



Australian Government

Australian Institute of  
Health and Welfare



**Northern Territory Emergency Response  
Child Health Check Initiative—  
Follow-up services for oral and ear health: final report  
2007–2012**



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*Authoritative information and statistics  
to promote better health and wellbeing*

# Northern Territory Emergency Response Child Health Check Initiative

**Follow-up services for oral and ear health:  
final report**

**2007–2012**

Australian Institute of Health and Welfare

Canberra

Cat. no. DEN 223

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# Abbreviations

ACCHO	Aboriginal Community Controlled Health Organisation
AIHW	Australian Institute of Health and Welfare
AOM	acute otitis media
CHC	Child Health Check
CHCI	Child Health Check Initiative
CSOM	chronic suppurative otitis media
CtG	Closing the Gap
CW-Hearing	Community workers - Hearing
dmft	decayed, missing or filled teeth (deciduous)
DMFT	decayed, missing or filled teeth (permanent)
DoHA	Australian Government Department of Health and Ageing
ENT	ear, nose and throat
ETD	eustachian tube dysfunction
HRN	hospital registration number
ID	identification number
NTER	Northern Territory Emergency Response
NPA	National Partnership Agreement
NT	Northern Territory
NT DoH	Northern Territory Department of Health
OATSIH	Office for Aboriginal and Torres Strait Islander Health
OHSNT	Oral Health Services – Northern Territory
OM	otitis media
OME	otitis media with effusion
RAHC	Remote Area Health Corps
SCRGSP	Steering Committee for the Review of Government Service Provision
VROA	Visual Reinforced Orientation Audiometry
WHO	World Health Organization

# **Symbols**

—	nil or rounded to zero
..	not applicable
n.a.	not available
n.p.	not publishable because of small numbers, confidentiality or other concerns about the quality of the data

# **Summary**

This report presents information on the dental, audiology and ear, nose and throat (ENT) services funded throughout the course of the CHCI (CtG) Program. Although open to all Aboriginal and Torres Strait Islander children under 16 years living in prescribed communities, this program specifically targeted those who received referrals from their Child Health Checks. Highlights from the analyses include the following:

## **Dental, audiology and ENT Services**

- Over the course of the CHCI (CtG) dental and audiology programs (August 2007 to June 2012) a total of 17,169 dental services were received by 9,281 children and 9,238 audiology services were received by 5,739 children.
- At the conclusion of CHCI (CtG) ENT Program (August 2007 to 31 December 2010), a total of 3,789 ENT services have been provided to 2,643 children. From 1 July 2009 to 31 December 2010, 291 ENT surgeries were performed on 283 children.

## **CHC referral follow-up**

- At the conclusion of the CHCI (CtG) Program (30 June 2012), the majority of children who were on active CHC referral lists were followed-up. The follow-up rates were 94% for dental referral, nearly 100% for audiology referral and 97% for ENT referral.

## **Oral and ear health status among children who received a service at the end of program**

- A large proportion of children (60%) were treated for at least one oral health problem. The most significant oral health problem was untreated caries (decay).
- Around half (51%) of children who had an audiological assessment were diagnosed with hearing loss and around a third (32%) of children were diagnosed with some degree of hearing impairment based on their better ear.
- At least one type of middle ear condition was diagnosed in around two-thirds (67%) of children who received an audiology or ENT service. The most common type of middle ear condition was otitis media with effusion (OME) (26%), followed by dry perforation (15%) and chronic suppurative otitis media (CSOM) (12%).
- Analysis of AOM, OME, CSOM and dry perforation shows the poor progress of children with these middle ear conditions. Apart from a small proportion of children who recovered from these conditions at their last checks, most children had another episode of acute infection or developed chronic conditions. These children may have developed, or be at high risk of developing, permanent hearing loss which is highly preventable.

## **Improvement on oral and ear health at the end of program**

- For children who had more than one course of dental care, the number of children with at least one oral health problem decreased by 12 percentage points.
- The prevalence of hearing loss decreased by 10 percentage points among children who had two or more audiology checks. About 60% of children who were diagnosed with hearing impairment at their first check, showed some degree of improvement at their last audiology check.
- The prevalence of middle ear conditions decreased by 21 percentage points among children who received two or more audiology or ENT services. However, the complex nature of middle ear conditions mean some children may experience re-infection.

# 1 Introduction

This report is the final report on hearing and oral health services funded by the Australian Government under the Northern Territory Emergency Response Child Health Check Initiative (NTER CHCI) and the Closing the Gap in the Northern Territory National Partnership Agreement (CtG NT). This report covers services provided under both the NTER CHCI and CtG programs. These programs are referred to as CHCI (CtG) throughout this report.

## 1.1 Background

Oral and hearing health services covered in this report are those that commenced in the second half of 2007 following the roll-out of voluntary CHCs targeting the 16,000 Indigenous children living in prescribed communities in the NT (AIHW 2008). The program of checks finished in June 2009 and reached over 10,000 children. The most common conditions identified through the NTER CHCs included ear disease, which affected 30% of children, and oral health problems, which affected 40% of children. The most common types of referrals made from those checks were to primary health-care providers (39%), dentists (35%), audiologists (14%), and ear, nose and throat (ENT) specialists (17%). In response to this high level of need, the Australian Government initiated a program of funding for ear health and oral health specialist and allied health follow-up services. The majority of this funding was provided to the Northern Territory Government, which is responsible for the delivery of these services to remote Indigenous communities. Aboriginal Community Controlled Health Services (ACCHO) also played a critical role through the delivery of primary health care which provides the platform for the delivery of specialist and allied health services.

In parallel with this increased investment in services, the Australian Government funded a program of data collection, monitoring and evaluation to ensure that the commitments made at the time of the NTER and under the CTG NT were delivered. This report is the final in a series of seven reports that have provided a level of transparency and accountability commensurate with the unacceptably high level of disease experienced by Indigenous children in the NT and the urgency of the need for government action. These reports are:

- *Progress of the NTER Child Health Check Initiative: Health Conditions and Referrals*, May 2008
- *Progress of the NTER Child Health Check Initiative: preliminary results from the Child Health Check and follow-up data collections*, December 2008
- *Progress of the NTER Child Health Check Initiative: final report on results from the Child Health Check and follow-up data collections*, December 2009
- *Dental health of Indigenous children in the NT – Findings from the Closing the Gap Program*, March 2011
- *Ear and hearing health of Indigenous children in the NT*, 2011
- *Dental health of Indigenous children in the NT – Progress of the Closing the Gap Oral Health Program up to December 2011*, April 2012.

These reports have been prepared by the Australian Institute of Health and Welfare (AIHW) under a Memorandum of Understanding with the Australian Government Department of Health and Ageing (DoHA) and are available on the AIHW website. The Australian

Government also funded an evaluation of the Child Health Check Initiative which reported on these investments in May 2011. The evaluation report recommended continued investment in the hearing and oral health programs because they had developed successful models of service delivery for children experiencing very high levels of need.

## 1.2 Program achievements and concerns

The program has made a number of noteworthy achievements. The most important of which has been the provision of a large number of services to children in need. Most Indigenous people in the Northern Territory (74%) live in very remote areas, making it difficult to access specialist health services. This presents a significant challenge in delivering such services. Through this program 17,169 dental services, 9,238 audiology services and 3,789 ENT consultations have been delivered.

The program has also been successful in targeting services to children with referrals from the Child Health Check Program. The referral follow-up rates were 94% for dental, nearly 100% for audiology and 97% for ENT services. This is a significant accomplishment given the very large number of referrals, the high level of need and the high mobility of the NT Indigenous population.

To enable this high level of service delivery the program has also funded a large amount of much-needed infrastructure, and supported necessary administrative processes. Key items include hearing booths and dental vans, assisting with workforce recruitment, training and accommodation.

The effectiveness of this program has been demonstrated through improvements to the health status of children who received services. Among children seen more than once, the overall proportion of children with at least one oral health problem has decreased by 12 percentage points, and 60% of children with a hearing impairment showed improvement.

Unfortunately the program has also shown that the burden of oral and hearing health disease remains unacceptably high among Indigenous children in remote communities and town camps in the Northern Territory. It is of particular concern that 67% of children who were provided with a service were found to have at least one middle ear condition, 51% were found to have hearing loss, and 27% had active (12%) or inactive (dry perforation, 15%) chronic suppurative otitis media – a level determined by the World Health Organization to constitute a major public health problem (WHO 2004). The most disconcerting finding was that while the services for ear disease showed a positive impact, the level of re-infection was high. This re-infection is likely due to the broader social determinants of health – particularly housing, education and nutrition (Coates et al. 2002).

Eighty-two per cent of children who received a dental service from January to June 2012 and for whom decayed, missing or filled teeth (DMFT/dmft) was available had caries experience.

## 1.3 The future

In March 2012, the Australian Government announced funding of \$754.4 million over 10 years for health services as part of the *Stronger Futures in the Northern Territory* package. This includes continued investment in hearing and oral health services.

The hearing health component will aim to achieve an integrated hearing health program for Indigenous children under 16 years who live in the Northern Territory. Key features of the

program include collaboration between audiology and specialist services to work with primary health-care services, a network of Child Hearing Health Coordinators to strengthen the diagnosis and management of ear disease at the primary care level and enable timely access to referred services; and a prevention program to educate families about how to prevent and manage ear disease using culturally appropriate communication methods.

ENT services will continue to be provided through the *Improving Eye and Ear Health Services for Indigenous Australians for Better Education and Employment Outcomes Program*.

The Oral Health Program will aim to achieve an integrated oral health program with a greater focus on prevention through a fluoride varnish and fissure sealant program. Evidence from a recent community-randomised controlled trial shows that a twice-yearly application of fluoride varnish can reduce dental caries by 30% among remote Aboriginal children (Slade et al., 2011).

Under the *Stronger Futures in the Northern Territory Program*, the existing data collections will continue and be further developed to include information from the preventive programs. The Department of Health and Ageing will continue to work with the AIHW, the Northern Territory Department of Health( NT DoH) and the Aboriginal Community Controlled Health sectors to collect high quality data and report regularly on service delivery and outcomes in these vital areas of Indigenous child health in the NT.

## 1.4 About this report

DoHA commissioned the AIHW to collect, manage and report on the data collected from the dental, audiology and ENT services funded through the CHCI (CtG) Program. Based on the data collected, this report provides information on the extent of services provided through the Australian Government funded CHCI (CtG) Program, and the oral, ear and hearing health of children who received these services.

The main questions addressed in this report are:

- How many dental, audiology and ENT services were provided as part of the CHCI (CtG) Program and what portion of eligible children in the prescribed areas of the Northern Territory received these services?
- What were the outcomes and recommendations that resulted from the dental, audiology and ENT services?
- What proportion of children with a dental, audiology or ENT referral from their Child Health Check received follow-up services and, if the children received a service, how long did they wait for the service?
- What type of oral health condition and middle ear conditions were diagnosed and treated? What is the hearing status of children receiving these services?
- Are there any changes in prevalence of oral health conditions, middle ear conditions and hearing status among children who received these services?

## Structure of report

The information in this report relates to dental and audiology services provided throughout the course of the CHCI (CtG) Program (August 2007 to 30 June 2012) and CHCI (CtG) Program funded ENT consultations provided from August 2007 to December 2010 and ENT surgeries performed from 1 July 2009 to 31 December 2010.

This information presented in the remainder of this report has been divided into the following chapters:

- Chapter 2, **Dental services**, details clinical treatment, oral health status of children who received services, the follow-up status of children who received a dental referral from their CHC and preventive interventions and oral health promotion.
- Chapter 3, **CHC (CtG) audiology and ENT follow-up service program**, details a series of CtG partnership agreements between the Australian Government and NT DoH to deliver audiology and ENT services from 2007 to 2012.
- Chapter 4, **Audiology services**, details the delivery of audiology services, results of hearing assessments and the follow-up status of children who received an audiology referral from their CHC.
- Chapter 5, **ENT services**, details the delivery of ENT services, outcomes of ENT consultations including treatments recommended, surgeries and procedures and the follow-up status of children with an ENT referral from their CHC.
- Chapter 6, **Prevalence of middle ear conditions**, examines ear and hearing health of children who received audiology and/or ENT services.

## **2 Dental services**

CHCI (CtG) dental services were provided through NT DoH and ACCHOs. These services included oral health education, preventive procedures and assessment and treatment of oral health conditions. The majority of these services were provided in mobile dental clinics or local dental clinics. Dental treatments and surgeries were undertaken in hospitals if children had severe dental health problems and required treatment under general anaesthetic.

This chapter presents the detailed information on dental services provided through the CHCI (CtG) Child Oral Health Program, including:

- service providers and infrastructure
- dental data collection
- dental service: dental clinical treatment
- oral health status
- CHC dental referrals and follow-up services
- preventive interventions and oral health promotion.

### **2.1 Service providers and infrastructure**

Over the course of the CHCI (CtG) Program, Oral Health Services Northern Territory, as well as six ACCHOs, were funded to deliver dental services to prescribed areas of the Northern Territory.

#### **Oral Health Services Northern Territory**

Oral Health Services Northern Territory (OHSNT), part of the NT DoH, is the primary provider of public dental services in the Northern Territory. OHSNT provides oral health services including pain and trauma management, emergency care, restorative fillings, endodontics, extractions, oral hygiene, oral health promotion and prosthetic services. Specialist services provided include orthodontics, minor oral surgery, treatment in hospitals under general anaesthesia and some periodontics.

Services are provided free of charge to eligible clients including infants and children up to the end of secondary school, holders of current Centrelink issued Health Care Cards and Pensioner Concession Cards. People living in remote communities more than 100 km from a private dental provider are eligible for emergency care. A map of the prescribed areas of the Northern Territory where eligible children are able to receive dental services is presented in Appendix A.

All oral health services provided are from a mix of multi-chair, single-chair and mobile clinics. Multi-chair community clinics are located at Darwin, Palmerston, Nhulunbuy, Katherine and Alice Springs. Single-chair clinics are located in primary schools in Darwin, Palmerston, Katherine, Tennant Creek and Alice Springs. Across the Top End (the northern part of the NT) the single-chair clinics are co-located with health centres in most remote communities. In Central Australia, six communities have an onsite dental clinic with the remainder serviced by two mobile dental trucks.

Specialist orthodontic services are available in Darwin, Gove, Katherine and Alice Springs. Oral surgery services are available in Darwin and Alice Springs. Treatment under general anaesthetic is provided in Darwin, Gove, Katherine, Tennant Creek and Alice Springs.

The large size of the NT, which covers an area of about 1.3 million km<sup>2</sup> or around seven times the size of Victoria, produces challenges to service provision in remote communities. The frequency of services to remote communities is influenced by population size, transport and accommodation availability, road and weather conditions and staffing levels.

Communities across the Top End are serviced out of Darwin and Nhulunbuy with staff travelling by 4WD to closer communities (up to 4 hours drive), and by chartered light aircraft or scheduled commercial flights (up to 3.5 hours flight time). In the Katherine area, communities are serviced by staff based in Katherine travelling by road. In Central Australia and the Barkly region, staff based in Alice Springs provide dental services by road with travel times of up to 9 hours.

Indigenous children under 16 years of age who were referred through the CHCI (CtG) Program, and who reside in prescribed communities, are eligible for oral health care and treatment under funding provided in Schedule F of the National Partnership Agreement on Closing the Gap in the Northern Territory.

The CHCI (CtG) Program sits within OHSNT and provides outreach services and treatment under general anaesthetic to this population group. These outreach services are provided by dental therapists, dentists and dental assistants – employed by the Remote Area Health Corps (RAHC) – who visit the remote communities for 3-week blocks. This service delivery model increases the capacity for providing services without compromising the staffing of regular services. Oral health treatment under general anaesthetic is provided at NT public hospitals using a mix of local staff and staff provided through RAHC and through agreements with Westmead Children's Hospital and the John James Foundation.

With funding from the CHCI (CtG) Program, NT DoH purchased two reloadable dental clinics, a mobile dental caravan, and a refurbished dental caravan from Queensland Health (currently at Hermannsburg). The funding also enabled the long-term lease of a mobile dental caravan from the South Australia Dental Service (currently at Ali Curung) and the lease of a mobile dental van from Queensland Health (lease period completed). Installation of clinics in Docker River and Kintore means that staff can travel there by light aircraft rather than road.

In the Top End, both dentists and dental therapists conduct remote visiting services. In Central Australia, the additional travel distances and the smaller community size makes service provision by a dentist more efficient.

## **Aboriginal Community Controlled Health Organisations' dental services**

Six Aboriginal Community Controlled Health Organisation (ACCHO) dental clinics provided dental services to prescribed areas of the NT. Detailed information on how the services were provided was only available for three ACCHOs – Laynhapuy Health Service, Marthakal Health Service and Miwatj Health Aboriginal Corporation.

Laynhapuy Health Service engaged a full-time dental therapist (initially seconded from OHSNT) and a dental assistant to provide dental services to children as part of the CHCI. These services are much needed in the homelands, as about 90% of children had never been seen by an oral health professional. Almost all children received a referral for a dental service

from their CHC. The dental services are mainly provided by mobile services, which rotate equipment around five health clinics within the homelands. One health clinic also has fixed dental equipment. If there is no clinic within the service, children are transported to the closest homeland with a clinic for treatment. The dental therapists and assistants spend about 3–4 months in each homeland, and so can provide a comprehensive course of care to children during that time, including preventive treatments. In addition to the mobile services, the single-chair OHSNT dental clinic at Yirrkala is sometimes used. Should a child require dental surgery, they are referred to OHSNT.

Marthakal Health Service, part of Marthakal Homelands Association, is located on Elcho Island and services the Marthakal Homelands in north-east Arnhem. It also has established dental services as part of the CHCI. The Marthakal Homelands Association employs a dentist and dental assistant who travel to the small homeland communities using portable equipment. Dental clinics are located in the three largest homeland communities, and clients in smaller communities are transported to these clinics for treatment. There is also an NT DoH dental clinic in the main township on the island.

Miwatj Health Aboriginal Corporation provides dental services to a number of nearby communities. A fixed dental clinic is located within the Ngalkanbuy clinic. Transport is available to transport children who live in nearby communities to receive dental services.

Since early 2011, Wurli Wurlingang Health Service and Katherine West Health Service contracted OHSNT to provide dental clinic services for the CtG child oral health Program.

Danila Dilba Medical Service also provided data on a small number of CHC (CtG) funded dental services.

## 2.2 Dental data collection

The dental data were collected based on ‘occasion of service’, which refers to occasions of examination, consultation, treatment or other services provided to a patient. When the dental service occurs, the dental professional completes a questionnaire with information about the service provided and the child’s demographic characteristics. The data are sent to AIHW in electronic and paper format.

The data collected are:

- the child’s basic demographic information—hospital registration number (HRN), date of birth and sex
- the community identification number
- the type(s) of dental services provided
- the type(s) of dental problems treated
- the number of decayed, missing and filled teeth—for both permanent (DMFT) and deciduous (dmft) teeth
- whether children require further follow-up services to complete their treatment plan.

However, the data that the AIHW receives are dependent on the children’s family providing consent for sharing the above information. There are three scenarios:

- If consent is given, all of the above dental service information is provided.
- If consent is not given, only a limited data set sufficient to enable determination of follow-up to a referral is provided.

- If consent is not given and the child does not have a dental referral from the CHC, only the aggregate information on the number of services and the number of children by 5-year age group, sex and community is sent to the AIHW.

The dental data collection has some limitations that should be considered when interpreting the data.

