Australian Government

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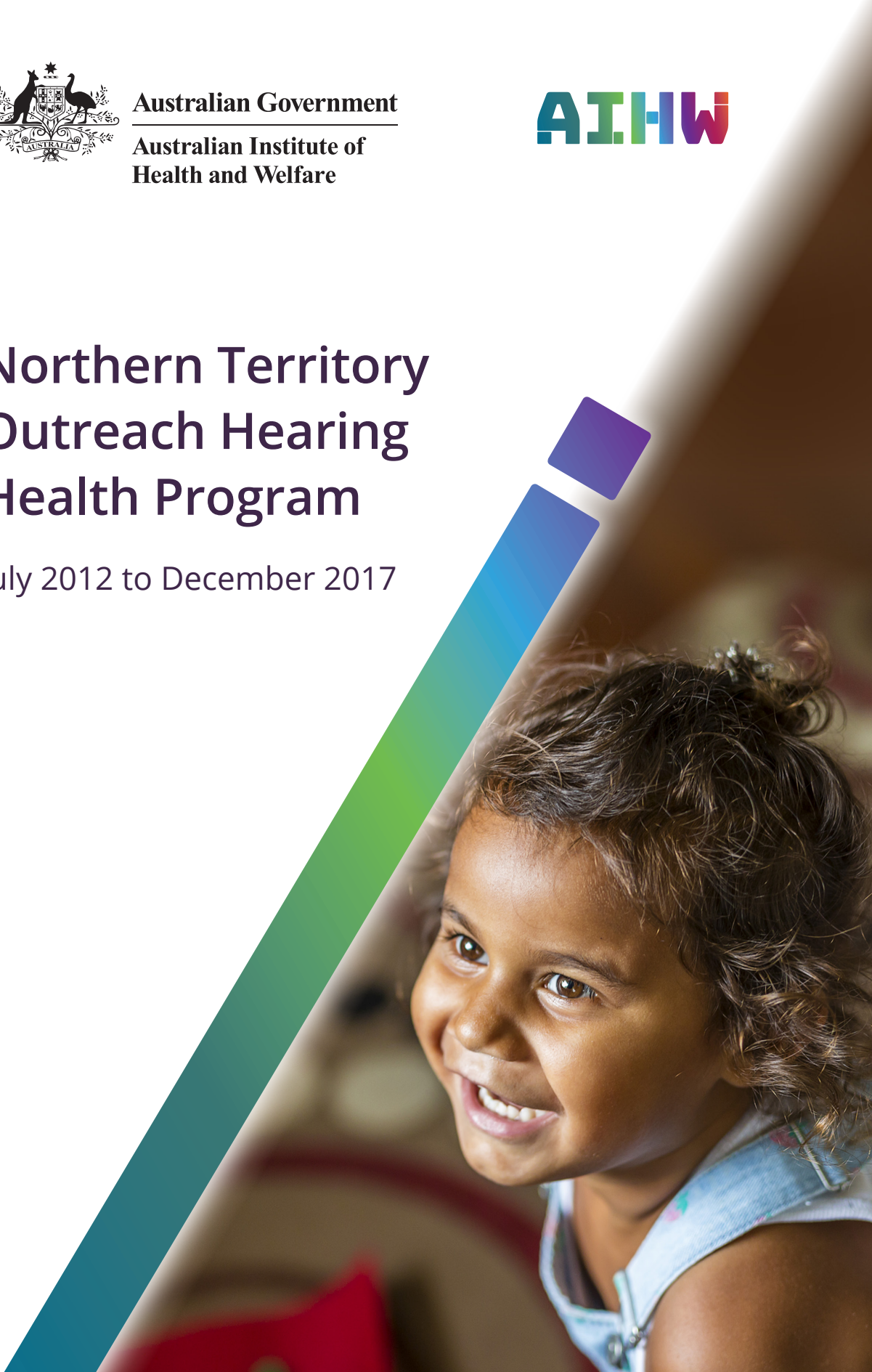
AIHW

Northern Territory Outreach Hearing Health Program

July 2012 to December 2017



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Please note that there is the potential for minor revisions of data in this report. Please check the online version at <www.aihw.gov.au> for any amendments.

Contents

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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
AOM	acute otitis media
CAHS	Central Australia Health Service
CHCI	Child Health Check Initiative
CNS	Clinical Nurse Specialist
CSOM	chronic suppurative otitis media
CtG	Closing the Gap program
ENT	ear, nose and throat
ETD	Eustachian tube dysfunction
NTER	Northern Territory Emergency Response
NTRAI	Northern Territory Remote Aboriginal Investment
OME	otitis media with effusion
SFNT	National Partnership Agreement on Stronger Futures in the Northern Territory
TEHS	Top End Health Service
WHO	World Health Organization

Symbols

≥	greater than or equal to
≤	less than or equal to
<	less than
>	greater than

Summary

This report presents updated information on ear and hearing health outreach services for Aboriginal and Torres Strait Islander children and young people aged under 21 in the Northern Territory, between July 2012 and December 2017. These services were funded by the Australian Government and delivered by the Northern Territory Government.

Service delivery targets have been met, but numbers fell in 2017

- In 2017, 1,870 outreach audiology services were provided to 1,707 children and young people—over 500 fewer services than in 2016.
- 876 ear, nose and throat (ENT) teleotology services were provided to 815 children and young people—almost 300 fewer services than in 2016.
- Clinical Nurse Specialists (CNSs) conducted 876 visits to 830 children—almost 300 fewer services than in 2016.
- A total of 1,879 children and young people received at least 1 audiology, CNS or ENT teleotology service in 2017. This was a decrease of almost 400 children from 2016.

The drop in numbers in 2017 is largely due to a shortage of available specialists to provide services in remote communities.

1,700
children and young people received
audiology services

830
children and young people received
CNS services

815
children and young people received
ENT teleotology services

Source: tables S2.1, S2.3, S2.5.

Hearing health is improving among children and young people who received hearing health outreach services

The percentage of children and young people with at least 1 ear disease decreased by 5 percentage points, from 66% to 61%, between July 2012 and December 2017.

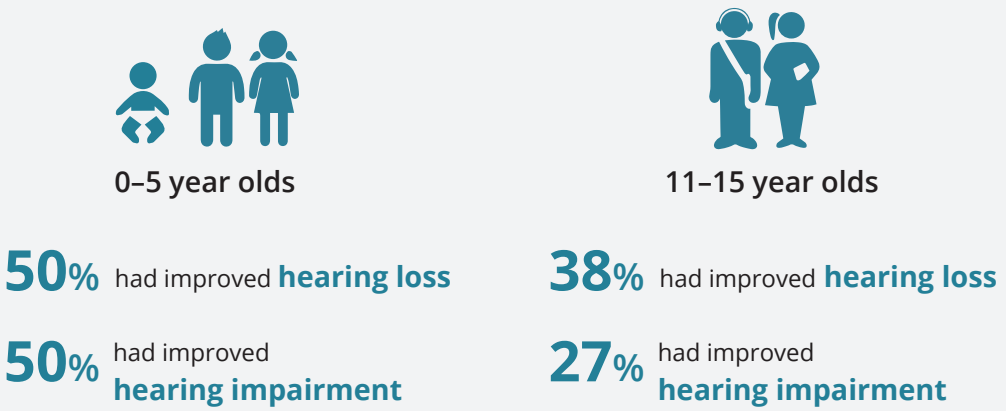
The percentage of children and young people with hearing loss decreased by 10 percentage points, from 55% to 45%, between July 2012 and December 2017.

Between July 2012 and December 2017:

Source: tables S3.1 and S3.6.

Children aged 0–5 who received audiology services were more likely to have improvements in hearing impairment and hearing loss over time, compared with older children. This is consistent with other studies that demonstrated that early intervention is effective in improving hearing health outcomes for children.

Between August 2007 and December 2017:



Source: tables S3.18 and S3.19.

Among children who received at least 2 services between 2012 and 2017 and who had hearing loss at their first service, 55% had improved—a change from bilateral to unilateral hearing loss or from unilateral hearing loss to no hearing loss.

Among children who had hearing impairment at their first service, 65% had improved—moving to a lower degree of hearing impairment or to no hearing impairment.

Over 3,000 children and young people are still waiting for hearing health services

While a number of hearing health services have been provided to Indigenous children and young people in the Northern Territory, there are still high numbers of outstanding referrals. As at December 2017, there were 3,010 children and young people on the waiting list for outreach audiology services and 1,681 on the waiting list for ENT teleotology services.

Progress against benchmarks

All targets for 2017 have been met or are on track to be met (Table 1).

Table 1: Progress against benchmarks, 2017

2017 Target	Outcome in 2017
Service delivery targets	
At least 1,700 audiology services per year	1,870 audiology services provided
At least 700 CNS services provided per year	830 CNS services provided
60 preventative hearing health promotion or training services/activities in 2017	131 preventative hearing health promotion or training services and activities provided
Health outcome targets—hearing impairment (between July 2015 and December 2018)	
Less than 10% of children tested with moderate/severe conductive hearing impairment	2.5% of children tested with moderate/severe conductive hearing impairment, July 2015–Dec 2017
Health outcome targets—middle ear conditions (between July 2015 and December 2018)	
Less than 14% of children (0–5) with CSOM	11% of children (0–5) with CSOM, July 2015–Dec 2017
Less than 11% of children (6–15) with CSOM	9.6% of children (6–15) with CSOM, July 2015–Dec 2017
Less than 8% of children (0–5) with dry perforation	7.5% of children (0–5) with dry perforation, July 2015–Dec 2017
Less than 17% of children (6–15) with dry perforation	14.2% of children (6–15) with dry perforation, July 2015–Dec 2017

Green shading indicates the target was met in 2017.

Blue shading indicates the target is on track to be met at the end of 2018.

1 Introduction

Why is ear and hearing health important?

Hearing loss is more prevalent among Aboriginal and Torres Strait Islander people, compared with non-Indigenous Australians, and continues to be an important health and social issue. Compared with non-Indigenous children, Indigenous children are reported to have 2.9 times the rate of ear and hearing problems (AIHW 2017a).

What is ear and hearing health?

'Ear and hearing health' can refer to a variety of ear-related conditions; hearing impairment; hearing loss; and the relationship between these health problems. 'Hearing loss' involves loss of hearing in 1 or both ears, and 'hearing impairment' describes the degree of impairment associated with hearing loss in the 'better hearing ear'.

'Middle ear disease' includes conditions such as otitis media and its various forms, and Eustachian tube dysfunction (ETD). Otitis media is an inflammation of the middle ear, and can be caused by an infection or ETD. The Eustachian tube functions to equalise the pressure in the middle ear to atmospheric pressure, and impairment of this function is known as ETD. Eustachian tube function can be impaired for a number of reasons, and most commonly occurs in childhood when it is developing and enlarged adenoids (glands in the roof of the mouth) are often present.

Impact of poor ear and hearing health

Among Indigenous children, otitis media is a large contributor to hearing loss, and often manifests itself at earlier ages, with greater severity, greater persistence and more frequently compared with non-Indigenous children (Jervis-Bardy et al. 2014).

Hearing loss can also have severe negative impacts on language development, cognitive development and socialisation, particularly in infants and young children. Hearing loss in early childhood can lead to social, learning, linguistic and behavioural problems in school. Experiencing these difficulties can translate into a lifetime of disadvantage affecting areas such as wellbeing, social success, income, and employment (WHO 1996).

Ear and hearing health in the Northern Territory

Middle ear disease is a common health problem and is a cause for concern among Indigenous children, particularly those who live in remote communities (ABS 2016). This may be associated with several factors, including:

- the nature of otitis media, which makes it a complicated disease to manage
- living conditions in some parts of the Northern Territory—for example housing, household overcrowding and hygiene

- low socioeconomic status
- secondhand smoke exposure
- the inability to find children and their families in communities during health outreach visits because of the high mobility of Indigenous families
- the geographical location and vast spread of Indigenous communities, which makes accessiblity to services difficult
- the difficulty in recruiting and retaining a specialist workforce.

The last 2 factors are also associated with living in remote areas. Living in remote areas may also affect access to general and ear health services, with fewer medical practitioners per capita, and lower access to general practitioners (AIHW 2014a, 2014b). Decreased access to these services can result in delays in diagnosis, treatment and management of middle ear disease among Indigenous children, prolonging periods of hearing loss and impairment.

Australian Government-funded Hearing Health Program in the Northern Territory

Hearing health services were expanded in the Northern Territory in response to the Child Health Check Initiative (CHCI) in July 2007, which was introduced under the Northern Territory Emergency Response (NTER). The original Child Health Check data for the 9,373 Indigenous children who received services in the NTER Prescribed Areas showed that between July 2007 and June 2009, 30% had ear disease. Through the introduction of the CHCI, the children who were found to have ear diseases were able to obtain audiology and ear, nose and throat (ENT) specialist services (AIHW & DoHA 2009).

The program continued under the Closing the Gap initiative (CtG) in the Northern Territory National Partnership Agreement from mid-2009 to mid-2012. More information can be found in the 2012 AIHW publication *Northern Territory Emergency Response Child Health Check Initiative—follow-up services for oral and ear health: final report 2007–2012* (AIHW 2012).

Between July 2012 and June 2015, the ear and hearing health services were replaced and expanded by the National Partnership Agreement on Stronger Futures in the Northern Territory (SFNT). Since July 2015, these services have been continued through the new National Partnership on Northern Territory Remote Aboriginal Investment (NTRAI).

The Australian Government also funds the Northern Territory Government to deliver services through the Healthy Ears—Better Hearing, Better Listening Program. The Northern Territory Government uses this funding to support audiology services and ENT teleotology services that are part of the Hearing Health Program. The teleotology services are for children and young people aged under 21, especially

in remote areas where there is high demand and lack of local services.The Hearing Health Program mentioned throughout this report refers to all of the Australian Government-funded programs that stemmed from the CHCI in the Northern Territory since July 2007.

