Gumine			
Kavieng	43	9	20.9
Kimbe	175	16	9.1
Kerema			
Kerowagi			
Koge			
Kompiam	72	9	12.5
Kundiawa	102	8	7.8
Kudjip			
Mabisanda			
Lorengau	22	1	4.5
Mendi			
Mingendi			
Modilon	203	15	7.4
Mt Hagen	252	16	6.3
Nonga	102	23	22.5
Popendetta			
Port Moresby	200	28	14.0
Rumginae	20	2	10.0
Tari	156	11	7.1
Vanimo	92	7	7.6
Wabag			
Wewak	59	13	22.0
Yampu			
TOTAL	**2111**	**244**	**11.6**

Appendix table 6. Meningitis

Hospitals	Meningitis admissions	Meningitis deaths	Meningitis CFR
Alotau	15	2	13.3
Angau	30	3	10.0
Buka	24	7	29.2
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	103	20	19.4
Kainantu			
Gumine			
Kavieng	17	4	23.5
Kimbe	41	9	22.0
Kerema			
Kerowagi			
Koge			
Kompiam	22	5	22.7
Kundiawa	56	4	7.1
Kudjip			
Mabisanda			
Lorengau	1	0	0.0
Mendi			
Mingendi			
Modilon	73	8	11.0
Mt Hagen	162	6	3.7
Nonga	26	6	23.1
Popendetta			
Port Moresby	245	28	11.4
Rumginae	6	0	0.0
Tari	15	1	6.7
Vanimo	14	0	0.0
Wabag			
Wewak	11	4	36.4
Yampu			
TOTAL	**861**	**107**	**12.4**

Appendix table 7. Tuberculosis

Hospitals	TB admissions	TB deaths	TB CFR
Alotau	52	5	9.6
Angau	157	9	5.7
Buka	51	8	15.7
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	110	22	20.0
Kainantu			
Gumine			
Kavieng	25	5	20.0
Kimbe	257	24	9.3
Kerema			
Kerowagi			
Koge			
Kompiam	37	1	2.7
Kundiawa	168	7	4.2
Kudjip			
Mabisanda			
Lorengau	20	0	0.0
Mendi			
Mingendi			
Modilon	179	14	7.8
Mt Hagen	80	10	12.5
Nonga	66	19	28.8
Popendetta			
Port Moresby	278	17	6.1
Rumginae	58	0	0.0
Tari	63	2	3.2
Vanimo	48	4	8.3
Wabag			
Wewak	191	20	10.5
Yampu			
TOTAL	**1840**	**167**	**9.1**

Appendix table 8. HIV

Hospitals	HIV admissions	HIV deaths	HIV CFR
Alotau	7	1	14.3
Angau	32	5	15.6
Buka	3	1	33.3
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	61	15	24.6
Kainantu			
Gumine			
Kavieng	4	2	50.0
Kimbe	5	0	0.0
Kerema			
Kerowagi			
Koge			
Kompiam	16	3	18.8
Kundiawa	6	1	16.7
Kudjip			
Mabisanda			
Lorengau	1	0	0.0
Mendi			
Mingendi			
Modilon	19	4	21.1
Mt Hagen	36	7	19.4
Nonga	5	1	20.0
Popendetta			
Port Moresby	70	21	30.0
Rumginae	1	0	0.0
Tari	6	1	16.7
Vanimo	1	0	0.0
Wabag			
Wewak	8	2	25.0
Yampu			
TOTAL	**281**	**64**	**22.8**

Appendix table 9. Total neonatal admissions

Hospitals	Neonatal admissions	Neonatal deaths	Neonatal CFR
Alotau	454	25	5.51
Angau			
Buka	131	27	20.61
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	609	90	14.78
Kainantu			
Gumine			
Kavieng	301	17	5.65
Kimbe	414	36	8.70
Kerema			
Kerowagi			
Koge			
Kompiam	88	16	18.18
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	146	10	6.85
Mendi			
Mingendi			
Modilon	590	64	10.85
Mt Hagen	1790	116	6.48
Nonga	546	43	7.88
Popendetta			
Port Moresby	2228	391	17.55
Rumginae			
Tari	411	22	5.35
Vanimo	330	21	6.36
Wabag			
Wewak	562	50	8.90
Yampu			
TOTAL	**8600**	**928**	**10.79**

