PNG Department of Health

Child Morbidity and Mortality

Annual Report 2015

Child Health Advisory Committee
PNG National Department of Health
PNG Paediatric Society

2015 Annual Report on Child Morbidity and Mortality

Summary

- This report covers data on child admissions and outcomes in 2015 from 14 provincial hospitals.
- In 2015 there were 16,278 admissions and 1247 deaths recorded (mortality rate 7.7%). There were 884 post-neonatal deaths and 363 neonatal deaths.
- Pneumonia was the most common reason for admission (21% of admissions)
- 25% of all admissions were in neonates.
- Although malnutrition is usually not the primary reason children present, severe malnutrition was present in 14% of admissions (2271 admissions), making it the third most common problem seen in hospitals. Malnutrition either directly caused or contributed to one third (33%) of all deaths.
- Diarrhoea (13% of admissions) was the fourth most common cause of admissions.
- Anaemia occurred in at least 7% of patients, and was present in 17% of deaths
- Neonatal deaths accounted for 30% of all deaths. The leading causes of death in neonates were: birth asphyxia (41% of neonatal deaths), neonatal infections (37% of neonatal deaths) and very low birth weight (24% of neonatal deaths).

Summary of major recommendations

In response to the findings of this report, the Child Health Advisory Committee of the National Department of Health has made a series of recommendations which are described in this Report:

1. Addressing unnecessary child deaths will depend to a large extent on reducing deaths from pneumonia and neonatal conditions, which together made up 51% of admissions and 50% of deaths in 2014.
2. Reducing cases of **severe pneumonia** requires both prevention and treatment. Prevention includes the use of the new pneumococcal conjugate vaccine (PCV), improving breast-feeding and the quality of complementary feeding, and reducing indoor air pollution. Education of mothers is needed on the signs of pneumonia so that parents recognise the signs of illness and seek care. Improved treatment in health centres and hospitals, including use of triage, and pulse oximetry for identification of the sickest children, giving appropriate antibiotics, and oxygen therapy to those with hypoxaemia. Treating co-morbidities including malnutrition and anaemia and identifying children who may have tuberculosis are also essential for reducing pneumonia deaths.
3. Reducing **neonatal deaths** 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* - typically around one to

three minutes from birth - reduces the risk of anaemia and 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, all newborns should have 4% chlorhexidine applied to the umbilical cord.

4. Better care for very low birth weight babies, 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, greater adherence to hand hygiene and other infection control practices, more careful use of IV fluids, audit and ward organisation.
5. Improving 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.
6. **Malnutrition** also needs both prevention and treatment. Prevention of malnutrition at the community level is the best way to avoid children dying from malnutrition. Identification and timely treatment of children with severe malnutrition is also essential and often poorly done in hospitals. Increased use of Mid Upper Arm Circumference (MUAC) measurement would improve identification of the children at highest risk of death. 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. Use of the new milk formulas F75 and F100 would improve the feeding of malnourished children who are not breast fed.
7. Children with **meningitis** have a high risk of death, and survivors are at risk of disabilities. Meningitis deaths can be prevented by the Hib vaccine (contained within the Pentavalent vaccine given at 1, 2 and 3 months), and the pneumococcal conjugate vaccine (PCV). Children presenting with meningitis need to be recognised and treated early, and monitored closely in a high dependency area of the ward. The common causes of meningitis are resistant to chloramphenicol so third-generation cephalosporins (such as ceftriaxone or cefotaxime) are the only effective antibiotic to treat meningitis.
8. **Tuberculosis** caused 12% of child deaths. Extra-pulmonary tuberculosis made up over 40% of children diagnosed with TB, and children with EPTB have a higher mortality. Every effort should be made to help children complete therapy. 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 follow-up.
9. There are more children with **chronic diseases**, including asthma, epilepsy, rheumatic and congenital heart diseases, cerebral palsy. Such children have many needs that are not being met, including the need for a long-term treatment plan, good follow-up, getting to school regularly and having schools

educated about their condition. Most children with chronic illness have to remain on some long-term medication, and the regular supply of this and help with taking the medicines on time is a challenge. Children with chronic illness have to understand their illness well, and children even as young as 4 or 5 years can start to understand their illness, and this will help them manage it 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.

10. **The National Child Health Plan** outlines a plan for improving child health until 2020. The Child Health Advisory Committee recommends that everyone involved in health care for children be familiar with this, and that Provincial and District Health officials use it to formulate their Annual Activity Plans. This plan can be downloaded at http://pngpaediatricsociety.org/png-child-health
11. **The PNG Standard Treatment Manual for Common Illnesses in Children** 10th Edition will be published in 2016. This should be available for all health workers to use when they are treating children.

2015 Annual Report on Child Morbidity and Mortality

Introduction

The Child Health Advisory Committee of the National Department of Health releases the fifth Annual Report on Child Morbidity and Mortality in Papua New Guinea. The Committee 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 all of 2015, with some comparisons throughout to data collected in the previous 6 years. The recommendations cover clinical and public health solutions that would result in many children's lives being saved in the coming years.