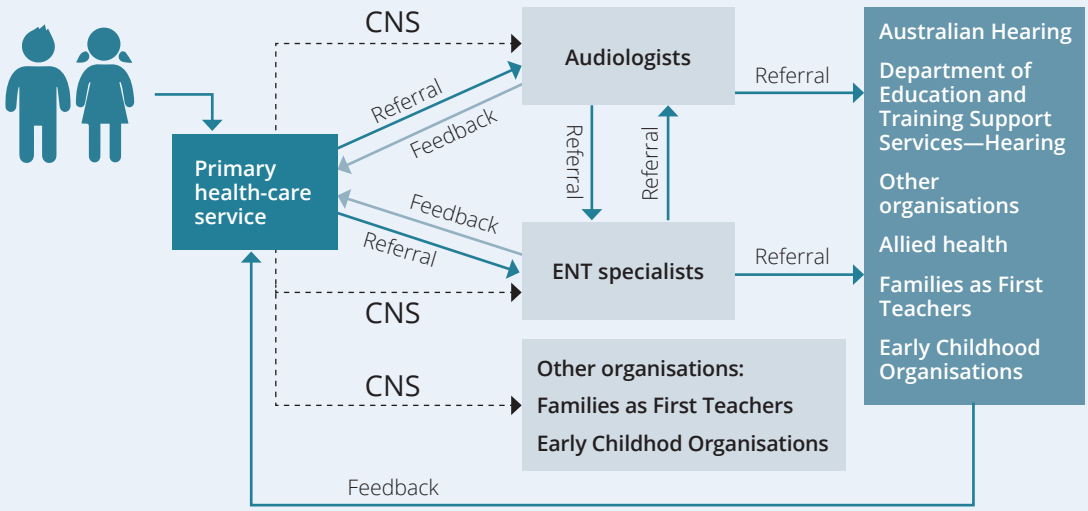
There are 4 services included in the Hearing Health Program (detailed information on these services can be found in Chapter 2):

1. health education, promotion and prevention
2. outreach audiology
3. ENT teleotology
4. Clinical Nurse Specialists (CNSs).

How do children and young people move through the Northern Territory hearing health system?

The Hearing Health Program is available to all Indigenous children and young people aged under 21 in the Northern Territory. As illustrated in Figure 1.1 below, children and young people generally enter the NT public hearing health system through the primary health-care sector. From this starting point, referrals can be made to audiologists, ENT specialists or CNS services. CNS services can also provide referrals to audiologists, or to other organisations. After children have been seen by audiologists or ENT specialists, they can then be sent for follow-up in primary care; or referred to other community-based support organisations; or to visiting rehabilitation support services through Australian Hearing or the Department of Education and Training's Hearing Support Services.

Figure 1.1: Clinical path of children and young people moving through the Northern Territory public hearing health system



About this report

This report presents information on hearing health outreach services provided to Aboriginal and Torres Strait Islander children and young people aged under 21 in the Northern Territory from July 2012 to December 2017. The Australian Government funds these services via various programs, and the Northern Territory Government delivers them. These programs aim to provide outreach services for the early detection, treatment and management of ear diseases and hearing health problems among Indigenous children and young people.

This report is an update of the *Northern Territory Remote Aboriginal Investment: Ear and Hearing Health Program July 2012 to December 2016* (AIHW 2017b), which is part of the Australian Institute of Health and Welfare's (AIHW) publication series reporting on the hearing programs in the Northern Territory. Throughout this report, you will find links to the supplementary tables related to the figures presented. Supplementary tables are available at: <https://www.aihw.gov.au/reports/indigenous-health-welfare-services/nt-hearing-program-2012-2017/data>.

About the data in this report

The data used in this report are collected from the hearing health outreach services funded by the Department of Health. The data includes over 9,800 children and young people aged under 21 who received services between August 2007 and December 2017. Of these children and young people, around 8,800 were still eligible for hearing health outreach services in 2017. This accounts for approximately 28% of the Northern Territory Indigenous population in this age group in 2017.

However, children and young people who received these services are not a random sample of the population. Audiology services were provided to children and young people in remote communities during visits from audiologists and trained specialists. Since January 2013, children and young people have been prioritised according to their need for services, which means that those with worse ear and hearing health are more likely to be captured in the data collection.

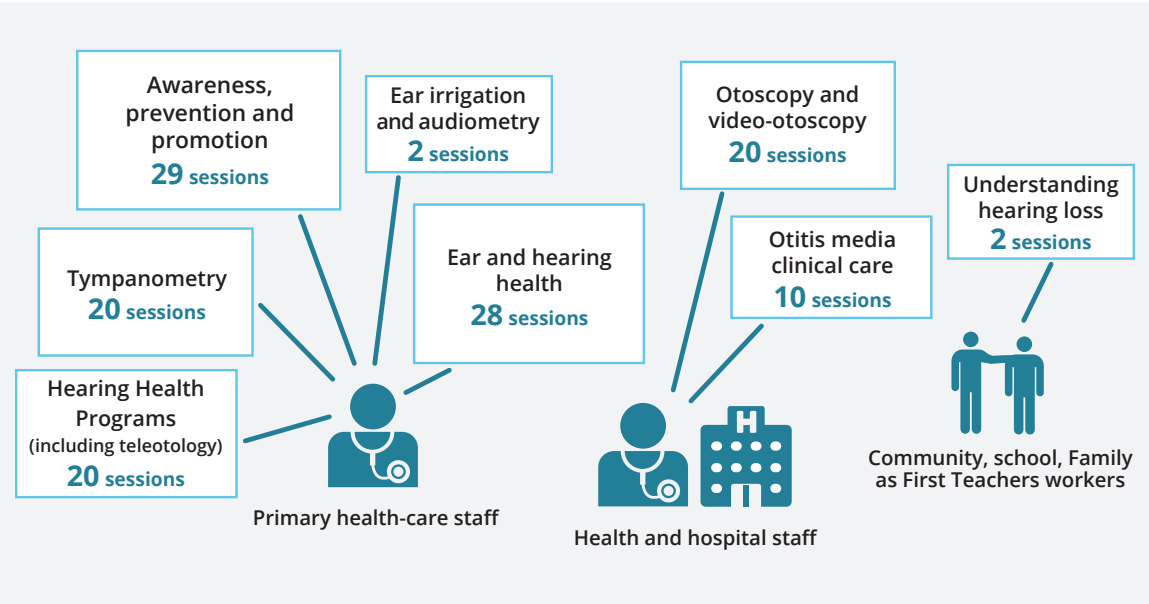
2 Service delivery

Health education, promotion and prevention

There are a variety of hearing health education, promotion and prevention activities delivered through the NT public hearing health system. Priority areas of hearing health promotion and prevention centre on enhancing hearing health literacy through education and community participation. Health education, promotion and prevention initiatives include:

- training for Aboriginal community hearing workers
- 'Stop the First Infection'—a program aimed to prevent early childhood infections
- ear health promotion material such as handouts, posters and audiovisual messages
- a hearing health social-marketing campaign with local football organizations
- a health promotion hip-hop music video addressing ear health.

In 2017, 131 training sessions for hearing health education, promotion and prevention activities were provided to heath care staff. The target audience for these activities are illustrated below.



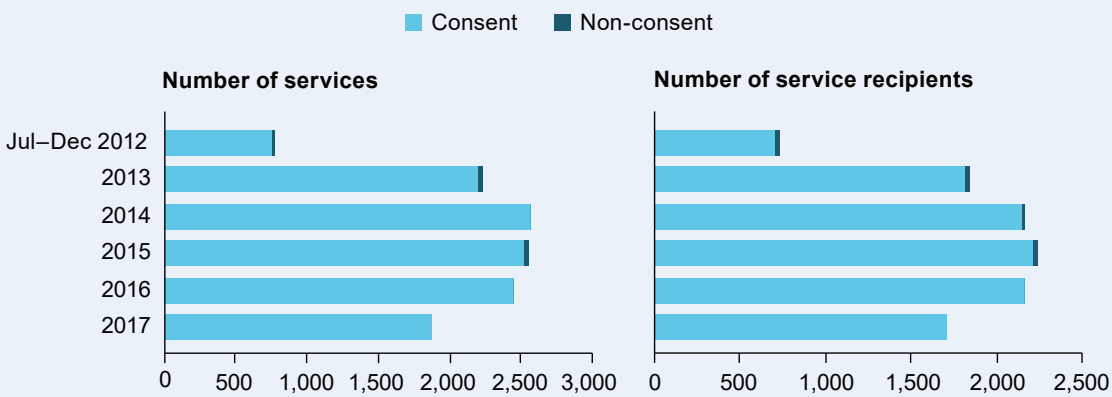
Outreach audiology

Audiology services include assessing middle ear function, diagnosing hearing loss and middle ear disease, and recommending clinical care or rehabilitation (such as communication strategies, classroom amplification, hearing aids, speech therapy and educational support). These services are delivered by audiology outreach teams, which consist of an audiologist and at least 1 other member of staff such as a registered nurse, nurse audiometrist, Aboriginal health worker or community health worker.

Parents or guardians of service recipients must provide their consent to share information with AIHW. The demographic information in this report, apart from the number of services and service recipients, only represents children who have provided consent to share their information. When a child's parent or guardian does not provide consent to share information, only a limited amount of aggregate information is provided to AIHW. See Appendix B for more information.

- In 2017, 1,870 audiology services were provided to 1,707 service recipients (Figure 2.1).
- From July 2012 to December 2017, a total of 12,446 services were provided to a total of 6,492 unique service recipients.
- The numbers of audiology services and service recipients increased between 2012 and 2015, but decreased in 2016 and 2017.

Figure 2.1: Number of outreach audiology services and service recipients, July 2012–December 2017



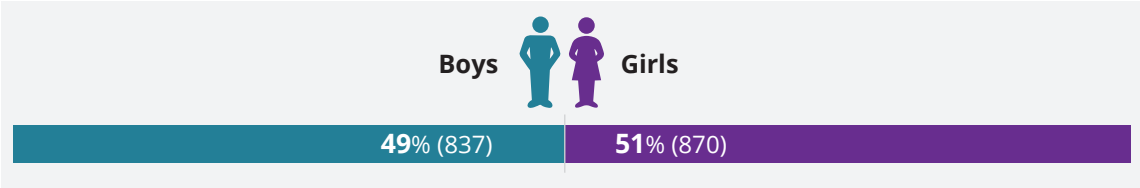
Note: The total number of service recipients in July 2012 to 2017 combined does not sum to the years because some children and young people received services in multiple calendar years; these services recipients were counted only once in the total.

Source: Table S2.1.

The drop in numbers between 2015 and 2017 can largely be explained by a shortage of audiologists available through a range of service providers, who supply specialist staff to provide services in remote communities. Current efforts are underway to alleviate this shortage and to provide training to primary health-care nurses to assist audiologists. Teleotology ENT and CNS services also experienced similar trends due to the shortage.

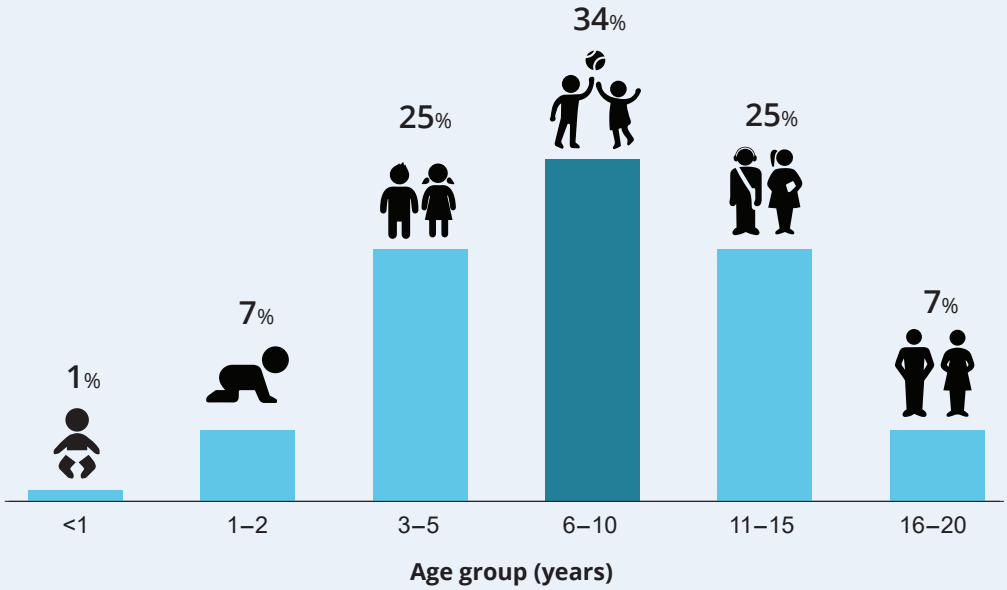
Overall, rates of non-consent to share the information of children and young people who received audiology services are quite small, and in 2017, there were no cases of non-consent for audiology service recipients.

In 2017, the proportion of service recipients was similar for boys and girls:



The highest proportion (34%) of service recipients in 2017 were aged 6–10 (Figure 2.2).

Figure 2.2: Outreach audiology service recipients in 2017, by age group



Source: Table S2.2.

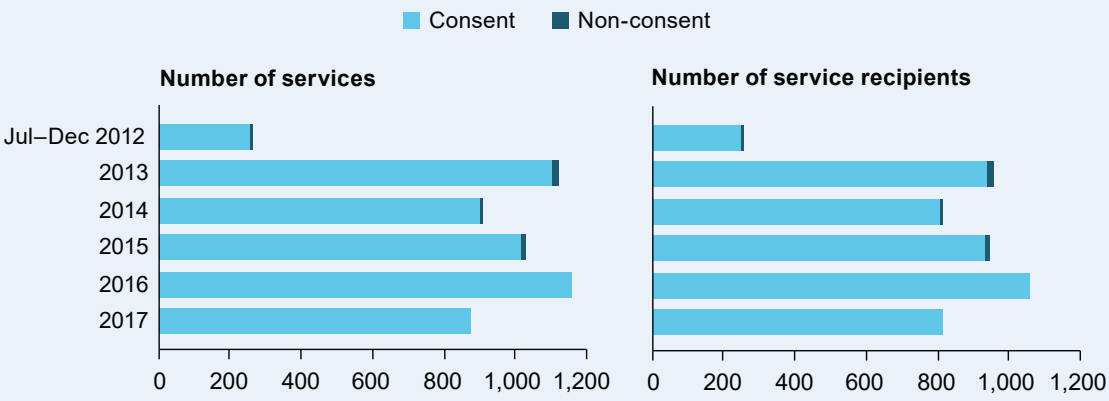
More information on outreach audiology services, such as services recommended by audiologists, can be found in the supplementary tables.