- When interpreting data from this collection, it should be noted that the children who received a dental check were not a random sample. Firstly, dental checks were only provided to children who volunteered for them. Secondly, although all Indigenous children in prescribed areas of the Northern Territory were eligible to receive a CHCI dental check, children with dental referrals from the CHC data collection were targeted for follow-up by the dental outreach teams. Thus, the findings from the dental data collection are not representative of the Northern Territory Indigenous child population or the Indigenous population of children within prescribed areas of the NTER CHCI.
- The number of dental services and number of children who received these services reported in this publication under-represent the total number of services provided because data collection from the ACCHOs were not complete.
- With consent arrangements, the AIHW only receives detailed information on dental services if the children's guardians give consent for sharing the information. Apart from the total number of services and the number of children who received services, other information in this report is representative of children for whom consent was obtained rather than all children who received dental services, although the AIHW obtained consent for the majority of children (80%).
- The number of children who received follow-up dental services from their dental referral may be undercounted as some children received dental care through NT DoH's regular dental program and these services were not included in this collection. In addition, because the child's name is not provided, the AIHW can only track children by linking different data sources using their HRN. A very small percentage of children (1.7%) cannot be tracked due to a missing or incorrect HRN.
- Due to data capture problems, information on decayed, missing and filled teeth (DMFT/dmft) was only available for children who received a dental service from 1 March to 31 December 2009, 1 January to 30 June 2011 and 1 January to 30 June 2012. In addition, a small proportion of DMFT/dmft records may be contaminated by an indicator of fissure seal application in the NT DoH database. It was estimated that 6.4% of DMFT/dmft records in 2009, 3.1% in 2011 and 1.5% in 2012 may have been affected by this issue. However, this issue has a negligible impact on the analysis results.

## **2.3 Dental services: dental clinical treatment**

Over the course of the CHCI (CtG) Program (August 2007 to 30 June 2012), 17,169 dental clinic services were provided (Table 2.1) through CHCI and then the CHCI (CtG) Program. A total of 9,281 children received dental services, which is approximately 57% of the Indigenous population aged under 16 in the NT prescribed areas<sup>1</sup>.

### **Services by financial year**

The total number of dental services and total number of children who received these services varied in each financial year. These variations are due to many factors, such as: funding arrangement, nature of dental services, weather and accessibility of local community and region.

In 2007–08, the number of dental services was relatively low (868), as this was the initial phase of planning, recruiting and the setting up of infrastructure. The number of dental services peaked at 4,445 in 2008–09, as many children received a first-time dental assessment (Table 2.1).

The number of occasions of dental services provided decreased to 3,643 in 2010–11, largely due to the nature of follow-up consultations, which tend to be longer in duration and often include treatment. Also, during this period the coverage of dental outreach teams was limited due to above-average rainfall in the prescribed areas of the NT, which reduced access to communities by road. Hence, fewer children could be accommodated during the 2010–11 period than in the earlier years of the program. In addition, the effort and resources required to engage 'hard to reach' children as the program progressed also contributed to decreased activity.

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<sup>1</sup> Estimated Indigenous resident population for children aged under 16 years who live in communities and town camps covered by the CHCI was 16,259. These estimates were provided by the DoHA.

**Table 2.1: Number of dental services provided and number of Indigenous children who received a dental service, by year and consent status, August 2007 to June 2012**

Financial year	Services			Children			
	Consent	Non-consent	Total	Consent	Non-consent	Total	
August 2007–June 2008	Number	563	305	868	503	291	794
	Per cent	64.9	35.1	100.0	63.4	36.6	100.0
July 2008–June 2009	Number	3,050	1,395	4,445	1,955	1,215	3,170
	Per cent	68.6	31.4	100.0	61.7	38.3	100.0
July 2009–June 2010	Number	4,133	238	4,371	2,690	192	2,882
	Per cent	94.6	5.4	100.0	93.3	6.7	100.0
July 2010–June 2011	Number	3,523	120	3,643	2,522	111	2,633
	Per cent	97.0	3.0	100.0	95.8	4.2	100.0
July 2011–June 2012	Number	3,696	146	3,842	2,673	137	2,810
	Per cent	96.2	3.8	100.0	95.1	4.9	100.0
<b>Total</b>	<b>Number</b>	<b>14,965</b>	<b>2,204</b>	<b>17,169</b>	<b>7,376</b>	<b>1,905</b>	<b>9,281</b>
	<b>Per cent</b>	<b>87.2</b>	<b>12.8</b>	<b>100.0</b>	<b>79.5</b>	<b>20.5</b>	<b>100.0</b>

*Note:* The total number of children does not add up to the sum of the columns as children may have received services in multiple years. The total number of children represents each child only once.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

About 20% of children's families did not give consent for sharing information with the AIHW, and this accounts for about 13% of services provided (Table 2.1). Services without consent for sharing information mainly occurred in the early stage of follow-up because of failure to return the consent form. Since July 2009, the NT DoH dental team has placed greater focus on the completion and return of consent forms to share data with AIHW. These efforts have included emphasising the importance of seeking consent during the orientation and training of outreach teams, sending consent forms to health clinics and schools prior to outreach teams arriving in the community, and greater assistance from Aboriginal Liaison Officers in following up parents and guardians for collection of completed consent forms. These efforts have resulted in an increased number of consent forms signed by parents/guardians, and therefore, a significant improvement in the amount of data captured.

Among 7,376 children who received services (and for whom consent was provided), children aged 6–11 accounted for more than half (55%), as they were more easily accessible through local schools (Table 2.2). Less than a quarter of services were provided to very young children (0–5 years), while only a very small proportion of children were aged 16 and over. Although the age of children eligible to receive dental services is limited to those aged under 16, there is an exception for children who were under 16 at the time of their CHC but were aged over 16 by the time they received their follow-up dental service. A similar proportion of males and females received dental services.

**Table 2.2: Number of Indigenous children who received dental services, by age and sex, August 2007 to June 2012**

	Number	Per cent
<b>Age group (years)</b>		
0–5	1,615	21.9
6–11	4,068	55.2
12–15	1,472	20.0
16+	183	2.5
Not recorded	38	0.5
<b>Total</b>	<b>7,376</b>	<b>100.0</b>
<b>Sex</b>		
Male	3,633	49.3
Female	3,736	50.7
Not recorded	7	0.1
<b>Total</b>	<b>7,376</b>	<b>100.0</b>

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW. This table reflects the age of children at their most recent dental service.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

Forty-eight per cent of all children, accounting for around one-quarter of all occasions of service, received one dental service (Table 2.3). A further 52% of children received two or more occasions of dental services, accounting for around three quarters of total occasions of service.

**Table 2.3: Number of dental services per child, Indigenous children who had a dental service, August 2007 to June 2012**

Dental services per child with consent	Dental services		Children	
	Number	Per cent of all services	Number	Per cent of children
1 dental service <sup>(a)</sup>	3,569	23.8	3,569	48.4
2 or more dental services	11,396	76.2	3,807	51.6
<b>Total services with consent</b>	<b>14,965</b>	<b>100.0</b>	<b>7,376</b>	<b>100.0</b>

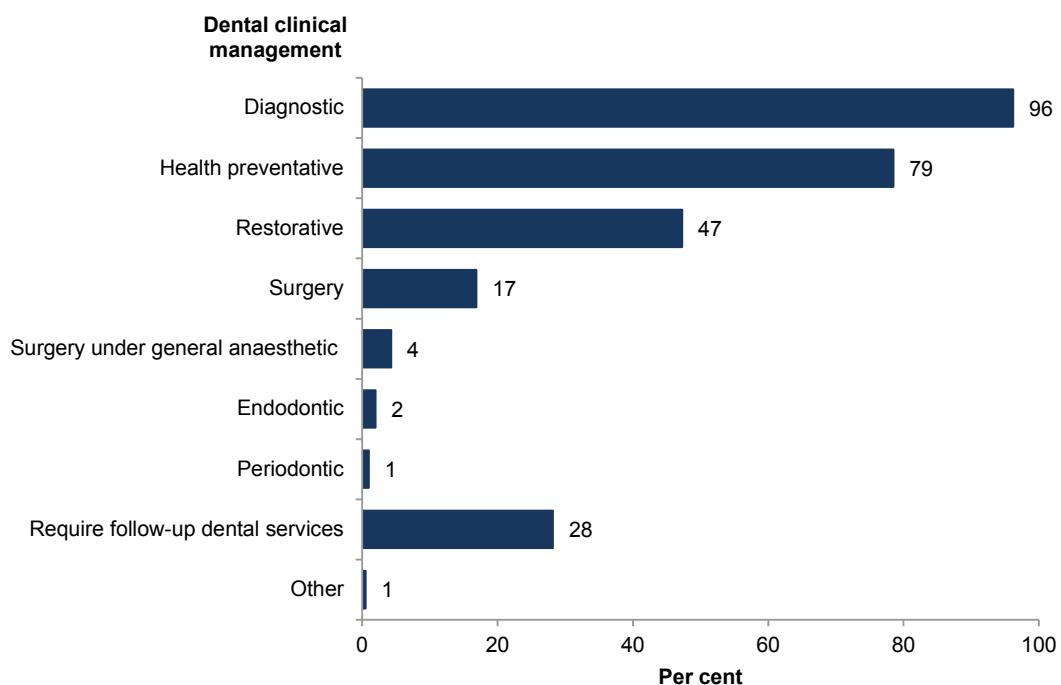
(a) Where invalid or missing HRN, reported as 1 dental service received.

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

## Type of dental clinical management

Of the children who attended a dental service, 96% received a diagnostic service. All children typically receive a diagnostic service prior to any dental treatment; however only those children whose families provided consent are included in this analysis. About 79% of children received a preventive service, restorative services (47%) and dental surgery (17%). Only a very small proportion of children received endodontic (2%), periodontic (1%) or other services (<1%). Around one in three children (28%) still required follow-up and/or ongoing clinical services to manage and treat existing dental conditions when they received last dental services in the CHCI (CtG) Program (Figure 2.1).



*Notes*

1. Data include cases where Hospital Record Number (HRN) is unknown.
2. This is a multiple response item. Children may have received more than one treatment.
3. Surgery under general anaesthetic is a subset of surgery.
4. Data is presented only for those children whose parent or guardian provided consent for sharing information with AIHW.

Source: AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

**Figure 2.1: Type of clinical dental management received by Indigenous children (per cent), August 2007 to June 2012**

## 2.4 Oral health status

This section describes the oral health of a group of children who received dental services in the prescribed areas of the NT from August 2007 to 30 June 2012, including the type of dental problems treated based on the last services and DMFT/dmft results.

### Oral health problems treated

Among the 7,376 children who received a dental service, 4,393 (60%) were treated for at least one oral health problem. Untreated caries was the most prominent oral health condition, requiring treatment in 52% of children (Table 2.4). Mouth infections or sores were treated in 5% of children, as were dental abscesses. Treatments for conditions such as gum disease, abnormal teeth growth, broken or chipped teeth due to trauma and missing teeth were less common. Other dental problems accounted for 15% of treatments provided.

**Table 2.4: Types of dental problems of Indigenous children that were treated at their last dental check, August 2007 to June 2012**

<b>Problem treated</b>	<b>Total number of children</b>	
	<b>Number</b>	<b>Per cent</b>
Untreated caries	3,863	52.4
Dental abscess	383	5.2
Mouth infection or mouth sore	366	5.0
Gum disease	175	2.4
Broken or chipped teeth due to trauma	88	1.2
Abnormal teeth growth	83	1.1
Missing teeth <sup>(a)</sup>	15	0.2
Other	1,075	14.6
<i>Sub-total number of children treated for at least one dental problem during dental service<sup>(b)</sup></i>	<i>4,393</i>	<i>59.6</i>
<i>Sub-total number of children who did not receive treatment or no dental health problem diagnosed during dental service</i>	<i>2,983</i>	<i>40.4</i>
<b>Total number of children who received dental service</b>	<b>7,376</b>	<b>100.0</b>

(a) Missing teeth are reported as a type of dental problem rather than a problem treated as missing teeth are not replaced.

(b) The sum of the columns does not add up to the sub-total because one child can receive treatment for multiple conditions.

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

## Decayed, missing and filled teeth

The total number of decayed, missing and filled teeth (DMFT/dmft) is a widely used indicator of oral health status. It measures the number of decayed, missing and filled teeth of a person. For example, a DMFT/dmft score of 5 would mean that the person has a total of 5 decayed, missing or filled teeth. Standard notation is that DMFT refers to permanent teeth while dmft refers to deciduous teeth. Exfoliated deciduous teeth (where normal tooth loss has occurred) are not included as missing teeth.

Due to data capture problems, updated information on decayed, missing and filled teeth (DMFT/dmft) was available for 1,273 children who received a dental service between 1 January and 30 June 2012 (Table 2.5). This represents 91% of all children who received a dental service during that period.

Of these children, 1,040 (82%) had a DMFT/dmft score of more than zero, which indicates that they had caries experience.

The mean dmft score (deciduous teeth) ranged from 0.2 for children less than one year old, to 7.1 for children aged 6 years old. At 2 years of age, more than half (51%) of children had caries experience, and this proportion increased to 92% for children aged 5.

The mean DMFT score (permanent teeth) ranged from 0.1 for children aged 6 years old to 6.6 for children aged 15–17. The proportion of children with caries experience was high for children aged 6–10 (85–92%), however this proportion was lower for children aged 11–13 (71–76%). This may be due to the exfoliation of deciduous teeth.

**Table 2.5: Number of decayed, missing and filled teeth, and mean number of deciduous dmft, permanent DMFT and total DMFT/dmft**

Age group (years)	Number of children	Mean dmft for deciduous teeth	Mean DMFT for permanent teeth	Mean DMFT + dmft	Number of children with DMFT/dmft > 0	Per cent of children with DMFT/dmft > 0
0–1	36	0.2	n.a.	0.2	2	5.6
2	53	2.2	n.a.	2.2	27	50.9
3	70	4.5	n.a.	4.5	51	72.9
4	101	4.9	n.a.	4.9	86	85.1
5	119	6.7	n.a.	6.7	110	92.4
6	117	7.1	0.1	7.2	108	92.3
7	119	5.0	0.6	5.6	106	89.1
8	100	4.8	0.9	5.7	90	90.0
9	116	3.6	0.8	4.4	105	90.5
10	99	2.7	1.4	4.1	84	84.8
11	93	3.0	2.2	5.2	66	71.0
12	86	0.8	2.4	3.2	65	75.6
13	63	n.a.	3.6	3.6	48	76.2
14	39	n.a.	4.6	4.6	37	94.9
15–17	62	n.a.	6.6	6.6	55	88.7
<b>Total</b>	<b>1,273</b>	<b>4.6</b>	<b>1.8</b>	<b>4.7</b>	<b>1,040</b>	<b>81.7</b>

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.

*Source:* AIHW analysis NT DoH DMFT/dmft data 1 January to 30 June 2012.

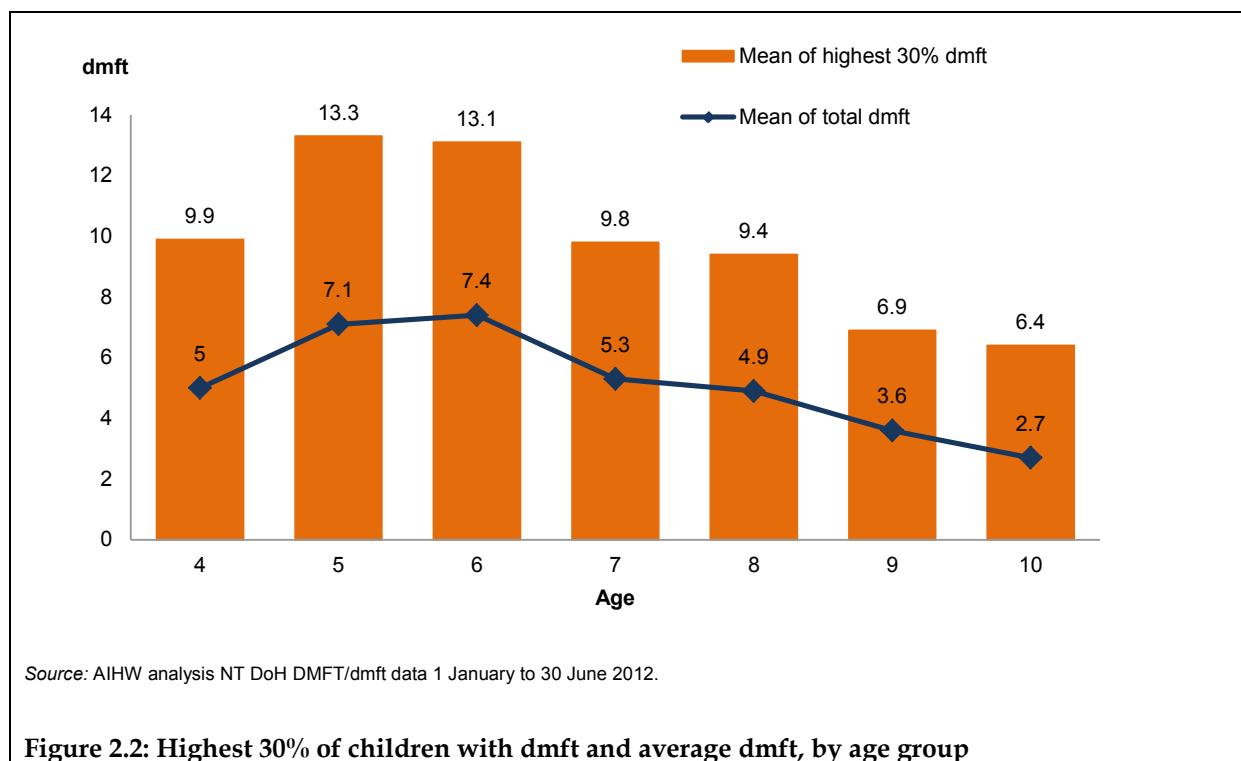
## Significant Caries Index

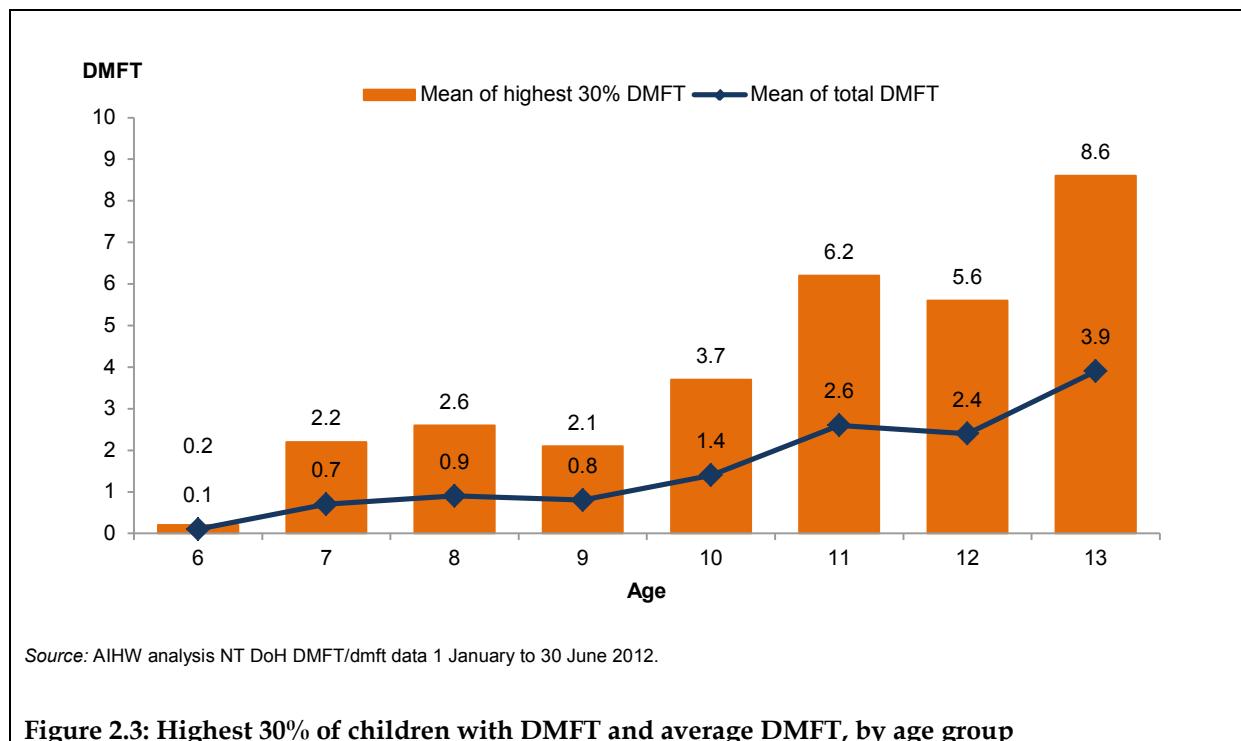
The *Significant Caries Index* (SiC) is the average number of decayed, missing and filled teeth of the 30% of the population with the highest DMFT/dmft. This measure is used to bring attention to those individuals with the worse dental decay experience in the population (Ha et al 2011).

