PNG Department of Health

Child Morbidity and Mortality
15th Annual Report, 2024

Paediatric Society of Papua New Guinea

2024 Annual Report on Child Morbidity and Mortality

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

Acknowledgements

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

Data compiled by Edilson Yano, Paediatric Surveillance Officer and PHR coordinator, and by all the members of the Paediatric Society of PNG.

Edited by Trevor Duke

Graphs by Eleanor Neal
PHR Software design: Adrian Hutchinson

Foreword by Dr Cornelia Kilalang, Chief Paediatrician, National Department of Health

Review committee: Drs Cornelia Kilalang, Fiona Kupe, Anna Toti, Mary Paiva, Gwenda Anga, Gamini Vali, Roland Barnabas, Rupert Marcus, Trevor Duke.

We are grateful to the Australian Department of Foreign Affairs and Trade (DFAT) for their support to this program.

July 2025

Our aims

To collect and analyse accurate and comprehensive data reflecting paediatric admissions to hospitals, and the overall health of newborns, children and adolescents.

To enable monitoring and benchmarking of health services for newborns, children and adolescents

To promote quality improvement initiatives in paediatric health care, and improvements in outcomes for newborns, children and adolescents

Foreword by the Chief Paediatrician

It gives me great pleasure to write the foreword for this Annual Report for 2024.

The Annual Reports on Child Morbidity and Mortality have been produced since 2010 and this report marks 15 years of this reporting through many versions to what we are up to now.

Fifteen 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 20 health facilities participated, including some district hospitals.

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 some outcomes remain stubbornly high – including birth asphyxia, the rise in deaths from septic shock, ongoing cases and deaths from severe malnutrition, and deaths from child protection issues. Many of these outcomes are preventable by early intervention, including more awareness of child health and nutrition in families and the community.

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, and his work is appreciated by the Society. And thanks to Prof Trevor Duke who edits and produces this report.

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

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Executive summary

This report covers admissions and outcomes for children in 2024 from 20 hospitals. We gratefully acknowledge the paediatricians, nurses, medical officers, and HEOs in charge of wards who record these data and submit it annually.

Report key points

- In 2024 overall, there were 33,917 admissions, and 2027 deaths, a mortality rate of 5.98%. The children's ward case fatality rate was 4.75% (18,848 admissions and 895 deaths). The neonatal ward admissions were 15,069, with 1132 neonatal deaths (case fatality rate 7.51%). Overall, there is a slow improving trend, a correction of the deterioration that occurred during the pandemic (Figure 1). Neonatal admissions are increasing as a proportion of overall admissions (Figure 2), emphasising that the neonatal period is the most hazardous period of childhood, and the need for better newborn services in all hospitals.
- The commonest causes of admission for children over 1 month were pneumonia (5507 cases), diarrhoea (3353 cases), severe malnutrition (3402), anaemia (2961), tuberculosis (2664), meningitis (1143), and malaria (1006).
- The most common causes of death were pneumonia (259), anaemia (276), tuberculosis (214), meningitis (133), severe sepsis or septic shock (128). Severe malnutrition (327), anaemia (276), and moderate malnutrition (135) were the most common comorbidities, and sometimes primary causes, leading to death in children outside the neonatal period.
- In 2024 there were 235 children older than 1 month with severe sepsis or septic shock, and 128 deaths, making septic shock the illnesses with the highest paediatric death rate (case fatality rate 55%). 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 immunisation are needed to reduce deaths from septic shock.
- It is concerning that there were 200 children admitted with abuse or neglect, and 22 died. This is a small fraction of the overall number of children who suffer from such injuries, most of whose cases are not reported, or are seen in Family Support Units and not admitted. More social workers, parenting support and community awareness are needed, including measures to reduce domestic and gender-based violence, which affects families and societies in all countries.
- There were 1402 patients admitted to these 20 hospitals with chronic non-communicable diseases, making up 4.1% of all admissions in children over 1 month of age, and 7.5% of all deaths. These chronic non-communicable illnesses – asthma, chronic lung disease, rheumatic and congenital heart disease, epilepsy and cerebral palsy, and cancer. More education and treatment to care for such children in hospitals and communities are needed.
- Almost half of the children admitted to hospitals are in the neonatal period, and infection, birth asphyxia, and low birth weight (LBW) are the commonest causes. Many of these infants, especially those with LBW, remain vulnerable throughout childhood.

- In 2024 Quality of Care Assessments were completed by 11 provincial hospitals, and the results are summarised in this report.

In response to the PHR results for 2024, the Paediatric Society of PNG has made the following recommendations:

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

- Regular child mortality and morbidity audits and review
- Regular perinatal review with obstetricians and midwives in hospitals
- A quality improvement team in each provincial hospital
- More paediatric nurses being trained
- Training on the care of seriously ill children, through the WHO Hospital Care for Children courses, and training in Early Essential Newborn Care (EENC)
- 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
- 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. If chlorhexidine is not available, air drying of the umbilical cord can be an option.

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 under 10% in 2023 and 2024, an overall improvement in the last decade.

Tuberculosis caused 7.9% of all admissions in 2024, and TB had a case fatality rate of 8%. Every effort should be made to help children complete TB treatment. For many children this requires keeping them under careful supervision 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.

Children with **chronic diseases**, including asthma, chronic lung disease, epilepsy, rheumatic and congenital heart diseases, cerebral palsy and neurodevelopmental problems, thalassaemia, and diabetes need ongoing holistic care. They 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 15th Annual Report on Child Morbidity and Mortality for 2024. 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 2024, with some comparisons to data collected in the previous 15 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 V12.5, but not all hospitals were using the latest version in 2024. 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 V12.5 are not reported by all hospitals. Version 12.5 is downloadable at: https://pngpaediatricsociety.org/hospital-reporting-program/

Version 12.5 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 2024 overall, there were 33,917 admissions and 2027 deaths recorded (mortality rate 5.98%). The newborn death rate was 7.51% and the children's ward case fatality rate was 4.75%, 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.

What matters are broad trends over time and looking for signals where there may be problems.

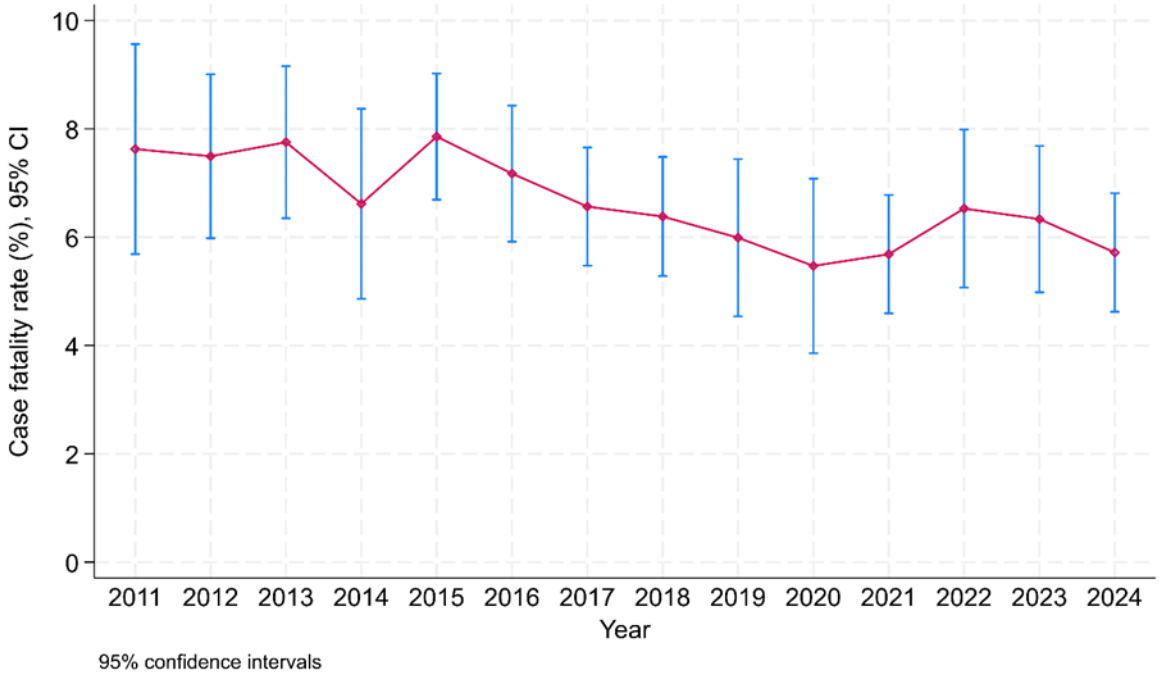

Figure 1. Overall paediatric (children's ward and special care nurseries combined) case fatality rates 2011-2024 (weighted averages).

Figure 1 Shows an overall improving trend, a correction in the last 2 years after the deterioration that occurred during the pandemic.

Hospitals	Paediatric admissions overall	Paediatric deaths	Total mortality rate
Alotau	533	14	2.63
Angau	3256 *	251 *	7.71 *
Buka			
Chuave			
Daru	406	29	7.14
Gembogl			
Gerehu	636	7	1.10
Goroka	2365	259	10.95
Kainantu			
Gumine			
Kavieng	685	39	5.69
Kimbe	1486	99	6.66
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	277	13	4.69
Mendi	1700	88	5.18
Mingendi			
Modilon	2173	155	7.13
Mt Hagen	5544	237	4.27
Nonga	751	69	9.19
Popendetta	599	53	8.85
PMGH	8711	414	4.75
Rumginae	74	1	1.35
Tari	1518	100	6.59
Vanimo	642	34	5.30
Wabag	1094	75	6.86
Wewak	1218	83	6.81
Yagum HC	249	7	2.81
Yampu			
TOTAL	**33,917**	**2027**	**5.98**

Table 1. Summary of admissions, deaths, and case fatality rates in 20 hospitals in 2024

* ANGAU Hospital reported 12 months of data from special care nursery but only 9 months of data from paediatric ward, and some missing data when excess patients were admitted to the Children's Outpatients Department. This amounted to an additional 1145 admissions and 51 deaths, which would bring the Angau total admissions to 4401, deaths 302, and CFR to 6.8%. These additional cases were reported late when the PHR data had been analysed but minimally change the overall picture.