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 focus on 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.

Case fatality rates (CFR) vary: low reported overall CFR in some smaller hospitals, such as Daru (2%) and Kaviang (4%); 5.4% in Goroka Hospital; and up to 10.7% in Angau Hospital and 10.1% in Kimbe. Differences in CFR reflect many things: including case mix, severity of illness at the time of presentation, human and other resources available to manage seriously ill children, and disease outbreaks. In some hospitals it may also reflect missing data.

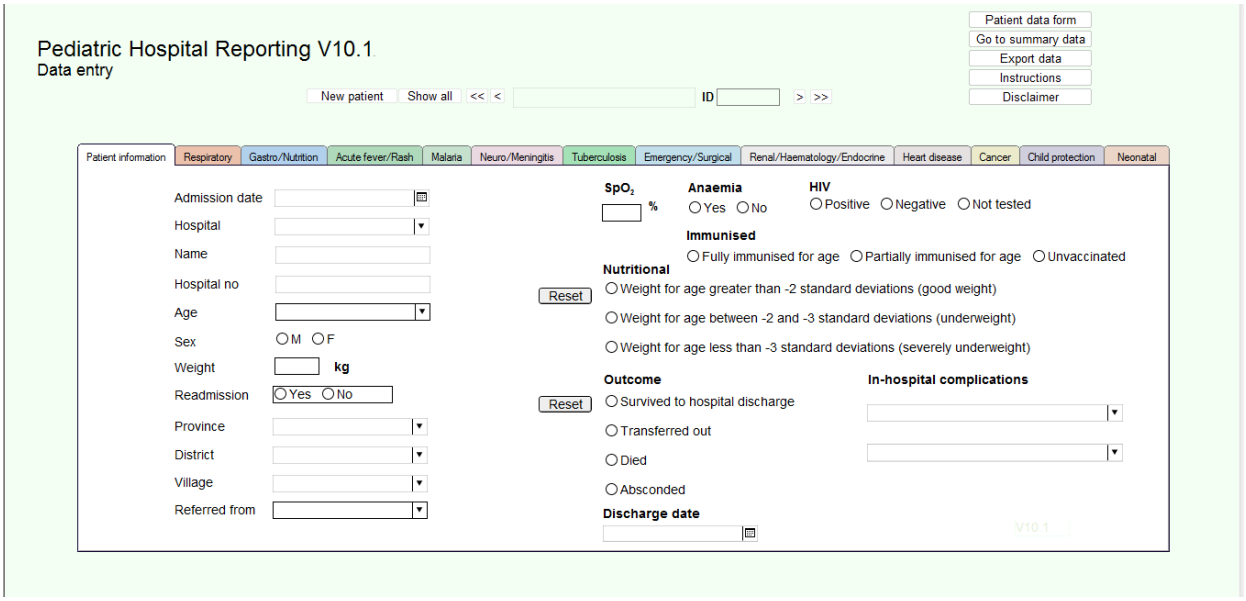
Hospital	Admissions	Deaths	Case fatality rate
Alotau			
Angau	1547	166	10.7
Buka	721	70	9.7
Daru	103	2	1.9
Goroka	2847	153	5.4
Kavieng	308	12	4.0
Kimbe	1153	107	9.3
Kerema			
Kundiawa	987	71	7.5
Manus			
Mendi			
Modilon	1478	142	9.6
Mt Hagen	2788	161	5.8
Nonga	1080	65	6.0
Oro	899	91	10.1
PMGH			
Vanimo	507	39	7.7
Wabag	818	73	8.9
Wewak	1042	95	9.1
Total	16278	1247	7.7

Table 1 summarises the admission, death and case fatality rates in the hospitals which submitted data in 2015.

Diagnoses	Admissions	Deaths	CFR 2015	CFR 2009-2014
All admissions	**16278**	**1247**	**7.66**	7.35
Pneumonia	3447	170	**4.93**	4.96
Severe pneumonia	1201	143	**11.90**	
Neonatal conditions	4464	394	**8.83**	10.76
Diarrhoea	1871	92	**4.92**	3.58
Malaria	852	44	**5.16**	4.42
Severe malnutrition	2271	428	**18.85**	18.22
Tuberculosis	1352	152	**11.24**	11.6
Meningitis	693	119	**17.17**	17.58
HIV	367	49	**13.3**	15.09

Table 2. Most common causes of hospital admission and case fatality rates in children for 2015, and comparative CFR for years 2009-2014

This year a new version of the PHR was introduced (V10.1), with some changes to improve the recording of chronic illnesses in children, and better recording of neonatal diagnoses.



The Paediatric Hospital Reporting program V10.1

Pneumonia

In 2015 there were 3447 admissions for pneumonia reported through the PHR. Pneumonia makes up 21% of admissions overall.

The overall pneumonia CFR was 4.9% (170 deaths from 3447 cases of pneumonia), comparable with the pneumonia case fatality rate for previous years.

The PHR system enables the calculation of mortality rates for both total cases of pneumonia overall and for cases of *severe* pneumonia. The overall case fatality rate for severe pneumonia was 11.9%.