The SiC values for deciduous teeth were calculated for children aged 4 to 10 years, as the number of children aged 0-3 years was too small to produce reliable statistics.

The SiC value for deciduous teeth peaked at 13.3 for children aged 5, and gradually decreased to 6.4 for children aged 10. This reduction is mainly due to natural loss of deciduous teeth. The SiC value for deciduous teeth was about twice as high as the overall mean dmft value for this group of children (Figure 2.2).

The SiC value for permanent teeth was 0.2 for children aged 6 years and peaked at 8.6 for children aged 13 years. The SiC value for permanent teeth was between 2 and 3 times higher than the overall mean DMFT values among these children (Figure 2.3).





## 2.5 Changes in oral health conditions over time

It is important to assess whether the treatment received by children has resulted in any changes in oral health. Table 2.6 shows changes in the prevalence of the most common oral health conditions among children who received two or more courses of dental care. In common dental practice, children may be treated over several consecutive occasions of services within one course of care. The duration of a course of care may vary according to the child's oral health. As information on the duration of course of care is not available in the CHCI (CtG) dental data collection, in this analysis *course of care* is defined as occasions of service that occur within a 90-day period. However, the duration of a course of care may vary in actual practice and in some cases may exceed 90 days.

In this analysis, we compared the prevalence of major oral health conditions between the first course and last course of dental care. The *first course of dental care* is defined as the child's first dental service and all other dental services received within 90 days of the first service. Similarly, the *last course of care* is defined as a child's most recent service and all other dental services received within 90 days prior to the latest service. There were 1,916 children who had two or more courses of dental care. The minimum time interval between the first and last courses of care was 9 months and the median time interval was 23 months.

About 52% of children who had more than one course of dental care had at least one oral health problem diagnosed during their first course of care, and this had decreased to 41% by the last course of care. The overall prevalence for children with at least one oral health problem was decreased by about 12 percentage points. At their last course of care, there was a decrease of 12 percentage points for untreated caries and about 5 percentage points for mouth infections or mouth sores. Furthermore, the prevalence of no oral health conditions increased by 12 percentage points between the first and last dental checks.

**Table 2.6: Changes in oral health conditions among children who received two or more courses of dental care, August 2007 to June 2012**

Oral health condition <sup>(a)</sup>	First course of dental care <sup>(b)</sup>		Last course of dental care <sup>(c)</sup>		Change in prevalence
	Number of children	Per cent	Number of children	Per cent	
Children who received two or more courses of dental care	1,916	100.0	1,916	100.0	n.a.
Children with at least one dental problem	1,003 <sup>(e)</sup>	52.3	778 <sup>(e)</sup>	40.6	-11.7
Untreated caries	961	50.2	733	38.3	-11.9
Mouth infection or mouth sores	118	6.2	24	1.3	-4.9
Other oral health conditions	119	6.2	127	6.6	0.4
Children with no oral health conditions	913	47.7	1,138	59.4	11.7
<b>Total<sup>(d)</sup></b>	<b>1,916</b>	<b>100.0</b>	<b>1,916</b>	<b>100.0</b>	<b>n.a.</b>

(a) Refers to oral health condition treated during any occasion of service in one course of dental care.

(b) Refers to a child's first dental service and all other services received within 90 days of the first service.

(c) Refers to a child's last dental service and all other services received up to 90 days prior to the latest service.

(d) Children can be treated for more than one oral health condition, therefore the sum of oral health conditions does not add up to the total of children with at least one oral health condition.

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

The treatment outcomes were examined only for untreated caries and mouth infections or mouth sores because they were the only two oral health problems with a sufficient number of children to conduct reliable statistical analysis. Table 2.7 shows that, among children who were treated for mouth infections or mouth sores at their first course of care, 99% did not show the same condition at their last course of care. Among children who were diagnosed with untreated caries, 58% did not have the condition at their last course of care. However, for children who still had untreated caries, it could not be determined if they were new or if they occurred in previously treated teeth.

**Table 2.7: Treatment outcome for children with mouth infection and untreated caries at their first course of dental care, August 2007 to June 2012**

<b>Type of condition</b>	<b>Total number of children with the condition at first course of care</b>	<b>Children without condition by last course of care</b>		<b>Children with recurrent condition at last course of care</b>	
		<b>Number</b>	<b>Per cent</b>	<b>Number</b>	<b>Per cent</b>
Mouth infection / mouth sores	118	117	99.2	1	0.8
Untreated caries	961	560	58.3	401	41.7

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

## Changes in DMFT/dmft values

In line with improvement on prevalence in oral health condition, DMFT/dmft value among children who received services also showed small improvement.

As showed in Table 2.8, from 2009 to 2012, the proportion of children with caries experience decreased from 83.1% to 81.7%.

Notable improvement was observed among the youngest age group (0–3 years old). The proportion of children with caries experience decreased from 72% to 43%.

However, the improvement was not distributed evenly in every age group. The proportion of children with caries experience increased for some age groups, especially for older children.

**Table 2.8: Per cent of children with DMFT/dmft > 0, children aged 0–17 years**

Age group (years)	Per cent of children with DMFT/dmft > 0		
	2009 March–December	2011 January–June	2012 January–June
0–3	71.6	66.3	43.1
4	78.8	80.8	85.1
5	88.3	88.8	92.4
6	88.5	92.5	92.3
7	91.8	86.0	89.1
8	92.8	83.9	90.0
9	86.2	87.1	90.5
10	81.5	85.7	84.8
11	69.3	63.1	71.0
12	80.5	72.0	75.6
13	70.1	89.7	76.2
14	81.8	92.0	94.9
15–17	75.3	79.5	88.7
<b>Total</b>	<b>83.1</b>	<b>82.3</b>	<b>81.7</b>

*Note:* Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.

*Source:* AIHW analysis NT DoH DMFT/dmft data March to December 2009, January to June 2011 and January to June 2012.

## 2.6 CHC dental referrals and follow-up services

A total of 3,223 Indigenous children received a dental referral from their CHC. Of these, 393 were lost to follow-up due to following reasons:

- passed away
- moved outside the prescribed communities
- living in communities not covered by CHCI (CtG) funding
- failure to attend services after three attempts to provide services by the dental outreach team.

There were 2,828 children on the active referral list after the exclusion of children lost to follow-up (Table 2.10).

At the conclusion of the CHCI (CtG) Program (30 June 2012), 2,646 (94%) of children who were on the active dental referral list had received a dental service with the average waiting time of 19 months. The remaining 182 children were on the outstanding referral list (Table 2.10).

**Table 2.9: Number of Indigenous children with a dental referral, who received dental service, average waiting time and have outstanding dental referral, 2007–12**

Children on active referral list	Children who received dental service <sup>(a)</sup>		Average waiting time between referral and service (months) <sup>(b)</sup>	Outstanding dental referral	
	Number	Per cent		Number	Per cent
2,828	2,646	93.6	19.5	182	6.4

(a) Only includes children with a valid Hospital Registration Number (HRN).

(b) Average waiting time excludes outstanding dental referrals.

Source: AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

There are a number of challenges to the provision of dental care to children who received a dental referral at their CHC.

One significant challenge for providing follow-up care in the prescribed areas of the NT is the high mobility of the Indigenous population. Previous analysis found that about 40% of children with a dental referral were residing in different communities by the time they received follow-up services. The high mobility of the population makes it difficult to trace children with a referral (AIHW 2011).

A further challenge to reaching children is that most dental outreach teams access children through local schools, making it very difficult to find children who are over the age of 12 or those who do not attend school regularly (AIHW 2011).

These challenges also affect the data collected on children with referrals for follow-up dental services, especially in communities that have existing dental services and are not visited by outreach teams. As the CHCI dental data are only collected from dental services funded by the Australian Government, the dental services provided by local service providers are not included if they did not receive funding. Therefore, it is possible that children have received follow-up care for the dental referral, but are not identified through the CHCI dental collection because they received the dental services funded by other sources (AIHW 2011).

It is important to note that attending for dental services is voluntary and some children, or their parent or guardian, may have declined the offer of a service.

## **2.7 Preventive interventions and oral health promotion**

Preventive interventions and oral health promotion activities are an important part of efforts to improve the oral health of Indigenous children. The CtG dental service provides a number of such programs, including oral health education and the application of fluoride varnish.

Regular application of fluoride varnish is a clinical preventive intervention which has consistently been shown to reduce tooth decay (Marinho et al. 2002, Slade et al. 2011). CtG dental teams also frequently administer fissure sealants, which have been shown to be effective in preventing dental caries in high-risk individuals (Weintraub 2001).

In total, from August 2007 to June 2012, it was estimated that at least 7,491 children received preventive services and some of them received multiple preventive measures, including:

- 4,662 children who attended oral health education sessions
- 2,162 children with full mouth fluoride varnish applications
- 1,776 children with fissure sealant applications.

In addition, a school-based tooth-brushing program was conducted in 14 schools and about 2,570 children participated in oral health education sessions, which were provided by outreach CtG dental teams and community-based oral health education programs.

In 2011, a program was also introduced to increase parental/caregiver engagement in children's oral health. The primary aim of the program was to ensure parents/caregivers attend children's assessment and treatment appointments. The program also provided the opportunity for outreach staff to better inform parents/caregivers of their child's oral health status and treatment needs and advise them about what actions they could take at home to maintain and improve oral health.

### **3   Audiology and ENT service**

The NTER instigated the CHCs in Indigenous communities across the NT resulting in 30% of all children checked being referred for audiology or ENT services. In response to the extensive ear and hearing problems in these areas, the CHCI included funding for audiology and ENT follow-up services from the middle of 2007 to June 2009. From July 2009 to 2012, these services were funded as part of CtG.

Audiology and ENT services provided by CHCI (CtG) Program focus on the children who had audiology or ENT referrals from their health checks, but also provide to children in need where it is possible. These services were delivered by NT DoH and were funded through a serial of agreements under the CtG partnership between Australian Government and NT DoH.

These agreements include:

- 2007–08 CHC Hearing and ENT Follow-up care: Central Australia
- 2008–09 CHC Hearing and ENT Follow-up care: Top End
- 2009–10 CtG ENT – Schedule E
- 2009–12 Expanding Health Service Delivery Initiative (EHSIDI): Hearing health care.

Each period of the agreement represented a different stage in the development of the Northern Territory ear health and hearing service system. Positive partnerships have led to integration of work units, standardisation of clinical protocols and reforming information management. The ear and hearing health investment and workforce engaged through CHCI (CtG) Program has strengthened capacity for improving hearing for Indigenous children of the Northern Territory.

The following sections provide an overview of major developments in the CHCI (CtG) audiology and ENT service Program in the Northern Territory under these agreements. The detailed audiology and ENT services delivered, as well as the ear and hearing health status of children who received these services are reported in Chapter 4: Audiology service, Chapter 5: ENT services and Chapter 6: Prevalence of middle ear conditions.

#### **2007–08 CHC Hearing and ENT Follow-up Care: Central Australia**

The objective of the first agreement (CHC Hearing and ENT Follow-up care in Central Australia) was to establish, manage and coordinate teams of ear health professionals to deliver hearing and ENT follow-up services to children residing in prescribed communities and town camps. The services were available to children who received a referral through the Child Health Check (CHC) Program, as well as to other children in need and eligible for the CHC Program in the prescribed areas. At the initial stage of the program, ear and hearing health services were prioritised for children referred via the Northern Territory Emergency Intervention (NTER) Child Health Check (CHC) process in Central Australia.

To implement these objectives, NT DoH established a comprehensive hearing and ENT follow-up project which consists of the following components:

- diagnostic audiology services including referral to rehabilitation services

- ENT case management including outreach visits, surgical services and community-based training for existing primary health-care staff
- ear health promotion and education to children and their families
- supported family care for otitis media treatment and surgical options phased into recurrent enhanced primary health strategy
- professional development and health centre support in best practice otitis media.

Audiology and ENT services were delivered by a multidisciplinary team that included: Community Hearing Workers, primary health practitioners (Aboriginal Health Worker, Doctor and Nurse), audiologists and ENT Care Nurses. Clinical care was provided according to the *Central Australian Rural Practitioners Association standard treatment manual* and on advice from the consulting ENT specialist. There were two service delivery models, including fly-in-fly-out ENT specialists stationed at Alice Springs Hospital in 10 weekly blocks, and an outreach component involving visits to each prescribed community in Central Australia.

To meet the service delivery needs, under the agreement, additional ENT and audiology equipment at Alice springs hospital was procured to enable the expanded activity and workforce. As a result, seven temporary audiology testing facilities were purchased and deployed in the following communities: Hermannsburg, Ampilatwatja, Papunya, Santa Teresa, Ti Tree, Yuendumu and Epenarra.

The funding also provided for the transport of children and carers living in some outstations and smaller communities to larger communities or regional centres to access audiology and ENT consultation and surgical services. To ensure these services were delivered with high quality, staff involved in services received training on cultural protocols, skills and competencies under this agreement.

At the community level, extra funding was available to employ Community Workers-Hearing (CW-Hearing). The CW-Hearing encouraged communities and families to engage in ear and hearing health through home visits, outreach and accompanying families to appointments with visiting specialists in the community or at regional hospitals. In addition, the ENT Care Nurse role was introduced to strengthen community participation, improve communication between Alice Springs Hospital and primary health organisations and support a continuity of care throughout the surgical pathway.

A suite of community resources was also developed and distributed to assist in community engagement and participation in ear and health activity. Resources in the suite included: CHC follow up Hearing and ENT services posters, fact sheets on otitis media prevention and clinical care, otitis media clinical care laminated manual, community ear and hearing knowledge flipchart and a DVD on the *Ear Surgery Story* at Alice Springs Hospital.

## **2008–09 CHC Hearing and ENT Follow-up Care: Top End**

Building on the experience on service delivery under the first agreement in 2007 to 2008, an identical model of service as implemented in Central Australia for CHC Hearing and ENT Follow-up care was implemented in the Top End (including Katherine, East Arnhem, Arnhem, Central Top End and Western Top End).

Apart from existing service delivery, extra funding was available to employ ENT surgical teams from other jurisdictions to increase the volume of ENT consultation and ENT surgical services. The ENT surgical team included an ENT specialist, anaesthetist and nursing theatre staff supported by an audiologist, an ENT surgical care coordinator and a data/administrative officer. The additional ENT services were provided through outreach ENT teams, outpatient clinics and surgical activities in Royal Darwin Hospital, Gove District Hospital and Katherine District Hospital. The funding also enhanced audiological capacity to support the ENT service and follow-up on hearing referrals from the CHC.

Under this agreement, an additional 9 temporary audiological facilities housed in shipping containers were made available and were located at Katherine and the Top End, and another facility was placed at Lake Nash in Central Australia.

An additional 99 staff received training to enhance their knowledge on ear and hearing health.

## **2009–10 CtG ENT—Schedule E**

In July 2009, the Northern Territory and the Australian Governments signed the National Partnership Agreement (NPA) 2009–2012. Under the Schedule E of this agreement, the Australian Government provided funding continually for the NT Government to implement the ENT Follow-up Care Project for the period from 1 July 2009 to 31 December 2010.

This project included the provision of ENT consultation services, ENT surgical services, primary health practitioner clinical support, pre and post ENT surgical care coordination and limited audiological services to support surgical interventions and to monitor peripheral hearing changes associated with surgical intervention.

ENT outreach consultations were delivered by a team of ENT specialists, an audiologist, an ENT surgical care coordinator and a support officer (for data and other administration matters). The teams were dispatched to target communities for a period of 1 week (5 days) per visit.

During the life of the project, the surgical blocks were performed in Alice Springs, Katherine and Gove District Hospitals. The surgery block was typically a 5-day event with a maximum of six (6) children operated on per day.

To meet the demands for ENT services in remote communities, particularly in relation to post-surgical assessment, a new technology, *teleotology*, was implemented during this agreement in partnership with Royal Darwin Hospital ENT department. After an outreach visit from an audiologist and nurse consultant (ENT), ENT specialist consultation is provided on electronic clinical data and digital otoscopy images. The ENT recommendations are communicated back to primary health practitioners through the ENT nurse consultant and updated in patient information recall systems (Primary Care Information System and Communicare). Use of this technology enables asynchronous ENT consultations, recommendations and case management for children from remote communities. Teleotology prevents many families from traveling to regional centres for services and reduces the amount of face-to-face ENT outreach required.

## **2009–12 EHSDI: Hearing health care**

The EHSDI 2009–12 Hearing Health Agreement built on initiatives from the NTER ear health and hearing investment 2007–08 and 2008–09. The purpose of this agreement was to provide audiology and hearing health services in the Northern Territory (NT) that contribute to managing ear disease and improving the hearing health of Indigenous children.

In addition to existing audiology services delivery, this program involved the deployment of child hearing health coordinators, who provide ‘expert’ case management in the coordination of health and hearing services through interaction with available primary health and specialist resources. After significant consultation with partners from the Aboriginal Medical Services Alliance of the Northern Territory and NT DoH Remote Health, 5.0 FTE child hearing health coordinators were recruited into 5 regionally based health development teams.

The EHSDI 2009–12 Hearing Health Agreement also endorsed and resourced the development of a Hearing Health Information Management System. The Hearing Health Information Management System will provide a coordinated view of the current status of each child under care and will be fully integrated with the overall health information architecture of the NT. This advanced information system will decrease the workload of the child hearing health coordinators to manage each child under clinical leadership and coordination.

# 4 Audiology services

CHCI (CtG) audiology services were funded by the Australian Government and were provided through NT DoH. Audiology services conducted an assessment of the status of middle ear function, diagnosis of hearing loss and middle ear conditions, and recommendations for clinical care and rehabilitation, such as communication strategies, classroom amplification, hearing aids, speech therapy and educational support. Audiological assessments can also monitor changes in hearing associated with medical and surgical management of middle ear conditions.

This chapter presents the detailed information on audiology services, including:

- audiology data collection
- audiology service provided
- the results of hearing assessment
- CHC audiology referrals and follow-up services.

Apart from aggregated information on number of services, no information was provided to the AIHW if the parent or guardian of the child did not give consent for sharing detailed information. Therefore, apart from tables 4.1 and 4.11 of this chapter, the analyses are based on consented data only.