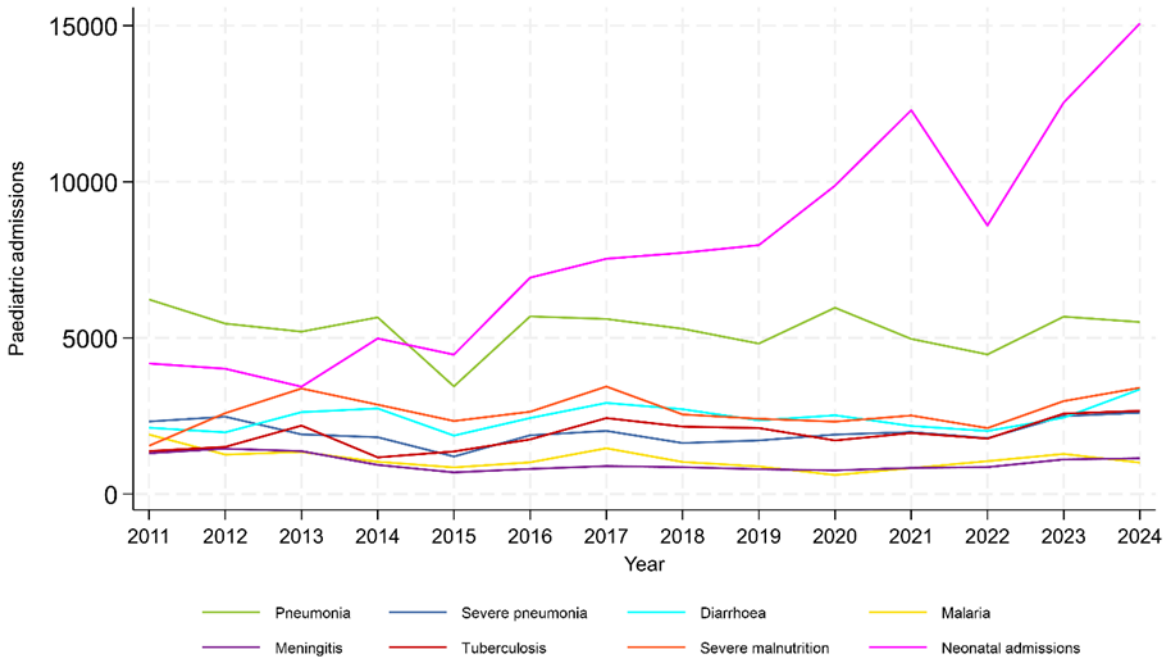

Figure 2. Admissions per year overall and for common conditions 2011-2024

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 10 years, the rise in chronic non-communicable paediatric conditions, and increased cases of severe sepsis.

Diagnoses	Admissions 2024	Deaths 2024	Case fatality rate 2024	CFR 2009-2024
All paediatric admissions	**33917**	**2027**	**5.98**	**6.76**
Neonatal conditions	**15069**	**1132**	**7.51**	**8.45**
Pneumonia	**5507**	**259**	**4.70**	**4.34**
Severe pneumonia	**2605**	**259**	**9.94**	**9.85**
Bronchiolitis	735	6	0.82	
Asthma	133	1	0.75	
Diarrhoea	**3353**	**127**	**3.79**	**4.20**
Dysentery	278	8	2.88	
Malaria	**1006**	**29**	**2.88**	**4.27**
Severe malnutrition	**3402**	**327**	**9.61**	**14.22**
Moderate malnutrition	2308	135	5.85	
Anaemia	**2961**	**276**	**9.32**	**11.77**
Typhoid	858	8	0.93	
Tuberculosis	**2664**	**214**	**8.03**	**9.69**
Meningitis	**1114**	**133**	**11.94**	**15.89**
Severe sepsis	**235**	**128**	**54.47**	
Epilepsy	156	3	1.92	
Dengue	37	4	10.81	
Developmental disability	201	15	7.46	
HIV	**400**	**39**	**9.75**	**15.33**
Rheumatic heart disease	**102**	**10**	**9.80**	**10.37**
Congenital heart disease	**657**	**84**	**12.75 ***	**15.18**
Cancer	**137**	**35**	**25.55**	**29.12**
Measles	2	0	0	2.94
Tetanus	14	1	7.14	19.25
Acute flaccid paralysis	20	1	5.00	5.14
Whooping cough	58	3	5.17	1.74
Child protection	**200**	**22**	**11.00**	**15.82**
Trauma and injuries	287	1	0.35	0.94

Table 2. Most common causes of hospital admission and case fatality rates in children for 2024, with 15-year average CFR (2009-2024)

Note: some diagnoses added recently, so CFRs do not reflect the complete 10 years of reporting. Paediatric admissions = neonatal conditions admitted to special care nurseries plus children's ward admissions. In hospitals where sick newborns were admitted to children's wards, or general wards, these are separated according to age (neonates <1 months; or children older than 1 month).

* Combined paediatric ward and neonatal cases of congenital heart disease.

Pneumonia

In 2024 as in all years, pneumonia was the most common reason for admission (5507 cases: 16.2% of all admissions overall).

Pneumonia case fatality rate overall in 2024 was 4.8%, and for severe pneumonia was 9.9%. This is higher than recent years, when the severe pneumonia case fatality rate had fallen to as low as 6-7%. There was a deterioration that occurred in the pandemic (2021-2022, see Figure 3), with some recovery in the last 2 years. However, improvements are needed to lower the deaths from severe pneumonia.

Severe pneumonia case fatality rates, which are partly standardised for illness severity at the time of presentation, 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.

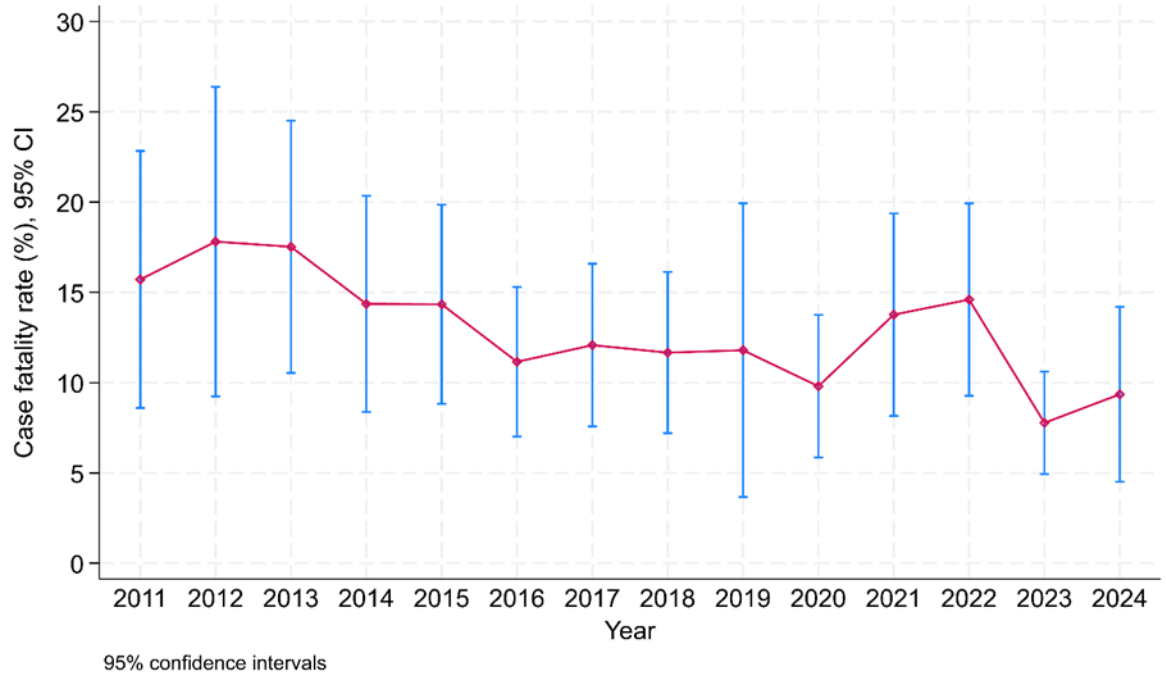

Figure 3. Severe pneumonia mortality rates 2011-2024

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 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.
- colour-coded paediatric monitoring and response charts.
- training for staff in the care of critically ill children
- sufficient nursing and medical staff to always provide clinical care
- supervision of nursing and medical care by senior clinicians

Deaths from pneumonia (259), meningitis (133) and severe sepsis (128) = 520 deaths from likely serious bacterial infection: and combined they account for 58% of all children's ward deaths and 26% of all paediatric deaths (children's ward and neonatal deaths combined).

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 and protect against pneumonia, meningitis and sepsis.

There are other common causes of pneumonia, including viruses (particularly respiratory syncytial virus - RSV, influenza) and other 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.

Pneumonia, meningitis and sepsis will continue to be major causes of presentation to health facilities and deaths in children in hospitals and in communities 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 preventing and treating pneumonia and other acute lower respiratory infections.

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 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 (Pentavalent), PCV, BCG, and other vaccines.
- Vector control measures will reduce the number of causes of mosquito-borne viral meningitis, such as Japanese encephalitis, dengue, as well as malaria.

Treatment

- Improving hospital and district health facility care of pneumonia through Hospital Care for Children training.

- Use of a colour-coded 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 that increase the risk of death from infections, especially anaemia, malnutrition, HIV and tuberculosis.
- 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.

Diarrhoea

3353 cases and 127 deaths (case fatality rate of 3.8%) due to diarrhoea were reported in the 20 hospitals in 2024 (Figure 4). Deaths from diarrhoea remain around 4-5%, with no improvement over the last decade (Figure 4) on the weighted averages.

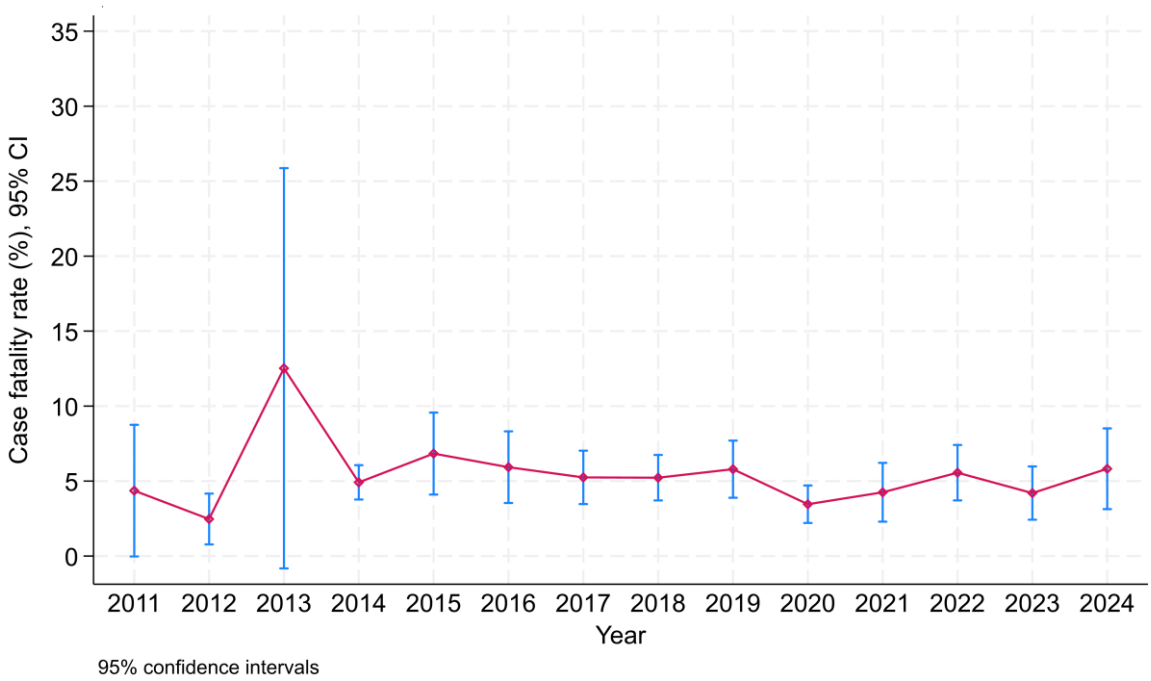

Figure 4. Diarrhoea mortality rates 2011-2024

Deaths in diarrhoea occur if the child (1) does not have access to effective rehydration, (2) has sepsis or bacillary dysentery, or (3) other co-morbidity, such as severe malnutrition or immune deficiency. Many deaths from diarrhoea occur in children who are bottle-fed, or adopted, and do not receive adequate nutrition.