ENT teleotology services

The ENT teleotology service model was developed to meet the demand for ENT services in remote Northern Territory communities. An outreach visit from an audiologist and ENT nurse provide hearing and full clinical assessments, and uses a video-otoscope to send electronic information to the ENT team at the Royal Darwin hospital. The remotely located ENT specialist provides advice, diagnosis and assessment; treatment recommendations (for example, medications, surgery, hearing aids); and care coordination. The availability of teleotology services reduces travel times for families and increases access to ENT service for children in remote areas.

- In 2017, 876 teleotology ENT services were provided to 815 service recipients (Figure 2.3).
- From July 2012 to December 2017, a total of 5,354 services were provided to a total of 3,126 unique service recipients.
- Consent rates to share the information have been very high, and in 2016 and 2017, there were no instances of non-consent.
- The drop in numbers in 2017 is due to a shortage of available specialists (see page 5 for more information).

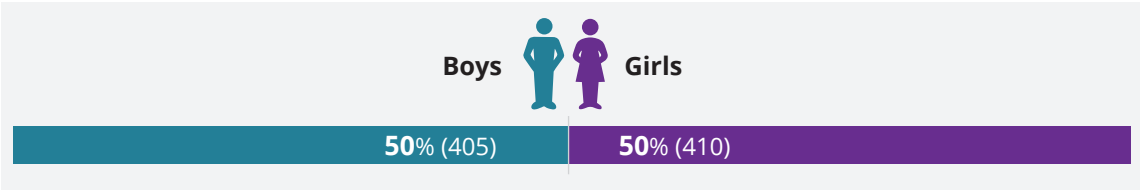
Figure 2.3: Number of ENT teleotology services and service recipients, July 2012–December 2017



Note: The total number of service recipients in July 2012 to 2017 combined does not sum to the years because some children and young people received services in multiple calendar years; these services recipients were counted only once in the total.

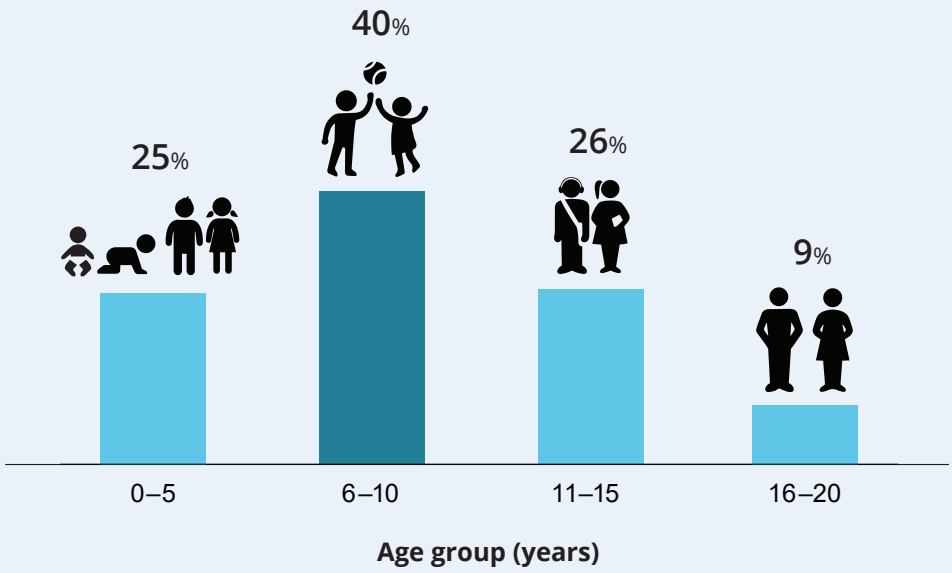
Source: Table S2.3.

The proportion of service recipients was the same for boys and girls in 2017:



The highest proportion (40%) of service recipients in 2017 were aged 6–10 (Figure 2.4).

Figure 2.4: ENT teleotology service recipients in 2017, by age group



Source: Table S2.4.

The most common age group for ENT service recipients aged 6–10 is partly attributed to ENT surgery being most suited for children who are over the age of 6. The extended follow-up that is required in the years after the surgery also contributes to the high percentage in this age group.

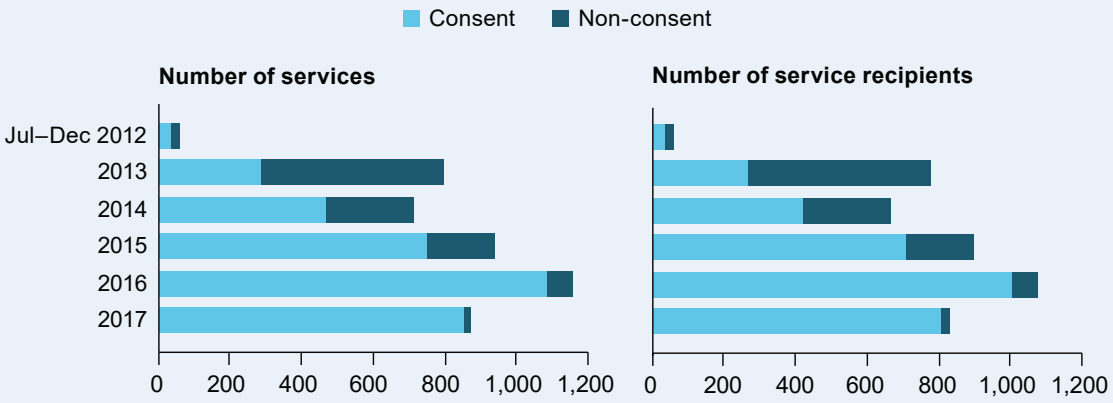
More information on ENT services, such as services recommended by ENT specialists, can be found in the supplementary tables.

Clinical Nurse Specialist services

The CNS services were developed in response to the challenges encountered in preventing ear disease and implementing clinical care for otitis media in the Northern Territory. The CNS services oversee and coordinate the treatment of children with a prioritised need for care by linking primary health-care services with specialist resources, and acting as a central point of contact between these 2.

- In 2017, 876 CNS services were provided to 830 service recipients (Figure 2.5).
- From July 2012 to December 2017, a total of 4,541 services have been provided to a total of 3,494 unique service recipients.
- From 2012 to 2016, there was a substantial increase in the number of service recipients and services provided, with a dip in 2017.
- The drop in numbers in 2017 is due to a shortage of available specialists (see page 5 for more information).

Figure 2.5: Number of CNS services and service recipients, July 2012–December 2017

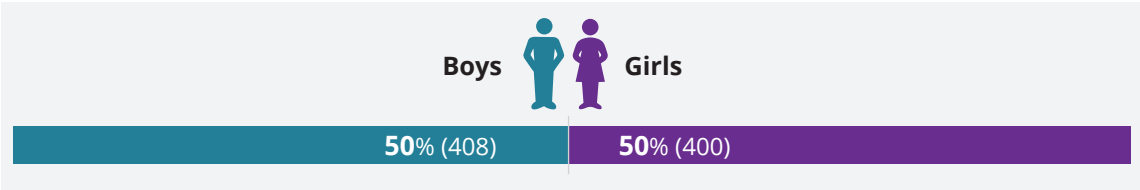


Note: The total number of service recipients in July 2012 to 2017 combined does not sum to the years because some children and young people received services in multiple calendar years; these services recipients were counted only once in the total.

Source: Table S2.5.

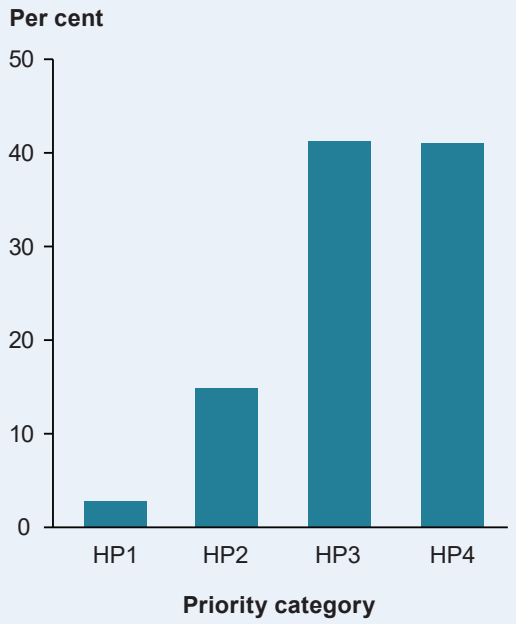
Caution should be taken when interpreting CNS data in 2013 and 2014 because non-consent rates for sharing information were high. However, non-consent rates have been decreasing over time. The hearing health team in the Northern Territory Department of Health implemented a training program to improve consent rates, and this could explain the decrease in non-consent rates in recent years.

The proportion of boys and girls who received CNS services was the same in 2017:



The CNS services are available to Indigenous children who have been identified as a hearing health priority (Figure 2.6), with the priority closely linked to age (Box 2.1).

Figure 2.6: Hearing health priority (closely linked to age) among CNS service recipients, 2017



Source: Table S2.6.

Box 2.1: Hearing health priority (HP) categories

HP1: Infants <12 months with recurrent acute otitis media (AOM) or chronic suppurative otitis media (CSOM). Infants who have failed newborn hearing screening.

HP2: Children aged 1–2 with perforation of the eardrum, recurrent AOM or persistent bilateral otitis media with effusion (OME).

HP3: Children aged 3–5 with perforation of the eardrum, recurrent AOM, persistent bilateral OME or moderate to profound hearing impairment.

HP4: Children aged 6–10 with moderate, severe or profound hearing impairment.

Older children represented the majority of service recipients in 2017: about 4 in 5 children were aged 3–10, and younger age groups represented a smaller proportion of service recipients.

More information on CNS services can be found in the supplementary tables.

3 Ear conditions and hearing health status

Ear conditions

There are 2 main types of ear conditions that are captured in the Hearing Health Program: otitis media, and Eustachian tube dysfunction (ETD) (Box 3.1).

Box 3.1: Types of ear conditions

Otitis media: all forms of inflammation and infection of the middle ear. Active inflammation or infection is nearly always associated with a middle ear effusion (fluid in the middle ear space). Types of otitis media include:

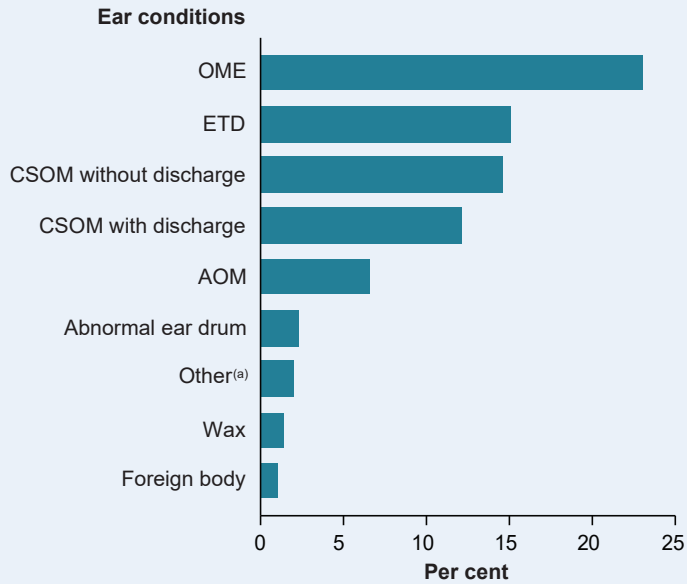
- acute otitis media (AOM)—the presence of fluid behind the eardrum plus at least 1 of the following: bulging eardrum, red eardrum, recent discharge of pus, fever, ear pain or irritability for less than 6 weeks
- chronic suppurative otitis media (CSOM) with discharge—a persistent suppurative discharge from the middle ear through a tympanic membrane perforation, for more than 6 weeks
- chronic suppurative otitis media (CSOM) without discharge—the presence of a perforation (hole) in the eardrum without evidence of discharge or fluid behind the eardrum (also known as inactive CSOM or dry perforation)
- otitis media with effusion (OME)—the presence of an intact eardrum and middle ear fluid without symptoms or signs of acute infection. OME may be episodic or persistent.

Eustachian tube dysfunction (ETD): negative middle ear pressure associated with compromised equalisation, impeding middle ear function and sometimes causing middle ear fluid accumulation.

In 2017, 1,879 children and young people received at least 1 audiology, CNS or teleotology ENT service. At their latest service, 1,145 (61%) children and young people were diagnosed with at least 1 type of ear condition, and this proportion has remained quite similar over the years from 2012 to 2017 (61–68%). Proportions of specific ear conditions have also had small fluctuations over the years.

In 2017, the most common type of ear condition, among the 1,145 children diagnosed with an ear condition, was OME (23%, or 433 cases); followed by ETD (15%, or 284 cases); CSOM without discharge (15%, or 275 cases); and CSOM with discharge (12%, or 229 cases) (Figure 3.1).

Figure 3.1: Types of ear conditions among children and young people who received an audiology, CNS or ENT teleotology service in 2017



(a) 'Other' includes grommets, myringitis, otitis external, tympanosclerosis, and other ear conditions.

Source: Table S3.1.