## 4.1 Audiology data collection

Information for the audiology data collection is transferred to the AIHW on paper forms. The data items that are included in the audiology data collection include:

- details about the child: Hospital Registration Number (HRN), date of birth and sex
- community identification (ID) and date of service
- outcomes from the audiology check: hearing loss, hearing impairment and diagnoses of middle ear diseases
- whether further action was required.

Each record in the audiology data collection corresponds to a single assessment of middle ear function and peripheral hearing (audiological assessment). A course of care for otitis media may consist of one or a series of audiological assessments to monitor hearing loss and assess middle ear function.

### Limitations of data

The audiology data collections have some limitations that should be considered when interpreting the findings.

- Data coverage for the CHCI audiology data collection is limited to data collected from the audiology services provided through CHCI (CtG) Program which was funded by the Australian Government. Audiology services provided through other funding sources (for example services funded by the NT Government or private sector) are not included (except for a small amount of these services data in the audiology referral sections).

- As AIHW does not receive detailed information on audiology if children's families do not consent to share the data, the data for which consent has not been obtained are not included in most of the analysis of this report.
- As personal information, such as the child's name, is not provided to the AIHW, children can only be tracked using their HRN. A very small percentage of children (1.1%) could not be tracked due to missing or incorrect HRN.
- Children who received an audiology service were not a random sample of Indigenous children in the prescribed areas or of children who had a CHC. Firstly, audiology services were only provided to children who volunteered for them. Secondly, although all Indigenous children in prescribed areas of the Northern Territory were eligible to receive a CHCI (CtG) audiology service, children with referrals as a result of their CHC were targeted for follow-up by the outreach teams. Thus, the findings are not representative of the Northern Territory Aboriginal child population or the Aboriginal population of children within prescribed areas of the NTER CHCI.
- The analysis comparing outcomes between first and last audiology should be treated with caution, because only a small proportion of children received subsequent services funded by the CHCI (CtG) Program following an initial audiology check.

## **4.2 Audiology services provided**

Over the course of the CHCI (CtG) Program (August 2007 and June 2012), a total of 9,238 audiology services were received by 5,739 children (Table 4.1). These services were received by approximately 35% of the Indigenous population aged under 16 in the NT prescribed areas<sup>2</sup>. The highest number of services provided was in the 2008–09 financial year, when 3,594 services were provided to 2,945 children. The number of audiology services provided in 2011–12 decreased to 1,386 due to changes in the funding arrangement. The rate of non-consent has declined. Between August 2007 and June 2008, consent was not provided for 14% of children, compared with 0% from July 2011 to June 2012.

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<sup>2</sup> Estimated Indigenous resident population for children aged under 16 years who live in communities and town camps covered by the CHCI was 16,259. These estimates were provided by the DoHA.

**Table 4.1: Number of audiology services provided and number of Indigenous children who received services, by financial year, August 2007 to June 2012**

Financial year	Services			Children			
	Consent	Non-consent	Total	Consent	Non-consent	Total <sup>(a)</sup>	
August 2007–June 2008	Number	864	129	993	794	126	920
	Per cent	87.0	13.0	100.0	86.3	13.7	100.0
July 2008–June 2009	Number	3,258	336	3,594	2,658	287	2,945
	Per cent	90.7	9.3	100.0	90.3	9.7	100.0
July 2009–June 2010	Number	1,674	110	1,784	1,348	108	1,456
	Per cent	93.8	6.2	100.0	92.6	7.4	100.0
July 2010–June 2011	Number	1,447	34	1,481	1,226	34	1,260
	Per cent	97.7	2.3	100.0	97.3	2.7	100.0
July 2011–June 2012	Number	1,386	0	1,386	1,228	0	1,228
	Per cent	100.0	0	100.0	100.0	0	100.0
<b>Total</b>	<b>Number</b>	<b>8,629</b>	<b>609</b>	<b>9,238</b>	<b>5,184<sup>(a)</sup></b>	<b>555</b>	<b>5,739</b>
	<b>Per cent</b>	<b>93.4</b>	<b>6.6</b>	<b>100.0</b>	<b>90.3</b>	<b>9.7</b>	<b>100.0</b>

(a) As one child can receive more than one service in different periods, the sum of children who received services in different periods does not add up to total number of children.

*Note:* Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

Of the children who received an audiology service and gave consent for sharing information with the AIHW, around half were aged between 6 and 11 years, 31% were 5 and under, 17% were aged 12–15, and 2% were over 16 (Table 4.2). A similar proportion of boys and girls received services.

**Table 4.2: Number of Indigenous children who received audiology services, by age and sex, August 2007 to June 2012**

Age and sex	Number	Per cent
<b>Age group (years)</b>		
0–5	1,581	30.5
6–11	2,583	49.8
12–15	874	16.9
16+	132	2.5
Not recorded	14	0.3
<b>Total</b>	<b>5,184</b>	<b>100.0</b>
<b>Sex</b>		
Male	2,678	51.7
Female	2,503	48.3
Not recorded	3	0.1
<b>Total</b>	<b>5,184</b>	<b>100.0</b>

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

## 4.3 Results of hearing assessment

During the audiology services, children's middle ear function and hearing acuity were examined by an audiologist. These include standard or digital otoscopic ear examination, diagnostic pure tone audiometry and diagnostic tympanometry. Visual response orientation audiometry (VROA) is also used to assess hearing in children between 9 months and 3 years of age. Because the results recorded are obtained in a sound field where both ears are being presented with sounds without differentiation, diagnostic audiology results do not provide detailed information on separate ears and generally reflect the ear with the best hearing acuity.

Apart from hearing function, children's middle ear condition is also examined and diagnosed according to CARPA standard diagnostic definitions. These results will be reported in Chapter 6 in conjunction with examination results of ENT consultation. This section will focus on reporting the results of hearing assessment, including hearing loss, type of hearing loss and hearing impairment. The data presented in this section are based on results from the latest audiology check for each child to ensure that the most up-to-date information is provided.

### Hearing loss and type of hearing loss

A diagnosis of hearing loss defines a functional limitation that may affect activity or participation. It is diagnosed when any pure tone audiometry hearing threshold response falls outside the normal range in either ear at any sound frequency. Hearing loss may be present in one ear (unilateral) or both ears (bilateral).

Among the 5,184 children who received audiology services, 2,664 (51%) had hearing loss in at least one ear. Of those children with hearing loss, 1,611 had hearing loss in both ears and 854 had hearing loss in one ear. A further 199 children who had hearing loss were tested with a sound field, so it could not be determined whether they had bilateral or unilateral hearing loss. However, it was likely that most children tested with a sound field may have bilateral hearing loss (Table 4.3).

**Table 4.3: Hearing status<sup>(a)</sup>, Indigenous children who received an audiology service, July 2007 to June 2012**

Hearing status	Number of children	Per cent of children who had an audiology check	Per cent of children who had hearing loss
No hearing loss	2,062	39.8	..
Hearing loss	2,664	51.4	100.0
<i>Unilateral (one ear)</i>	854	16.5	32.1
<i>Bilateral (both ears)</i>	1,611	31.1	60.5
<i>As tested by sound field<sup>(b)</sup></i>	199	3.8	7.5
Missing <sup>(c)</sup>	458	8.8	..
<b>Total number of children who received an audiology service</b>	<b>5,184</b>	<b>100.0</b>	..

(a) Where child received multiple audiology services, information is from latest service.

(b) Children tested for hearing loss using a sound field are presented separately, because it is not possible to distinguish unilateral and bilateral hearing loss using this testing.

(c) Missing includes not stated, unsure, invalid and not tested responses.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.

2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

The proportion of children with hearing loss varied slightly by age. It was about 54% for children aged 5 years and under, 53% for children aged 12 and over and 49% for children aged 6–11. An equal percentage of boys and girls were found to have hearing loss (Table 4.4).

**Table 4.4: Hearing status<sup>(a)</sup> by age and sex, Indigenous children<sup>(b)(c)</sup> who received an audiology service, July 2007 to June 2012**

	Total number of children who received an audiology service	Number of children with hearing loss in at least one ear	Hearing loss (%)
<b>Age group (years)</b>			
0–5	1,581	851	53.8
6–11	2,583	1,271	49.2
12+	1,006	534	53.1
Missing <sup>(c)</sup>	14	8	57.1
<b>Total</b>	<b>5,184</b>	<b>2,664</b>	<b>51.4</b>
<b>Sex</b>			
Male	2,678	1,375	51.3
Female	2,503	1,288	51.5
Missing	3	1	33.3
<b>Total<sup>(d)</sup></b>	<b>5,184</b>	<b>2,664</b>	<b>51.4</b>

(a) Where child received multiple audiology services, information is from latest service.

(b) Excludes children with an unknown or invalid HRN.

(c) Missing includes 'not stated', 'unsure', 'invalid' and 'not tested' responses.

(d) Includes children with missing sex variable.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

**Box 1: Type of hearing loss**

- *Sensorineural hearing loss* is a deviation of hearing threshold from the normal range attributable to problems in the inner ear or the cochlear nerve.
- *Conductive hearing loss* describes a deviation of hearing threshold from normal range associated with reduced conduction of sound through the outer ear, tympanic membrane (eardrum) or middle ear including ossicles (middle ear bones).
- *Mixed hearing loss* refers to a deviation of hearing threshold from the normal range that has conductive and sensorineural component combined.

The majority (87%) of children who had hearing loss had conductive hearing loss, while only a small proportion (3%) had sensorineural and a further 3% had both conductive and sensorineural hearing loss (Table 4.5).

**Table 4.5: Type of hearing loss<sup>(a)</sup>, Indigenous children who received an audiology service, July 2007 to June 2012**

Type of hearing loss	Number	Per cent of children who had an audiology check	Per cent of children with hearing loss
Conductive	2,322	44.8	87.2
Sensorineural	75	1.4	2.8
Mixed (both conductive and sensorineural)	70	1.4	2.6
Missing <sup>(b)</sup>	197	3.8	7.4
<i>Total number of children with hearing loss</i>	<i>2,664</i>	<i>51.4</i>	<i>100.0</i>
<i>Total number of children with no hearing loss</i>	<i>2,520</i>	<i>48.6</i>	<i>..</i>
<b>Total number of children who had an audiology check</b>	<b>5,184</b>	<b>100.0</b>	<b>..</b>

(a) Where child received multiple audiology services, information is from latest service.

(b) Missing includes not stated, unsure, invalid and not tested responses.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

## Hearing impairment

Hearing impairment estimates the degree of hearing difficulty associated with hearing loss and links directly to the level of recommended rehabilitation support. It is classified using a scale of mild, moderate, severe and profound, and is based on the average of the pure tone threshold, in the best hearing ear, at three frequencies—500 Hz, 1000 Hz and 2000 Hz.

It is important to note that the pure tone thresholds used to identify hearing impairment for the purpose of this report are based on NT specific standards, which differ from Australian and the World Health Organization (WHO) standards. Because the pure tone threshold used by the NT is lower than Australian and WHO standards, it means more children were classified as having hearing impairment and a higher level of hearing impairment than it would have been if the Australian or WHO standard was used. The number of children with hearing impairment and the severity of the impairment in this report were reported based on the categorical variable on the data collection form provided by the NT DoH, and the measurement of hearing impairment was not provided to the AIHW (Appendix G).

**Box 2: Definitions of hearing impairment**

- *Mild*: On average, the quietest sounds that people can hear with their better ear are between 16–30 dB HL in soundproof conditions and 26–35 dB HL in non-soundproof conditions. They are able to hear and repeat words spoken in normal voice at 1 m. Counselling and hearing aids may be needed.
- *Moderate*: On average, the quietest sounds that people can hear with their better ear are between 31–60 dB HL in soundproof conditions and 36–60 dB HL in non-soundproof conditions. They are able to hear and repeat words spoken in raised voice at 1 m and have difficulty keeping up with conversations without using a hearing aid.
- *Severe*: On average, the quietest sounds that people can hear with their better ear are between 61–90 dB HL either in soundproof conditions or non-soundproof conditions. They are able to hear some words when shouted into the better ear. Hearing aids are needed. If no hearing aids are available, lip-reading and signing may be necessary.
- *Profound*: On average, the quietest sounds that people can hear with their better ear are 91+ dB HL either in soundproof conditions or non-soundproof conditions. They are unable to hear and understand even a shouted voice. Hearing aids may help understanding words. Additional rehabilitation needed. Lip-reading and sometimes signing essential.

In total, 1,669 children (32% of those who received an audiology check) had hearing impairment (Table 4.6). About 23% of children had mild hearing impairment, 9% had moderate and less than 1% had either severe or profound hearing impairment.

**Table 4.6: Degree of hearing impairment, Indigenous children<sup>(a)</sup> who received an audiology service, July 2007 to June 2012**

Degree of hearing impairment	Number	Per cent of children who had an audiology check
<b>Hearing impairment<sup>(b)</sup></b>		
Mild	1,169	22.6
Moderate	480	9.3
Severe	14	0.3
Profound	6	0.1
<i>Sub-total number of children with hearing impairment</i>	<i>1,669</i>	<i>32.2</i>
<i>Sub-total number of children with no hearing impairment</i>	<i>3,014</i>	<i>58.7</i>
<i>Sub-total missing<sup>(c)</sup></i>	<i>474</i>	<i>9.1</i>
<b>Total number of children who received an audiology check</b>	<b>5,184</b>	<b>100.0</b>

(a) Where child received multiple audiology services, information is from latest service.

(b) Hearing impairment is based on the child's better ear. Therefore, degree of hearing loss is only reported for those children who may have bilateral hearing loss.

(c) Missing includes not stated, unsure, invalid and not tested responses.

#### Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.

2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

The prevalence of hearing impairment among children who received audiology services varied by age, but less so by sex. Of children aged 5 years and under, 40% had hearing impairment (26% had mild and 15% had moderate, severe or profound hearing impairment) (Table 4.7). The prevalence of hearing impairment was under 30% (20-21% had mild and 7-8% had moderate, severe or profound hearing impairment) for children aged over 5 years. Boys and girls had similar levels of hearing impairment.

**Table 4.7: Degree of hearing impairment<sup>(a)(b)</sup>, by age and sex, Indigenous children<sup>(c)</sup> who received an audiology service, July 2007 to June 2012**

Number of children who received an audiology service	Children with hearing impairment						
	Mild		Moderate/severe/profound		Total		
	Number	Per cent	Number	Per cent	Number	Per cent	
<b>Age group (years)</b>							
0–5	1,581	409	25.9	230	14.5	639	40.4
6–11	2,583	552	21.4	185	7.2	737	28.5
12+	1,006	206	20.5	83	8.3	289	28.7
Not recorded	14	2	14.3	2	14.3	4	28.6
<b>Total</b>	<b>5,184</b>	<b>1,169</b>	<b>22.6</b>	<b>500</b>	<b>9.6</b>	<b>1,669</b>	<b>32.2</b>
<b>Sex</b>							
Male	2,678	618	23.1	252	9.4	870	32.5
Female	2,503	550	22.0	248	9.9	798	31.9
Not recorded	3	1	33.3	0	0.0	1	33.3
<b>Total</b>	<b>5,184</b>	<b>1,169</b>	<b>22.6</b>	<b>500</b>	<b>9.6</b>	<b>1,669</b>	<b>32.2</b>

(a) Where child received multiple audiology services, information is from latest service.

(b) Hearing impairment is based on the child's better ear. Therefore, degree of hearing loss is only reported for those children who may have bilateral hearing loss.

(c) Excludes children with an unknown or invalid HRN.

#### Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

## Changes in hearing loss and hearing impairment over time

A total of 1,893 children (38% of all children who received an audiology service) received two or more audiology services over 4.5 years. This provides an opportunity to examine the changes in prevalence of ear disease and hearing status among these children in this period. At their first audiology check, 69% of children had hearing loss. The prevalence of hearing loss is decreased by 10 percentage points at the last audiology service. Furthermore, the proportion of children with no hearing loss increased by about 14 percentage points between the first and last audiology checks (Table 4.8).

Although some of these changes may be partly attributed to the fluctuating nature of otitis media (OM) and hearing loss associated with this condition, the information in this section provides valuable indications of the outcomes of medical intervention and hearing services of the CHCI (CtG) hearing Program.

**Table 4.8: Hearing loss status at first and last service<sup>(a)</sup>, Indigenous children<sup>(b)</sup> who received at least two audiology services, July 2007 to June 2012**

<b>Hearing loss status</b>	<b>First service</b>		<b>Last service</b>		<b>Change in prevalence</b>
	<b>Number of children</b>	<b>Per cent</b>	<b>Number of children</b>	<b>Per cent</b>	
Hearing loss	1,305	68.9	1,114	58.8	-10.1
<i>Unilateral</i>	399	21.1	375	19.8	-1.3
<i>Bilateral</i>	833	44.0	702	37.1	-6.9
<i>As tested by sound field</i>	73	3.9	37	2.0	-1.9
No hearing loss	412	21.8	674	35.6	13.8
Missing <sup>(c)</sup>	176	9.3	105	5.5	-3.8
<b>Total children who received two or more audiology services</b>	<b>1,893</b>	<b>100.0</b>	<b>1,893</b>	<b>100.0</b>	<b>n.a.</b>

(a) Based on all children who received two or more audiology services.

(b) Excludes children with an unknown or invalid HRN.

(c) Missing includes not stated, unsure, invalid and not tested responses.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.

2. Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

Among children who received two or more audiology services, 854 had some degree of hearing impairment at their first check. More than half of these children (60%) had *improved hearing* at their last audiology check (Table 4.9), defined as a reduction in the degree of hearing impairment between the first and most recent audiology checks. Just under one in three children (29%) had no change in the degree of impairment between their first and last audiology services, and 6% experienced a *deterioration*, defined as an increase in the degree of impairment between the first and most recent audiology services.

**Table 4.9: Changes in degree of hearing impairment<sup>(a)</sup> between first and last audiology service<sup>(b)</sup>, Indigenous children<sup>(c)</sup> who received an audiology service, July 2007 to June 2012**

Change in degree of hearing impairment	Number	Per cent
Improved	508	59.5
No change	243	28.5
Deteriorated	51	6.0
Missing <sup>(d)</sup>	52	6.1
<b>Total children who received two or more audiology services who had hearing impairment at their first check</b>	<b>854</b>	<b>100.0</b>

(a) Based on those children who had some degree of hearing impairment at the first service.

(b) First service after CHC.

(c) Excludes children with an unknown or invalid HRN.

(d) Missing includes not stated, unsure, invalid and not tested responses.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.

2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

## Further action required

During audiology consultations, the audiologists recommend appropriate further action for the continuing care of the child. These actions may include care from an ENT specialist, primary healthcare or other hearing services, rehabilitation and educational services. Of those children who had received an audiology service, 74% were judged to require further action (Table 4.10). The most common action was continued monitoring by NT hearing services (56%), followed by case management by primary health-care workers (40%) and case management by an ENT specialist (33%). About 13% of children were referred to the Department of Education, Employment and Training Hearing Advisory Support, and 8% were referred for rehabilitation, which were provided by an organisation: Australian Hearing.

A large proportion of children who required further services were children with hearing loss. Some children who did not have hearing loss (at the time when their hearing assessment was conducted) also required further services. Treatment or monitoring may be required to prevent hearing loss, particularly for children with OM.