Appendix table 10. Neonatal infections

Hospitals	Neonatal sepsis admissions	Neonatal sepsis deaths	Neonatal sepsis CFR
Alotau	231	11	4.8
Angau			
Buka	91	14	15.4
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	236	38	16.1
Kainantu			
Gumine			
Kavieng	233	5	2.1
Kimbe	273	13	0.0
Kerema			
Kerowagi			
Koge			
Kompiam	71	9	12.7
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	93	3	3.2
Mendi			
Mingendi			
Modilon	386	12	3.1
Mt Hagen	780	22	2.8
Nonga	307	17	5.5
Popendetta			
Port Moresby	503	50	9.9
Rumginae			
Tari	379	18	4.7
Vanimo	225	6	2.7
Wabag			
Wewak	378	23	6.1
Yampu			
TOTAL	**4186**	**241**	**5.8**

Appendix Table 11. Very low birth weight (1000-1499g)

Hospitals	Very low birth weight admissions	Very low birth weight deaths	Very low birth weight CFR
Alotau	13	4	30.8
Angau			
Buka	14	6	42.9
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	70	25	35.7
Kainantu			
Gumine			
Kavieng	9	3	33.3
Kimbe	20	7	35.0
Kerema			
Kerowagi			
Koge			
Kompiam	0	0	0.0
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	2	0	0.0
Mendi			
Mingendi			
Modilon	45	13	28.9
Mt Hagen	62	24	38.7
Nonga	18	3	16.7
Popendetta			
Port Moresby	136	62	45.6
Rumginae			
Tari	13	3	23.1
Vanimo	15	3	20.0
Wabag			
Wewak	47	14	29.8
Yampu			
TOTAL	**464**	**167**	**36.0**

Appendix table 13. Perinatal asphyxia

Hospitals	Birth asphyxia admission	Birth asphyxia death	Birth asphyxia CFR
Alotau	80	7	8.8
Angau			
Buka	26	5	19.2
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	178	22	12.4
Kainantu			
Gumine			
Kavieng	57	7	12.3
Kimbe	128	15	11.7
Kerema			
Kerowagi			
Koge			
Kompiam	17	6	35.3
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	10	4	40.0
Mendi			
Mingendi			
Modilon	134	23	17.2
Mt Hagen	514	32	6.2
Nonga	104	22	21.2
Popendetta			
Port Moresby	425	52	12.2
Rumginae			
Tari	137	9	6.6
Vanimo	61	12	19.7
Wabag			
Wewak	102	15	14.7
Yampu			
TOTAL	**1973**	**231**	**11.7**

Appendix table 14. Paediatric cancer

Hospitals	Cancer admission	Cancer death	Cancer CFR
Alotau	1	0	0.0
Angau	2	1	50.0
Buka	10	2	20.0
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	8	1	12.5
Kainantu			
Gumine			
Kavieng	7	2	28.6
Kimbe	8	3	37.5
Kerema			
Kerowagi			
Koge			
Kompiam	3	1	33.3
Kundiawa	0	0	0.0
Kudjip			
Mabisanda			
Lorengau	0	0	0.0
Mendi			
Mingendi			
Modilon	9	2	22.2
Mt Hagen	15	5	33.3
Nonga	6	1	16.7
Popendetta			
Port Moresby	38	12	31.6
Rumginae	0	0	0.0
Tari	3	0	0.0
Vanimo	2	1	50.0
Wabag			
Wewak	3	1	33.3
Yampu			
TOTAL	**115**	**32**	**27.8**