2 in 3 (61%) children were found to have ≥1 ear condition consistently each year

Age and sex differences

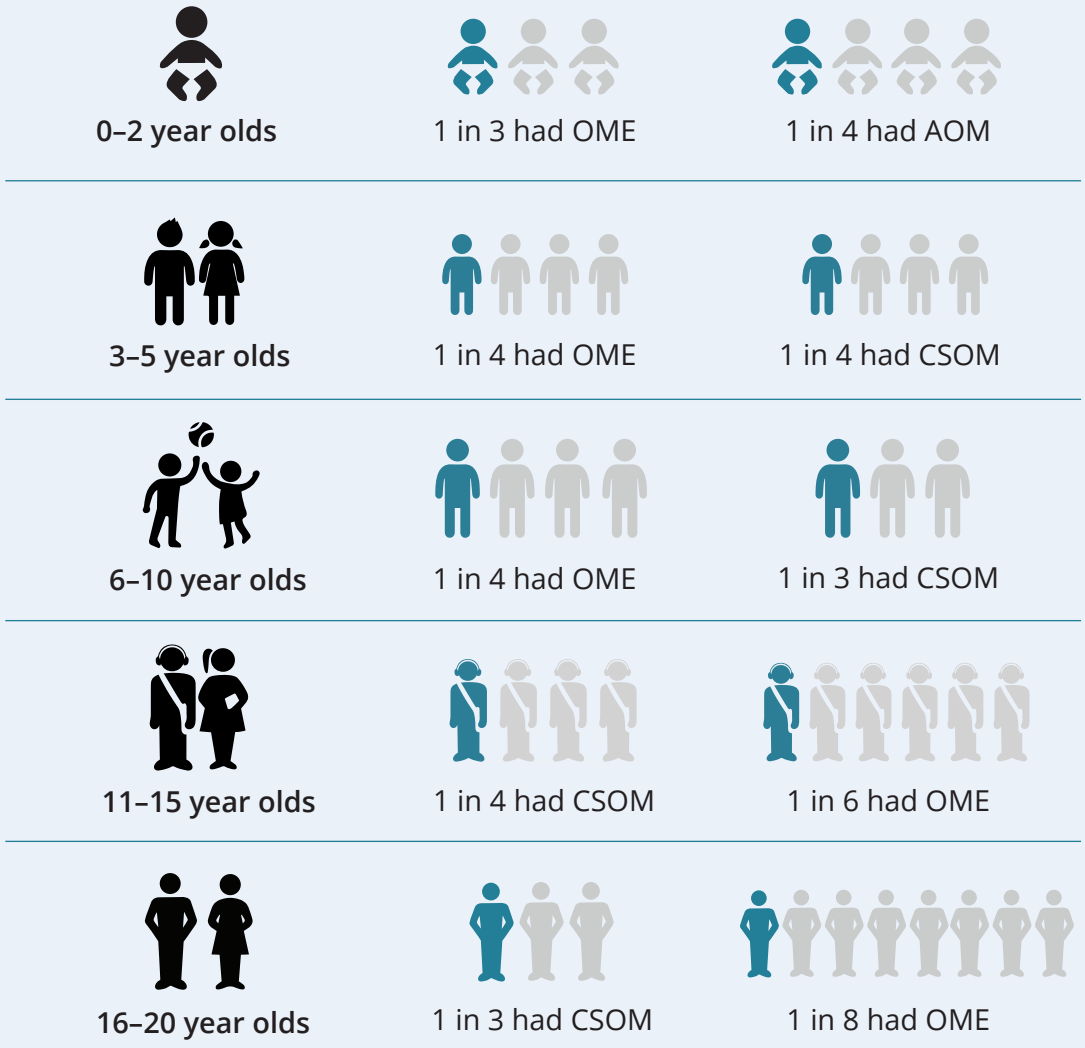
The proportions of ear conditions were generally similar by sex, but varied by age group in 2017.

Younger children who had received a service had the highest proportion of ear conditions. In 2017, 71% of children aged 0–2 and 66% of children aged 3–5 had at least 1 type of ear condition. This pattern reflects the natural profile of ear disease, where children typically grow out of ear conditions (AIHW 2014c).

Find out more *in Table S3.2.*

The most common types of ear conditions differed among age groups in 2017, as shown in Figure 3.2.

Figure 3.2: Most common ear conditions for children and young people who received at least 1 audiology outreach, CNS or teletology ENT service in 2017, by age group



Source: Table S3.2.

Apart from the trends shown above, the following patterns were also observed:

- The proportion of OME, ETD and AOM generally decreased with age.
- The proportion of CSOM without discharge generally increased with age.
- The proportion of children and young people with no ear conditions generally increased with age.

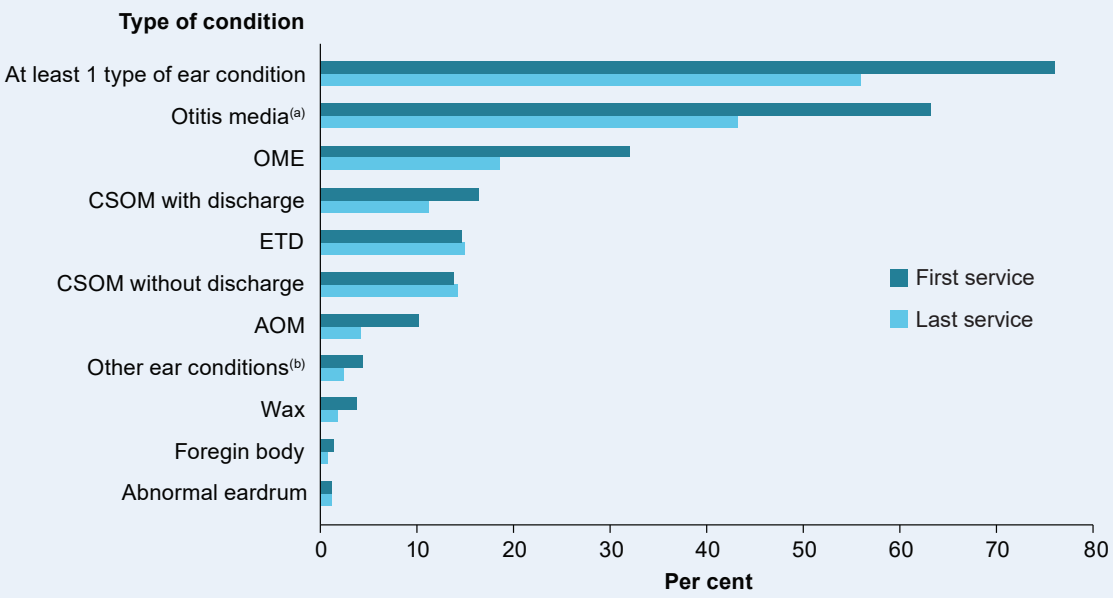
Short term changes (2012–2017)

This section presents information about changes in ear conditions, hearing loss and hearing impairment among children and young people along the Hearing Health Program treatment pathway who received more than 1 audiology service. This is 1 way to understand the effectiveness of the hearing health outreach services in terms of improving outcomes. It is important to keep in mind that changes may also be partially attributed to the natural progression of the disease as children and young people grow older. To measure changes over time and observe the outcomes of treatment, this analysis includes only children and young people with minimum time interval of 3 months between their first and last service. A total of 3,042 children and young people met this criteria.

For almost all conditions, there was an improvement over time. Figure 3.3 shows the change in proportion of ear conditions among first and last services:

- The number of children and young people with at least 1 type of ear condition decreased from 2,314 at their first service to 1,706 at their last service.
- The proportion of children and young people with at least 1 type of ear condition decreased by 20 percentage points between the first and the last service (from 76% to 56%).
- While there was a decrease in the proportion of children with an ear condition between first and last services for the majority of middle ear conditions, there were small increases in proportions of ETD and CSOM without discharge.

Figure 3.3: Change in proportion of ear conditions between first and last hearing health service, among children who received ≥2 services between July 2012 and December 2017



(a) Otitis media includes OME, CSOM with discharge, CSOM without discharge and AOM. The sum of these 4 conditions may exceed the total of otitis media as service recipients may have more than one ear condition.

(b) Other ear conditions include includes grommets, reduced ear drum movement or retracted ear drum, and other ear conditions.

Source: Table S3.3.

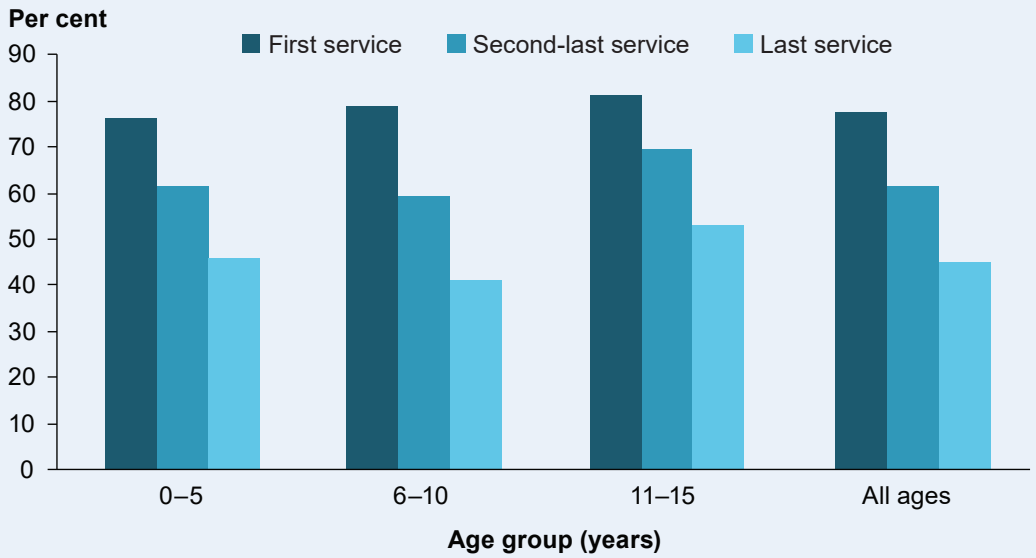
Long term changes (2007–2017)

The expansion of the Northern Territory public hearing health services started in 2007, so changes over time can be examined across a longer period. Examining a longer time period allows for a more in-depth look at any changes in ear conditions.

Among the 2,828 children aged up to 15 who had at least 3 outreach audiology, CNS or ENT teleotology service visits between August 2007 and December 2017, improvement was seen over the long term (Figure 3.4):

- At the first service, 2,200 (78%) of children had at least 1 type of otitis media.
- At the last service, 1,281 (45%) of children had at least 1 type of otitis media.
- There was a decrease of 33 percentage points between first and last service visits, among children with otitis media.
- There were similar decreases across all age groups.

Figure 3.4: Change in proportion of otitis media across visits, among children who received ≥3 services between August 2007 and December 2017



Notes

1. Includes Indigenous children and young people who received 3 or more outreach audiology, CNS or ENT teleotology services with a minimum interval between first and last service of 6 months, and with a minimum of 3 months between first and second last services and 3 months between second last and last services.
2. Median interval between first and second last services: 30 months. Median interval between second last and last services: 14 months.
3. Age group was classified based on the service recipient's age at the first service.

Source: Table S3.4.

Ear conditions among CNS service recipients

Children and young people who receive CNS services are those with a prioritised need for care. As such, it is important to examine these children and young people separately to track their hearing health as they move through the program.

In 2017, among the 808 children who received a CNS service and consented to sharing information with AIHW, 531 (66%) children and young people were diagnosed with at least 1 ear condition at their first CNS visit and 29% of childen were not diagnosed with any ear condition. (Information was missing for the remaining 5%).

The most commonly diagnosed conditions were:

- OME (29%)
- Eustachian tube dysfunction (ETD) (19%)
- AOM (8%).

The distribution of ear conditions across CNS visits is similar to the distribution among other Hearing Health Program visits.

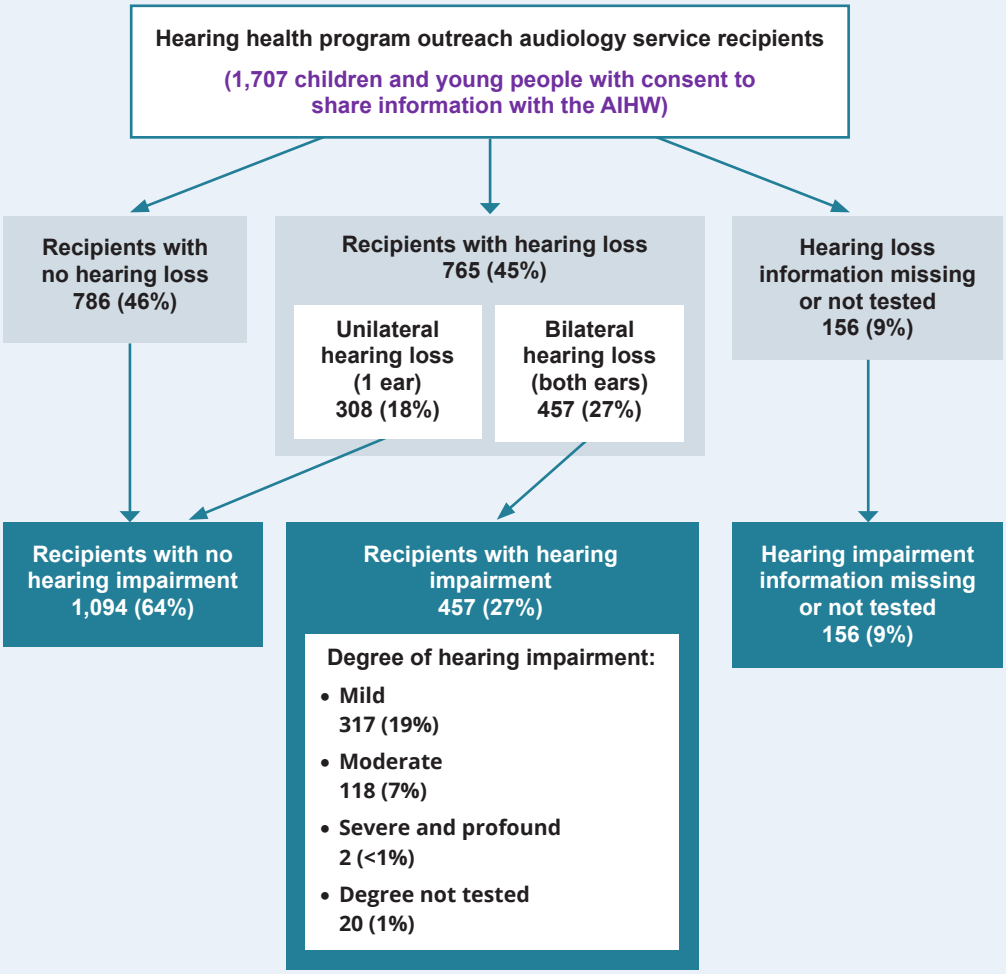
Find out more *in Table S3.5.*

Hearing status

Two measures of hearing status are reported in this report: hearing loss and hearing impairment. 'Hearing loss' may affect 1 ear (unilateral) or both ears (bilateral). 'Hearing impairment' is based on the ear with the best hearing, meaning that children and young people with unilateral hearing loss are not defined as having a hearing impairment. Only those with bilateral hearing loss are classified according to the degree of hearing impairment.