**Table 4.10: Type of further action required, Indigenous children who received an audiology service, August 2007 to June 2012**

<b>Type of further action required</b>	<b>No hearing loss</b>		<b>Hearing loss</b>		<b>Missing</b>		<b>Total</b>	
	<b>No. children</b>	<b>%</b>	<b>No. children</b>	<b>%</b>	<b>No. children</b>	<b>%</b>	<b>No. children</b>	<b>%</b>
At least one further action required <sup>(a)</sup>	764	37.1	2,568	96.4	404	88.4	3833	73.9
Ongoing monitoring by NT hearing services	471	22.8	2112	79.2	329	72.0	2912	56.2
Case management by primary health-care services	313	15.2	1529	57.4	249	54.5	2091	40.3
Case management by ENT specialist	226	11.0	1365	51.2	103	22.5	1694	32.7
Referral to Department of Education, Employment and Training hearing advisory support	25	1.2	645	24.2	20	4.4	690	13.3
Referral to Australian Hearing (rehabilitation)	6	0.3	413	15.5	16	3.5	435	8.4
Other	163	7.9	725	27.2	68	14.9	956	18.4
No further action required	1,355	65.7	97	3.6	44	9.6	1,496	28.9
<b>Total children</b>	<b>2,062</b>	<b>100.0</b>	<b>2,665</b>	<b>100.0</b>	<b>457</b>	<b>100.0</b>	<b>5,184</b>	<b>100.0</b>

(a) Children can have multiple further actions required, and as such, sum of this category totals more than 100%.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

## 4.4 CHC audiology referrals and follow-up services

During the CHCs, 1,291 children (about 14% of children who had a CHC) received an audiology referral (AIHW 2009). The following section presents data on the audiology follow-up services that were provided to these children.

Apart from audiology data collected through the CHCI (CtG) Program, data on follow-up services were obtained by linking to audiology services provided by other programs or funding sources in order to monitor their follow-up status and avoid duplication of services.

Of the 1,291 children who received a referral for audiology service, 231 were declared 'lost to follow-up' after three unsuccessful attempts by audiology outreach teams to provide services, and were subsequently removed from the referral list. Children who moved out of the prescribed areas of the NT or who passed away were also considered 'lost to follow-up'.

At the conclusion of the CHCI (CtG) Program (30 June 2012), there were 1,060 children on the active audiology referral list. Of these, 1,057 received an audiology service and 3 were still outstanding (Table 4.11). The average waiting time between referral and follow-up audiology services was around 16 months.

**Table 4.11: Number of Indigenous children<sup>(a)</sup> with an audiology referral: referral status and average waiting time, August 2007 to June 2012**

Active audiology referral	Children receiving audiology service		Average waiting time between referral and service (months) <sup>(b)</sup>	Outstanding audiology referral as at 30 June 2012
	Number	Per cent		
1,060	1,057	99.7	15.5	3

(a) Excludes children with an unknown or invalid HRN.

(b) Average waiting time excludes outstanding audiology referrals.

*Note:* Audiology services were provided to 50 children through other funding sources.

*Source:* AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

# **5 ENT services**

The CHCI (CtG) funded ENT services began in early 2008 as a part of the CHC follow-up services, although the data on these services were not collected at that time. Over the course of the CHCI (CtG) Program (July 2009 to December 2010), it was funded continually through the CtG Program with additional funding to enhance outreach ENT services. Since 2011 these services have been funded by other sources, which are not included in this report.

This chapter presents detailed information on these ENT services, including:

- ENT data collection and data limitations
- ENT services: number of services provided and number of children who received services
- results of ENT consultations, type of treatment given and further action required
- ENT surgery and procedures
- follow-up care for children who received a CHC ENT referral.

Apart from aggregated information on the number of services, no information was provided to the AIHW if the parent/guardian of the child did not give consent for sharing detailed information. Therefore, except in sections 5.2 and 5.5 of this chapter, the analyses are based on consented data only.

## **5.1 ENT data collection**

Information was collected using an ENT consultation data collection form (including face-to-face consultations and teleotology) and an ENT surgery data collection form.

The ENT consultation form provides information on:

- the date of service and ID of the community or town camp where the service was provided
- date image was taken of the eardrum (for teleotology only)
- details of the child, including hospital registration number (HRN), date of birth, and sex
- diagnosis of each ear
- actions taken and follow-up required
- type of surgery recommended.

The ENT surgery form provides information on the type of surgery performed.

Because detailed information from the CHC ENT consultation and surgery data were available to AIHW only from July 2009, the information on the number of ENT services provided from August 2007 to June 2009 is derived from the CHC Chart review database. The Chart review data was established to monitor whether children received follow-up care for the referrals they received at their CHC. It includes information only on children's demographic characteristics and whether they were seen by the health professional they were referred to. Thus, the information from the Chart review is available only for section 5.2. The information in this chapter includes ENT consultations and surgery provided through the CHCI (CtG) Program only, which is not representative of the total number of ENT consultations and surgeries provided in the NT.

## Limitations of the data

The audiology and ENT data collections held by the AIHW share the same data limitations. Detailed information on these limitations including data coverage, consent for sharing information, tracking children by HRN, the sampling method and comparison of outcomes was presented in Chapter 4.

## 5.2 ENT services provided

Between August 2007 and December 2010, a total of 3,789 ENT services were provided to 2,643 children (Table 5.1). From August 2007 to June 2009, 968 services were received by children, as reported by Chart review data.

From July 2009 until December 2010, 2,530 ENT consultations funded through the CHCI (CtG) Program were received by 2,028 children. During this time, 291 ENT surgeries were received by 285 children. The majority (97%) of children's parents/guardians provided consent for sharing information with the AIHW.

**Table 5.1: Number of ENT services provided to Indigenous children by year, August 2007 to December 2010<sup>(a)</sup>**

Financial year	Services			Children		
	Consent	Non-consent	Total	Consent	Non-consent	Total
August 2007–June 2009						
<i>Chart review</i>	Number	968	0	968	968	0
	Per cent	100.0	0.0	100.0	100.0	0.0
July 2009–December 2010						
<i>ENT consultation</i>	Number	2,439	91	2,530	1,939	89
	Per cent	96.4	3.6	100.0	96.1	3.9
<i>ENT surgery</i>	Number	291	0	291	285	0
	Per cent	100.0	0	100.0	100.0	0
<b>Total<sup>(b)</sup></b>	<b>Number</b>	<b>3,698</b>	<b>91</b>	<b>3,789</b>	<b>2,554</b>	<b>89</b>
	<b>Per cent</b>	<b>97.6</b>	<b>2.4</b>	<b>100.0</b>	<b>96.6</b>	<b>3.4</b>

(a) A number of CHCI (CtG) funded ENT consultations and surgery were provided to the children in the prescribed areas before 1 July 2009. Apart from information collected from Chart review, these data were not collected and therefore are not included in this report.

(b) As one child can receive more than one service in different periods and can receive both ENT consultation and surgery, the column does not add up to sub-total or total.

*Note:* Services include only those provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of NTER CHCI ENT and ENT surgery databases for services provided as at 31 December 2010.

More than half (52%) of children who received an ENT service (including ENT consultation, ENT surgery or as per Chart review) were aged 6–11, and 29% were aged 0–5 (Table 5.2). This may be because younger children are more easily accessible by ENT services as their parents/guardians are likely to bring them for health checks, or they are in school when outreach teams were visiting the community. Older children are less likely to be attending school, and are therefore more difficult to locate for ENT services. A similar number of boys and girls received an ENT service.

**Table 5.2: Number of Indigenous children who received an ENT service<sup>(a)</sup>, by age and sex, August 2007 to December 2010**

	Number	Per cent
<b>Age group<sup>(b)</sup> (years)</b>		
0–5	744	29.1
6–11	1,319	51.6
12–15	422	16.5
16+	67	2.6
Missing	2	0.1
<b>Total</b>	<b>2,554</b>	<b>100.0</b>
<b>Sex</b>		
Male	1,283	50.2
Female	1,270	49.7
Missing	1	0.0
<b>Total</b>	<b>2,554</b>	<b>100.0</b>

(a) Includes ENT consultation, ENT surgery and Chart review.

(b) Age based on latest ENT service received.

#### Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI ENT database for services provided as at 31 December 2010.

## 5.3 ENT consultations

The information provided in this section is derived from 2,439 ENT consultations provided for 1,939 children who received services from July 2009 to December 2010 and gave consent for sharing information.

A large proportion of ENT consultations were face-to-face (89%) and around 1 in 10 involved the use of teleotology (Table 5.3).

**Table 5.3: Indigenous children who received an ENT consultation, type of ENT consultation, July 2009 to December 2010**

Type of ENT consultation	Number of consultations	Number of children	Per cent of consultations <sup>(a)</sup>
Face-to-face consultation	2,158	1,755	88.5
Teleotology	281	277	11.5
<b>Total</b>	<b>2,439</b>	<b>1,939<sup>(b)</sup></b>	<b>100.0</b>

(a) Percentage of ENT consultations.

(b) The number of children does not add up to the sum as children may receive more than one consultation.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI ENT database for services provided as at 31 December 2010.

For children who received an ENT consultation through the use of teleotology, the median time between digital images of a child's eardrum being taken and reviewed was about 6 weeks. The minimum time that elapsed was 2 weeks and the maximum was about 9 weeks (Table 5.4).

**Table 5.4: Time elapsed between photo taken and photo reviewed for teleotology, July 2009 to December 2010**

Time elapsed	Number of weeks
Minimum	2.0
Median	5.7
Maximum	9.4

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHC (CtG) Program.
3. The effectiveness of teleotology is currently under review by NT DOH.

Source: AIHW analysis of NTER CHCI ENT database for services provided as at 31 December 2010.

## Clinical management during ENT consultations

A range of treatments were available to children during the ENT consultations. Around one in three (32%) children who received a consultation were treated (Table 5.5). The most common type of treatment was medication (29%), which comprised topical antibiotic (22%), oral antibiotics (11%) and other drugs (2%). An aural toilet<sup>3</sup> was provided to 9% of children. A total of 1,323 children had an assessment and received a recommendation for further action, although they did not receive any treatment on-site.

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<sup>3</sup> Aural toilet: This involves the cleaning of the ear under the microscope, usually with a small sucker to remove wax and debris.

**Table 5.5: Type of treatment given during ENT consultation, Indigenous children who received an ENT consultation, July 2009 to December 2010**

Treatment	Number	Per cent
<b>Subtotal number of children receiving any treatment<sup>(a)</sup></b>	<b>616</b>	<b>31.8</b>
Medication	566	29.2
Antibiotics (oral)	208	10.7
Antibiotics (topical)	426	22.0
Other drugs	43	2.2
Foreign body removed	48	2.5
Aural toilet	179	9.2
Other	16	0.8
<b>Subtotal number of children receiving assessment and further recommendation only</b>	<b>1,323</b>	<b>68.2</b>
<b>Total number of children receiving ENT consultation</b>	<b>1,939</b>	<b>100.0</b>

(a) This is a multiple-response item. The sum does not add up to the total because one surgery can involve multiple procedures.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI ENT database for services provided as at 31 December 2010.

## Further action required

Around three-quarters (73%) of children who received an ENT consultation required at least one further action after their initial ENT consultation (Table 5.6). The most common further actions required were ENT review (65%) and audiological assessment (63%). Just under half (42%) of children were referred for case management by primary health-care services for monitoring of prescribed medications and ear health. A small portion of children (3%) were referred to Australian Hearing to receive or review hearing aids.

Surgery was recommended for 24% of children who received a consultation (Table 5.6). The most common surgery recommended was myringoplasty (16%), followed by myringotomy (6%) and adenoidectomy (5%).

**Table 5.6: Type of further action required and type of surgery recommended for Indigenous children who received an ENT consultation, July 2009 to December 2010**

	Number	Per cent of children who received ENT consultation
<b>Type of further action required</b>		
Case management by primary health-care services	819	42.2
Audiological assessment	1,218	62.8
Australian Hearing	53	2.7
ENT review	1,266	65.3
<b>Total number of children who had at least one further action required</b>	<b>1,414<sup>(b)</sup></b>	<b>72.9</b>
<b>Type of surgery recommended</b>		
Myringoplasty	315	16.2
Adenoidectomy	92	4.7
<i>Myringotomy</i>		
<i>Myringotomy only</i>	74	3.8
<i>Myringotomy&amp; grommets</i>	38	2.0
<i>Subtotal for myringotomy</i>	112	5.8
EUA <sup>(a)</sup>	44	2.3
Exploration of middle ear/ mastoid	10	0.5
Removal of tubes	5	0.3
Other procedure	20	1.0
<b>Total number of children who had at least one surgery recommended<sup>(b)</sup></b>	<b>461</b>	<b>23.8</b>
<b>Total number of children who received ENT consultation</b>	<b>1,939</b>	<b>100.0</b>

(a) Examination under anaesthetic.

(b) This is a multiple-response item. The sum does not add up to the total because one surgery can involve multiple procedures.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI ENT and ENT surgery database for services provided as at 31 December 2010.

## 5.4 ENT surgery and procedures

Children aged 5 years or over with OME that has persisted for more than 3 months and had associated bilateral hearing loss are considered for ENT surgical intervention. Children with inactive CSOM/dry perforation, who are older than 8 years, are also considered for ENT surgical intervention.

Acute otitis media conditions and active CSOM will generally not be considered suitable for surgical intervention until the underlying active infection is treated and maintained through primary health intervention.

Surgeries are discussed with children's families before operation, including pre- and post-surgical care which may be ongoing for up to 3 years. Families are also provided with resources to support discussion of the types of surgeries being performed.

### Box 3: Major types of ENT surgery provided through the CHCI (CtG) Program

- A *myringoplasty* is most commonly performed when there is a hole (perforation) in the ear drum. Children with a perforated ear drum usually experience some degree of hearing loss. The purpose of the surgery is to restore the eardrum, which acts to improve hearing and also as a safety barrier minimising the risk of further infections (Ross 2012).
- A *myringotomy* is performed when there is an accumulation of fluid in the middle ear causing some hearing loss. A myringotomy is the creation of a small incision in the eardrum, through which fluid within the middle ear can be drained. This may be followed by inserting small plastic tubes called grommets that maintain the patency of the hole in the ear drum for the next 6–12 months. This is one of the most common ENT procedures (Zoll 2006).
- An *adenoidectomy* may be performed where children are experiencing trouble breathing through the nose or have chronic ear infections, caused by enlarged or infected adenoids. The removal of enlarged adenoids during this procedure may resolve issues the child is having with their ears, nose or throat (Laberge 2004).

CHCI (CtG) funded ENT surgeries were carried out before July 2009, but no data was collected at the time. The information in this section includes ENT surgery conducted from July 2009 to the end of December 2010.

A total of 291 ENT surgeries were received by 283 children between July 2009 and December 2010. The most common ENT procedure performed was myringoplasty (68%), followed by myringotomy (25%) and adenoidectomy (14%) (Table 5.7).

The types of procedures performed varied between age groups. Myringoplasty was the most common procedure received by children over 5 years (74%), while the majority of children under 5 years received myringotomy (86%) (with grommets 32%, and without grommets 55%).

Of the 461 children who were recommended for surgery, just over 60% received surgery funded through the CHCI (CtG) Program (Table 5.6). One reason was that the NT DoH was constrained by the amount of funding available for surgery. Some surgery had to be cancelled or delayed as children's ears were not in condition for surgery at the time. Several patients declined surgery, and the reasons for declined surgery were unknown.

**Table 5.7: Type of ENT procedure, Indigenous children who received ENT surgery, July 2009 to December 2010**

Type of ENT procedure	ENT procedure for children under 5 years		ENT procedure for children 5 years or over		Total	
	Number	Per cent	Number	Per cent	Number	Per cent
Myringoplasty	0	0	198	73.6	198	68.0
Myringotomy	19	86.4	55	20.4	74	25.4
<i>Myringotomy only</i>	12	54.5	46	17.1	58	19.9
<i>Myringotomy &amp; grommets</i>	7	31.8	9	3.3	16	5.5
Adenoidectomy	12	54.5	30	11.2	42	14.4
Exploration of middle ear/ mastoid with or without anaesthetic	n.p.	n.p.	n.p.	n.p.	26	8.9
Other procedure	n.p.	n.p.	n.p.	n.p.	12	4.1
<b>Total number of ENT procedures<sup>(a)</sup></b>	<b>35</b>	<b>n.p.</b>	<b>317</b>	<b>n.p.</b>	<b>352</b>	<b>n.p.</b>
<b>Total number of ENT surgery</b>	<b>22</b>	<b>100</b>	<b>269</b>	<b>100</b>	<b>291</b>	<b>100</b>
<b>Total number of children who received surgery</b>	<b>22</b>	<b>..</b>	<b>261</b>	<b>..</b>	<b>283</b>	<b>..</b>

(a) This is a multiple response item. The sum does not add up to the total because one surgery can involve multiple procedures.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI ENT and ENT surgery database for services provided as at 31 December 2010.

## 5.5 CHC ENT referrals and follow-up services

During the CHCs, 1,630 children (about 14% of children who had a CHC) received an ENT referral (AIHW 2009). The following section presents data on the ENT follow-up services that were provided to these children.

Apart from ENT data collected through the CHCI (CtG) Program, data on follow-up services were obtained by linking to ENT services provided by other programs or funding sources in order to monitor their follow-up status and avoid duplication of services.

Of the children who received a referral for ENT services, 250 were lost to follow-up after three unsuccessful attempts by ENT outreach teams to provide services. Children who moved out of the prescribed areas of the NT or who passed away were also considered lost to follow-up.

At the conclusion of the CHCI (CtG) Program (30 June 2012), there were 1,380 children on the active ENT referral list. Of these, 1,344 (97%) had received an ENT service and 36 were still outstanding (Table 5.8). The average waiting time between referral and follow-up ENT service was just over 2 years (25 months).

**Table 5.8: Number of Indigenous children<sup>(a)</sup> with an ENT referral: referral status and average waiting time, July 2009 to December 2010**

Children with active ENT referral <sup>(b)</sup>	Children receiving ENT service		Average waiting time between referral and service (months) <sup>(c)</sup>	Outstanding ENT referral
	Number	Per cent		
1,380	1,344	97.4	25.0	36

(a) Excludes children with an unknown or invalid HRN.

(b) Referral from CHC and Chart review.

(c) Average waiting time excludes outstanding ENT referrals.

Source: AIHW analysis of NTER CHCI ENT database for services provided as at 31 December 2010.

# 6 Prevalence of middle ear conditions

The data presented in this section were compiled using the CHC ENT and audiology databases. A total of 5,474 children received ENT consultations or audiology services (Table 6.1). The majority received both these services. If children received two or more of these services, the diagnosis in the most recent service was used and if children received two services on the same day the ENT diagnosis was selected for analysis.

## 6.1 Types of middle ear conditions

At least one type of middle ear condition was diagnosed in 67% of children who received an audiology or ENT service (Table 6.1). The most common middle ear condition was OME (26% of children), followed by dry perforation (15%) and CSOM (12%). Eleven per cent of children were diagnosed with eustachian tube dysfunction (ETD) and 7% were diagnosed with AOM.

The prevalence of CSOM among these children is three times the rate defined by WHO (4%) as a massive public health problem needing urgent action (WHO 2004).

### Box 4: Description of middle ear conditions

- *Otitis media* (OM) is a condition with any inflammation, fluid or suppurative infection in the middle ear.
- *Otitis media with effusion* (OME) is the presence of intact eardrum and middle ear fluid without symptoms or signs of infection.
- *Acute otitis media* (AOM) is the presence of suppurative (infected) middle ear fluid with or without eardrum perforation.
- *Chronic suppurative otitis media* (CSOM) is a persistent suppurative discharge from the middle ear through a tympanic membrane perforation for more than 6 weeks.
- *Dry perforation* refers to a CSOM condition that presents as a hole in the eardrum without any evidence of suppurative otitis media.
- *Eustachian tube dysfunction* (ETD) is negative middle ear pressure associated with compromised equalisation impeding middle ear function and sometimes causing middle ear fluid accumulation.