Severe pneumonia case fatality rates, as they 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.

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 high dependency care and close monitoring
- 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 provide clinical care at all times
- senior supervision of nursing and medical practice

Chloramphenicol may be becoming less effective in the treatment of very severe pneumonia, and this may be one factor that explains the high case fatality rates in some hospitals. In the 2016 Standard Treatment Book, the recommended treatment for severe pneumonia is penicillin (or ampicillin) and gentamicin, or ceftriaxone for the seriously ill or deteriorating child with pneumonia.

The high numbers of deaths from pneumonia and meningitis (289 or 23% of all deaths) underline the importance of *Hemophilus influenzae* type b (Hib) vaccine, which was introduced in 2008, and the pneumococcal conjugate vaccine, which was introduced in 2014.

These vaccines are best solution to preventing deaths and disability from bacterial meningitis. There are other common causes of pneumonia, including viruses (particularly respiratory syncitial virus, influenza) and bacteria that are not prevented by these two vaccines (such as Group A streptococcus, *Staphylococcus aureus*, enteric gram negative bacilli, Chlamydia, Mycoplasma and tuberculosis). This means that even with these important vaccines, pneumonia will continue to be a major

cause of hospitalisation and death in children in PNG. Therefore improving clinical care and general preventative measures to reduce pneumonia are also essential.

The PNG Child Health Plan 2009-2020 outlines a comprehensive approach to pneumonia. This includes key areas to address:

Prevention

- Nutrition and breast feeding
- Helping parents be aware of the signs of pneumonia and the need for seeking care
- Reduction in indoor air pollution
- Hand-washing
- Vaccines: measles, Hib, pneumococcal

Treatment

- Improving quality of hospital and health centre care of pneumonia through IMCI, Standard Treatment Guidelines and Hospital Care for Children training
- Oxygen, pulse oximetry and CPAP
- Identification and treatment of comorbidities, including anaemia, malnutrition, and HIV.
- Infection control practices, particularly hand hygiene, and addressing rising rates of bacterial resistance and improving rational antibiotic prescribing
- Models of outpatient treatment for moderate pneumonia

Diarrhoea

1871 admissions and 92 deaths (CFR 4.9%) due to diarrhoea were reported in the 14 hospitals in 2015.

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.

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, and the appropriate use of antibiotics in bloody diarrhoea.

Most watery diarrhoea is due to viruses and does not require antibiotics, but require that children have access to ORS, zinc and breast feeding. 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 is ineffective and ciprofloxacin is needed to treat dysentery. Oral ciprofloxacin is currently recommended treatment by WHO for dysentery in a dose of 10-15mg/kg twice daily for 5 days. If children are too sick to take oral medications, give ceftriaxone intravenously (IV) or intramuscularly (IM).

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

Malaria

In 2015 malaria accounted for 852 admissions and 44 deaths (case fatality rate of 5.1%). The number of reported cases and deaths from malaria is falling each year.

PNG has changed malaria guidelines to:

- 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 new treatments. They are described in the Standard Treatment Book for Common Illnesses in Children, new edition published in 2016.

Malnutrition

The PHR records malnutrition as a co-morbidity or a main diagnosis, so even if it is not the primary diagnosis it is still recorded. In 2015 in the 14 hospitals that reported using the PHR, 2271 children were admitted with severe malnutrition (weight for age <3 SD below the median), or with severe wasting or kwashiorkor. This represented 14.0% of all admissions. Severe malnutrition in these 14 hospitals was associated with 428 deaths: 34% of all deaths, and the case fatality rate for severe malnutrition was 18.7%. Case fatality rate for malnutrition was more than 20% in 4 hospitals.

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).
- The main problems in the management of malnutrition are inadequate feeding (starting feeds to late, not enough milk feeds and not frequent enough feeds).
- Guidelines for the management of malnutrition should be in place and used. 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 early and provided with supplemental feeding
- Zinc and vitamin A should be available
- Staff should be trained in the management of malnutrition

The *prevention* of malnutrition must have the highest priority. This requires improved rates of breast feeding and complimentary (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 and the WHO Pocket Book of Hospital Care for Children. 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 14 hospitals meningitis accounted for 693 admissions, this is a reduction on the previous 5 years. There were 119 deaths, also a significant reduction on the previous 4 years. The case fatality rate for meningitis was 17.2%.

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 is a preventable tragedy.

The best method of preventing meningitis is the use of conjugate Hib and pneumococcal vaccines. Hib vaccine (in Pentavalent) was introduced in PNG in 2008. Too many cases of Hib meningitis are still being reported in 2015, suggesting that the vaccine is not yet reaching all children. Meningitis due to *S. pneumoniae*, one of the two commonest causes, can be prevented by the pneumococcal conjugate vaccine (PCV), which was introduced in 2014.

Most Hib and many pneumococci causing meningitis are resistant to chloramphenicol, so this is now no longer effective treatment for bacterial meningitis. If children receive chloramphenicol for meningitis, rates of death and brain injury will be very high.