Figure 3.5 shows the number and proportion of children and young people with hearing loss and hearing impairment, among service recipients in 2017, and the relationship between the two.

Figure 3.5: Hearing loss and impairment among children and young people who received audiology outreach services (including CNS service recipients), 2017



Source: tables S2.1, S3.6, S3.8.

Hearing loss

In addition to the 'unilateral' and 'bilateral' descriptions of hearing loss, there are 3 types of hearing loss: conductive, sensorineural and mixed (Box 3.2). Among the children and young people who received audiology outreach services in 2017, 45% had hearing loss:

- 25% had conductive hearing loss
- 1% had sensorineural hearing loss
- 0.6% had mixed hearing loss
- 18% could not be determined.

Among the 862 children and young people who received both an outreach audiology and CNS service between July 2012 and December 2017, and who received their latest service in 2017:

- 53% had some form of hearing loss—35% bilateral and 18% unilateral
- between July 2012 and December 2017, the proportion of children receiving CNS services who had hearing loss decreased from 79% to 53%.

Find out more *in Table S3.7 and Table S3.9.*

Box 3.2: Types of hearing loss

Conductive hearing loss: 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).

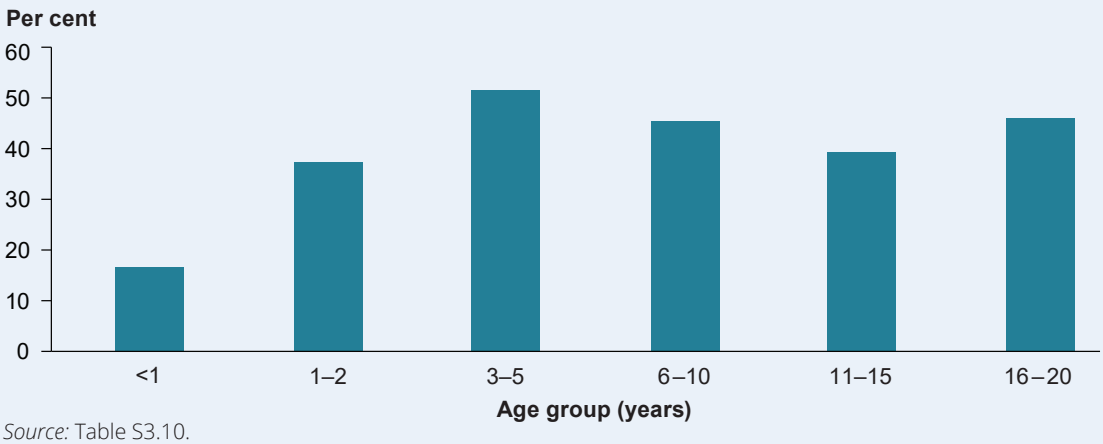
Sensorineural hearing loss: A deviation of hearing threshold from the normal range, attributable to problems in the inner ear or vestibulocochlear nerve.

Mixed hearing loss: Hearing loss that has conductive and sensorineural components combined.

Variation by age and sex

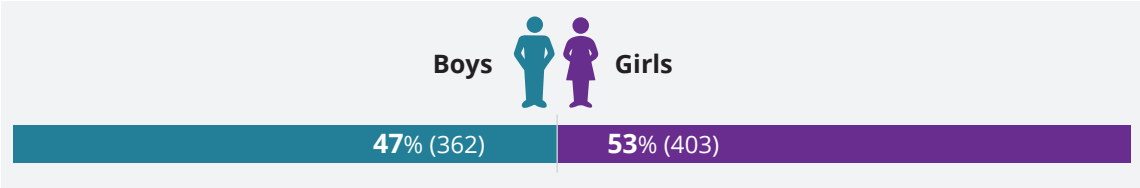
Among children and young people who received an audiology service in 2017, the proportion with hearing loss differed between age groups (Figure 3.6). Children aged 3–5 had the highest proportion of hearing loss (52%).

Figure 3.6: Proportion of children and young people with hearing loss who received audiology outreach services in 2017, by age group



Source: Table S3.10.

The proportion of hearing loss among girls was slightly higher than the proportion of hearing loss among boys in 2017.



Hearing loss among children and young people with ear conditions

Proportions of hearing loss were much higher among children and young people who had ear conditions than among those with no ear conditions.

In 2017, among children who were diagnosed with **at least 1** ear condition:

4 in 5 experienced hearing loss

50% had bilateral hearing loss

33% had unilateral hearing loss

Source: Table S3.11.

Trends

Among children and young people who received an audiology service, the proportion with hearing loss decreased from 55% in July–December 2012 to 45% in 2017.

When comparing service recipients from July-December 2012 and 2017:

55% → **45%**

Hearing loss decreased

Bilateral hearing loss **decreased** by **13%**

Unilateral hearing loss **increased** by **3%**

The proportion of 'no hearing loss' increased: **34%** → **47%**

Note: Some of the changes in hearing loss over time would be attributed to changes in the proportion of children who were not tested.

Source: Table S3.6.

Hearing impairment

Hearing impairment describes the degree of impairment associated with hearing loss in the 'better hearing ear', using a scale of mild, moderate, severe and profound (Australian Hearing, cited in Access Economics 2006). In 2017, 457 (27%) of children and young people who received an audiology service had a hearing impairment.

In 2017

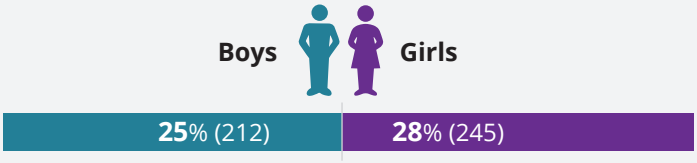
457 children had a hearing impairment

- **19%** mild impairment
- **7%** moderate impairment
- **<1%** severe and profound impairment

Source: Table S3.8.

Variation by age and sex

The proportion of hearing impairment among boys was similar to the proportion of hearing impairment among girls in 2017.



In 2017, the proportion of children and young people with no hearing impairment rose with age, and hearing impairment tended to be more severe in younger than in older age groups.

Ages 1–2: highest proportion of moderate/severe/profound hearing impairment **(19%)**

Ages 3–5: highest proportion of mild hearing impairment **(25%)**

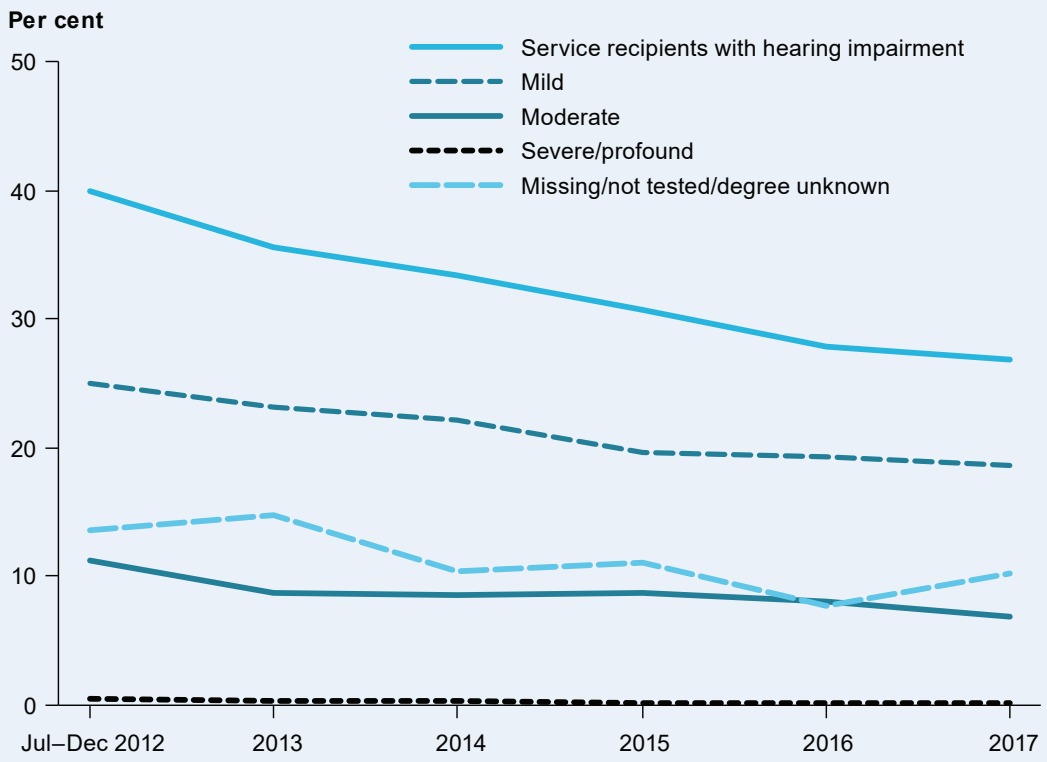
Source: Table S3.13.

The shifts with age in the severity of hearing impairment can be partly explained by the effects of both medical intervention and natural development (whereby children typically grow out of ear conditions and associated hearing loss with age). At older ages (3–5 onwards), it is likely that medical treatment and interventions for those with ear conditions help reduce the severity of hearing impairment, and therefore reduce the proportion of children and young people with hearing impairment.

Trends

Among children and young people who received outreach audiology services between July 2012 and December 2017, the proportion with a hearing impairment decreased from 40% to 27% (Figure 3.7). Over time, there was an increase from 50% to 64% in those with no hearing impairment.

Figure 3.7: Degree of hearing impairment among children and young people, July 2012 to December 2017



Source: Table S3.8.

Some of the hearing impairment decrease over time could be due to the natural history of ear disease, as previously discussed. However, it is more likely that the observed decrease is attributed to the increasing effectiveness of hearing health services and medical interventions. It is difficult to attribute such a large decrease in hearing impairment over a short period of time solely to the natural progression of the disease. Overall, the effectiveness of these services can only be measured through an evaluation program, which is beyond the scope of this report.

Changes over time in hearing loss and impairment

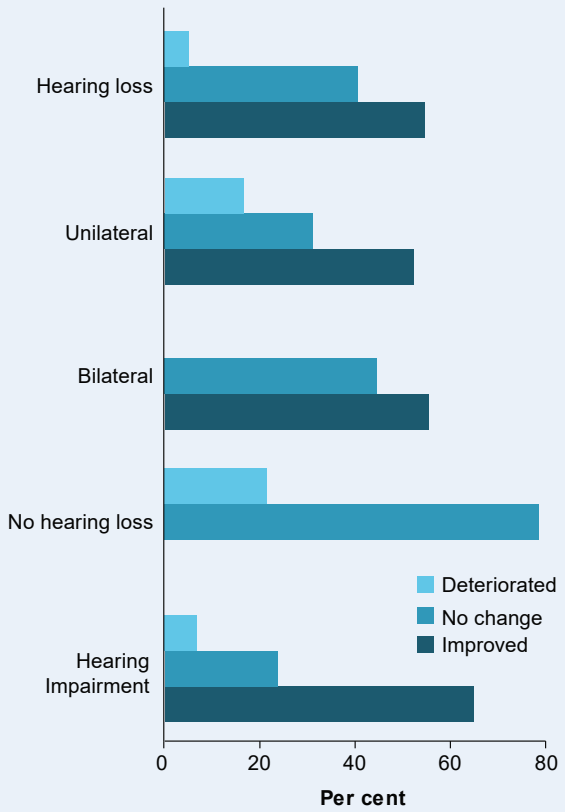
Short term changes (2012–2017)

One way to examine hearing health changes is by matching first and last visits among children and young people as they move through the health system. Individual children who received multiple audiology services were tracked to determine whether their hearing health changed (see Box 3.3).

2,619 children and young people received 2 or more outreach audiology services between July 2012 and December 2017. Generally, their hearing health improved over this period (Figure 3.8):

- 1,062 children (55%) had an improved **hearing loss** status and only 99 (5%) had deteriorated.
- Among the 1,279 children with **hearing impairment**, 828 (65%) had improved and only 88 (7%) deteriorated.

Figure 3.8: Change in hearing loss and impairment among children who received ≥ 2 audiology services between July 2012 and December 2017



Sources: tables S3.14, S3.15.

Box 3.3: Change in hearing capability across services

Hearing loss

Improved—a change in hearing loss status: (1) from bilateral hearing loss to unilateral hearing loss or no hearing loss and (2) from unilateral hearing loss to no hearing loss.

Deteriorated—a change in hearing loss status: (1) from no hearing loss to unilateral or bilateral hearing loss or (2) from unilateral hearing loss to bilateral hearing loss.

Hearing impairment

Improved—movement to a lower degree of hearing impairment (for example, from profound hearing impairment to severe, moderate or mild hearing impairment).

Deteriorated—movement to a higher degree of hearing impairment (for example, from mild hearing impairment to moderate, severe or profound).

A number of factors might contribute to the observed improvements in hearing health. These include:

- the effectiveness of medical interventions
- the effect of health promotion activities in:
  - increasing awareness and knowledge of hearing health among families
  - improving the acceptance of and attendance at audiology services provided by outreach teams
- the natural improvement in the condition as children and youth get older
- the confounding factor of 'missing' and 'not tested' records, and missing information from children and youth for whom consent was not obtained.