**Table 6.1: Type of middle ear condition<sup>(a)</sup>, Indigenous children who received an audiology or ENT service**

Type of middle ear condition	Number	Per cent
At least one type of middle ear condition <sup>(b)</sup>	3,650	66.7
<i>OME</i>	1,431	26.1
<i>Dry perforation</i>	791	14.5
<i>CSOM</i>	676	12.3
<i>ETD</i>	600	11.0
<i>AOM</i>	380	6.9
<i>Foreign body</i>	55	1.0
<i>Other</i>	373	6.8
No middle ear condition <sup>(c)</sup>	1,691	30.9
Missing <sup>(d)</sup>	133	2.4
<b>Total children who received an audiology or ENT service</b>	<b>5,474</b>	<b>100.0</b>

(a) Middle ear condition at most recent ENT service or, if only received audiology service, most recent audiology service.

(b) Because one child can have more than one middle ear condition, the column does not add up to sub-total.

(c) Where no middle ear condition reported for both ears.

(d) Includes cases where there is a missing value for one ear, and no middle ear condition in the other ear. Missing includes not stated, unsure, invalid and not tested responses.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 30 June 2012 and ENT services provided on or before 31 December 2010.

The presence of middle ear conditions varied by children's age and sex (Tables 6.2 and 6.3). The youngest children (0–5 years) had the highest prevalence of middle ear conditions, with 77% of children in this age group being diagnosed with at least one middle ear condition. The prevalence decreased with age, being 63% for children aged 6–11 years and 60% for children aged 12 and over. The majority of children in the 12 and over age group comprised children who were under 16.

The types of middle ear conditions were also distributed differently among children in different age groups. OME (35%), CSOM (14%), AOM (13%) and ETD (13%) were most common conditions in children aged 0–5 years. The prevalence of these conditions decreased with age, being 14% for OME, 14% for CSOM and 2% for AOM among children aged 12 and over. In contrast, the prevalence of dry perforation increased sharply with age from 10% in the youngest age group to 23% in the oldest age group (Table 6.2).

The presence and type of middle ear conditions were similar for boys and girls (Table 6.3).

**Table 6.2: Type of middle ear condition<sup>(a)</sup>, by age group, Indigenous children<sup>(b)</sup> who received an audiology or ENT service**

Type of middle ear condition	Age group							
	0–5 years		6–11 years		12+ years		Total	
	Number of children	Per cent						
At least one middle ear condition	1,355	76.9	1,692	62.6	603	59.8	3,650	66.7
AOM	225	12.8	132	4.9	23	2.3	380	6.9
CSOM	245	13.9	294	10.9	137	13.6	676	12.3
OME	620	35.2	671	24.8	140	13.9	1431	26.1
ETD	231	13.1	294	10.9	75	7.4	600	11.0
Dry perforation	167	9.5	396	14.7	228	22.6	791	14.5
Foreign body/ Other	147	8.3	201	7.4	78	7.7	426	7.8
No middle ear condition <sup>(c)</sup>	344	19.5	962	35.6	385	38.2	1,691	30.9
Missing <sup>(d)</sup>	63	3.6	47	1.7	21	2.1	133 <sup>(e)</sup>	2.4
<b>Total</b>	<b>1,762</b>	<b>100.0</b>	<b>2,701</b>	<b>100.0</b>	<b>1,009</b>	<b>100.0</b>	<b>5,474</b>	<b>100.0</b>

(a) Middle ear condition at most recent ENT service or, if only received audiology service, most recent audiology service.

(b) Excludes children with an unknown or invalid HRN.

(c) Where no middle ear condition reported for both ears.

(d) Missing cases for middle ear condition, which are 2.5% of cases, are not shown. Missing cases include cases where there is a missing value for one ear, and no middle ear condition in the other ear. Missing also includes not stated, unsure, invalid and not tested responses.

(e) Total missing children includes two cases where age was not reported.

#### Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 30 June 2012 and ENT services provided on or before 31 December 2010.

**Table 6.3: Type of middle ear condition<sup>(a)</sup> by sex, Indigenous children<sup>(b)</sup> who received an audiology or ENT service**

Type of middle ear condition	Sex					
	Male		Female		Total	
	Number of children	Per cent	Number of children	Per cent	Number of children	Per cent
At least one middle ear condition	1,890	51.8	1,759	48.2	3,650 <sup>(c)</sup>	100.0
AOM	209	55.0	171	45.0	380	100.0
CSOM	357	52.8	318	47.0	675	100.0
OME	739	51.6	692	48.4	1431	100.0
ETD	337	56.2	263	43.8	600	100.0
Dry perforation	383	48.4	408	51.6	791	100.0
Foreign body/ other	222	52.1	204	47.9	426	100.0
No middle ear condition <sup>(d)</sup>	872	51.6	819	48.4	1,691	100.0
Missing <sup>(e)</sup>	65	49.3	67	50.0	133 <sup>(c)</sup>	100.0
<b>Total</b>	<b>2,827</b>	<b>51.6</b>	<b>2,645</b>	<b>48.3</b>	<b>5,474</b>	<b>100.0</b>

(a) Middle ear condition at most recent ENT service or, if only received audiology service, most recent audiology service.

(b) Excludes children with an unknown or invalid HRN.

(c) Includes two children with missing values for sex.

(d) Where no middle ear condition was reported in both ears.

(e) Missing cases for middle ear condition, which are 2.5% of cases, are not shown. Missing cases include cases where there is a missing value for one ear, and no middle ear condition in the other ear. Missing also includes not stated, unsure, invalid and not tested responses.

#### Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.

2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 30 June 2012 and ENT services provided on or before 31 December 2010.

## 6.2 Changes in middle ear conditions over time

This section examines changes in prevalence of middle ear conditions among children who received audiology or ENT services. These changes were assessed from two aspects: the prevalence of middle ear conditions among children who received services at both the early and late stages of CHCI (CtG) and the ear health status of these children over time.

Children were selected to assess changes in prevalence of middle ear conditions if they received services in both periods (August 2007 to June 2009) and (July 2009 to June 2012) according to the date the services were received. For children who received services between August 2007 and June 2009, the diagnoses of their first services are used. For children who received services between July 2009 and June 2012, the diagnoses at their last service are used. Then, the difference of prevalence rate of middle ear conditions between both periods is calculated.

A total of 1,103 children received services in both periods. The number of children with no middle ear condition increased by 21 percentage points between August 2007 and June 2012 (Table 6.4). There was a reduction in the prevalence of OME (16 percentage points decrease), dry perforation (11 percentage points decrease) and AOM (6 percentage points decrease), but the prevalence of CSOM increased by 2 percentage points. Overall, the prevalence of at least one type of middle ear condition decreased by around 21 percentage points.

**Table 6.4: Changes in prevalence of middle ear conditions among Indigenous children<sup>(a)</sup> who received audiology or ENT service before and after June 2009**

Type of middle ear condition	August 2007–June 2009		July 2009–June 2012		Changes in prevalence rate
	Number of children	Prevalence	Number of children	Prevalence	
At least one middle ear condition <sup>(b)</sup>	960	87.0	733	66.5	-20.6
OME	362	32.8	191	17.3	-15.5
Dry perforation	355	32.2	231	20.9	-11.2
CSOM	206	18.7	186	16.9	1.8
AOM	106	9.6	42	3.8	-5.8
Any AOM, CSOM, OME or dry perforation	868	78.7	585	53.0	-25.7
Foreign body/ other	97	8.8	117	10.6	1.8
ETD	85	7.7	109	9.9	2.2
No middle ear condition <sup>(c)</sup>	122	11.1	352	31.9	20.9
Missing <sup>(d)</sup>	21	1.9	18	1.6	-0.3
<b>Total</b>	<b>1,103</b>	<b>n.a.</b>	<b>1,103</b>	<b>n.a.</b>	<b>n.a.</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Because one child can have more than one middle ear condition, the column does not add up to sub-total.

(c) Where no middle ear condition reported for both ears.

(d) Missing cases for middle ear condition, which are 2.5% of cases, are not shown. Missing cases include cases where there is a missing value for one ear, and no middle ear condition in the other ear. Missing also includes not stated, unsure, invalid and not tested responses.

#### Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 30 June 2012 and ENT services provided on or before 31 December 2010.

## 6.3 Disease progression of children with otitis media

There were 1,640 children who had another audiology check or ENT consultation 3 months after initial diagnosis of OM (OME, AOM, CSOM or dry perforation) in one ear or both ears. This section presents an analysis of the progress of OM among these children. This is achieved by comparing the health of each ear at the first and last audiology/ENT consultations. The minimum, medium and maximum length of time between the two checks was about 3, 22 and 49 months respectively.

AOM was diagnosed in at least in one ear for 196 children (Figure 6.1.1). At the last check, about 31% of these children were free from any middle ear condition in the affected ear. However, 11% still had the same condition and 20% had OME which may be an early sign of recurrence of this condition. In addition, 18% developed a chronic middle ear condition (CSOM or dry perforation) in the same ear at their last check.

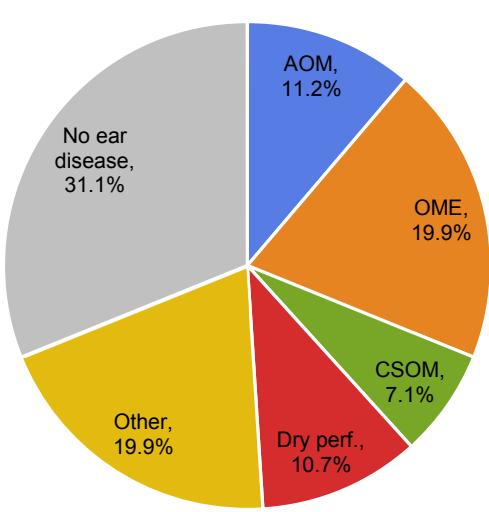
There were 607 children who had OME diagnosed in at least one ear (Figure 6.1.2). In the last check, 38% of them were free from any middle ear condition in the affected ear. However, nearly 30% had acute infection (AOM), and OME was persistent or recurrent in 5% of children. About 5% developed CSOM and 6% developed dry perforation in the same ear.

Among the 509 children with dry perforation at their first check, 22% had been successfully treated or the affected ear had spontaneously recovered at the time of their last check (Figure 6.1.4). However, 40% had AOM or OME in the affected ear at their last check. In addition, 9% developed a chronic infection in that ear and dry perforation persisted in 19% of children.

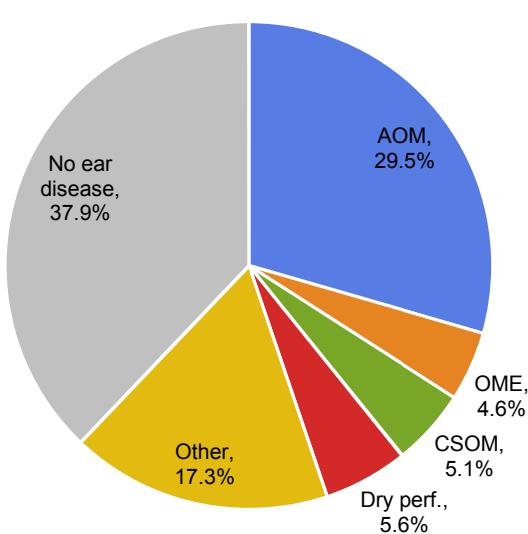
Many children diagnosed with CSOM at their first check experienced ongoing middle ear conditions, with only 15% of children being free of any middle ear condition at their last check (Figure 6.1.3). About 40% had AOM or OME, 25% had dry perforation and 11% still had CSOM at the same ear.

Overall, the results of the analysis show the poor progress of children with middle ear conditions. Apart from small proportion of these children who recovered from the conditions at their last checks (15–38%), most children had another episode of acute infection or developed chronic conditions (62–85%). These children may have developed, or be at high risk of developing, permanent hearing loss—which is highly preventable.

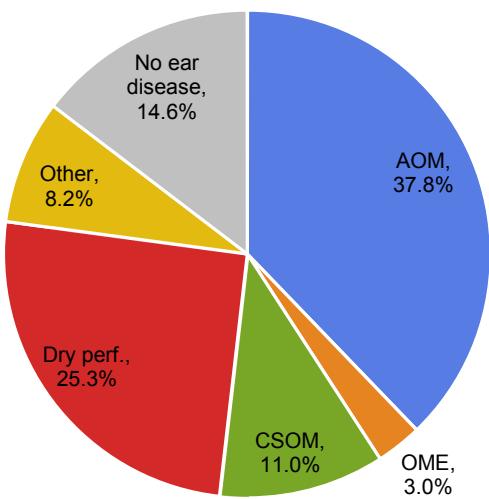
Past studies have focused on the poor progress of Indigenous children with OM (Morris et al. 2005). OM is a very complicated disease, which can persist for long periods of time and is highly likely to recur. The treatment of this disease not only requires coordination of multiple health service providers, such as general practitioners, audiologists and ENT specialists, but also requires substantial time and effort from caregivers to comply with the treatment plan for their children. In addition, the socio-economic conditions of Indigenous children in the prescribed areas contribute to the difficulties in the management of this disease.



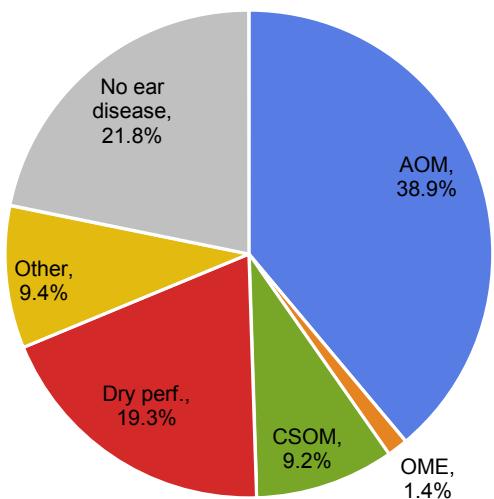
**Figure 6.1.1 Children diagnosed with AOM at first check  
N = 196**



**Figure 6.1.2 Children diagnosed with OME at first check  
N = 607**



**Figure 6.1.3 Children diagnosed with CSOM at first check  
N = 328**



**Figure 6.1.4 Children diagnosed with dry perforation at first check N = 509**

#### Notes

OM – Otitis media

AOM – Acute otitis media

CSOM – Chronic suppurative otitis media

Dry perf. – Dry perforation of the ear drum

Source: AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 31 December 2010.

**Figure 6.1: Progress of children with OM between first and last checks**

# Appendix A: Prescribed NTER areas

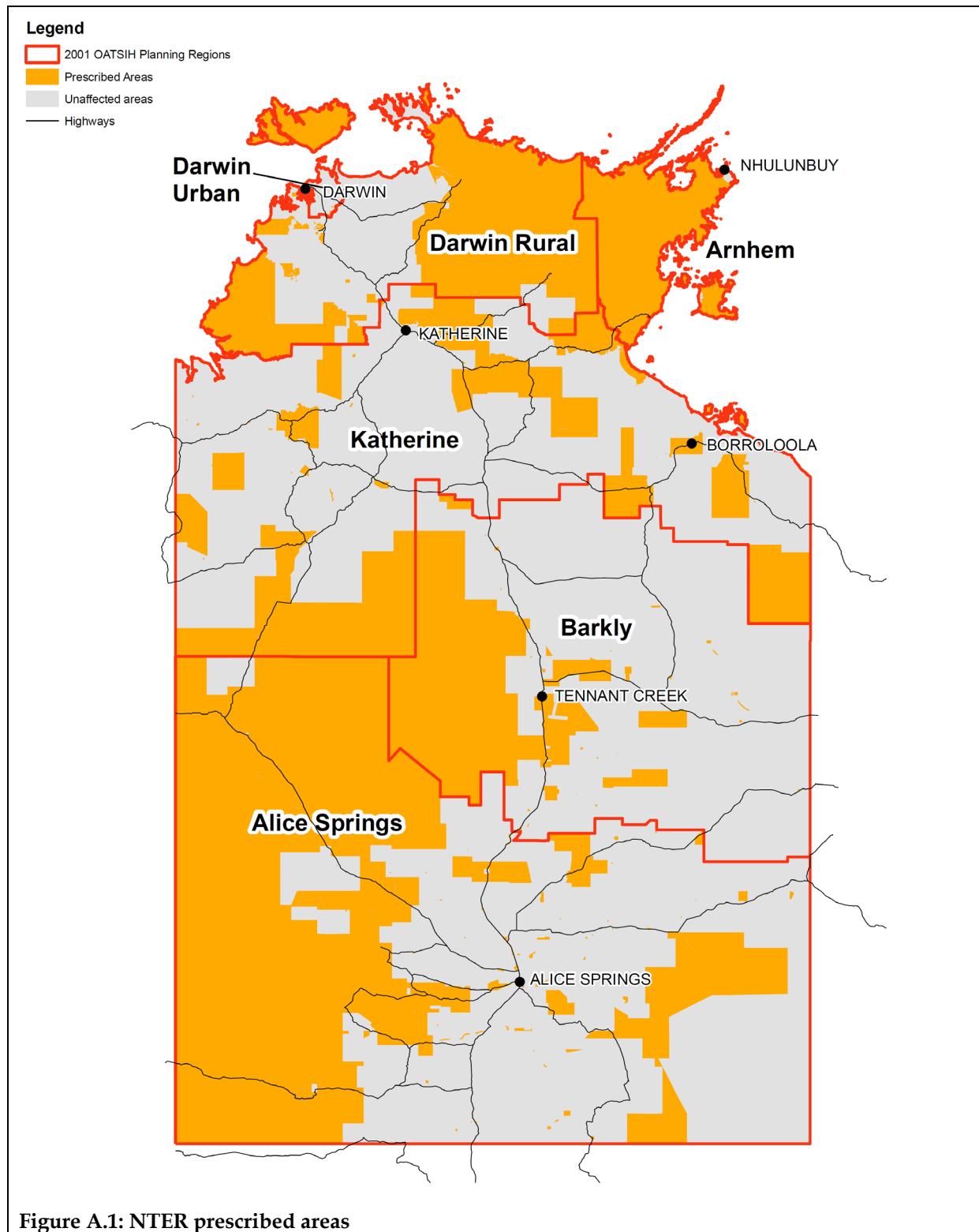


Figure A.1: NTER prescribed areas

# Appendix B: Dental, audiology and ENT services, by region

**Table B1: Number of Indigenous children receiving dental services and as a proportion of the population aged under 16 years, by region**

Region <sup>(a)</sup>	Children	Population under 16 years <sup>(b)</sup>	Per cent of population under 16 years
Arnhem	2,373	3,350	71.6
Central Australia	2,106	3,934	54.4
Darwin Rural	1,995	5,188	40.5
Katherine/Barkly	1,849	3,787	50.0
Hospital <sup>(c)</sup> /out of area <sup>(d)</sup>	710	n.a.	n.a.
<b>Sub-total (consent)</b>	<b>7,376</b>	<b>16,259</b>	<b>45.3</b>
<b>Sub-total (non-consent)</b>	<b>1,905</b>	<b>16,259</b>	<b>11.8</b>
<b>Total</b>	<b>9,281</b>	<b>16,259</b>	<b>57.1</b>

(a) Region where received dental service.

(b) Estimated Indigenous resident population figures for children aged under 16 years who live in communities and town camps covered by the CHCI. These estimates were provided by the DoHA.

(c) Received dental service in hospital.