Recommendations

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

Pentavalent contains the Hib vaccine and also protects against diphtheria (a throat infection), tetanus, pertussus (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. They should be treated with ceftriaxone 50mg/kg twice daily IV or IM for 10 days.

Acute complications can lead to high case fatality rates, and may be minimised by

- Nursing all children with meningitis in a high dependency unit
- Monitoring with pulse oximetry to detect hypoxaemia
- Monitoring the blood glucose and treatment of hypoglycaemia
- Close observation for convulsions
- Avoid use of too much IV fluids in children with meningitis, body and brain swelling can occur and this results in poor outcomes

Recommendations on identification and treatment of severe infections

It is very important that health workers recognise the signs of severe sepsis (severe pneumonia, meningitis, septicaemia), and know how to give emergency management.

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

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

- high fever
- fast breathing and respiratory distress
- Heart rate >160 with pulses that are difficult to feel
- cold skin of arms and legs
- low blood pressure
- prolonged poor capillary refill
- pallor
- lethargy or unconsciousness

There may be **localising signs suggesting meningitis**

- severe headache
- neck stiffness
- severe vomiting
- repeated convulsions
- bulging fontanelle

There may be **purpura** (red or black spots on the skin).

There may be **signs of Staph 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 or the oxygen saturation is <90%
- 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 Hartmanns, 20ml/kg, then reassess.
- Give appropriate IV or IM antibiotics: ceftriaxone, (plus flucloxacillin if signs of Staph infection are present)
- Monitor in a high dependency area in the ward or in the ICU. Monitor with pulse oximetry to detect hypoxaemia
- Check blood glucose. Give a bolus of glucose if the BSL is low
- Seek assistance from an experienced doctor
- Look up treatment recommendations in the PNG Standard Treatment Book for Children, and the WHO Pocketbook of Hospital Care for Children.

Neonatal admissions

Neonatal admissions made up 4464 (25%) of all 16,278 paediatric admissions to the 14 hospitals in 2015. There were 394 neonatal deaths reported, meaning that 31% of all deaths in children were in the neonatal period.

Neonatal infections

70% of all neonatal admissions were associated with infections (n=3085). 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. The case fatality rate for neonatal infections in the 14 hospitals was 5.9%, consistent with previous years.

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

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. There were 1334 hospital admissions due to birth asphyxia, and the CFR was 14.8%% (198 of 1334). 50% of neonatal deaths were due to or associated with perinatal asphyxia. Eight of 14 hospitals had more than 50 cases of birth asphyxia for the year – that's more than one per week. The largest hospitals (Goroka, Mt Hagen and Angau) had between 3 and 4 cases per week on average.

The developmental implications for many surviving children are significant: cerebral palsy, intellectual disability, blindness, and seizures are common. Prevention of perinatal asphyxia requires encouragement of delivery with a skilled midwife, identification of delays in labour, active management of labour and close communication between obstetric / midwifery services and paediatric services. Provision of immediate newborn care described below can also prevent some cases of asphyxia, as babies are stimulated to initiate breathing early by drying. Neonatal resuscitation training for nurses and doctors can also reduce the effects of birth asphyxia.

Very low birth weight

Very low birth weight is a birth weight between 1000 and 1499g. There were 267 very low birth weight admissions in the 14 hospitals. In 2015 37% of VLBW newborns died while in hospital.

	2015		
Diagnoses	**Admissions**	**Deaths**	**CFR**
All neonatal	4464	394	**8.8**
Neonatal sepsis	3149	185	**5.9**
Asphyxia	1334	198	**14.8**
VLBW (1000-1500g)	267	100	**37.5**

Table 3. The most common causes of neonatal admissions and deaths for 2015

Recommendations for improving neonatal care

Provision of early essential newborn care can have a big impact on reducing neonatal sepsis, birth asphyxia and other complications. All newborns need the following:

- ***Immediate and thorough drying*** stimulates breathing and prevents hypothermia which can threaten newborns with delayed foetal-to-newborn circulatory adjustment, acidosis, hyaline membrane disease, coagulation defects, infection, hypogycaemia 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*** 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 from birth, reduces the risk of anaemia and in preterm infants, intraventricular haemorrhages.
- ***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 a baby 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 will not breathe at birth. ***Bag and mask resuscitation*** for all babies who are not breathing at 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 least invasive and most natural as possible, and that babies spend as much time as possible with 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 clinical signs predicting hypoxaemia in neonates are relatively insensitive, 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, aminophyline 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. In neonates hypoglycaemia occurs because of 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. 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 should be started.
- 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, large volumes of enteral feeding in the first day or two of life is not well tolerated and may increase the risk of necrotising enterocolitis. The use of any 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 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 also helps 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.
- Auditing of practice. It is only by keeping accurate records of all admissions and outcomes that patterns of adverse events will become identified. Clinical audit is essential to reduce neonatal mortality.
- Training of nurses in early essential newborn care and neonatal high-dependency care

Tuberculosis

In the 14 hospitals in 2015 there were 1352 children admitted with tuberculosis, with 152 known deaths, and a case fatality rate of 11.2%. This may represent only a fraction 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. However these data underlines that in its severest forms TB cause many childhood deaths.