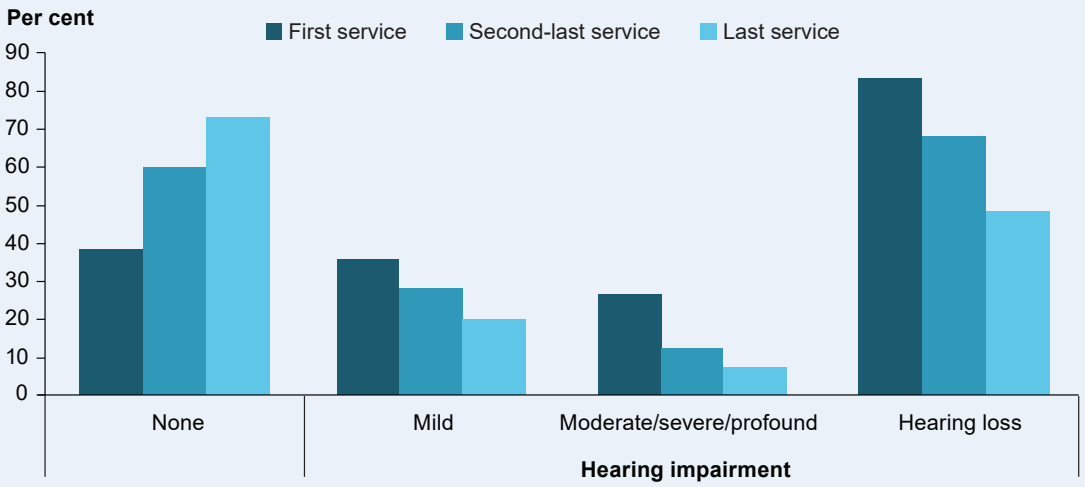
Long term changes (2007–2017)

Hearing health outcomes at a child or young person's first, second-last and last audiology service visits were obtained for children who had at least 3 services visits between August 2007 and December 2017. To allow for sufficient time for changes between service visits, only services with at least 3 months in between were included in the analysis.

As seen in Figure 3.9, among the 2,215 children and young people who had at least 3 audiology visits:

- the proportion of **hearing loss** (in 1 or both ears) at the last audiology visit (48%) was much less than the proportion at the first visit (83%)
- the proportions of **hearing impairment** (among mild and moderate/severe/profound categories) decreased over subsequent audiology services.

Figure 3.9: Proportion of hearing impairment and hearing loss at various audiology service visits between August 2007 and December 2017 (among children with ≥ 3 visits)



Sources: tables S3.16, S3.17.

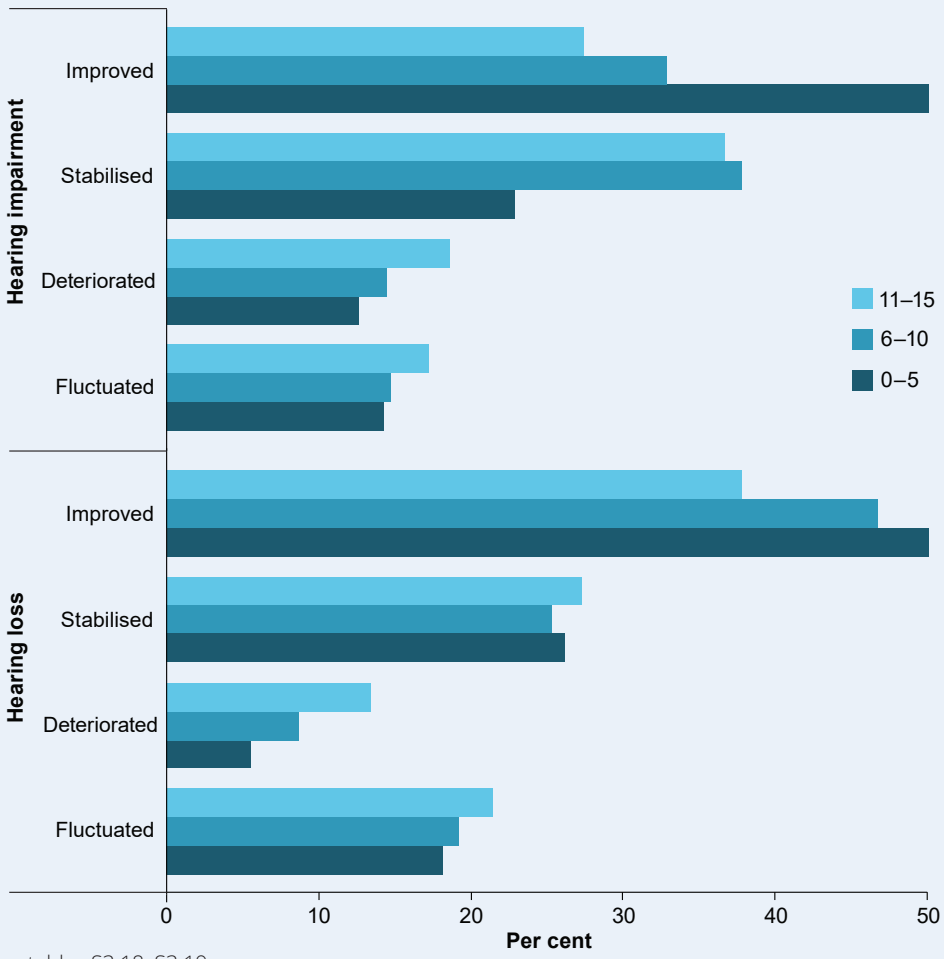
Effect of age over time

Children and young people were tracked over time, with their first, second-last and last audiology service visits matched, and included in the analysis if they received at least 3 services between August 2007 and December 2017, with a minimum of 3 months between each service. These children were classified into 3 age groups (0–5, 6–10 and 11–15) based on their age at their first service.

When comparing a child or young person's first and last visit, for all ages (Figure 3.10):

- there were somewhat similar patterns of changes in hearing health status for both hearing impairment and hearing loss. There were lower proportions of deterioration, and the majority of the children and young people had hearing loss or impairment that stabilised or improved
- those who received audiology services at a younger age (0–5) were more likely to have improvements in hearing impairment and hearing loss status over time.

Figure 3.10: Changes in hearing health among children and young people with ≥3 audiology services between August 2007 and December 2016, by age



Sources: tables S3.18, S3.19.

The biggest improvements to hearing health were observed for the youngest children who entered the audiology program (0–5). This is consistent with the findings of other studies that demonstrate the effectiveness of early intervention in improving outcomes for children (Moeller 2000). Hearing health improvements at a young age are important because they are associated with large functional gains in learning and language acquisition throughout childhood. These improvements might be attributed to several factors:

- Younger children may grow out of the conditions naturally as they age.
- Early treatment is more effective at younger ages.
- The most common ear conditions in younger age groups are acute, so early interventions may prevent them from developing into chronic conditions or more severe or permanent hearing damage.
- Because the services from this program are only available for children and young people aged under 21, the duration of follow-up might be longer among younger service recipients than older ones. For example, a 5 year old could be followed up for over 10 years, but a 15 year old could only be followed up for 5 years before they left the program.

Similarly, reasons for differences in reduction of hearing impairment between the first and last services across age groups are not clear. However, a few factors may be involved:

- Younger children are more likely to have AOM, and less likely to have permanent hearing damage due to the higher effectiveness of treatment.
- Older children are more likely to have chronic otitis media, which is associated with damage to middle ear structures, and is related to an increased risk of residual permanent hearing loss.

4 Demand for ear and hearing health services and other follow-up services

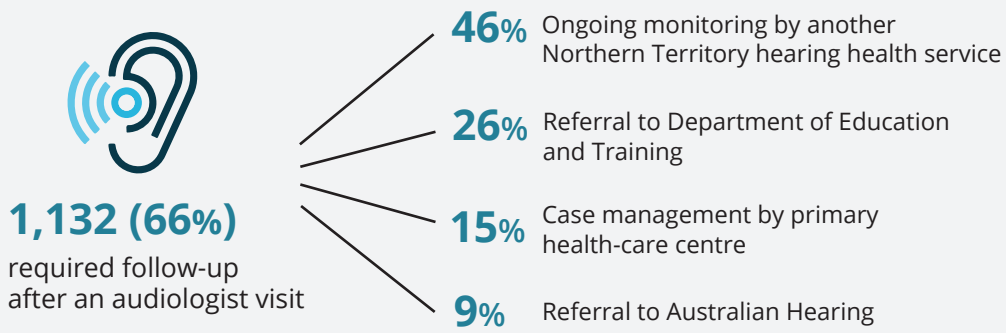
The Australian Government-funded activities in the Northern Territory public hearing health system are very valuable for children and young people in the Northern Territory. Since 2012, the number of children and young people accessing services has increased, with consent rates increasing as well. Improvements in hearing health status across the years have also been consistently demonstrated. However, there is still a high demand for audiology and ENT services given the high number of outstanding referrals (as seen in figures 4.1 and 4.2).

In addition to these hearing health services, children can be referred to other follow-up services. Follow-up can encompass a wide range of services, from having a hearing aid fitted by Australian Hearing, to medical treatment, such as ear cleaning or the need for ENT surgery.

Follow-up services required after audiologist visits

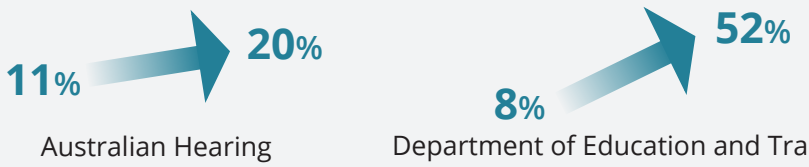
In 2017, 66% of children and young people required at least 1 further action following their audiology visit. (Percentages in the infographic below sum to over 66% because some children required more than 1 referral).

In 2017, 1,707 children and young people received an audiology service. Among these:



Source: Table S4.1.

Among those with hearing loss, 96% required follow up. Referrals from audiology services to various other services have increased from July 2012 to December 2017 for children and young people with hearing loss.



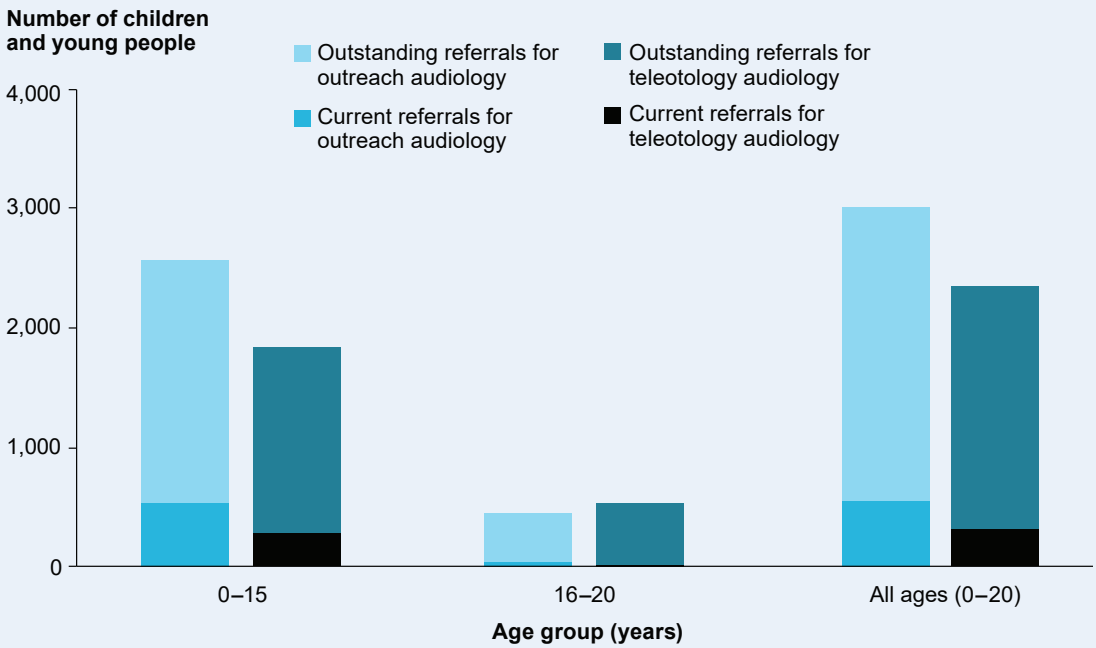
Source: Table S4.2.

Additionally, as shown in Figure 4.1, there are still many children and young people who have current and outstanding referrals to audiology services as at December 31, 2017.

'Current referrals' are those that are not overdue—that is, the time elapsed since the date of the referral was not longer than the recommended period. 'Outstanding referrals' are those that are overdue, as at December 31, 2017.

At the end of 2017, there were over 2,400 children and young people with outstanding referrals for outreach audiology services, and over 1,400 with outstanding referrals for teleotology audiology services.

Figure 4.1: Number of current and outstanding referrals to audiology services as at December 2017



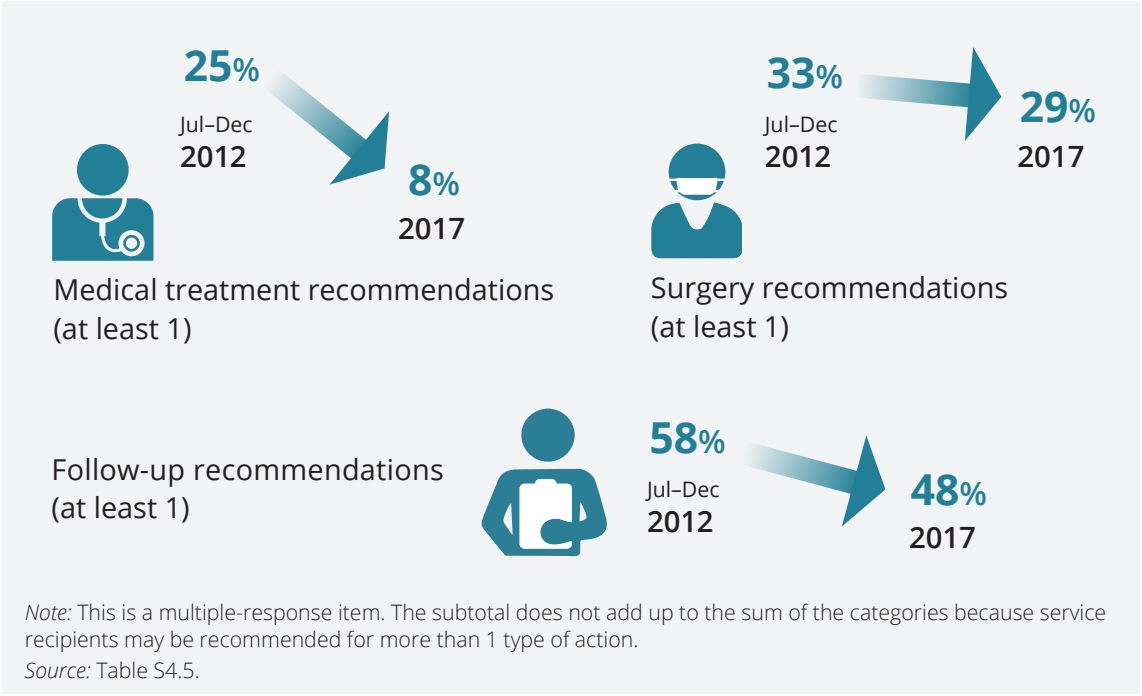
Sources: tables S4.3, S4.4.