(d) Received dental service outside of prescribed area.

#### Notes

1. The total does not add up as some children may receive services in more than one region.
2. Data are only provided for services where children's families have provided consent to share information with the AIHW.
3. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

**Table B2: Number of Indigenous children receiving audiology services and as a proportion of the population aged under 16 years, by region**

Region <sup>(a)</sup>	Children	Population under 16 years <sup>(b)</sup>	Per cent of population under 16 years
Arnhem	1,064	3,350	31.8
Central Australia	1,543	3,934	39.2
Darwin Rural	1,202	5,188	23.2
Katherine/Barkly	1,231	3,787	32.5
Hospital <sup>(c)</sup> /out of area <sup>(d)</sup>	144	n.a.	n.a.
<b>Sub-total (consent)</b>	<b>5,184</b>	<b>16,259</b>	<b>31.9</b>
<b>Sub-total (non-consent)</b>	<b>555</b>	<b>16,259</b>	<b>3.4</b>
<b>Total</b>	<b>5,739</b>	<b>16,259</b>	<b>35.3</b>

(a) Region where received audiology service.

(b) Estimated Indigenous resident population figures for children aged 15 years and under who live in communities and town camps covered by the CHCI. These estimates were provided by the DoHA.

(c) Received audiology service in hospital.

(d) Received audiology service outside prescribed area.

*Notes*

1. The total does not add up as some children may receive services in more than one region.
2. Data are only provided for services where children's families have provided consent to share information with the AIHW.
3. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 30 June 2012.

**Table B3: Number of Indigenous children receiving ENT services<sup>(a)</sup> and as proportion of the population aged 15 years and under, by region**

Region <sup>(b)</sup>	Children	Population 0–15 years <sup>(c)</sup>	Per cent of population 0–15 years
Arnhem	446	3,350	13.3
Central Australia	820	3,934	20.8
Darwin Rural	512	5,188	9.9
Katherine/Barkly	589	3,787	15.6
Hospital <sup>(d)</sup> /out of area <sup>(e)</sup>	276	n.a.	n.a.
<b>Sub-total (consent)</b>	<b>2,554</b>	<b>16,259</b>	<b>15.7</b>
<b>Sub-total (non-consent)</b>	<b>89</b>	<b>16,259</b>	<b>0.6</b>
<b>Total</b>	<b>2,643</b>	<b>16,259</b>	<b>16.3</b>

(a) Includes children who received ENT consultation, ENT surgery and Chart review.

(b) Region where received ENT service.

(c) Estimated Indigenous resident population figures for children aged 15 years and under who live in communities and town camps covered by the CHCI. These estimates were provided by the DoHA.

(d) Received ENT service in hospital.

(e) Received ENT service outside prescribed area.

*Notes*

1. The total does not add up as some children may receive services in more than one region.
2. Data are only provided for services where children's families have provided consent to share information with the AIHW.
3. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check audiology and ENT dataset for ENT services provided on or before 31 December 2010.

# Appendix C: Children requiring follow-up services, by region

**Table C1: Number of Indigenous children<sup>(a)</sup> requiring follow-up dental services as at their latest service, by region**

Region/location	Number	Per cent
Arnhem	701	33.8
Central Australia	385	18.6
Darwin Rural	591	28.5
Katherine/Barkly	287	13.8
Hospital/out of area <sup>(b)</sup>	110	5.3
<b>Total</b>	<b>2,074</b>	<b>100.0</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Children who received a CHC within the prescribed areas then received dental services outside of the prescribed areas.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

**Table C2: Number of Indigenous children<sup>(a)</sup> requiring follow-up audiology services as at their latest service, by region**

Region	Number	Per cent
Arnhem	740	19.8
Central Australia	1,094	29.3
Darwin Rural	884	23.7
Katherine/Barkly	906	24.3
Hospital/out of area <sup>(b)</sup>	109	2.9
<b>Total</b>	<b>3,733</b>	<b>100.0</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Children who received a CHC within the prescribed areas then received dental services outside of the prescribed areas.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of NTER CHCI audiology database on audiology services provided on or before 30 June 2012.

**Table C3: Number of Indigenous children<sup>(a)</sup> requiring follow-up ENT services as at their latest service, by region**

Region	Number	Per cent
Arnhem	222	18.4
Central Australia	398	32.9
Darwin Rural	252	20.8
Katherine/Barkly	287	23.7
<b>Hospital/out of area<sup>(b)</sup></b>	<b>50</b>	<b>4.1</b>
<b>Total</b>	<b>1,209</b>	<b>100.0</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Children who received a CHC within the prescribed areas then received dental services outside of the prescribed areas.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

*Source:* AIHW analysis of Child Health Check ENT dataset for services provided on or before 31 December 2010.

# Appendix D: CHC referral status, by region

**Table D1: Number of Indigenous children<sup>(a)(b)</sup> with a dental referral, who received a dental service: average waiting time and referral status, by region**

Region <sup>(d)</sup>	Children who received dental service		Average waiting time between referral and service (months) <sup>(c)</sup>	Outstanding dental referral	
	Children on active referral list	Number		Number	Per cent
Arnhem	837	734	87.7	22.5	103
Central Australia	609	606	99.5	15	3
Darwin Rural	727	721	99.2	20.9	6
Katherine/Barkly	655	585	89.3	18.7	70
<b>Total</b>	<b>2,828</b>	<b>2,646</b>	<b>93.6</b>	<b>19.5</b>	<b>182</b>
					<b>6.4</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Data are only provided for services where children's families have provided consent to share information with the AIHW.

(c) Average waiting time excludes outstanding audiology referrals.

(d) Region where received first audiology service.

Source: AIHW analysis of Child Health Check dental dataset for dental services provided on or before 30 June 2012.

**Table D2: Number of Indigenous children<sup>(a)(b)</sup> with an audiology referral, who received an audiology service: average waiting time and referral status, by region**

Region <sup>(d)</sup>	Children who received audiology service		Average waiting time between referral and service (months) <sup>(c)</sup>	Outstanding audiology referral	
	Children on active referral list	Number		Number	Per cent
Arnhem	211	211	100.0	16.1	0
Central Australia	347	345	99.4	12.5	2
Darwin Rural	246	246	100.0	16.2	0
Katherine/Barkly	256	255	99.6	18.3	1
<b>Total</b>	<b>1,060</b>	<b>1,057</b>	<b>99.7</b>	<b>15.5</b>	<b>3</b>
					<b>0.3</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Data are only provided for services where children's families have provided consent to share information with the AIHW.

(c) Average waiting time excludes outstanding audiology referrals.

(d) Region where received first audiology service.

Source: AIHW analysis of NTER CHCI audiology database on audiology services provided as at 31 July 2012.

**Table D3: Number of Indigenous children<sup>(a)(b)</sup> with an ENT referral, who received an ENT service: average waiting time and referral status, by region**

Region <sup>(d)</sup>	Children who received ENT service		Average waiting time between referral and service (months) <sup>(c)</sup>	Outstanding ENT referral	
	Children on active referral list	Number		Number	Per cent
Arnhem	270	267	98.9	24	3
Central Australia	495	482	97.4	26.4	13
Darwin Rural	248	242	97.6	26.5	6
Katherine/Barkly	367	353	96.2	23	14
<b>Total</b>	<b>1,380</b>	<b>1,344</b>	<b>97.4</b>	<b>25</b>	<b>36</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Region where received first audiology service.

(c) Average waiting time excludes outstanding ENT referrals.

(d) Referral from CHC and Chart review.

Source: AIHW analysis of Child Health Check ENT dataset for services provided on or before 30 June 2012.

# Appendix E: Oral health, hearing health and ear health status, by region

**Table E1: Percentage of children with DMFT/dmft > 0 and mean DMFT/dmft by region, children aged 0–17**

Region <sup>(a)</sup> /location	Children	DMFT/dmft > 0 (%)	Mean DMFT/dmft
Arnhem	524	79.8	4.8
Central Australia	67	88.1	4.1
Darwin rural	175	81.7	4.4
Katherine/Barkly	382	80.6	3.9
Hospital <sup>(b)</sup>	125	89.6	7.2
<b>Total</b>	<b>1,273</b>	<b>81.7</b>	<b>4.9</b>

(a) Region where dental service was received.

(b) Received dental service in hospital.

*Notes*

1. Data is presented only for children whose families provided consent for sharing detailed information with the AIHW.
2. Due to data capture problems, DMFT/dmft information was only available for 939 children who received a dental service between 1 January and 30 June 2012.

Source: AIHW analysis NT DoH DMFT/dmft data 1 January to 30 June 2012.

**Table E2: Hearing status (per cent), by middle ear condition, Indigenous children<sup>(a)</sup> who received an audiology service**

	Type of hearing loss				Sub-total of hearing loss	Missing <sup>(b)</sup>	Total
	No hearing loss	Bilateral	Unilateral	Tested by sound field			
At least one middle ear condition	23.1	41.5	21.4	4.7	67.6	9.3	100.0
AOM	10.5	40.6	15.3	13.1	69.0	20.5	100.0
OME	16.8	48.5	18.8	5.7	73.0	10.2	100.0
CSOM	7.3	59.6	19.7	2.5	81.8	10.9	100.0
Dry perforation	14.6	49.1	31.2	0.9	81.2	4.1	100.0
ETD	41.5	26.4	21.2	4.1	51.6	6.9	100.0
Foreign body/other	24.1	39.1	20.8	6.8	66.7	9.3	100.0
No middle ear condition <sup>(c)</sup>	85.3	5.1	3.5	1.0	9.6	5.1	100.0
<b>Total</b>	<b>39.8</b>	<b>31.1</b>	<b>16.5</b>	<b>3.8</b>	<b>51.4</b>	<b>8.8</b>	<b>100.0</b>

(a) Excludes children with an unknown or invalid HRN.

(b) Missing includes not stated, unsure, invalid and not tested responses.

(c) Where no middle ear condition reported for both ears.

*Notes*

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.
2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 30 June 2012.

# Appendix F: Hearing impairment, by middle ear condition

Table F1: Hearing impairment (per cent) by type of middle ear condition<sup>(a)</sup>, Indigenous children<sup>(b)</sup> who received an audiology service

	Children with hearing impairment (per cent)					Sub-total of hearing loss	Missing <sup>(c)</sup>	Total
	None	Mild	Moderate	Severe/ Profound				
At least one middle ear condition	47.3	29.8	12.7	0.5	43.0	9.7	100.0	
AOM	29.0	30.7	18.8	0.6	50.0	21.0	100.0	
OME	39.2	35.6	14.3	0.3	50.3	10.5	100.0	
CSOM	29.4	36.7	22.2	0.5	59.4	11.2	100.0	
ETD	47.5	32.1	15.8	0.5	48.5	4.0	100.0	
Dry perforation	66.9	21.5	3.7	0.5	25.8	7.4	100.0	
Foreign body/other	48.1	31.7	9.5	1.0	42.2	9.7	100.0	
No middle ear condition <sup>(d)</sup>	90.4	3.8	0.5	0.2	4.5	5.1	100.0	
<b>Total</b>	<b>58.7</b>	<b>22.6</b>	<b>9.3</b>	<b>0.4</b>	<b>32.2</b>	<b>9.1</b>	<b>100.0</b>	

(a) Middle ear condition at most recent ENT service or, if only received audiology service, most recent audiology service.

(b) Excludes children with an unknown or invalid HRN.

(c) Missing includes not stated, unsure, invalid and not tested responses.

(d) Where no middle ear condition reported for both ears.

## Notes

1. Data are only provided for services where children's families have provided consent to share information with the AIHW.

2. Services include only those which were provided through the CHCI (CtG) Program.

Source: AIHW analysis of Child Health Check audiology and ENT dataset for audiology services provided on or before 30 June 2012.

# Appendix G: CHCI data collections quality statement

This appendix include the data quality statement for the CHCI (CtG) data collection in METeoR—Australia's repository for national metadata standards for the health, community services and housing assistance sectors.

## Quality statement

The CHCI was one component of the NTER. The NTER was announced by the former Australian Government on 21 June 2007 in response to the *Little Children are Sacred* report by the NT Board of Inquiry into the Protection of Aboriginal Children from Sexual Abuse.

From July 2009, follow-up services were provided under the Closing the Gap in the Northern Territory National Partnership Agreement, a joint initiative of the Australian and Northern Territory governments.

## Institutional environment

The AIHW is a major national agency set up by the Australian Government under the *Australian Institute of Health and Welfare Act 1987* to provide reliable, regular and relevant information and statistics on Australia's health and welfare. It is an independent statutory authority established in 1987, governed by a management Board, and accountable to the Australian Parliament through the Health and Ageing portfolio.

The AIHW aims to improve the health and wellbeing of Australians through better health and welfare information and statistics. It collects and reports information on a wide range of topics and issues, ranging from health and welfare expenditure, hospitals, disease and injury, and mental health, to ageing, homelessness, disability and child protection.

The AIHW also plays a role in developing and maintaining national metadata standards. This work contributes to improving the quality and consistency of national health and welfare statistics. The Institute works closely with governments and non-government organisations to achieve greater adherence to these standards in administrative data collections to promote national consistency and comparability of data and reporting.

One of the main functions of the AIHW is to work with the states and territories to improve the quality of administrative data and, where possible, to compile national datasets based on data from each jurisdiction, to analyse these datasets and disseminate information and statistics.

The *Australian Institute of Health and Welfare Act 1987*, in conjunction with compliance to the *Privacy Act 1988*, ensures that the data collections managed by the AIHW are kept securely and under the strictest conditions with respect to privacy and confidentiality.

For further information see the AIHW website <[www.aihw.gov.au](http://www.aihw.gov.au)>.

The AIHW is responsible for undertaking the data management, analysis and reporting of information collected as part of the CHCI.

## **Relevance**

Children who receive child health checks or follow-up services are not a random sample of Indigenous children in the Northern Territory. Health checks and services are only available to children in prescribed areas of the Northern Territory and are provided on a voluntary basis. As such, it is important to note that CHCI data cannot be used to determine the prevalence of health conditions among all Indigenous children in the Northern Territory, or all children in the prescribed areas of the NTER.

The data that have been collected as part of the CHCI are a by-product of a clinical process. That is, health professionals providing the child health checks and the follow-up services document the results on standard data collection forms and send the completed forms to the AIHW.

The AIHW CHCI collection consists of six separate collections:

### **Child Health Check data collection**

Captures data on Indigenous Australian children (aged 15 years and under) in prescribed areas of the NT who volunteered for, and received, a Child Health Check (CHC). Includes information on health conditions identified and referrals made.

### **Chart review data collection**

Captures data on children who had a CHC (with the exception of those whose CHC was undertaken during the early follow-up phase of the NTER CHCI and identified 'no follow-up actions'). Includes information on whether the child had been seen for conditions identified during their CHC, and whether there were outstanding conditions requiring follow-up.

### **Audiology data collection**

Captures data on children who had a CHC and were identified as requiring follow-up audiology services, as well as other children in the prescribed areas of the NT aged 15 years and under. Includes information on type and degree of hearing loss (if any), middle ear conditions (if any), and the requirement for further action.

### **ENT consultation data collection**

Contains information on ear health status, type of action taken during the consultation and recommendation for follow-up action and surgery.

### **ENT surgery data collection**

Contains information on description of surgery.

### **Dental data collection**

Captures data on children who had a CHC and were identified as requiring follow-up dental care, as well as other children in the prescribed areas of the NT aged 15 years and under. Includes information on types of dental services provided, problems treated, number of decayed, missing and filled teeth, and the requirement for further action.

## **Timeliness**

Three general reports have been published using the Child Health Check, Chart review and follow-up data collections (see Department of Health and Ageing website for the reports). Separate reports are prepared on dental and ear health, using the Dental, Audiology and

ENT data collections. The first dental report was published in March 2011, with a reference period of August 2007 to June 2010; the ear and hearing health report was released on 10 November 2011, with a reference period of August 2007 to May 2011.

The CHCI Program ended in June 2012, and it is anticipated that another two or three reports will be published by December 2012.

Due to the nature of the collection process, there is a lag between the date when the service was provided and the date of data receipt. This means that at any point in time, there may be services provided that have not yet been captured in the data.

## **Accuracy**

Health service providers used standard forms to record information from the CHCs and follow-up health services. The forms were developed by DoHA, in consultation with the Northern Territory Department of Health and Families, the Aboriginal Medical Services Alliance of the Northern Territory and the AIHW.

The extent of missing data should be taken into account when using and interpreting CHCI data. Where possible, published tables show the percentage of missing data.

Not all children who receive a service can be captured in the follow-up databases. The audiology and dental data collections capture information on children who receive a service by a member of a specific audiology or dental team, but services conducted by other providers are not captured.

To obtain unit record data for the audiology, ENT surgery, ENT consultation and dental collections, consent for sharing information must be obtained from children and families. If children or families do not give consent for their information to be used in unit record form, they cannot be presented by demographic characteristics or referral type, but only in aggregated form.

In order to protect privacy, personal information, such as child's name, is not provided to the AIHW. As such, children can only be tracked using a Hospital Registration Number (HRN). Due to missing or incorrect HRNs, a very small percentage of children cannot be tracked.

## **Coherence**

Initially, the CHCI was provided under the NTER. From July 2009, child health checks and follow-up services were provided under the Closing the Gap in the Northern Territory National Partnership Agreement.

The form used to collect data for the Child Health Check data collection has been modified since the initial roll-out of the program.

## **Interpretability**

CHCI reports contain basic information about the programs and the data contained in the report to enable interpretation of this information. Recent CHCI reports include:

AIHW (Australian Institute of Health and Welfare) 2011. Dental health of Indigenous children in the Northern Territory: findings from the Closing the Gap Program. Cat. no. IHW 41. Canberra: AIHW Dental Health 2011

AIHW (Australian Institute of Health and Welfare) 2011. Ear and hearing health of Indigenous children in the Northern Territory. Cat. no. IHW 60. Canberra: AIHW Ear and Hearing Health 2011

AIHW and DoHA (Department of Health and Ageing) 2009. Progress of the Northern Territory Emergency Response Child Health Check Initiative: Update on results from the Child Health Check and follow-up data collections. Cat. no. IHW 28. Canberra: AIHW Child Health Check Initiative Update

For information about the NTER see the Department of Families, Housing, Community Services and Indigenous Affairs: FaHCSIA information on NTER

A copy of the Closing the Gap in the Northern Territory National Partnership Agreement is available from the Ministerial Council for Federal Financial Relations: Closing the Gap NT National Partnership Agreement.

## **Accessibility**

CHCI reports are published on the websites of the Department of Health and Ageing and the AIHW. Permission to obtain unpublished data must be sought from the Monitoring and Evaluation Memorandum of Understanding Committee for the Northern Territory Primary Health Care Expansion and Reform and the Australian Government Department of Health and Ageing. In addition, approvals from relevant ethics committees of the Northern Territory may also be required.

# Appendix H: Dental, audiology and ENT data collection forms

## NTER CHCI DENTAL SERVICES DATA COLLECTION FORM

### 1. Organisation details

Date of Service: // (dd/mm/yyyy)

ID or name of Community or Town Camp where this service was provided:

ID or name of Community or Town Camp where child is resident:

### 2. Consent to provide information to the Commonwealth

*This dental service is funded by the Commonwealth Government. Information relating to the dental services provided to you, including any treatment and follow up treatment you receive (for example, surgery) will be kept by your dentist and provided to the Australian Institute of Health and Welfare (AIHW). To ensure you receive any follow up services you need and to evaluate and improve this program, the AIHW may disclose the information it receives to the Commonwealth Government to enable this evaluation, improvement and follow up to occur. Your name will not be provided to the AIHW or the Commonwealth Government and your information will not be reported in any way which could identify you.*

**Consent given to provide information to the Commonwealth?**

Yes       No

If consent is not obtained, no data to be sent to the AIHW.