Extra-pulmonary tuberculosis (TB meningitis, lymph node TB, spinal TB, abdominal TB, miliary TB) makes up over 47% of children diagnosed with TB (636 reported cases). EPTB has a higher hospital mortality rate than PTB (16.8% compared with 8.1%), often reflecting the multi-system nature of many cases of EPTB which are treated as in-patients in hospitals.

The source of transmission of TB to a child is usually an adult family member who has sputum smear-positive pulmonary TB (PTB), although many adults who pass on TB to children will not know they are affected. Children who develop TB disease usually do so within a year after being infected. Children under the age of 3 are at much higher risk of developing TB disease if infected.

Malnutrition contributes substantially to high case fatality rates for children with PTB and EPTB.

Recommendations

Every effort should be made to help children complete 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 be 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 i.e. 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 xray 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 new GeneXpert test can help diagnose TB and multi-drug resistant TB. This is only 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 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 roving 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 2012 there were 367 new cases of HIV admitted to the 14 hospitals, and 49 known HIV-related deaths. This only represents cases that were reported in hospitals, based on admissions, 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.

Recommendations

- Mothers who are diagnosed with HIV during or after pregnancy are now treated with three anti-retroviral drugs for life, not just for shorter periods to prevent transmission to the baby. The ongoing care of the mother is paramount, and what is good for the mother is good for her children.
- Early infant diagnosis of HIV with PCR testing is now available. Children who have HIV confirmed by early infant diagnosis and start on ante-retroviral therapy (ART) before they become symptomatic have a much better chance of healthy life than children diagnosed in late stages because of AIDS-defining infections.
- All children diagnosed with HIV should see a paediatrician regularly, for starting on and follow-up of antiretroviral therapy.
- All children with HIV need prophylaxis with cotrimoxazole and INAH, treatment of intercurrent infections and good nutrition.
- **Teach children 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.**

Vaccine preventable diseases

The major outbreak of measles which affected thousands of children in 2014 diminished, and in 2015 the PHR recorded 44 cases and 2 deaths from measles. Another major outbreak of measles will only be avoided in the next few years if measles coverage is maintained at very high levels. This will be done with regular and reliable routine immunisation services, mobile outreach services, and 3-4 yearly supplemental immunisation activities.

There were 8 cases of whooping cough, 6 tetanus and 11 cases of acute flaccid paralysis in 2015.

Cases of suspected measles, acute flaccid paralysis, and tetanus are all reportable. Measles and AFP require laboratory investigation and confirmation.

There have been changes to immunization in 2015-16. The new schedule is in Table 4.

Immunization Schedule for Papua New Guinea (0 month-24 months)							
Immunization to be given at							
	Birth	**1 month**	**2 months**	**3 months**	**6 months**	**9 months**	**18 months**
BCG	√						
Hepatitis B	√						
OPV		√	√	√			
IPV				√			
Pentavalent		√	√	√			
PCV-13		√	√	√			
Measles-Rubella (MR)					√	√	√
Vitamin A					√	√	√

Table 4. PNG's new Immunization Schedule for children 0-24 months as of November 2015

No.	Vaccine	Age Group	Dose	Route	Disease Protects
1.	BCG	At Birth	0.05 ml (only one dose)	Intradermal	Tuberculosis
2.	OPV	Under 2 years old	2 drops (in 1 month, 2 months, 3 months)	Oral	Poliomyelitis
3.	Hepatitis B	At Birth	0.5 ml	Intramuscular	Hepatitis B
4.	IPV (inactivated Polio vaccine)	At 3 months	0.5 ml (one dose with 3rd dose of OPV	Intramuscular	Poliomyelitis
5.	Pentavalent	Under 2 years	0.5ml (3 doses in 1st ,2nd and 3rd months)	Intramuscular	Diphtheria, Whooping Cough, pneumonia and meningitis due to H. Influenzae, tetanus, Hepatitis B
6.	PCV-13 Pneumococcal Conjugate Vaccine)	Under 2 years	0.5ml (3 doses at 1st, 2nd and 3rd months)	Intramuscular	Pneumonia and meningitis due to Streptococcus pneumoniae
7	MR (Measles, Rubella)	Under 2 years	0.5ml (3 doses at 6,9 and 18 months)	Subcutaneous	Measles and Rubella
8	Tetanus Toxoid	Pregnant Mother, School Entry. School Leaving	0.5ml (2 doses in one month apart	Intramuscular	Tetanus
9.	Vitamin A	06 months - 2 years	3 doses (6 months, 9 months blue capsule 100,000 IU and 18 months Red capsules 200,000 IU)	Oral	Protects from night blindness

Table 5. The vaccines and diseases prevented

Chronic diseases in children

There are increasingly children with **chronic diseases**, including asthma, epilepsy, rheumatic (65 cases in 2015) and congenital heart diseases (113 cases in 2015), cerebral palsy, and cancer (95 cases).