Severe diarrhoea can be prevented by breast feeding, timely use of oral rehydration solution (ORS) in the community and in primary care, by parents bringing their child to a health facility early if they have diarrhoea and signs of being sick, 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 malnutrition.

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 acute watery diarrhoea, death is very unlikely.

Watery diarrhoea is mostly due to rotavirus, and now there are vaccines against rotavirus. Consideration can be given to the introduction of rotavirus vaccine in the near future.

If a child with watery diarrhoea is very sick, toxic, with high fever, then antibiotics are needed, as some watery diarrhoea is due to *Escherichia coli* (*E. coli*), a bacterium, and causes sepsis.

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 no longer effective, and that ciprofloxacin is needed to treat dysentery. **Oral ciprofloxacin is currently recommended treatment by WHO for children with dysentery** in a dose of 10-15 mg/kg twice daily for 5 days.

If children have dysentery and are too sick to take oral medications, give ceftriaxone intravenously (IV) or intramuscularly (IM), and refer if you can.

In 2024 there were 278 children admitted with dysentery, with 8 reported deaths. With the right treatment children with dysentery can recover.

Recommendations

- Deaths from watery diarrhoea usually means the child did not receive sufficient fluids, or the child had sepsis or underlying malnutrition.
- Give ORS and zinc to all children with diarrhoea.
- Treat bloody diarrhoea (dysentery) with ciprofloxacin.
- Recognise sepsis in children with diarrhoea who look too sick (they will often be toxic, malnourished, with high fever), treat according to sepsis protocols, and have the child reviewed by an experienced paediatrician.
- Recognise the high risk of mortality among children with chronic or persistent diarrhoea, they often have underlying problems or comorbidity (anaemia, malnutrition, immune deficiency, adoption), and need referral for assessment.
- Consider rotavirus vaccine introduction

Typhoid

In 2024 there continued high numbers of reported cases of typhoid: 858 in total, with 8 reported deaths from typhoid. Most were from major highlands hospitals: Mt Hagen (555 cases) reported by far the most paediatric typhoid cases, followed by Goroka (133).

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 ciprofloxacin. Third generation cephalosporins such as ceftriaxone, and azithromycin are also options.

The rising incidence of typhoid being seen in the PHR data 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. WHO recommends this vaccine in highly endemic areas, but it is not currently available in PNG.

Malaria

In 2024 malaria accounted for 1006 admissions and 29 deaths (case fatality rate of 2.9%, Table 3). The number of cases of malaria are static over the last 3 years. The case fatality rate has not changed (around 3-4% most years).

Cases of malaria may be increasing again because of lack of use of insecticide-treated bed nets and other public health protective measures.

Year	Cases	Deaths	CFR
2024	1006	29	2.9
2023	1283	51	4.0
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 2010-2024

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, 11th Edition (2025).

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 2024 in the 20 hospitals that reported data, 3402 children were admitted with severe malnutrition (weight for age <3 SD below the median), or with severe wasting or kwashiorkor. This represented 10% of all admissions and 18% of all children's ward admissions.

The case fatality rate for severe malnutrition was 9.6%, which compares with previous years (Figure 5 and Table 4). There have been clear improvements in severe malnutrition outcomes in the last 10 years, but the death rates are still high.

Malnutrition is a social condition, and improved social, economic and educational conditions are needed to reduce the numbers of children with malnutrition. Informal adoption, early weaning, lack of education on complimentary feeding practices, poor water and sanitation, and other social problems are all risk factors for malnutrition.

Many children with severe malnutrition have comorbidities such as tuberculosis (based on studies in Africa, about 17%).

There is a need for ongoing supply of essential commodities for managing severe malnutrition, but the best way to prevent deaths from malnutrition is prevention at a community level.

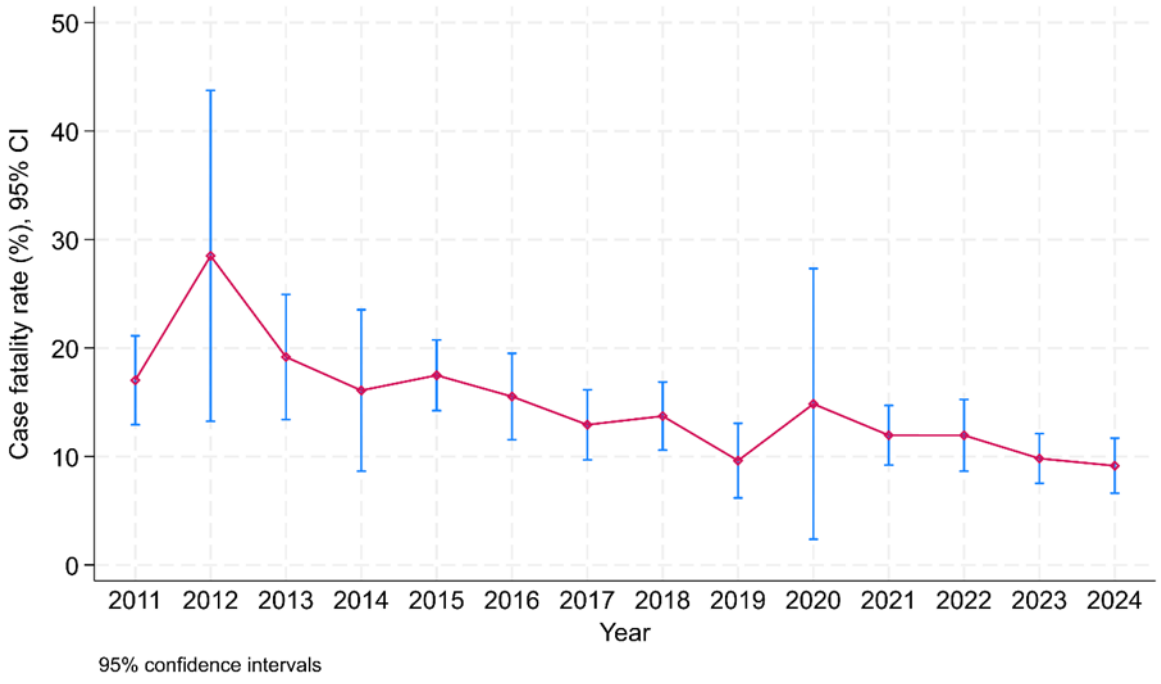

Figure 5. Severe malnutrition case fatality rate 2011-2024

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
2023	2976	9.0	273	9.4	0
2024	3402	10.0	327	9.6	0

Table 4. Cases and outcomes of children with severe malnutrition 2011-2024

In the last 5 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 2024 2308 children were reported with moderate malnutrition, and there were 135 deaths (CFR 5.9%).

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.
- Check all children with severe malnutrition for tuberculosis, as it is likely that 17% of such children will have tuberculosis. They should all have a thorough clinical examination, chest x-ray, GeneXpert test, and TB score. If children with severe malnutrition have a positive family history of a household contact with sputum smear positive, the risk is even higher, and starting TB treatment can be lifesaving.
- Zinc and vitamin A should be available and given to children with severe malnutrition, as per Standard Treatment guidelines.
- Staff should be trained in the management of malnutrition.

The *prevention* of malnutrition should be a high 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 20 hospitals, meningitis accounted for 1143 admissions and 133 deaths. The case fatality rate for meningitis was 11.6%.

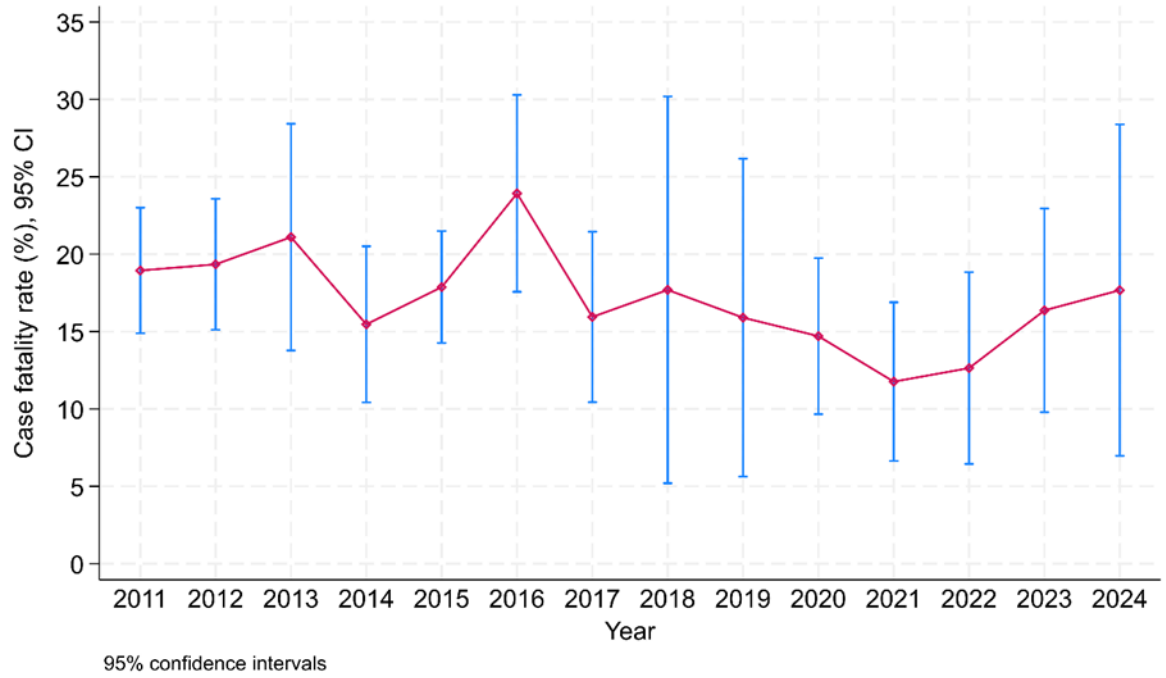

Figure 6. Meningitis case fatality rates 2011-2024

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 2023, 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 bacterial 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 <94%
- 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 2024 there were 235 children outside the neonatal period reported with severe sepsis or septic shock, and 128 deaths, making septic shock the illness with the highest death rate (54%). There has been a large increase in cases of septic shock in recent years.

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

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

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

There may be localising signs suggesting **bowel sepsis**.

- Severe vomiting and abdominal distension
- Blood in vomit or dysentery (blood in stools)

There may be a rash, different types of rashes suggest 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 or pleural effusion

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

- If the child is unconscious or convulsing, nurse on the side, 30° head up, keep the airway clear.
- Give oxygen if there is severe respiratory distress, cyanosis, poor conscious state, or the oxygen saturation is <94%

- Measure blood pressure if you can, and assess the circulation for signs of shock (are the limbs cold, are the pulses hard to feel, is the capillary refill very prolonged?)
- 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 (IV) or IM.
- Monitor in the 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. If you cannot insert an IV, give IM antibiotics and refer urgently if you can.
- Look up further treatment recommendations in the PNG Standard Treatment Book for Children, and the WHO Pocketbook of Hospital Care for Children.

Tuberculosis

Tuberculosis consistently makes up around 7% of all admissions (this year 7.9%), **Error! R eference source not found.**. In the 20 hospitals in 2024 there were 2664 children admitted with a diagnosis of tuberculosis, and 214 deaths and a case fatality rate of 8%. (Figure 7).

Year	Cases of TB	Total paediatric admissions	TB cases as a percentage 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%
2023	2574	32,741	7.8%
2024	2664	33,917	7.9%

Table 5. Cases of TB as a proportion of all admissions 2017-2024

The case fatality rates for paediatric pulmonary TB were 5.1% (78/1539), and extrapulmonary TB 11.7% (124/1062), Figure 7.