Follow-up services required after ENT teleotology services

In 2017, 628 (77%) children and young people were given a recommendation for at least 1 further action following an ENT teleotology service. There are 3 types of actions that are recommended by ENT specialists:

- Medical treatment—treatment can be recommended for implementation by the child or young person's primary health-care provider. The most common type of treatment recommendations was medication.
- Surgery—the most common types of surgery recommended were myringoplasty and myringotomy (see Glossary).
- Further follow-up—this is the main type of ENT action recommended through the ENT teleotology service. This was primarily for an ENT review or an audiological assessment.

Recommendations by ENT specialists for medical treatment, surgery and further follow-up decreased between July 2012 and December 2017.



Note: This is a multiple-response item. The subtotal does not add up to the sum of the categories because service recipients may be recommended for more than 1 type of action.
Source: Table S4.5.

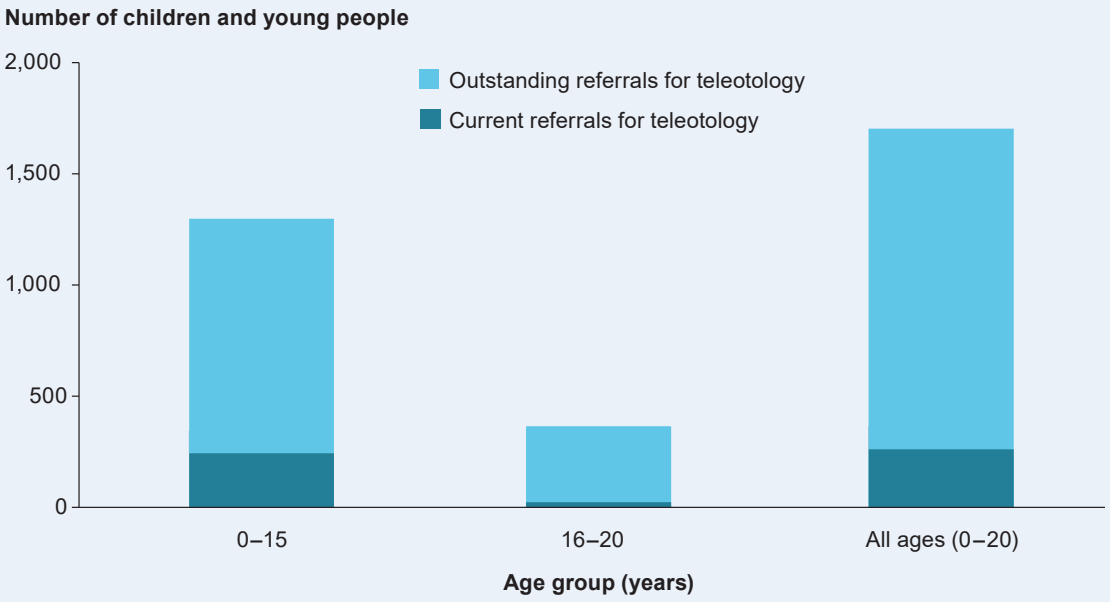
Additionally, between July 2012 and December 2017, the proportion of children and young people recommended for an audiological assessment decreased by 33 percentage points (from 51% to 18%).

However, the number of children and young people with current and outstanding ENT referrals as of December 31, 2017 remains high, as demonstrated in Figure 4.2.

As of December 31, 2017, there were over 300 children and young people with current referrals and over 2,000 with outstanding referrals for ENT teleotology services.

Despite the decreases in ENT recommendations, the number of children and young people with current and outstanding ENT referrals as of December 2016 remains high, as demonstrated in Figure 4.2.

Figure 4.2: Number of current and outstanding referrals to teleotology services as at December 2017



Source: Table S4.6.

5 Outcomes of children after exiting the program

The Australian Government-funded Hearing Health Program is for children and young people under 21, and so all participants aged 21 and older would have exited the program. These young people can continue to access services through the Northern Territory public hearing health system; however, these clinical data are not reported through the Hearing Health Program. By analysing this specific set of young people, certain questions can be addressed:

- How long did they participate in the programs?
- Did their ear and hearing health improve?
- Were further actions for continued care and monitoring recommended at their last service?

Time spent in Hearing Health Programs

There were 317 young people who had received audiology services and 181 young people who received ENT teleotology services who had exited the Australian Government-funded Hearing Health Program as at December 2017. As some of these young people received both types of services, a total of 321 unique young people had received outreach audiology services and/or ENT services before exiting the program. Of these:

- 190 (59%) received 2 or more services
- the median length of time spent in the Hearing Health Program (length of time between first and last services) was 61 months (5.1 years).

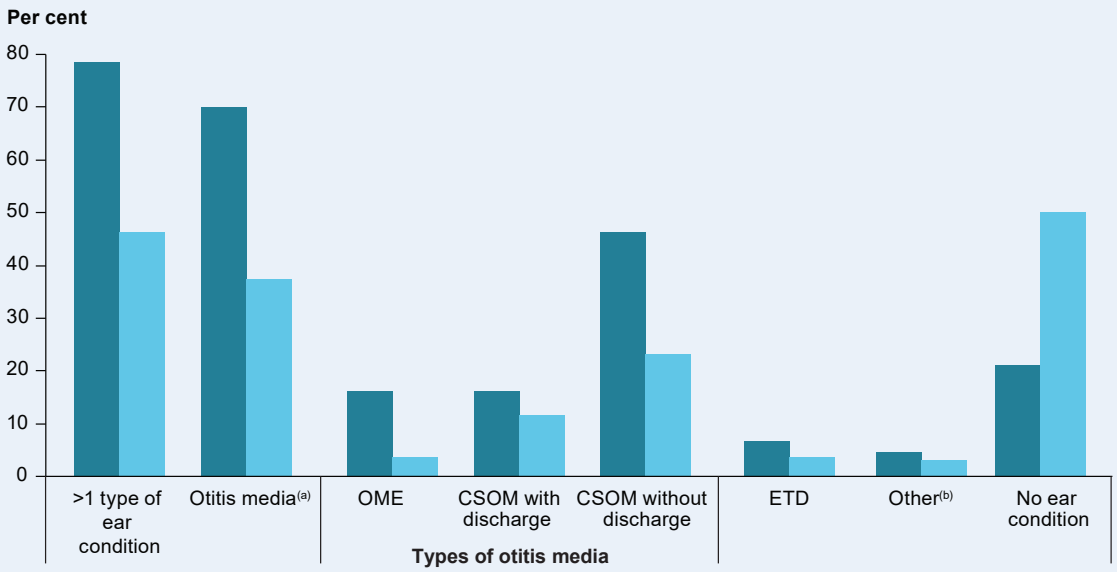
Find out more *in Table S5.1.*

Changes over time in hearing health

Among the 190 young people who had exited the Hearing Health Program and who had received at least 2 audiology or ENT services between August 2007 and December 2017 (Figure 5.1):

- 149 young people (78%) had at least 1 condition at their first service
- at the last service visit, this decreased to 88 young people with at least 1 condition (46%).

Figure 5.1: Change in proportion of ear conditions between first and last ENT or audiology visits between August 2007 and December 2017, among young people who exited the Hearing Health Program



(a) Otitis media includes OME, CSOM with discharge, CSOM without discharge and AOM. The sum of these 4 conditions may exceed the total of otitis media as service recipients may have more than one ear condition.

(b) 'Other' includes grommets, reduced ear drum movement or retracted ear drum, and other ear conditions.

Source: Table S5.2.

Among young people who had exited the program as of December 2017, 185 had a hearing impairment at their first service. The following figure describes their outcomes:

Among young people with a **hearing impairment** who left the Hearing Health Program:

51 (28%)
Improved

105 (57%)
No change

22 (12%)
Deteriorated

Note: The sum of the categories does not add up to 100% due to missing information for 7 service recipients.
Source: Table S5.3.

When interpreting these figures, it is important to keep some data limitations in mind:

- Some young people may not have had a hearing impairment at their first check, and as such, the figures might under- or overestimate change over time.
- Some changes in hearing improvement might be too small to cross a hearing impairment category threshold, and as such, these changes would not be reflected above.

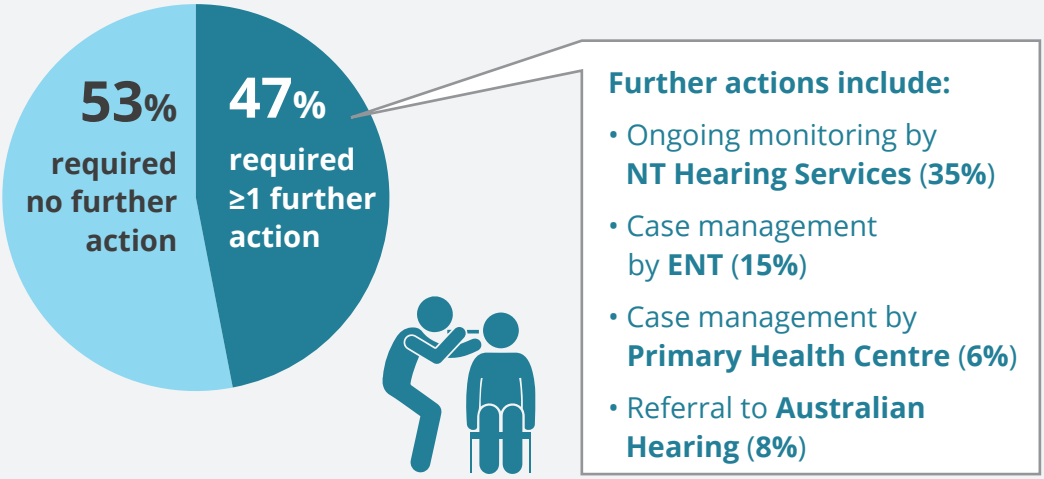
Further actions and recommendations

At least 1 type of follow-up was required for:

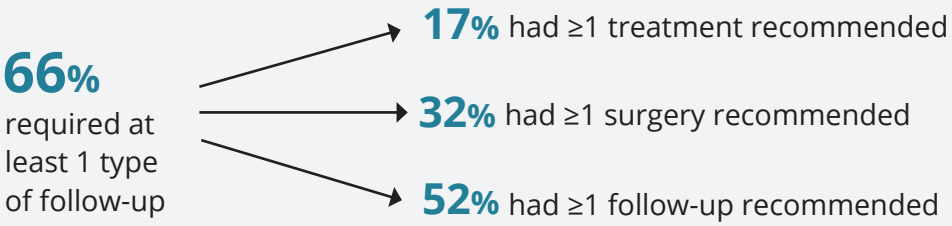
- 149 (47%) of the 317 young people who had exited the outreach audiology program
- 119 (66%) of the 181 young people who had exited the ENT teleotology program.

The following infographic outlines the specific types of follow-up that were recommended for young people who had exited the programs.

Among young people who left the outreach audiology program:



Among young people who left the ENT teleotology program:



Note: This is a multiple-response item. The subtotal may not add up to the sum of the categories because service recipients may be recommended for more than 1 type of action.

Source: tables S5.4 and S5.5.

For these young people who were too old to be included in the Hearing Health Program, it is unknown whether they have received appropriate follow-up care. However, it is possible that they have gone on to receive mainstream medical care to continue their hearing health follow-up.

6 Regional analysis

The Northern Territory has 2 main health service delivery regions: the Top End Health Service (TEHS) and Central Australia Health Service (CAHS). This section presents the hearing health status of the children and young people who received outreach audiology, CNS or ENT teleotology services in these 2 regions. In 2017, 1,113 children and young people within TEHS and 547 within CAHS received an audiology service.

Hearing loss

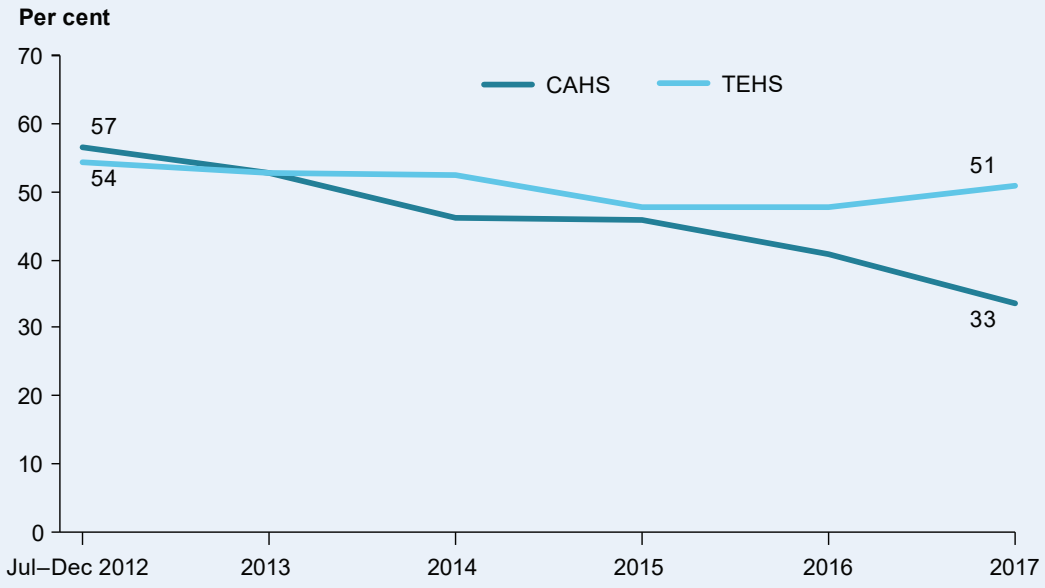
Patterns over the years, from July 2012 to December 2016, were similar between TEHS and CAHS (Figure 6.1) in that:

- the proportions with hearing loss (in 1 or both ears) generally decreased over time
- the proportions with no hearing loss increased over time.