Children with chronic diseases have many needs, including

- **a long-term treatment plan**
- **good follow-up by a trusted doctor or nurse**
- **going to school regularly and having schools informed about their condition**
- **regular supply of and adherence to medicines on time**
- **optimal nutrition**

Children with chronic illnesses have to 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.

In 2015 there were 95 reported cases of childhood cancer, likely an under-estimate of the total national number of cases, but it is a start of reporting on paediatric cancer.

Guidelines for the management of common cancers are available at www.pngpaediatricsociety.org (under Treatment Guidelines, Cancer Protocols)

Child protection

Data on child physical, sexual and other forms of abuse are now being collected by the PHR. There were 65 cases of child abuse reported in 2015, and 10 deaths. This is also an under-estimate of the burden of child abuse and maltreatment, but it is a start at systematic gathering of data on this problem. Social issues are also a frequent root causes of malnutrition and its disease risks.

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

Summary

The Paediatric Hospital Reporting System has highlighted problem areas in hospitals and the health system. Addressing these in a systematic way will lower the death rates from common diseases. The Child Health Advisory Committee asks that all health workers and hospital administrators play their part to address specific

problems, adopt the recommendations in this report, and see these results improve in the coming years.

Diagnoses	Deaths / Admissions 2009	Deaths / Admissions 2010	Deaths / Admissions 2011	Deaths / Admissions 2012	Deaths / Admissions 2013	Deaths / Admissions 2014	Deaths / Admissions 2015	Total Deaths / Admissions	Case fatality rate
All paediatric admissions	209 / 3456	646 / 10,897	1545 / 20,582	1660 / 20,546	1555 / 20543	1482 / 20,974	1247 / 16,278	8375 / 113,276	7.39
Pneumonia	24 / 836	140 / 2504	299 / 6330	272 / 5458	261 / 5200	294 / 5658	170 / 3447	1460 / 29433	4.96
Severe pneumonia	16 / 321	119 / 697	272 / 2322	238 / 2476	221 / 1909	224 / 1818	143 / 1201	1233 / 10744	11.48
Neonatal conditions	88 / 834	150 / 1596	480 / 4180	473 / 4012	406 / 3437	452 / 4981	394 / 4464	2443 / 23504	10.39
Diarrhoea	12 / 284	35 / 1277	52 / 2122	67 / 1975	120 / 2622	109 / 2739	92 / 1871	487 / 12890	3.78
Malaria	26 / 507	50 / 1814	60 / 1774	69 / 1263	70 / 1347	67 / 1033	44 / 852	386 / 8590	4.49
Severe malnutrition	61 / 344	157 / 739	287 / 1544	604 / 2590	524 / 3379	455 / 2861	438 / 2338	2526 / 13795	18.31
Tuberculosis	16 / 164	58 / 514	145 / 1375	199 / 1510	241 / 2190	179 / 1470	152 / 1352	990 / 8575	11.55
Meningitis	42 / 271	92 / 417	230 / 1305	279 / 1452	219 / 1374	149 / 933	119 / 693	1130 / 6445	17.53
HIV	3 / 20	13 / 54	37 / 195	57 / 470	61 / 378	77 / 527	49 / 367	297 / 2011	14.77
Anaemia *					155 / 1015	253 / 1455	274 / 1953	682 / 4423	15.42
Rheumatic heart disease *					4 / 58	3 / 48	6 / 65	13 / 171	7.60
Congenital heart disease *					10 / 24	21 / 59	21 / 113	52 / 196	26.53
Measles	0 / 1	0 / 0	0 / 2	1 / 2	1 / 2	60 / 2098	2 / 44	64 / 2149	2.98
Cancer *					18 / 47	21 / 77	28 / 95	67 / 219	30.59
Tetanus	0 / 2	1 / 6	0 / 47	0 / 8	0 / 0	2 / 14	2 / 6	5 / 83	6.02
Acute flaccid paralysis	0 / 6	0 / 7	0 / 15	0 / 9	1 / 6	1 / 10	0 / 11	2 / 64	3.13
Whooping cough	0 / 15	0 / 16	0 / 3	0 / 41	0 / 0	1 / 15	0 / 8	1 / 98	1.02
Child protection *					0 / 7	3 / 35	10 / 65	13 / 107	12.15

Table 2: Admissions, deaths and case fatality rates for common diagnoses 2009-2015

* Diagnoses that were introduced in later versions of the PHR as annually reported, some hospitals were still using older versions, so data reporting are incomplete, even in 2013-14.