530 children were diagnosed and treated for central nervous system TB, which has the highest case fatality rate (96 deaths, 18.1%).

There were 59 cases of MDR TB reported, with 3 deaths in this group of high-risk children, which proves MDR-TB that it can be treated successfully if identified and the medications and other resources are available to treat.

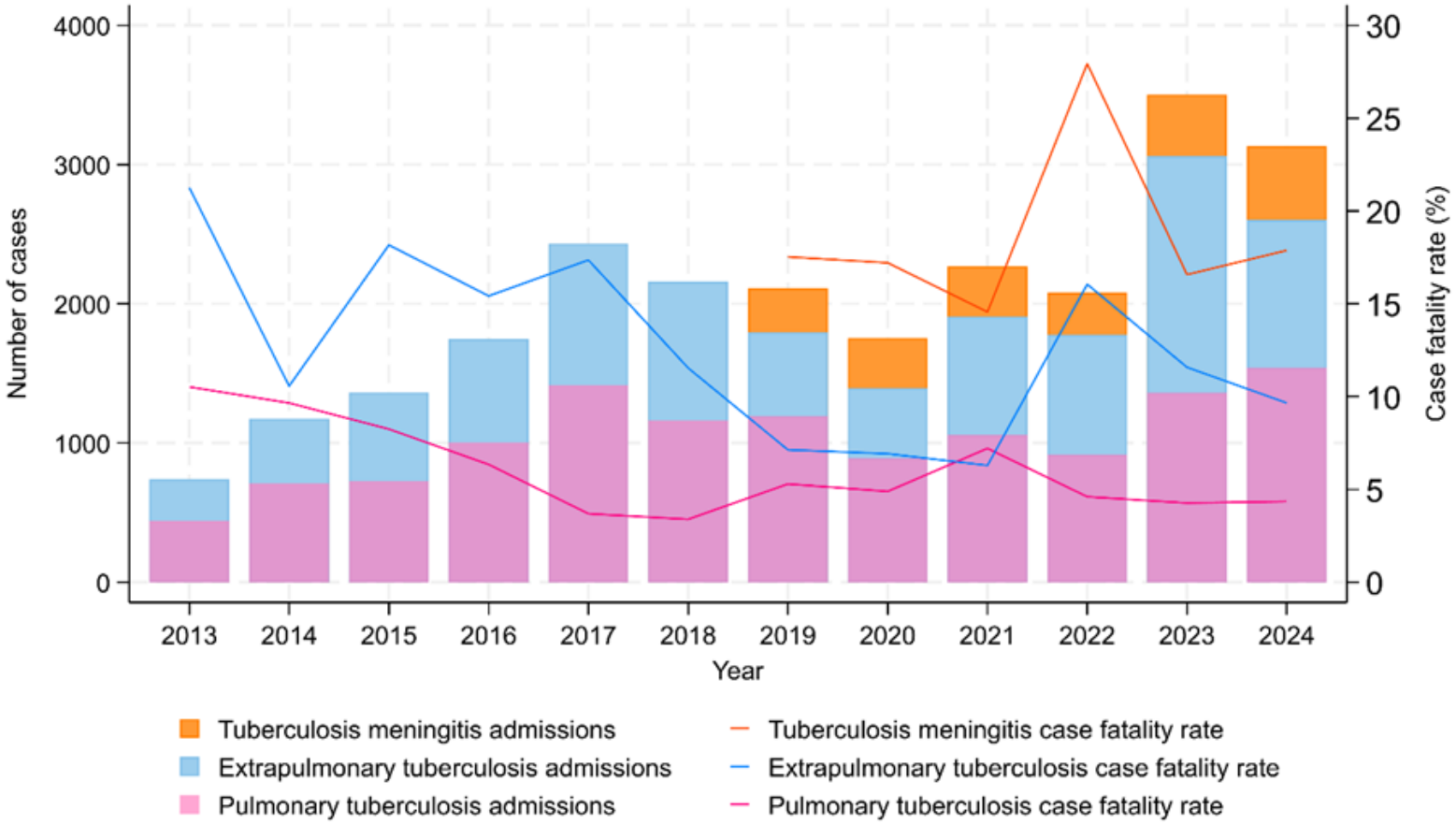

Figure 7. Pulmonary and extra-pulmonary tuberculosis admissions and case fatality rates 2013-2024

The numbers represented in this report are a 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 up to 2 months of hospitalisation to ensure adherence, adequate education of the family, and arrange 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 TB Preventative Therapy (TPT, see paediatric Standard Treatment Manual). If children have symptoms or signs 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 (AFB) staining of sputum 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 identify drug-resistant TB. GeneXpert is available in almost all provincial hospitals. However, a negative GeneXpert test does not mean a child does not have TB. The diagnosis of TB is based on the history of infectious contact, the clinical features, radiology, sputum or gastric aspirate for acid fast bacilli, and other tests, including 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 who are seriously ill with TB 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 400 children with HIV admitted to the hospitals, and 39 known HIV-related deaths (case fatality rate of 9.8%, Table 6). This is fewer HIV-related deaths than in previous years and may reflect earlier diagnosis and better treatment.

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
2023	455	76
2024	400	39

Table 6 Cases and deaths of paediatric HIV 2016-2024

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, and are not admitted to wards.

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), particularly Nevirapine. This led to poor treatment outcomes on NNRTI-based ART among infants and young children, which is now addressed by new treatments with Dolutegravir based therapy (see below).

Recommendations

- Early infant diagnosis (EID) of HIV with PCR testing is now available (including rapid point-of-care testing using GeneXpert in some hospitals). In Western Highlands Province EID with GeneXpert for HIV is being done successfully at birth, and this is helping identify babies who have HIV before they become sick.
- 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-related opportunistic infections.

- Effective therapy using Dolutegravir (DGV)-based therapy is available, and other recommended drugs Lopinavir (LPV)/ritonavir, Abacavir and Lamivudine are now also available. If these are not available in your province, contact the Chief Paediatrician.
- 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.
- 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.
- 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, endocrine problems, and cancer. 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 2024, 1402 patients with these chronic conditions were admitted to these 20 hospitals (Table 7), making up 4.1% of all admissions in children over 1 month of age, and 7.5% of all deaths. However most chronic disease management occurs in outpatients and in the community, so hospital inpatient data are an under-representation of the overall disease burden for children and adolescents.

Chronic condition	Admissions	Deaths
Congenital heart disease	657	84
Cerebral palsy / developmental disability	201	15
Epilepsy	156	3
Cancer	135	35
Asthma	133	1

Rheumatic heart disease	102	10
Diabetes and endocrine disorders	18	3
Total	1402	151 (10.8%)

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

Table 7. Common chronic diseases reported in 2024

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 and Dr Benjamin Daur, oncology paediatricians at Port Moresby General Hospital.

Rheumatic heart disease

From 2013 to 2024, admissions for rheumatic heart disease / acute rheumatic fever increased overall, peaking at 229 cases in 2022 (Table 8). Case fatality rates fluctuated, and in 2024 have declined to 9.8% from a 15% high in 2020.

Year	Rheumatic heart disease / acute rheumatic fever admissions	RHD / ARF Deaths	Case fatality rate (%)
2013	58	4	6.9
2014	48	3	6.3
2015	65	6	9.2
2016	77	7	9.0
2017	132	16	12.1
2018	92	6	6.5
2019	116	15	12.9
2020	140	21	15.0
2021	170	15	8.8
2022	229	23	10.0
2023	203	21	10.3
2024	**102**	**10**	**9.8**

Table 8. Paediatric rheumatic heart disease / acute rheumatic fever admissions and outcomes 2013 - 2024

Recommendations

Hospitals and health facilities to start using the ARF / RHD case reporting form, to feed into a national register of cases. The case reporting form can be downloaded at: https://pngpaediatricsociety.org/reports/disease-surveillance-case-reporting-forms/

Child protection

Data on child physical, sexual, and other forms of abuse are gathered by the PHR. There were 200 child protection cases and 22 deaths reported in 2024. These under-estimates the true burden of child abuse, maltreatment, and neglect, as many children do not present to hospitals.

There are other conditions that children present with that represent child protection issues: social issues are also a frequent root cause of malnutrition, and a proportion of children with severe malnutrition have also been subject to neglect.

In many families where a child has been abused or neglected, there will also be gender-based violence against the mother.

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.

For resources on Child protection see: https://pngpaediatricsociety.org/treatment/, scroll down to **Child protection, maltreatment and gender-based violence.**

Vaccine preventable diseases

In 2024, there were 58 cases of whooping cough, 20 cases of acute flaccid paralysis (AFP), 14 cases of tetanus. There were 2 cases of suspected measles and 0 cases of rubella reported in 2024 (Figure 8).

Measles is affecting many countries in Asia and the Western Pacific region, including Cambodia, Laos, Mongolia, Malaysia, the Philippines, and Viet Nam. Measles vaccination coverage in PNG is far too low, and despite few reported cases in 2024 it is inevitable that there will be another measles epidemic in the next few years, unless measures are taken to improve coverage.

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 must go to communities to immunise them. Routine and outreach immunisation programs are a high priority.

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.

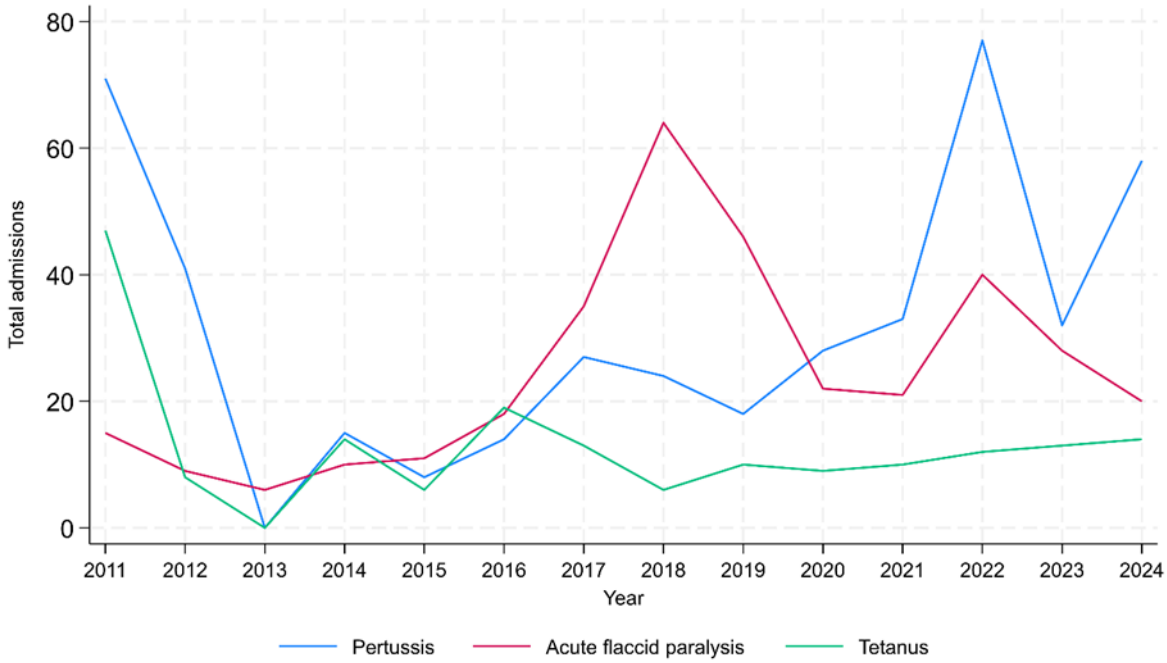

Figure 8. Cases of vaccine preventable diseases reported in 2011-2024: pertussis, AFP and tetanus