Appendix table 15. Acute rheumatic fever / Rheumatic heart disease

Hospitals	Rheumatic heart disease admissions	Rheumatic heart disease deaths	Rheumatic heart disease CFR
Alotau	6	0	0.0
Angau	3	0	0.0
Buka	7	1	14.3
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	21	1	4.8
Kainantu			
Gumine			
Kavieng	14	1	7.1
Kimbe	6	1	16.7
Kerema			
Kerowagi			
Koge			
Kompiam	2	1	50.0
Kundiawa	13	0	0.0
Kudjip			
Mabisanda			
Lorengau	1	0	0.0
Mendi			
Mingendi			
Modilon	11	2	18.2
Mt Hagen	19	0	0.0
Nonga	8	1	12.5
Popendetta			
Port Moresby	106	14	13.2
Rumginae	0	0	0.0
Tari	5	0	0.0
Vanimo	3	1	33.3
Wabag			
Wewak	4	0	0.0
Yampu			
TOTAL	**229**	**23**	**10.0**

Appendix Table 16. Congenital heart disease (admissions outside the newborn period)

Hospitals	Congenital heart disease admissions	Congenital heart disease deaths	Congenital heart disease CFR
Alotau	26	4	15.4
Angau	14	3	21.4
Buka	11	3	27.3
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	121	8	6.6
Kainantu			
Gumine			
Kavieng	18	2	11.1
Kimbe	18	2	11.1
Kerema			
Kerowagi			
Koge			
Kompiam	3	2	66.7
Kundiawa	53	7	13.2
Kudjip			
Mabisanda			
Lorengau	7	2	28.6
Mendi			
Mingendi			
Modilon	33	6	18.2
Mt Hagen	50	3	6.0
Nonga	20	3	15.0
Popendetta			
Port Moresby			
Rumginae	0	0	0.0
Tari	17	2	11.8
Vanimo	23	3	13.0
Wabag			
Wewak	8	1	12.5
Yampu			
TOTAL	**422**	**51**	**12.1**

Appendix table 17. Child protection admissions (physical abuse, neglect, or sexual abuse)

Hospitals	Child protection admission	Child protection death	Child protection CFR
Alotau	14	0	0.0
Angau	7	2	28.6
Buka	6	2	33.3
Chuave			
Daru			
Gembogl			
Gerehu			
Goroka	0	0	0.0
Kainantu			
Gumine			
Kavieng	8	3	37.5
Kimbe	1	0	0.0
Kerema			
Kerowagi			
Koge			
Kompiam	27	6	22.2
Kundiawa	0	0	0.0
Kudjip			
Mabisanda			
Lorengau	2	0	0.0
Mendi			
Mingendi			
Modilon	86	4	4.7
Mt Hagen	2	0	0.0
Nonga	20	7	35.0
Popendetta			
Port Moresby			
Rumginae	0	0	0.0
Tari	1	0	0.0
Vanimo	25	3	12.0
Wabag			
Wewak	7	3	42.9
Yampu			
TOTAL	**206**	**30**	**14.6**

Paediatric monitoring and response chart

Name

UR Number | Age: | Weight: | Length / height

Diagnoses: | Frequency of observations:

Date																										
Time																										
	Temp °C	≥ 39																								>39
		38-38.9																								38-38.9
		36-37.9																								36-37.9
		<36																								<36
AIRWAY / BREATHING	Respiratory Rate (bpm)	≥ 80																								≥ 80
		70																								70
		60																								60
		50																								50
		40																								40
		30																								30
		20																								20
		10																								10
		0																								0
	SpO_2 (%)	95-100																								95-100
		90-94																								90-95
		85-89																								80-90
		80-84																								
		70-79																								70-80
		<70																								<70
	Oxygen	L/min																								L/min
	Respirat distress	Severe																								Severe
		Mod.																								Mod.
		Mild																								Mild
		Normal																								Normal
CIRCULATION	Heart rate (bpm)	≥ 200																								≥ 200
		190																								190
		180																								180
		170																								170
		160																								160
		150																								150
		140																								140
		130																								130
		120																								120
		100																								100
		90																								90
		80																								80
		70																								70
		60																								60
		<60																								<60
	Cap refill	≥ 3 secs																								≥ 3 secs
		< 3 secs																								< 3 secs
	BP	Systolic																								Systolic
		Diastolic																								Diastolic
		Mean																								Mean
DISABILITY	AVPU response to stimuli	Alert																								Alert
		Verbal																								Verbal
		Pain																								Pain
		None																								None
	Pain score (/10)																									Pain
Blood sugar level																										
Treatments given Actions taken																										

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