Pneumonia admissions and outcomes in 2015

Hospital	Pneumonia admissions 2015	Pneumonia deaths 2015	Pneumonia CFR 2015		Severe pneumonia admissions 2015	Severe pneumonia deaths 2015	Severe pneumonia CFR 2015
Alotau							
Angau	233	19	8.2		108	16	14.8
Buka	169	13	7.7		74	13	17.6
Daru	4	1	25.0		4	1	25.0
Goroka	701	20	2.9		250	20	8.0
Kavieng	24	0	0.0		1	0	0.0
Kimbe	164	21	12.8		58	20	34.5
Kerema							
Kundiawa	170	8	5.9		125	8	8.3
Manus							
Mendi							
Modilon	232	9	3.9		64	7	10.9
Mt Hagen	927	29	3.1		219	17	7.8
Nonga	167	10	6.0		33	8	24.2
Oro	269	23	8.6		112	18	16.1
PMGH							
Vanimo	45	3	6.7		12	3	25.0
Wabag	253	12	4.7		71	10	14.1
Wewak	89	2	2.2		70	2	2.9
Total	3447	170	4.9		1201	143	11.9

Diarrhoea admissions and outcomes in 2014

Hospital	Diarrhoea admissions 2015	Diarrhoea deaths 2015	Diarrhoea CFR 2015
Alotau			
Angau	159	7	4.4
Buka	81	3	3.7
Daru	2	0	0.0
Goroka	421	7	1.7
Kavieng	0	0	0.0
Kimbe	91	5	5.5
Kerema			
Kundiawa	183	8	4.1
Manus			
Mendi			
Modilon	126	8	6.3
Mt Hagen	490	24	4.9
Nonga	128	11	8.6
Oro	62	11	17.7
PMGH			
Vanimo	29	1	3.4
Wabag	54	5	9.3
Wewak	45	2	4.4
Total	1871	92	4.9

Malaria admissions and outcomes in 2014

Hospital	Malaria admissions 2015	Malaria Deaths 2015	Malaria CFR 2015
Alotau			
Angau	134	6	4.5
Buka	16	0	0.0
Daru	2	0	0.0
Goroka	40	4	10.0
Kavieng	22	1	4.5
Kimbe	135	9	6.7
Kerema			
Kundiawa	4	0	0.0
Manus			
Mendi			
Modilon	160	6	3.8
Mt Hagen	66	8	12.1
Nonga	46	1	2.2
Oro	57	4	7.0
PMGH			
Vanimo	64	1	1.6
Wabag	1	0	0.0
Wewak	105	4	3.8
Total	852	44	5.1

Severe malnutrition admissions and outcomes in 2014

Hospital	Severe malnutrition admission 2015	Severe malnutrition deaths 2015	Malnutrition CFR 2015
Alotau			
Angau	270	71	26.3
Buka	115	13	11.3
Daru	0	0	0.0
Goroka	405	65	16.0
Kavieng	6	0	0.0
Kimbe	151	34	22.5
Kerema			
Kundiawa	173	31	17.9
Manus			
Mendi			
Modilon	225	28	12.4
Mt Hagen	352	70	19.9
Nonga	150	27	18.0
Oro	189	40	21.2
PMGH			
Vanimo	67	10	14.9
Wabag	87	14	16.1
Wewak	148	35	23.6
Total	2338	438	18.7

Meningitis admissions and outcomes in 2015

Hospital	Meningitis admissions 2015	Meningitis deaths 2015	Meningitis CFR 2015	Meningitis admissions due to S. pneumoniae	Meningitis admissions due to H. influenzae
Alotau					
Angau	85	20	23.5	5	7
Buka	19	5	26.3	0	0
Daru	5	1	20.0	0	0
Goroka	131	17	13.0	0	2
Kavieng	5	1	20.0	0	0
Kimbe	54	11	20.4	0	1
Kerema					
Kundiawa	39	5	14.0	3	21
Manus					
Mendi					
Modilon	70	15	21.4	1	4
Mt Hagen	120	8	6.7	6	98
Nonga	15	3	20.0	1	1
Oro	65	19	29.2	0	0
PMGH					
Vanimo	15	2	13.3	0	0
Wabag	28	6	21.4	0	1
Wewak	42	6	14.3	23	0
Total	693	119	17.2	39	135

TB admissions and outcomes in 2015

Hospital	TB admissions	TB deaths	TB CFR		Pulmonary TB admissions	Pulmonary TB deaths	Pulmonary TB CFR		Extra Pulmonary TB admissions	Extra Pulmonary deaths	Extra Pulmonary CFR
Alotau											
Angau	156	20	12.8		82	10	12.2		74	10	13.5
Buka	69	4	5.8		47	1	2.1		22	3	13.6
Daru	18	1	5.6		0	0	0.0		0	0	0.0
Goroka	199	18	9.0		96	6	6.3		103	12	11.7
Kavieng	15	0	0.0		10	0	0.0		5	0	0.0
Kimbe	173	15	8.7		110	8	7.3		63	7	11.1
Kerema											
Kundiawa	104	10	9.3		47	1	2.1		57	9	2.1
Manus											
Mendi											
Modilon	144	25	17.4		48	4	8.3		96	21	21.9
Mt Hagen	122	14	11.5		77	6	7.8		45	8	17.8
Nonga	34	2	5.9		15	0	0.0		19	2	10.5
Oro	151	24	15.9		80	4	5.0		71	20	28.2
PMGH											
Vanimo	39	5	12.8		15	0	0.0		24	5	20.8
Wabag	29	4	13.8		44	15			14	4	28.6
Wewak	99	10	10.1		56	4	7.1		43	6	14.0
Total	1352	152	11.2		727	59	8.1		636	107	16.8