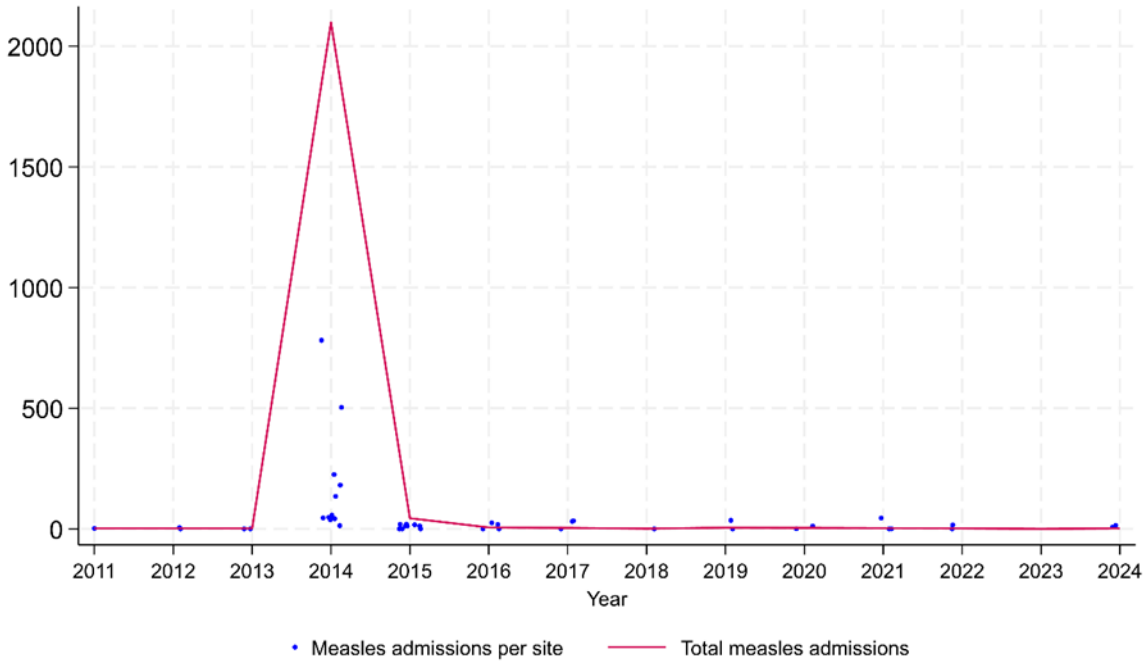

Figure 9. Measles cases 2011-2024

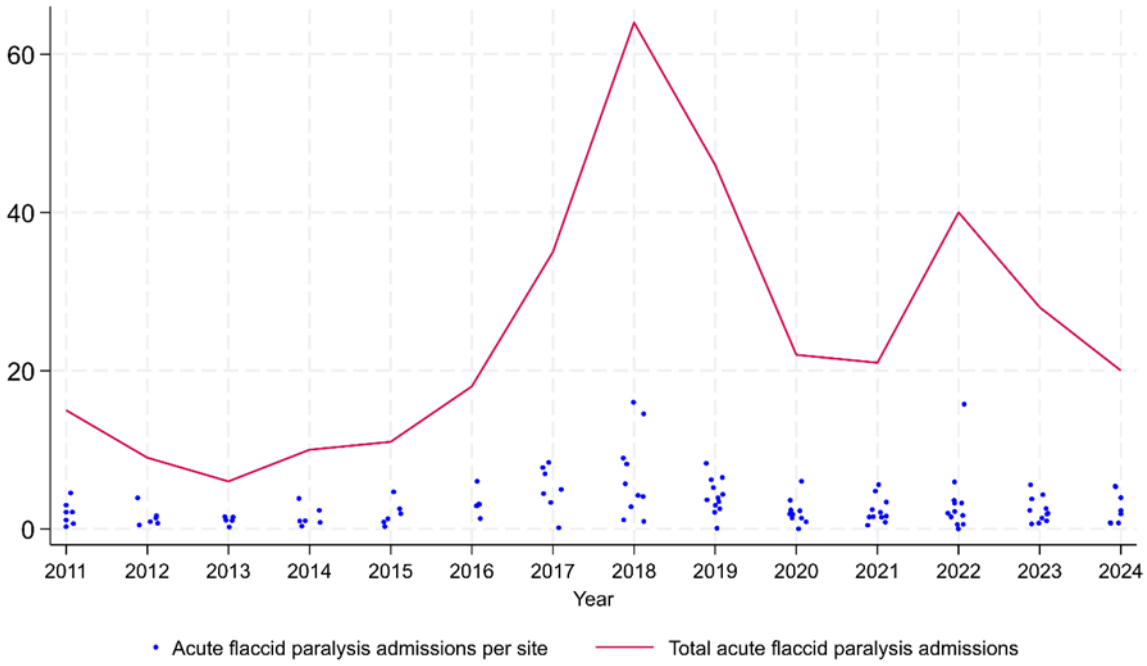

Figure 10. Acute flaccid paralysis cases 2011-2024

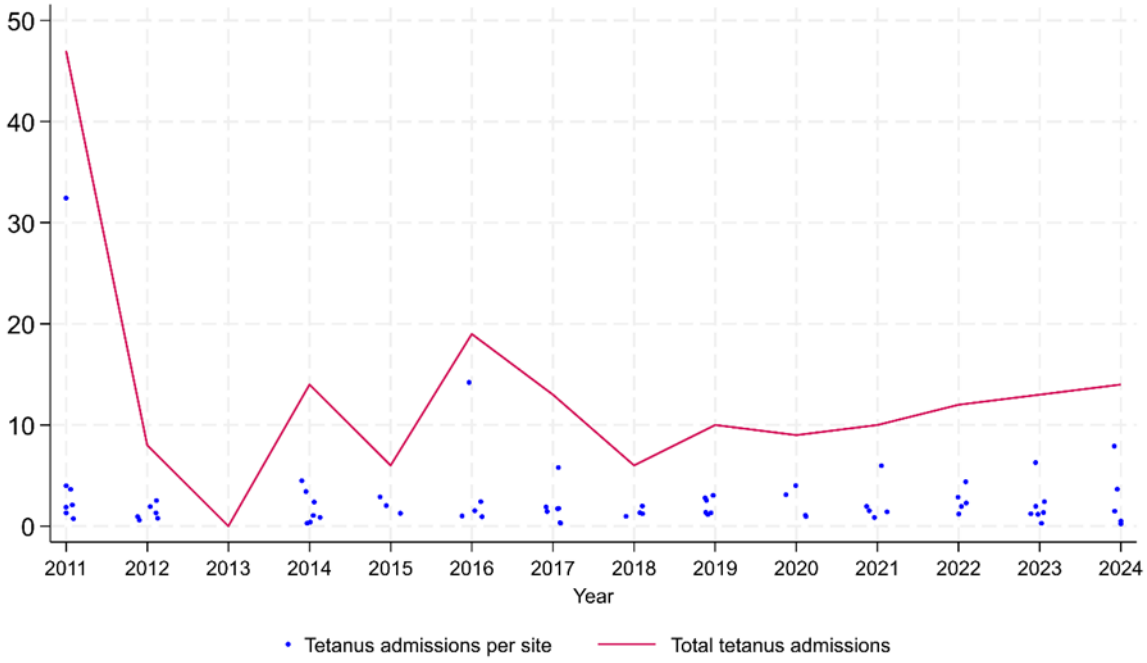

Figure 11. Tetanus cases 2011-2024

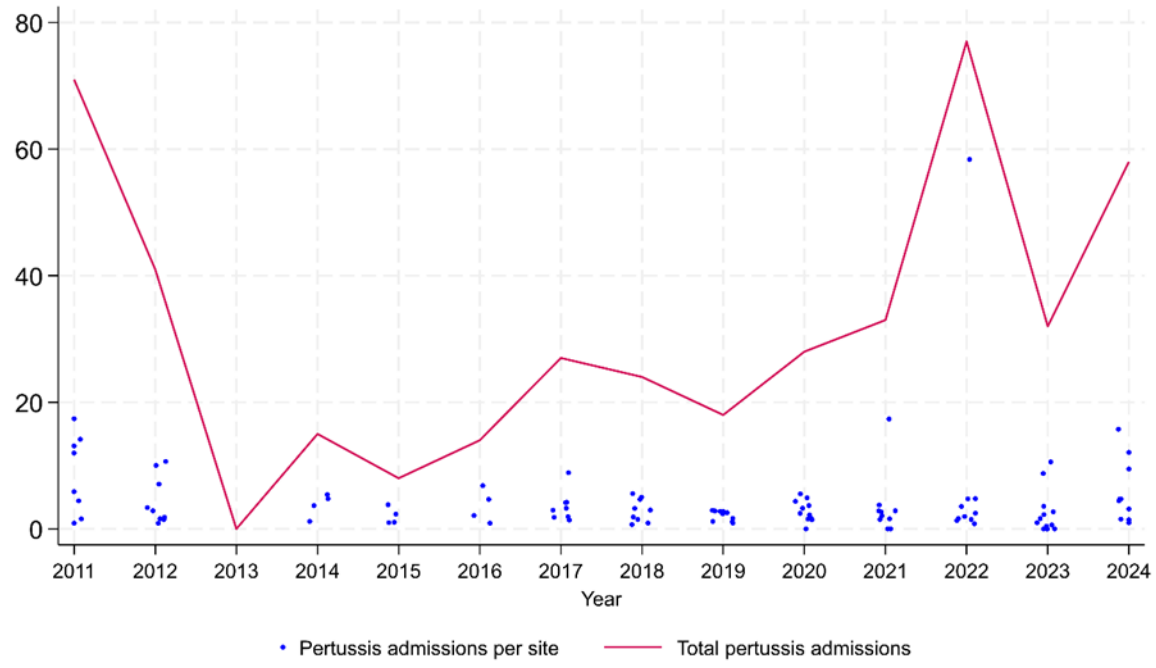

Figure 12. Pertussis (whooping cough) cases 2011-2024

Neonatal care and newborn health

Neonatal admissions made up 15,069 (44%) of all 33,917 paediatric admissions to the 20 hospitals in 2024.