### 3. Child's details

HRN: \_\_\_\_\_

DOB: // (dd/mm/yyyy)

SEX:       Male       Female

*Continued on next page*

Please provide HRN and date of service again: HRN: \_\_\_\_\_ Date of service: \_\_\_\_\_

#### 4. Dental services provided

**Indicate all services provided during this occasion of service**

- 0: Diagnostic
- 1: Preventive
  - 1(a): Full mouth fluoride
- 2: Periodontic
- 3: Surgery/Exodontia
- 4: Endodontic
- 5: Restorative
- 6: Crown or bridge
- 7: Prosthetics
- 8: Orthodontic
- 9: Other – please specify \_\_\_\_\_

#### 5. Problems treated

**Indicate all problems treated during this occasion of service**

- 1: Assessment only
- 2: Oral health education
- 3: Untreated caries
- 4: Gum disease
- 5: Broken or chipped teeth due to trauma
- 6: Abnormal teeth growth
- 7: Missing teeth
- 8: Mouth infection or mouth sores
- 9: Dental hygiene (including plaque and calcification)
- 10: Dental abscess
- 11: Other – please specify \_\_\_\_\_

#### 6. dmft/DMFT and dmfs/DMFS scores

dmft: if less than 11 years old

d		m		f		dmft	
D		M		F		DMFT	

DMFT: if 7 years or over

D		M		F		DMFT	
d		m		f		dmft	

dmfs: if less than 11 years old

d		m		f		dmfs	
D		M		F		DMFS	

DMFS: if 7 years or over

D		M		F		DMFS	
d		m		f		dmfs	

#### 7. Follow-up requirements

Does this child require further follow-up in order to complete their treatment plan?  Yes  No

#### 8. Referred for GA

Yes  No



Northern  
Territory  
Government

## DEPARTMENT OF HEALTH

## AUDIOLOGY SERVICES FORM

## 1. ORGANISATION DETAILS

Date of service:                  /                  /20                  (dd/mm/yyyy)

ID of Community or Town Camp where this service was provided:

## 2. CHILD DETAILS

HRN: \_\_\_\_\_ Date of Birth: \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_  Male  Female

### **3. SUMMARY OF AUDIOLOGY FINDINGS (select one option under each heading)**

<b>Hearing Loss</b>	<b>Type of hearing loss</b>
<input type="checkbox"/> None	<input type="checkbox"/> None
<input type="checkbox"/> Unilateral	<input type="checkbox"/> Conductive
<input type="checkbox"/> Bilateral	<input type="checkbox"/> Sensorineural
<input type="checkbox"/> Sound Field	<input type="checkbox"/> Mixed (both conductive and sensorineural)

**Degree of hearing impairment (based on better ear)**

<b>(av. HTL)</b>	<b>Sound Proof Conditions</b>	<b>Non-Sound Proof Conditions</b>
<input type="checkbox"/> Normal	(0 – 15 dB)	(0 – 25 dB)
<input type="checkbox"/> Mild	(16 – 30 dB)	(26 – 35 dB)
<input type="checkbox"/> Moderate	(31 – 60 dB)	(36 – 60 dB)
<input type="checkbox"/> Severe	(61 – 90 dB)	(61 – 90 dB)
<input type="checkbox"/> Profound	(91dB +)	(91 dB +)

## Middle ear condition

<b>Right</b>	<b>Left</b>
<input type="checkbox"/> None	<input type="checkbox"/> None
<input type="checkbox"/> Eustachian Tube Dysfunction	<input type="checkbox"/> Eustachian Tube Dysfunction
<input type="checkbox"/> Acute Otitis Media	<input type="checkbox"/> Acute Otitis Media
<input type="checkbox"/> Otitis Media with Effusion	<input type="checkbox"/> Otitis Media with Effusion
<input type="checkbox"/> Chronic Suppurative Otitis Media	<input type="checkbox"/> Chronic Suppurative Otitis Media
<input type="checkbox"/> Dry Perforation	<input type="checkbox"/> Dry Perforation
<input type="checkbox"/> Other, (please specify).....	<input type="checkbox"/> Other, (please specify).....
<input type="checkbox"/> Unsure	<input type="checkbox"/> Unsure

**4. ACTION (please indicate all that apply)**

- No further action required
  - Case management by Primary Health Centre
  - Case management by ENT
  - Ongoing monitoring by NT Hearing Services
  - Referral to Australian Hearing (rehabilitation)
  - Referral to Department of Education Employment
  - Other, (please specify).....

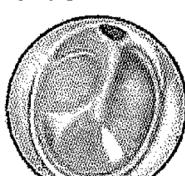


**HEARING HEALTH PROGRAM**  
**TELEOTOLGY ENT SPECIALIST CONSULTATION**  
**DEPARTMENT OF HEALTH**

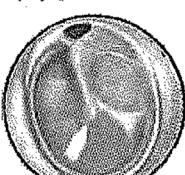
COMMUNITY:	ENT SPECIALIST:	VISIT DATE:
COMMUNITY ID:	DOB:	HRN: MEDICARE:
PATIENT NAME:	<input type="checkbox"/> MALE <input type="checkbox"/> FEMALE <input type="checkbox"/> CARER:	

Post-Up Check

Right Tympanic Membrane



Left Tympanic Membrane



THE FOLLOWING CLINICAL DIAGNOSIS AND RECOMMENDATIONS BY THE ENT SPECIALIST ARE BASED ON CASE HISTORY, AUDILOGY AND OTOSCOPY INFORMATION COLLECTED THROUGH TELEOTOLGY PROTOCOL WITH NO DIRECT EXAMINATION OF THE PATIENT BY THE ENT SPECIALIST.

Comment:

**RIGHT EAR**

<input type="checkbox"/> Intact TM	<input type="checkbox"/> Normal	<input type="checkbox"/> Healed	<input type="checkbox"/> Other:	SIZE
<input type="checkbox"/> Perforation	<input type="checkbox"/> Central	<input type="checkbox"/> Marginal	<input type="checkbox"/> Attic	
<input type="checkbox"/> WET	<input type="checkbox"/> Purulent	<input type="checkbox"/> DRY	<input type="checkbox"/> Squamous	
<input type="checkbox"/> Moist (serous)	<input type="checkbox"/> Mucosal			
<input type="checkbox"/> Grommet	<input type="checkbox"/> In situ	<input type="checkbox"/> Patent	<input type="checkbox"/> Blocked	
	<input type="checkbox"/> Extruded	<input type="checkbox"/> TM Intact	<input type="checkbox"/> Residual perforation	

**LEFT EAR**

<input type="checkbox"/> Intact TM	<input type="checkbox"/> Normal	<input type="checkbox"/> Healed	<input type="checkbox"/> Other:	SIZE
<input type="checkbox"/> Perforation	<input type="checkbox"/> Central	<input type="checkbox"/> Marginal	<input type="checkbox"/> Attic	
<input type="checkbox"/> WET	<input type="checkbox"/> Purulent	<input type="checkbox"/> DRY	<input type="checkbox"/> Squamous	
<input type="checkbox"/> Moist (serous)	<input type="checkbox"/> Mucosal			
<input type="checkbox"/> Grommet	<input type="checkbox"/> In situ	<input type="checkbox"/> Patent	<input type="checkbox"/> Blocked	
	<input type="checkbox"/> Extruded	<input type="checkbox"/> TM Intact	<input type="checkbox"/> Residual perforation	

PRESUMPTIVE DIAGNOSIS	R	L
NAD		
AOM		
AOM with Perforation		
CSOM (active discharge)		
CSOM (inactive dry perforation)		
OME		
Foreign Body		
Other		

Insufficient information for Dx

- Needs teleotolgy review
- Needs ENT F2F

Comment:

ACTIONS RECOMMENDED	INSTRUCTIONS	R	L
Medication:	<input type="checkbox"/> Amoxyl <input type="checkbox"/> Ciloxan <input type="checkbox"/> Kenaeomb <input type="checkbox"/> Other	<input type="checkbox"/> as per CARPA Specific Instructions:	
Other:	<input type="checkbox"/> Foreign body removal <input type="checkbox"/> Aural Toilet <input type="checkbox"/> Other	Specific Instructions:	

FOLLOW-UP REQUIRED	
PRIMARY HEALTH:	<input type="checkbox"/> Not Required <input type="checkbox"/> Review progress after medication <input type="checkbox"/> Dry ear precautions <input type="checkbox"/> Monitor-Rx as required <input type="checkbox"/> 1 week <input type="checkbox"/> 2 week <input type="checkbox"/> 1 month <input type="checkbox"/> 6 months <input type="checkbox"/> PRN Comment:
Audiology:	<input type="checkbox"/> Not Required <input type="checkbox"/> 3 months <input type="checkbox"/> 6 months <input type="checkbox"/> 1 year <input type="checkbox"/> PRN
Australian Hearing:	Hearing aid: Medical clearance given to fit <input type="checkbox"/> Bone conductor aid <input type="checkbox"/> Hearing aid/s with mold <input type="checkbox"/> Has hearing aid/s Review required

ENT Review:	<input type="checkbox"/> Not Required <input type="checkbox"/> 3 months <input type="checkbox"/> 6 months <input type="checkbox"/> 1 year <input type="checkbox"/> PRN <input type="checkbox"/> Needs F2F ENT
SURGERY RECOMMENDATIONS	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Too young for surgery
<input type="checkbox"/> Decide car at operation	Myringoplasty (Tympanoplasty Type I)
<input type="checkbox"/> TWAIT completed	Myringotomy
Comment:	Adenoidectomy
	Grommets
	EUA
	Exploration of middle ear/mastoid
	Removal of tubes
	Other procedure

Signature: \_\_\_\_\_



**CLOSING THE GAP**  
**ENT OPERATION SUMMARY FORM**

<b>OPERATION DATE</b> ...../...../.....	<b>HOSPITAL</b> <input type="checkbox"/> ASH <input type="checkbox"/> GDH <input type="checkbox"/> KH <input type="checkbox"/> RDH <input type="checkbox"/> TCH	<b>PATIENT POST-OP TRANSPORT HOME</b> <input type="checkbox"/> CAR / BUS <input type="checkbox"/> PLANE	<b>PATIENT ID</b>		
		<b>COMMUNITY</b>	NAME	DOB	GENDER
		SPECIALIST:			

**PRE-OP EXAMINATION**

(<sup>1</sup> Marginal refers to any perforation that involves the annulus)

<b>LEFT EAR</b>	<b>EAM</b>	<b>Tympanic Membrane</b>	<b>Perforation Description</b>	<b>PRE-OP DIAGNOSIS</b>
<input type="checkbox"/> NOT ASSESSED  	<input type="checkbox"/> clear <input type="checkbox"/> wax / debris <input type="checkbox"/> discharge <input type="checkbox"/> foreign body <input type="checkbox"/> otitis externa <input type="checkbox"/> other	<input type="checkbox"/> Intact <input type="checkbox"/> Normal <input type="checkbox"/> Scarred/abnormal <input type="checkbox"/> Dull <input type="checkbox"/> Immobile <input type="checkbox"/> Retracted  <input type="checkbox"/> Perforation  <input type="checkbox"/> Grommet	<input type="checkbox"/> Central <input type="checkbox"/> Wet <input type="checkbox"/> Serous <input type="checkbox"/> Marginal <sup>1</sup> <input type="checkbox"/> Purulent <input type="checkbox"/> Attic <input type="checkbox"/> Dry  <b>Size:</b> <input type="checkbox"/> pinhole <input type="checkbox"/> <40% of TM <input type="checkbox"/> > 40% of TM <input type="checkbox"/> subtotal / total	<input type="checkbox"/> Normal <input type="checkbox"/> COM <input type="checkbox"/> Healed (intact abnormal) <input type="checkbox"/> Active (purulent d/c) <input type="checkbox"/> Inactive (dry or serous perf) <input type="checkbox"/> Squamous <input type="checkbox"/> Mucosal <input type="checkbox"/> OME <input type="checkbox"/> AOM <input type="checkbox"/> AOM w/perf <input type="checkbox"/> Other

<b>RIGHT EAR</b>	<b>EAM</b>	<b>Tympanic Membrane</b>	<b>Perforation</b>	<b>Pre-op Diagnosis</b>
<input type="checkbox"/> NOT ASSESSED  	<input type="checkbox"/> clear <input type="checkbox"/> wax / debris <input type="checkbox"/> discharge <input type="checkbox"/> foreign body <input type="checkbox"/> otitis externa <input type="checkbox"/> other	<input type="checkbox"/> Intact <input type="checkbox"/> Normal <input type="checkbox"/> Scarred/abnormal <input type="checkbox"/> Dull <input type="checkbox"/> Immobile <input type="checkbox"/> Retracted  <input type="checkbox"/> Perforation  <input type="checkbox"/> Grommet	<input type="checkbox"/> Central <input type="checkbox"/> Wet <input type="checkbox"/> Serous <input type="checkbox"/> Marginal <input type="checkbox"/> Purulent <input type="checkbox"/> Attic <input type="checkbox"/> Dry  <b>Size:</b> <input type="checkbox"/> pinhole <input type="checkbox"/> <40% of TM <input type="checkbox"/> > 40% of TM <input type="checkbox"/> subtotal / total	<input type="checkbox"/> Normal <input type="checkbox"/> COM <input type="checkbox"/> Healed (intact abnormal) <input type="checkbox"/> Active (purulent d/c) <input type="checkbox"/> Inactive (dry or serous perf) <input type="checkbox"/> Squamous <input type="checkbox"/> Mucosal <input type="checkbox"/> OME <input type="checkbox"/> AOM <input type="checkbox"/> AOM w/perf <input type="checkbox"/> Other

**SURGERY DESCRIPTION:** [IF THE SURGERY PERFORMED IS DIFFERENT TO THE SURGERY REQUESTED PLEASE INDICATE REASON IN COMMENTS]

<b>Surgery</b>	<b>Ear</b>	<b>Approach</b>	<b>Graft</b>	<b>State of Middle Ear</b>
<b>Myringoplasty</b> <input type="checkbox"/> Revision	<input type="checkbox"/> Left  <input type="checkbox"/> Right	<input type="checkbox"/> transcanal <input type="checkbox"/> endaural <input type="checkbox"/> postaural	<input type="checkbox"/> temp.fascia <input type="checkbox"/> cartilage <input type="checkbox"/> cartilage /perichondrium <input type="checkbox"/> fat <input type="checkbox"/> other	<input type="checkbox"/> underlay <input type="checkbox"/> inlay <input type="checkbox"/> onlay <input type="checkbox"/> butterfly <input type="checkbox"/> patch  OC Intact <input type="checkbox"/> Y <input type="checkbox"/> N Mobile <input type="checkbox"/> Y <input type="checkbox"/> N
	<b>Ear</b>	<b>Fluid in ME</b>	<b>Grommet</b>	<b>Comments</b>
<b>Myringotomy</b>	<input type="checkbox"/> Left  <input type="checkbox"/> Right	<input type="checkbox"/> None <input type="checkbox"/> Serous <input type="checkbox"/> Mucoid	<input type="checkbox"/> Yes → Type <input type="checkbox"/> No	
			<input type="checkbox"/> Yes → Type <input type="checkbox"/> No	
<b>Adenolectomy</b>	<input type="checkbox"/> Yes  <input type="checkbox"/> EUA <input type="checkbox"/> Expl. of ME	<input type="checkbox"/> No	Comments:	
	<input type="checkbox"/> Left  <input type="checkbox"/> EUA <input type="checkbox"/> Expl. of ME	Description:		
	<input type="checkbox"/> Right	Description:		
<input type="checkbox"/> Remove tubes	<input type="checkbox"/> Left <input type="checkbox"/> Right			
<input type="checkbox"/> Other	<input type="checkbox"/> Left <input type="checkbox"/> Right			

Name

Signed

Date

# Glossary

## Dental data terms

### **Deciduous teeth**

Develop during the embryonic stage of human development and erupt—that is, they become visible in the mouth—during infancy. They are usually lost and replaced by permanent teeth, but in the absence of permanent replacements, they can remain functional for many years.

### **Dental caries**

An infectious disease that can lead to cavities (small holes) in the tooth structure that compromises both the structure and the health of the tooth.

### **Diagnostic**

Examinations (initial, periodic and emergency oral exams; consultations; written reports; referrals). Radiographical examination and interpretation (intraoral radiographs; skull radiographs). Other diagnostic services (bacteriological examination; antibiotic sensitivity test; biopsy; casts).

### **Endodontics**

Pulp treatments (pulp capping; pulpotomy; extirpation or debridement of root canal).

### **Fissure sealants**

Thin plastic coatings that are applied to the grooves on the chewing surfaces of the back teeth to protect them from tooth decay.

### **Periodontics**

Treatment of gums (treatment of acute infection).

### **Preventive**

Dental prophylaxis (removal of plaque; removal of calculus; recontouring of existing restorations). Topical fluoride (application of fluoride solution or gel; instruction on self-application). Other preventive services (dietary advice; oral hygiene instruction; fissure sealing; mouthguards).

### **Restorative**

Amalgams (filling of 1, 2, 3+ surfaces). Glass ionomer, silicate and composite resins (filling of 1, 2, 3+ surfaces).

### **Surgery**

Extractions (removal of permanent or deciduous tooth, tooth fragment).

# Audiology data terms

## Otoscopy

Is the clinical skill of examining the outer and middle ear, including the eardrum, using an otoscope/auriscope.

## Tympanometry

Is an examination used to test the condition of the middle ear and mobility of the eardrum and the conduction bones. It is an objective test of middle-ear function and provides a measure of energy transmission through the middle ear.

## Audiometry/ pure tone audiometry

Is the standard technique of testing hearing ability. Pure tone audiometry records a subjective response to threshold (softest) sound stimuli presented through headphone, bone conductor or speaker at discrete frequencies essential for detecting and discriminating speech. Any response deviation from the normal range, at any sound stimuli, in either ear, is described as a hearing loss and the type of hearing loss is diagnosed.

## Visual reinforce observation audiometry (VROA)

Is a hearing assessment technique using specialised sound field facilities appropriate for smaller children and babies (9–36 months). When able to sit and turn head independently children can be conditioned to repeatedly and reliably respond to frequency specific warble tones, presented via speaker, headphone or bone conductor. This conditioned response is reinforced through provision of a visual reward (puppet) to obtain threshold (softest) measures. Results obtained via speaker (standard test) do not provide separate ear information but determine adequacy of hearing for speech and language development and reflect the better ear.

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## **Related publications**

AIHW 2012. Dental health of Indigenous children in the Northern Territory. Bulletin no.102. Cat. no. AUS 154. Canberra: AIHW.

AIHW 2011. Ear and hearing health of Indigenous children in the Northern Territory. Cat. no. IHW 60. Canberra: AIHW.

AIHW 2011. Dental health of indigenous children in the northern Territory: findings from the Closing the Gap Program. Cat. no. IHW 41. Canberra: AIHW.

This report presents data on dental, audiology and ear, nose and throat (ENT) services funded by the Northern Territory Emergency Response Child Health Check Initiative Closing the Gap program, between 2007 and 2012.

More than 17,000 dental and 9,000 audiology services were provided between August 2007 and June 2012, and about 6,000 ENT services between August 2007 and December 2010. The majority of children who received a referral at their Child Health Check received the referred service, with follow-up rates of 94% for dental referrals, nearly 100% for audiology referrals and 97% for ENT referrals.