PTB = Pulmonary tuberculosis EPTB = Extra-pulmonary tuberculosis

HIV admissions and outcomes in 2014

Hospital	HIV admissions	HIV deaths	HIV CFR
Alotau			
Angau	14	3	21.4
Buka	4	0	0.0
Daru	0	0	0.0
Goroka	133	3	2.3
Kavieng	1	0	0.0
Kimbe	5	1.0	20.0
Kerema			
Kundiawa	11	2	18.2
Manus			
Mendi			
Modilon	19	5	26.3
Mt Hagen	120	26	21.7
Nonga	2	0	0.0
Oro	8	2	25.0
PMGH			
Vanimo	0	0	0.0
Wabag	45	6	13.3
Wewak	5	1	20.0
Total	367	49	13.3

Total neonatal admissions and outcomes in 2009-2014

Hospital	Neonatal admissions 2014	Neonatal deaths 2014	Neonatal CFR 2014
Alotau			
Angau	633	55	8.7
Buka	125	18	14.4
Daru	22	0	0.0
Goroka	622	61	9.8
Kavieng	3	2	66.7
Kimbe	388.0	31.0	8.0
Kerema			
Kundiawa	236	26	11.0
Manus			
Mendi			
Modilon	492	49	10.0
Mt Hagen	521	40	7.7
Nonga	443	30	6.8
Oro	314	19	6.1
PMGH			
Vanimo	186	11	5.9
Wabag	101	17	16.8
Wewak	378	35	9.3
Total	4464	394	8.8

Neonatal infections in 2009-2014

Hospital	Neonatal Infections Admissions 2014	Neonatal Infections Deaths 2014	Neonatal Infection CFR 2014
Alotau			
Angau	514	30	5.8
Buka	66	4	6.1
Daru	0	0	0.0
Goroka	351	35	10.0
Kavieng	117	1	0.9
Kimbe	287	9	3.1
Kerema			
Kundiawa	139	9	6.5
Manus			
Mendi			
Modilon	339	15	4.4
Mt Hagen	295	15	5.1
Nonga	381	20	5.2
Oro	205	13	6.3
PMGH			
Vanimo	152	4	71.1
Wabag	65	6	9.2
Wewak	238	24	10.1
Total	3149	185	5.8

Very low birth weight (1000-1499g) admissions and deaths in 2009-2014

Hospital	VLBW admissions 2014	VLBW deaths 2014	VLBW CFR 2014
Alotau			
Angau	38	24	63.2
Buka	13	7	53.8
Daru	0	0	0.0
Goroka	50	21	42.0
Kavieng	24	1	4.2
Kimbe	46	10	21.7
Kerema			
Kundiawa	0	0	0.0
Manus			
Mendi			
Modilon	0	0	0.0
Mt Hagen	17	9	52.9
Nonga	27	6	22.2
Oro	0	0	0.0
PMGH			
Vanimo	9	4	44.4
Wabag	10	6	60.0
Wewak	33	12	36.4
Total	267	100	37.5

Perinatal asphyxia admissions and deaths in 2019-2014

Hospital	Asphyxia admissions 2014	Asphyxia deaths 2014	Asphyxia CFR 2014
Alotau			
Angau	137	27	19.7
Buka	41	9	22.0
Daru	15	0	0.0
Goroka	283	33	11.1
Kavieng	6	1	16.7
Kimbe	92	21	22.8
Kerema			
Kundiawa	73	10	13.7
Manus			
Mendi			
Modilon	135	27	20.0
Mt Hagen	204	25	12.3
Nonga	50	8	16.0
Oro	122	8	6.6
PMGH			
Vanimo	27	6	22.2
Wabag	27	9	33.3
Wewak	122	14	11.5
Total	1334	198	14.8

Cancer and Rheumatic heart disease admissions and deaths in 2015

Hospital	Cancer admissions 2014	Cancer deaths 2014	Cancer CFR 2014		Rheumatic heart admissions 2014	Rheumatic heart deaths 2014	RHD CFR 2014
Alotau							
Angau	5	4	80.0		1	0	0.0
Buka	15	3	20.0		7	1	14.3
Daru	0	0	0.0		0	0	0.0
Goroka	9	2	22.2		13	2	15.4
Kavieng	2	0	0.0		10	0	0.0
Kimbe	12	3	25.0		3	1	33.3
Kerema							
Kundiawa	9	5	55.5		6	0	0.0
Manus							
Mendi							
Modilon	7	3	42.9		4	0	0.0
Mt Hagen	13	1	7.7		7	1	14.3
Nonga	7	4	57.1		1	0	0.0
Oro	3	1	33.3		7	0	0.0
PMGH							
Vanimo	0	0	0.0		0	0	0.0
Wabag	4	1	25.0		3	0	0.0
Wewak	9	1	11.1		3	1	33.3
Total	95	28	29.5		65	6	9.2