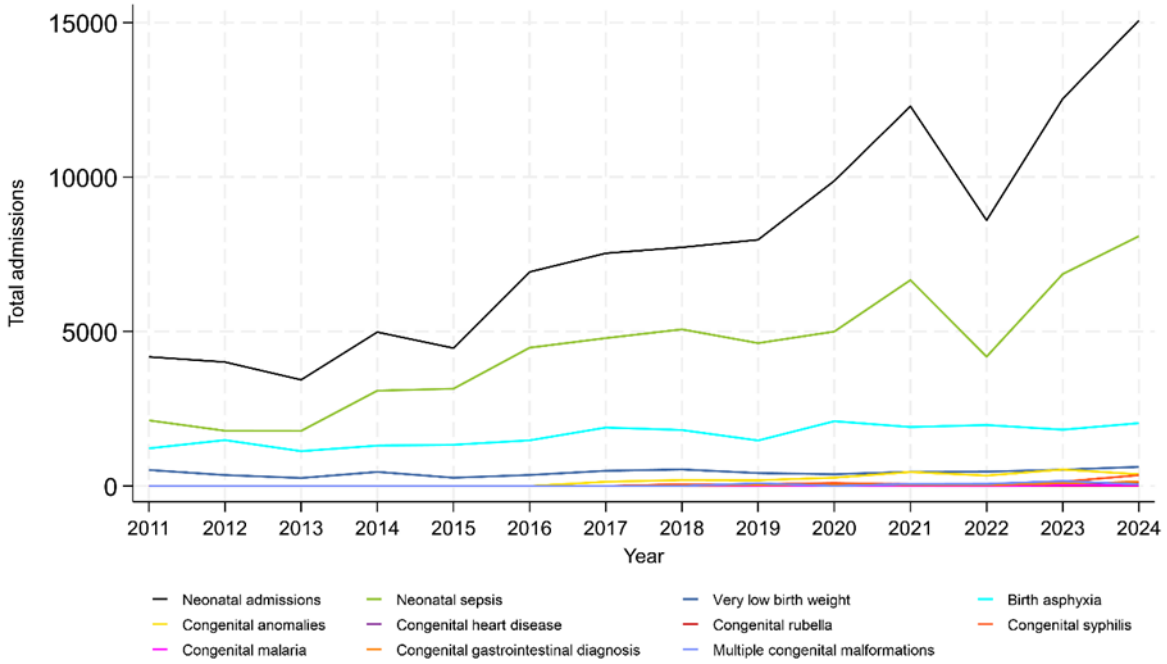

Figure 13. Common neonatal diagnoses 2011-2024

Each year the number of neonates in special care nurseries and neonatal units increases, this year neonatal admissions made up 44% of all paediatric admissions.

There were 1132 neonatal deaths reported (mortality rate 7.5%): (Table 9, Figure 14).

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
2023	12,537	1160	9.25
2024	15,069	1132	7.51

Table 9. Neonatal admissions and deaths 2015-2024

The major causes of neonatal deaths are infection, birth asphyxia, and very low birth weight.

There are many possible reasons for high newborn mortality: out-of-hospital deliveries, delays in accessing obstetric care, parents not bringing their newborns to be assessed until they were very unwell, overcrowding of special care nurseries, unavailable newborn care equipment, and insufficient beds and other resources to admit the number of unwell neonates.

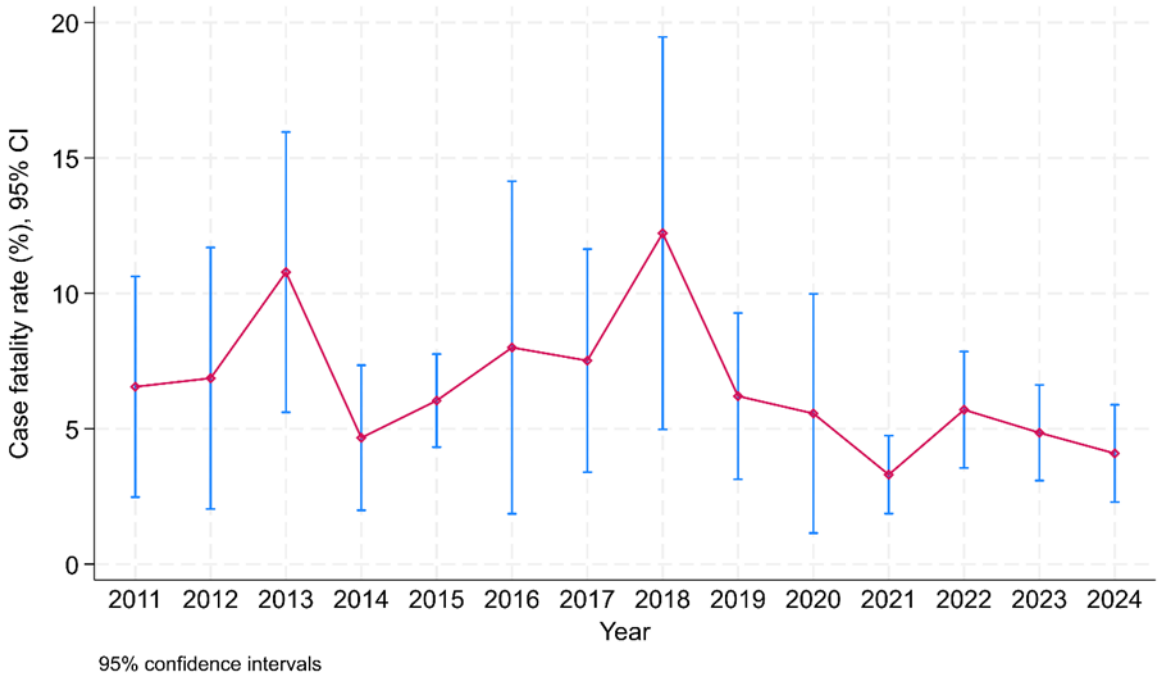

Figure 14. Overall neonatal mortality rates in Special Care Nurseries 2011-2024

Neonatal infections

In 2024, 54% (8088 of 15,069 neonatal admissions) were associated with infections, and there were 348 deaths from neonatal infections (CFR 4.3%). These proportions have been consistent for several years.

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.

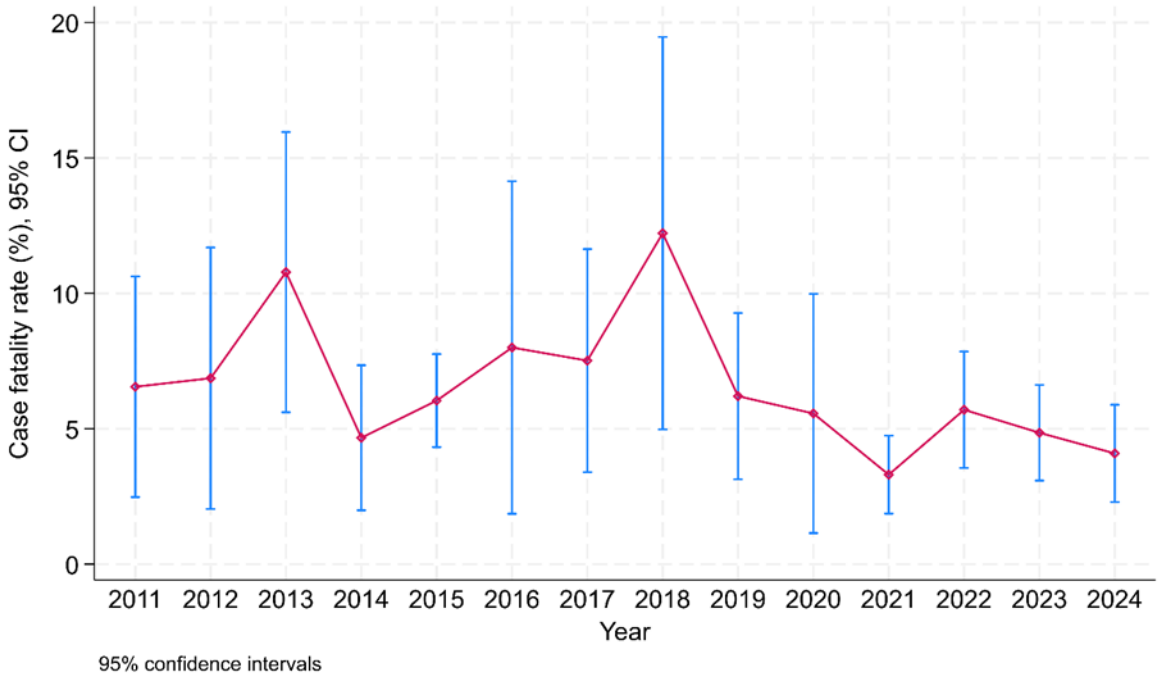

Figure 15. Neonatal infection case fatality rates in Special Care Nurseries 2011-2024

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 2024 there were 2035 cases of birth asphyxia, and 354 deaths, with a CFR of 17.4, unchanged from 2023 (Figure 16 and Table 10). 31% of neonatal deaths were due to perinatal asphyxia or associated with it.

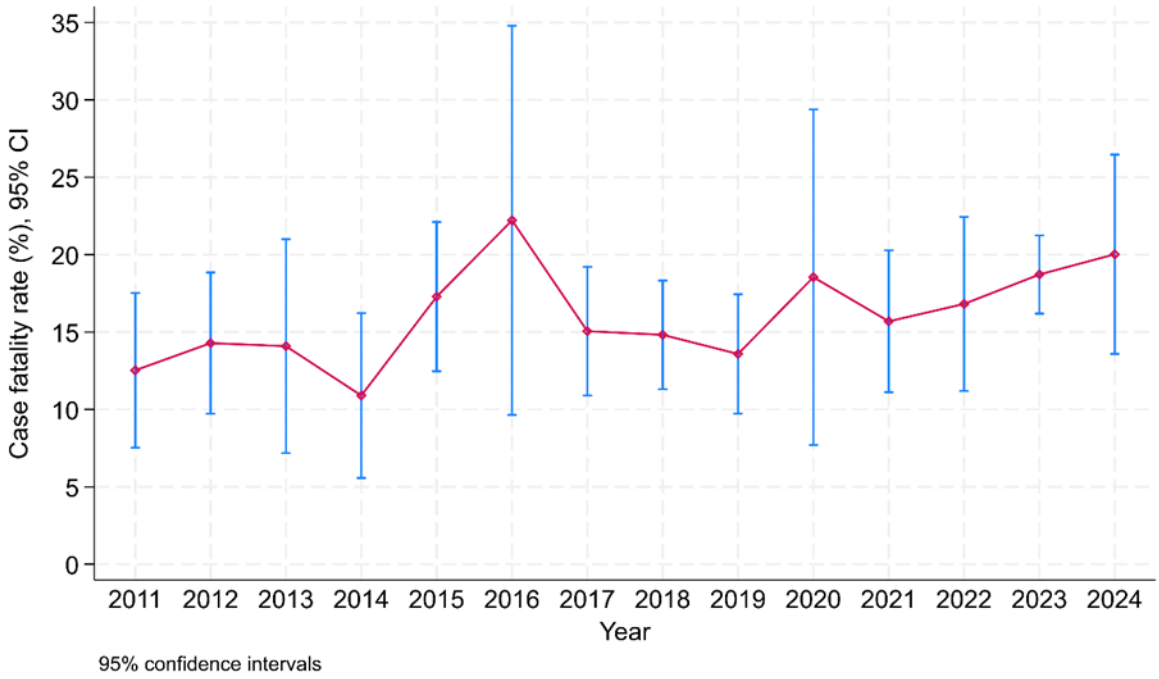

Figure 16. Case fatality rates for newborns with birth asphyxia 2011-2024

Year	Birth asphyxia cases	Birth asphyxia as a percentage of all newborn SCN 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%
2023	1822	14.5%	311 (26.8%)	17.1%
2024	2035	13.5%	354 (31.3%)	17.4%

Table 10. Birth asphyxia cases as a proportion of all newborn admissions and deaths 2015-2024

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.

Birth asphyxia can be reduced 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 reduce the number of babies with birth asphyxia.

Very low birth weight

Very low birth weight (VLBW) is a birth weight between 1000 and 1499g. In 2024, there were 619 VLBW admissions in the 20 hospitals. Of those VLBW newborns, 220, or 36% died, which is unchanged on recent years (Table 11 and Figure 17).

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%
2023	527	186	35.3%
2024	619	220	35.5%

Table 11. Very low birth weight cases and deaths 2015-2024

Although two-thirds of these VLBW babies survive to hospital discharge, the survivors remain very vulnerable, and many become ill, malnourished or die after discharge. They are especially at risk if they are too small when they leave hospital. It is not generally safe to discharge VLBW babies until they reach at least 1.8kg. These babies need close follow-up and care in the first year of life.

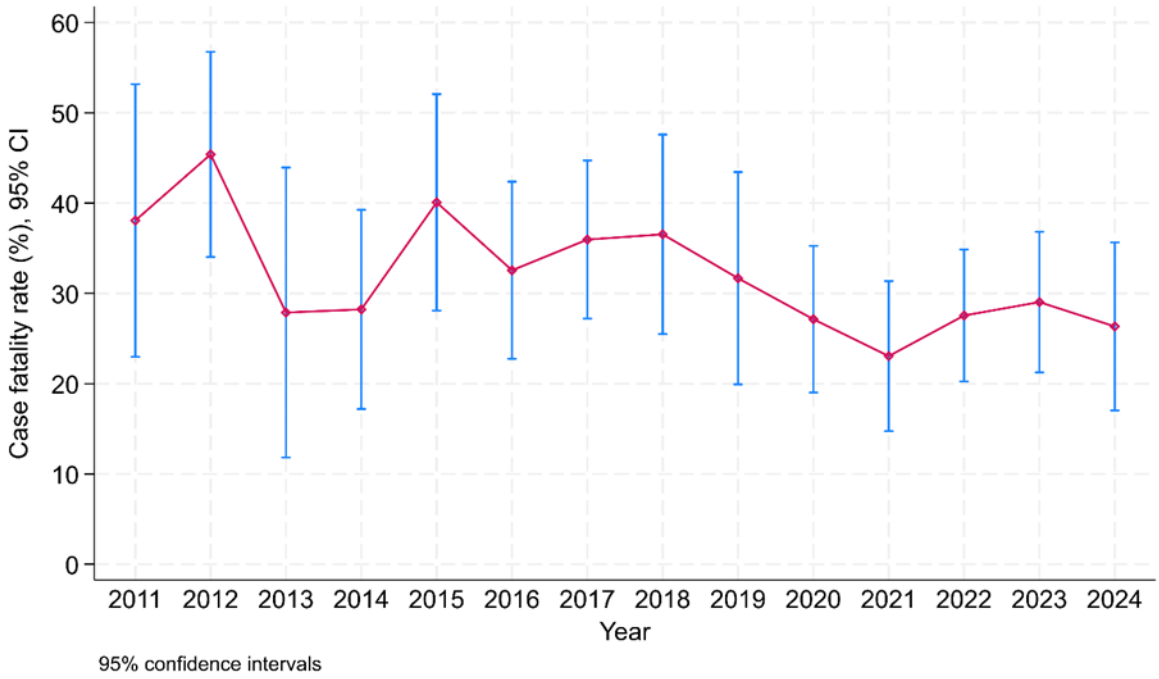

Figure 17. Case fatality rates for very low birthweight newborns 2011-2024

In addition, there were 3471 babies admitted with **low birth weight** (1500-2500g), and 291 deaths, with a case fatality rate of 8.4%. Again, these babies are highly vulnerable in infancy and throughout childhood, especially to malnutrition and infections.

Congenital anomalies

In 2024, 379 newborns were reported to have congenital malformations, of whom 87 died (case fatality rate 23%). These are shown in Table 12. Gastrointestinal malformations include ano-rectal malformations (anal atresia), other bowel atresia, Hirschsprung disease, congenital diaphragmatic hernia, and trachea-oesophageal fistula. "Multiple congenital anomalies" include chromosomal abnormalities, and birth defects caused by teratogens (such as foetal alcohol syndrome, and neural tube defects caused by maternal folic acid deficiency).

Type of congenital anomaly	Admissions	Deaths	CFR (%)
Gastrointestinal anomalies	133	44	33.1
Congenital heart disease in newborn	103	25	24.3
Multiple congenital anomalies	56	12	21.4
Microcephaly	14	4	28.6
Other congenital malformations	73	2	2.7
Total congenital malformations	**379**	**87**	**23.0**

Table 12. Congenital malformations 2024

Congenital or intrauterine infections

There were 350 cases of newborns exposed to syphilis who were unwell enough to be admitted to the special care nursery. Not all had signs of congenital syphilis, most were born to mothers who tested VDRL (venereal disease research laboratory) or TPHA (Treponema Pallidum Haemaglutination assay) positive. There were 11 deaths among these babies whose mothers were VDRL positive.

There were 22 cases of congenital malaria (1 death), and 4 cases of congenital rubella identified in 2024.

These are a fraction of the congenital infections that occur. Others of course include vertical (parent to newborn) transmission of HIV, and vertical transmission of hepatitis B. The transmission of hepatitis B from parent to newborn is why the birth dose of hepatitis B vaccine is vital in protecting newborns from becoming chronic carriers of the infection. Also, congenital cytomegalovirus is likely to be very common but currently cannot be tested for in hospitals in PNG.

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, 5-10% of newborns do not breathe immediately after birth and require some assistance or resuscitation.

Bag and mask resuscitation for babies who are not breathing within the first minute of life 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 pulse oximetry is recommended. In very low birth weight babies, keep SpO_2 90-95%, but do not give oxygen to make the SpO_2 higher than 95%, as it can cause eye damage (retinopathy of prematurity: ROP).
- 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.
- Organisation of the SCN 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

Quality of care assessments

In 2024-25, The Paediatric Society and the National Department of Health carried out quality of paediatric care assessments. This was a detailed assessment done by paediatricians and senior nurses in their own hospitals. 11 hospitals completed these assessments.

Some of the summarised results are below:

- Child / adolescent population per paediatric bed: 7700 (interquartile range 3800-15,200)
- **Nurse: patient ratio day: one nurse per 9 (5-15) patients**
- **Nurse: patient ratio night: one nurse per 13 (10-20) patients**
- One paediatrician per 153,000 (94,000-231,000) children and adolescents in the population

Resources and average staff per hospital

- Paediatric beds: 21 (interquartile range 18-40)
- Paediatric nurses: 5 (4-10)
- General nurses: 12 (6-15)
- CHWs: 13 (8-19)
- HEOs: 2 (1-3)
- Total RMOs: 1 (0-2)

Facilities for caring for children

- Clean facilities 7 (4 not adequately clean, and many wards in great need of repair)
- Adequate lighting 6 (5 wards had inadequate lighting)
- Adequate ventilation 5 (6 wards had inadequate ventilation)
- Three meals per day for patients 3 (8 not providing adequate nutrition)
- Green spaces 3 (8 without child friendly spaces)
- No wards had adolescent beds, or a space for adolescents, or adequate privacy

As part of the assessments, the paediatric teams were asked to nominate 5 key priorities for the next 1-2 years. The following are the priorities identified by multiple hospitals.

Priorities identified by hospitals for the next 1-2 years
Improving ward infrastructure and buildings in children's ward and special care nursery
Medical equipment for emergencies and HDU / PICU and essential drugs
Greater health workforce – paediatricians, paediatric nurses, ICU trained staff
Training - WHO Pocketbook of Hospital Care for Children, and EENC
Supervisory visits and outreach in rural areas
Need for development of adolescent services
Need for a dedicated nutrition unit
Laboratory services improvements – microbiology
Improving specialist services, cardiac, chronic disease
Child protection services

Summary

This Annual Report and the Paediatric Hospital Reporting System in 2024 has highlighted progress in several areas, but also some areas where the outcomes have not improved much over recent 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

Appendix Table 1 Severe pneumonia

Hospital	Admissions	Deaths	Case fatality rate
Alotau	20	2	10.00
Angau	387	25	6.46
Buka			
Chuave			
Daru	12	6	50.00
Gembogl			
Gerehu	60	2	3.33
Goroka	338	18	5.33
Kainantu			
Gumine			
Kavieng	9	4	44.44
Kimbe	28	5	17.86
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	0	0	0.00
Mendi	73	5	6.85
Mingendi			
Modilon	104	6	5.77
Mt Hagen	658	113	17.17
Nonga	58	5	8.62
Popendetta	119	3	2.52
PMGH	233	33	14.16
Rumginae	9	0	0.00
Tari	258	14	5.43
Vanimo	55	3	5.45
Wabag	123	9	7.32
Wewak	33	6	18.18
Yagum HC	28	0	0.00
Yampu			
TOTAL	2605	259	9.94

Appendix Table 2 Diarrhoea

Hospital	Admissions	Deaths	Case fatality rate
Alotau	52	2	3.85
Angau	279	18	6.45
Buka			
Chuave			
Daru	38	1	2.63
Gembogl			
Gerehu	120	5	4.17
Goroka	219	14	6.39
Kainantu			
Gumine			
Kavieng	47	3	6.38
Kimbe	83	2	2.41
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	9	0	0.00
Mendi	179	6	3.35
Mingendi			
Modilon	145	8	5.52
Mt Hagen	1051	5	0.48
Nonga	75	6	8.00
Popendetta	46	8	17.39
PMGH	587	17	2.90
Rumginae	7	0	0.00
Tari	227	13	5.73
Vanimo	22	3	13.64
Wabag	100	15	15.00
Wewak	34	1	0.00
Yagum HC	33	0	0.00
Yampu			
TOTAL	3353	127	3.79

Appendix Table 3 Malaria

Hospital	Admissions	Deaths	Case fatality rate
Alotau	18	0	0.00
Angau	125	4	3.20
Buka			
Chuave			
Daru	9	0	0.00
Gembogl			
Gerehu	8	0	0.00
Goroka	19	0	0.00
Kainantu			
Gumine			
Kavieng	43	0	0.00
Kimbe	101	7	6.93
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	10	0	0.00
Mendi	4	0	0.00
Mingendi			
Modilon	328	7	2.13
Mt Hagen	16	0	0.00
Nonga	26	2	7.69
Popendetta	41	3	7.32
PMGH	84	0	0.00
Rumginae	3	0	0.00
Tari	4	0	0.00
Vanimo	29	1	3.45
Wabag	3	0	0.00
Wewak	59	5	8.47
Yagum HC	76	0	0.00
Yampu			
TOTAL	1006	29	2.88

Appendix Table 4 Severe malnutrition

Hospital	Admissions	Deaths	Case fatality rate
Alotau	67	8	11.94
Angau	320	42	13.13
Buka			
Chuave			
Daru	77	14	18.18
Gembogl			
Gerehu	141	5	3.55
Goroka	298	34	11.41
Kainantu			
Gumine			
Kavieng	31	4	12.90
Kimbe	188	10	5.32
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	21	4	19.05
Mendi	126	9	7.14
Mingendi			
Modilon	317	28	8.83
Mt Hagen	433	33	7.62
Nonga	98	7	7.14
Popendetta	128	15	11.72
PMGH	460	39	8.48
Rumginae	15	0	0.00
Tari	317	33	10.41
Vanimo	58	2	3.45
Wabag	101	20	19.80
Wewak	145	17	11.72
Yagum HC	61	3	4.92
Yampu			
TOTAL	3402	327	9.61

Appendix Table 5 Anaemia

Hospital	Admissions	Deaths	Case fatality rate
Alotau	94	6	6.38
Angau	92	20	21.74
Buka			
Chuave			
Daru	55	3	5.45
Gembogl			
Gerehu	26	0	0.00
Goroka	87	15	17.24
Kainantu			
Gumine			
Kavieng	54	5	9.26
Kimbe	178	13	7.30
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	22	4	18.18
Mendi	112	12	10.71
Mingendi			
Modilon	410	26	6.34
Mt Hagen	526	54	10.27
Nonga	81	7	8.64
Popendetta	93	8	8.60
PMGH	501	60	11.98
Rumginae	6	0	0.00
Tari	37	2	5.41
Vanimo	64	3	4.69
Wabag	30	8	26.67
Wewak	414	30	7.25
Yagum HC	79	0	0.00
Yampu			
TOTAL	2961	276	9.32

Appendix Table 6 Meningitis

Hospital	Admissions	Deaths	Case fatality rate
Alotau	8	1	12.50
Angau	92	20	21.74
Buka			
Chuave			
Daru	11	6	54.55
Gembogl			
Gerehu	32	1	3.13
Goroka	115	20	17.39
Kainantu			
Gumine			
Kavieng	10	4	40.00
Kimbe	33	5	15.15
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	2	0	0.00
Mendi	5	5	100.00
Mingendi			
Modilon	120	7	5.83
Mt Hagen	314	24	7.64
Nonga	18	7	38.89
Popendetta	32	5	15.63
PMGH	231	17	7.36
Rumginae	2	0	0.00
Tari	53	3	5.66
Vanimo	13	2	15.38
Wabag	31	4	12.90
Wewak	16	1	6.25
Yagum HC	5	1	20.00
Yampu			
TOTAL	1114	133	11.94

Appendix Table 7 Sepsis and septic shock

Hospital	Admissions	Deaths	Case fatality rate
Alotau	1	1	100.00
Angau	83	53	63.86
Buka			
Chuave			
Daru	0	0	0.00
Gembogl			
Gerehu	19	4	21.05
Goroka	8	7	87.50
Kainantu			
Gumine			
Kavieng	4	2	50.00
Kimbe	21	11	52.38
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	2	0	0.00
Mendi	0	0	0.00
Mingendi			
Modilon	7	3	42.86
Mt Hagen	15	11	73.33
Nonga	22	7	31.82
Popendetta	1	0	0.00
PMGH	24	15	62.50
Rumginae	0	0	0.00
Tari	14	7	50.00
Vanimo	4	2	50.00
Wabag	0	0	0.00
Wewak	6	5	83.33
Yagum HC	4	0	0.00
Yampu			
TOTAL	235	128	54.47

Appendix Table 8 Tuberculosis

Hospital	Admissions	Deaths	Case fatality rate
Alotau	48	6	12.50
Angau	366	39	10.66
Buka			
Chuave			
Daru	31	4	12.90
Gembogl			
Gerehu	29	0	0.00
Goroka	138	16	11.59
Kainantu			
Gumine			
Kavieng	31	4	12.90
Kimbe	191	11	5.76
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	3	1	33.33
Mendi	197	14	7.11
Mingendi			
Modilon	271	16	5.90
Mt Hagen	205	19	9.27
Nonga	44	4	9.09
Popendetta	115	13	11.30
PMGH	518	21	4.05
Rumginae	3	0	0.00
Tari	133	7	5.26
Vanimo	32	7	21.88
Wabag	96	8	8.33
Wewak	204	24	11.76
Yagum HC	9	0	0.00
Yampu			
TOTAL	2664	214	8.03

Appendix Table 9 HIV

Hospital	Admissions	Deaths	Case fatality rate
Alotau	15	1	6.67
Angau	25	4	16.00
Buka			
Chuave			
Daru	2	0	0.00
Gembogl			
Gerehu	19	0	0.00
Goroka	64	4	6.25
Kainantu			
Gumine			
Kavieng	1	1	100.00
Kimbe	3	1	33.33
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	0	0	0.00
Mendi	13	3	23.08
Mingendi			
Modilon	25	5	20.00
Mt Hagen	40	4	10.00
Nonga	13	0	0.00
Popendetta	17	4	23.53
PMGH	101	6	5.94
Rumginae	0	0	0.00
Tari	15	1	0.00
Vanimo	1	0	0.00
Wabag	33	3	9.09
Wewak	13	2	15.38
Yagum HC	0	0	0.00
Yampu			
TOTAL	400	39	9.75

Appendix Table 10 Total neonatal admissions

Hospital	Admissions	Deaths	Case fatality rate
Alotau	35	0	0.00
Angau	1845	149	8.08
Buka			
Chuave			
Daru	184	5	2.72
Gembogl			
Gerehu	93	0	0.00
Goroka	671	139	20.72
Kainantu			
Gumine			
Kavieng	333	23	6.91
Kimbe	645	67	10.39
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	57	5	8.77
Mendi	506	42	8.30
Mingendi			
Modilon	989	84	8.49
Mt Hagen	1613	124	7.69
Nonga	386	43	11.14
Popendetta	190	17	8.95
PMGH	5749	302	5.25
Rumginae	16	0	0.00
Tari	482	37	7.68
Vanimo	272	18	6.62
Wabag	253	32	12.65
Wewak	650	43	6.62
Yagum HC	100	2	2.00
Yampu			
TOTAL	15069	1132	7.51

Appendix Table 11 Neonatal infections

Hospital	Admissions	Deaths	Case fatality rate
Alotau	18	0	0.00
Angau	1751	94	5.37
Buka			
Chuave			
Daru	100	0	0.00
Gembogl			
Gerehu	88	0	0.00
Goroka	238	39	16.39
Kainantu			
Gumine			
Kavieng	271	15	5.54
Kimbe	407	21	5.16
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	59	1	1.69
Mendi	414	21	5.07
Mingendi			
Modilon	631	15	2.38
Mt Hagen	777	25	3.22
Nonga	303	20	6.60
Popendetta	96	8	8.33
PMGH	1789	40	2.24
Rumginae	10	0	0.00
Tari	398	17	4.27
Vanimo	106	0	0.00
Wabag	161	19	11.80
Wewak	406	12	2.96
Yagum HC	65	1	1.54
Yampu			
TOTAL	8088	348	4.30

Appendix Table 12 Very low birth weight (1000-1499g)

Hospital	Admissions	Deaths	Case fatality rate
Alotau	1	0	0.00
Angau	66	37	56.06
Buka			
Chuave			
Daru	4	0	0.00
Gembogl			
Gerehu	0	0	0.00
Goroka	61	33	54.10
Kainantu			
Gumine			
Kavieng	12	7	58.33
Kimbe	21	13	61.90
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	5	0	0.00
Mendi	19	5	26.32
Mingendi			
Modilon	42	12	28.57
Mt Hagen	43	21	48.84
Nonga	26	10	38.46
Popendetta	7	2	28.57
PMGH	150	56	37.33
Rumginae	1	0	0.00
Tari	12	5	41.67
Vanimo	98	5	5.10
Wabag	15	4	26.67
Wewak	32	10	31.25
Yagum HC	4	0	0.00
Yampu			
TOTAL	619	220	35.54

Appendix Table 13 Perinatal asphyxia

Hospital	Admissions	Deaths	Case fatality rate
Alotau	3	0	0.00
Angau	96	69	71.88
Buka			
Chuave			
Daru	27	3	11.11
Gembogl			
Gerehu	0	0	0.00
Goroka	190	38	20.00
Kainantu			
Gumine			
Kavieng	32	3	9.38
Kimbe	134	15	11.19
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	16	1	6.25
Mendi	93	18	19.35
Mingendi			
Modilon	151	19	12.58
Mt Hagen	445	40	8.99
Nonga	94	20	21.28
Popendetta	25	5	20.00
PMGH	475	67	14.11
Rumginae	0	0	0.00
Tari	36	15	41.67
Vanimo	29	12	41.38
Wabag	74	11	14.86
Wewak	115	18	15.65
Yagum HC	0	0	0.00
Yampu			
TOTAL	2035	354	17.40

Appendix Table 14 Paediatric cancer

Hospital	Admissions	Deaths	Case fatality rate
Alotau	2	1	50.00
Angau	4	1	25.00
Buka			
Chuave			
Daru	2	2	100.00
Gembogl			
Gerehu	0	0	0.00
Goroka	27	5	18.52
Kainantu			
Gumine			
Kavieng	2	0	0.00
Kimbe	8	4	50.00
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	2	0	0.00
Mendi	10	3	30.00
Mingendi			
Modilon	3	1	33.33
Mt Hagen	20	10	50.00
Nonga	16	3	18.75
Popendetta	2	0	0.00
PMGH	22	4	18.18
Rumginae	1	0	0.00
Tari			
Vanimo	0	0	0.00
Wabag	4	0	0.00
Wewak	12	1	8.33
Yagum HC	0	0	0.00
Yampu			
TOTAL	137	35	25.55

Appendix Table 15 Acute rheumatic fever / Rheumatic heart disease

Hospital	Admissions	Deaths	Case fatality rate
Alotau	5	1	20.00
Angau	5	1	20.00
Buka			
Chuave			
Daru	5	1	20.00
Gembogl			
Gerehu	1	0	0.00
Goroka	4	1	0.00
Kainantu			
Gumine			
Kavieng	3	0	0.00
Kimbe	5	1	20.00
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	0	0	0.00
Mendi	11	1	9.09
Mingendi			
Modilon	8	0	0.00
Mt Hagen	18	1	5.56
Nonga	6	1	16.67
Popendetta	5	0	0.00
PMGH	20	2	10.00
Rumginae	0	0	0.00
Tari	2	0	0.00
Vanimo	1	0	0.00
Wabag	1	0	0.00
Wewak	2	0	0.00
Yagum HC	0	0	0.00
Yampu			
TOTAL	102	10	9.80

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

Hospital	Admissions	Deaths	Case fatality rate
Alotau	15	1	6.67
Angau	15	5	33.33
Buka			
Chuave			
Daru	4	1	25.00
Gembogl			
Gerehu	6	0	0.00
Goroka	110	10	9.09
Kainantu			
Gumine			
Kavieng	14	2	14.29
Kimbe	18	2	11.11
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	3	1	33.33
Mendi	69	0	0.00
Mingendi			
Modilon	35	3	8.57
Mt Hagen	84	13	15.48
Nonga	35	7	20.00
Popendetta	8	0	0.00
PMGH	44	6	13.64
Rumginae	0	0	
Tari	16	2	12.50
Vanimo	9	1	11.11
Wabag	57	2	3.51
Wewak	11	3	27.27
Yagum HC	1	0	0.00
Yampu			
TOTAL	554	59	10.65

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

Hospital	Admissions	Deaths	Case fatality rate
Alotau	2	1	50.00
Angau	7	4	57.14
Buka			
Chuave			
Daru	5	0	0.00
Gembogl			
Gerehu	0	0	0.00
Goroka	5	1	20.00
Kainantu			
Gumine			
Kavieng	2	0	0.00
Kimbe	1	0	0.00
Kerema			
Kerowagi			
Kompiam			
Kundiawa			
Kudjip			
Mabisanda			
Lorengau	0	0	0.00
Mendi	0	0	0.00
Mingendi			
Modilon	21	6	28.57
Mt Hagen	3	0	0.00
Nonga	32	2	6.25
Popendetta	4	1	25.00
PMGH	9	4	44.44
Rumginae	0	0	
Tari			
Vanimo	1	0	0.00
Wabag	0	0	0.00
Wewak	6	3	50.00
Yagum HC	102	0	0.00
Yampu			
TOTAL	200	22	11.00

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**																									