However in 2017, there were differences between the percentages of hearing loss (unilateral and bilateral) between the regions (Figure 6.1):

- TEHS had a higher proportion of hearing loss (51%, or 567 children) compared to CAHS (33%, or 183 children)
- the proportion of children and young people with no hearing loss was higher in CAHS (56%, or 308 children) compared with TEHS (40%, or 450 children).

Figure 6.1: Hearing loss among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS)

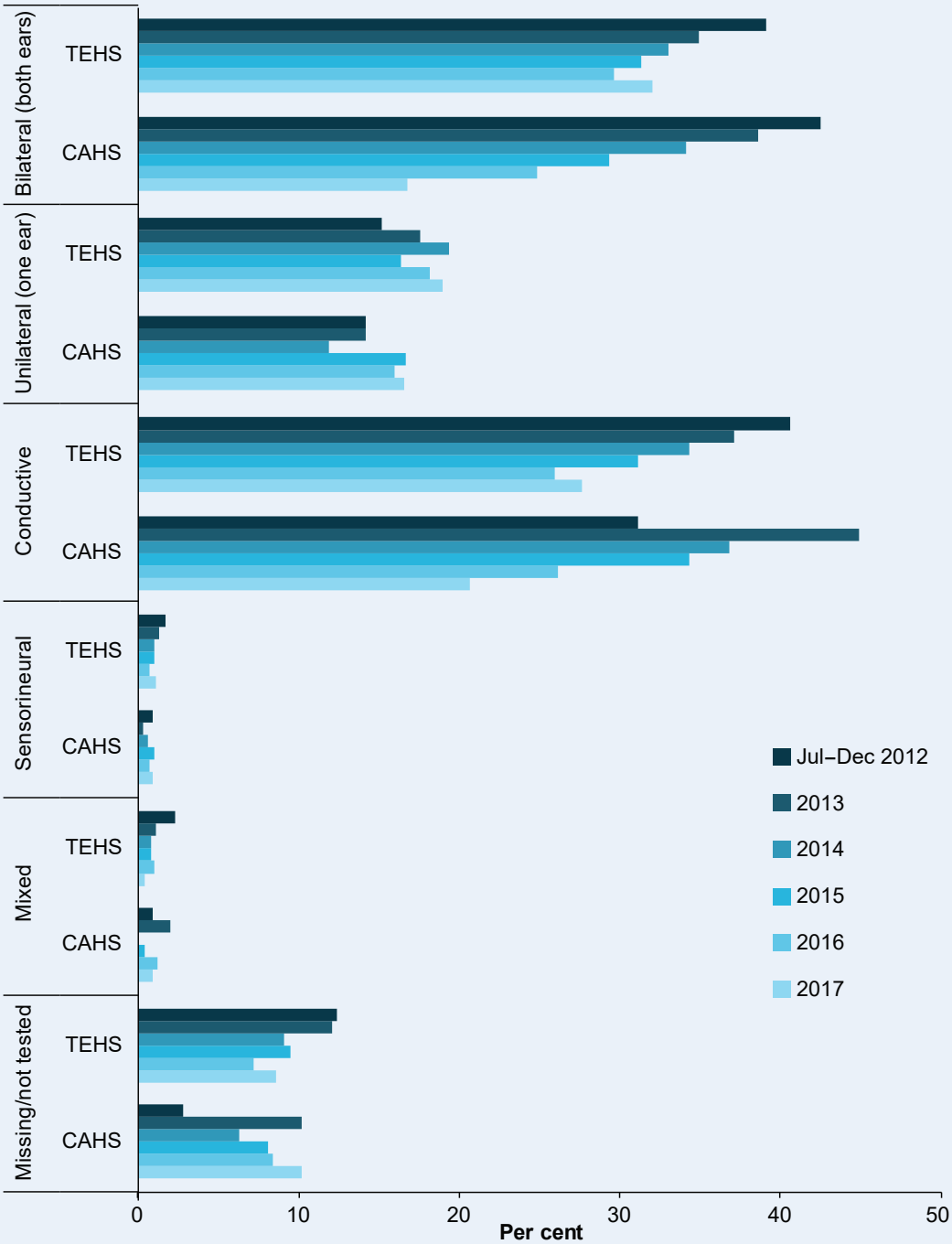


Source: Table S6.1.

When looking at specific types of hearing loss in 2017 (Figure 6.2), the proportions between TEHS and CAHS are generally quite similar.

However, in 2017, there were much higher proportions of bilateral hearing loss for TEHS (32%, or 356 cases) compared with CAHS (17%, or 92 cases).

Figure 6.2: Types of hearing loss among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS)



Sources: tables S6.1, S6.2.

Hearing impairment

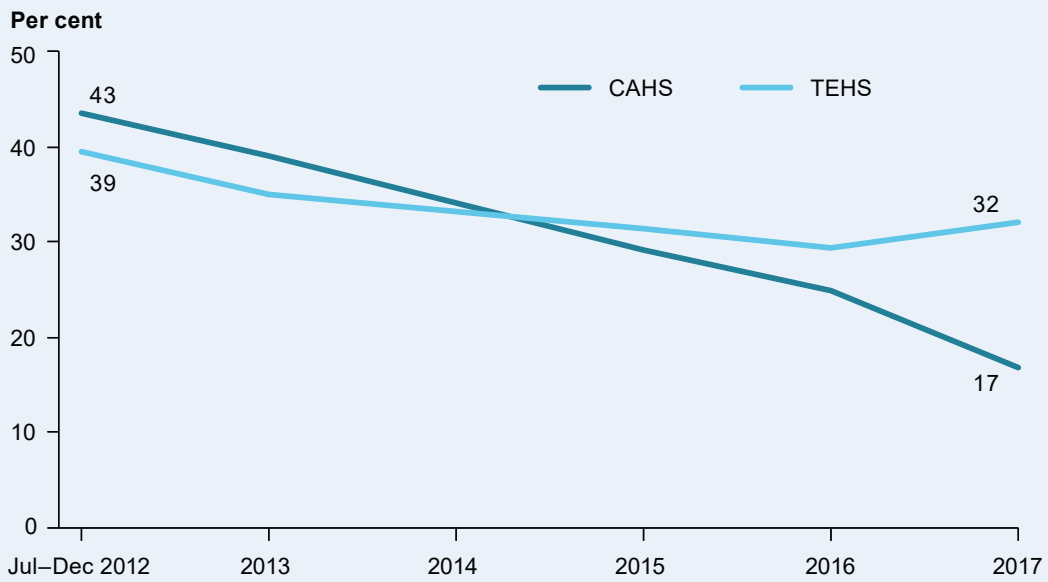
From July 2012 to December 2016, hearing impairment patterns across the years were similar for children and young people who received services in TEHS and CAHS, with a deviation in these patterns in 2017 (Figure 6.3). In 2017, there were 92 children and young people with hearing impairment in CAHS, compared with 356 in TEHS.

Overall, for both regions:

- the proportion of children and young people with hearing impairment decreased over time (Figure 6.3) by:
  - 7 percentage points for TEHS
  - 27 percentage points for CAHS
- the proportion of children and young people with no hearing impairment increased over the years by:
  - 11 percentage points for TEHS
  - 18 percentage points for CAHS.

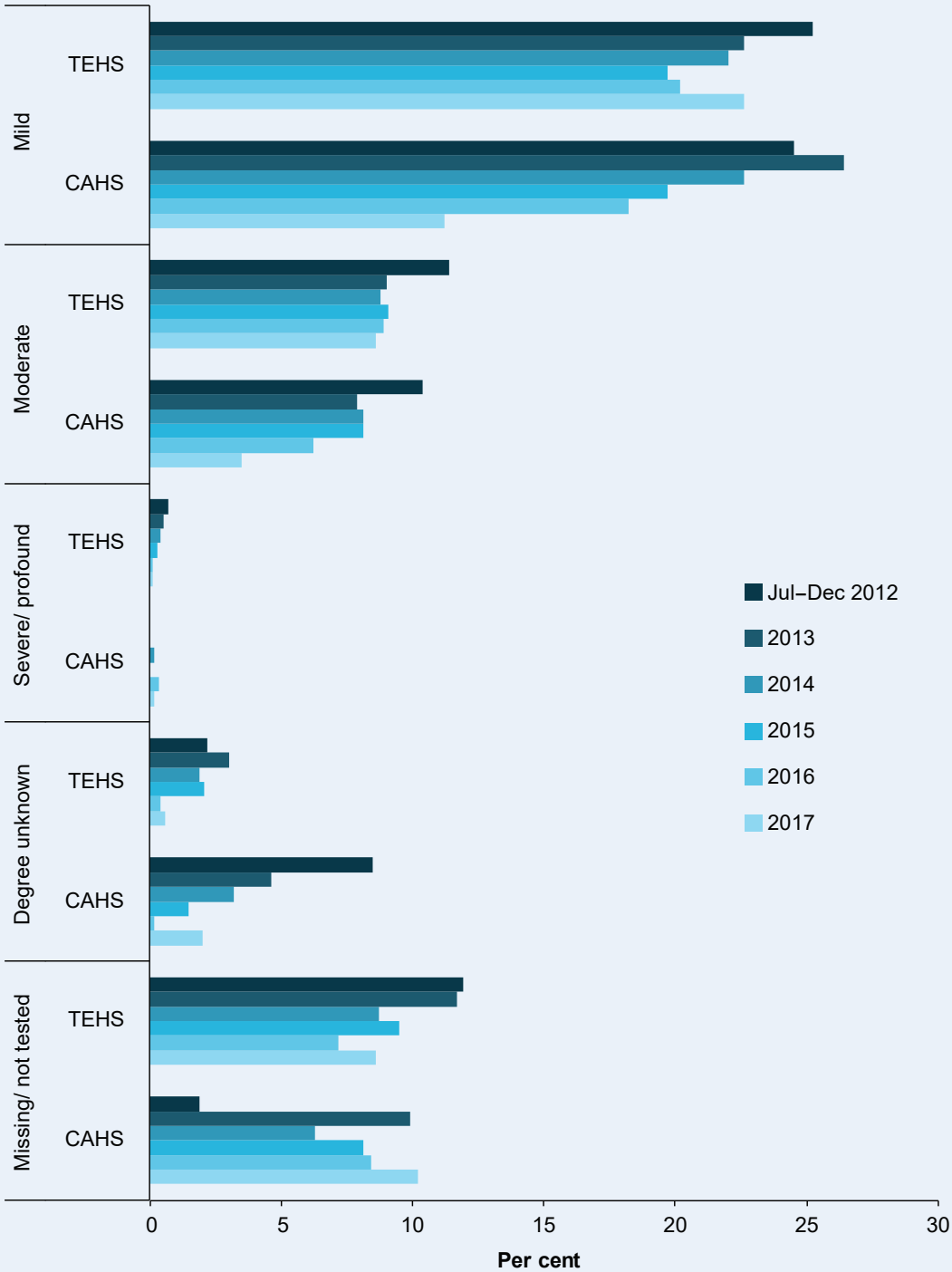
In 2017, TEHS had a much higher proportion of hearing impairment among children and young people (32% compared with 17% in CAHS). Proportions of children and young people with mild and moderate hearing impairment were twice as high in TEHS compared with CAHS (22% compared with 11% for mild, and 9% compared with 4% for moderate) (Figure 6.4). Proportions for severe/profound hearing impairment were similar across the 2 regions.

Figure 6.3: Hearing impairment among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS)



Sources: Table S6.3.

Figure 6.4: Types of hearing impairment among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS)

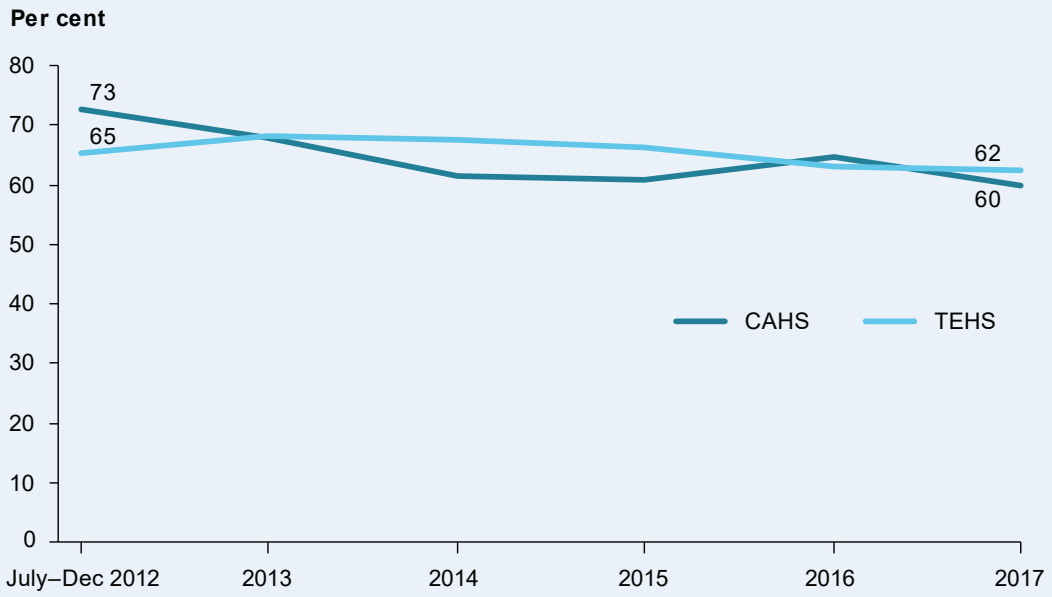


Source: Table S6.3.

Ear conditions

Between July 2012 and December 2017, the proportion of children and young people who received an outreach audiology, CNS or ENT teleotology service and who had an ear condition decreased overall in both regions—from 65% to 62% in TEHS and from 73% to 60% in CAHS (Figure 6.5).

Figure 6.5: Presence of ear conditions among children and young people who received outreach audiology, CNS or ENT teleotology services in the Top End (TEHS) and Central Australia (CAHS)

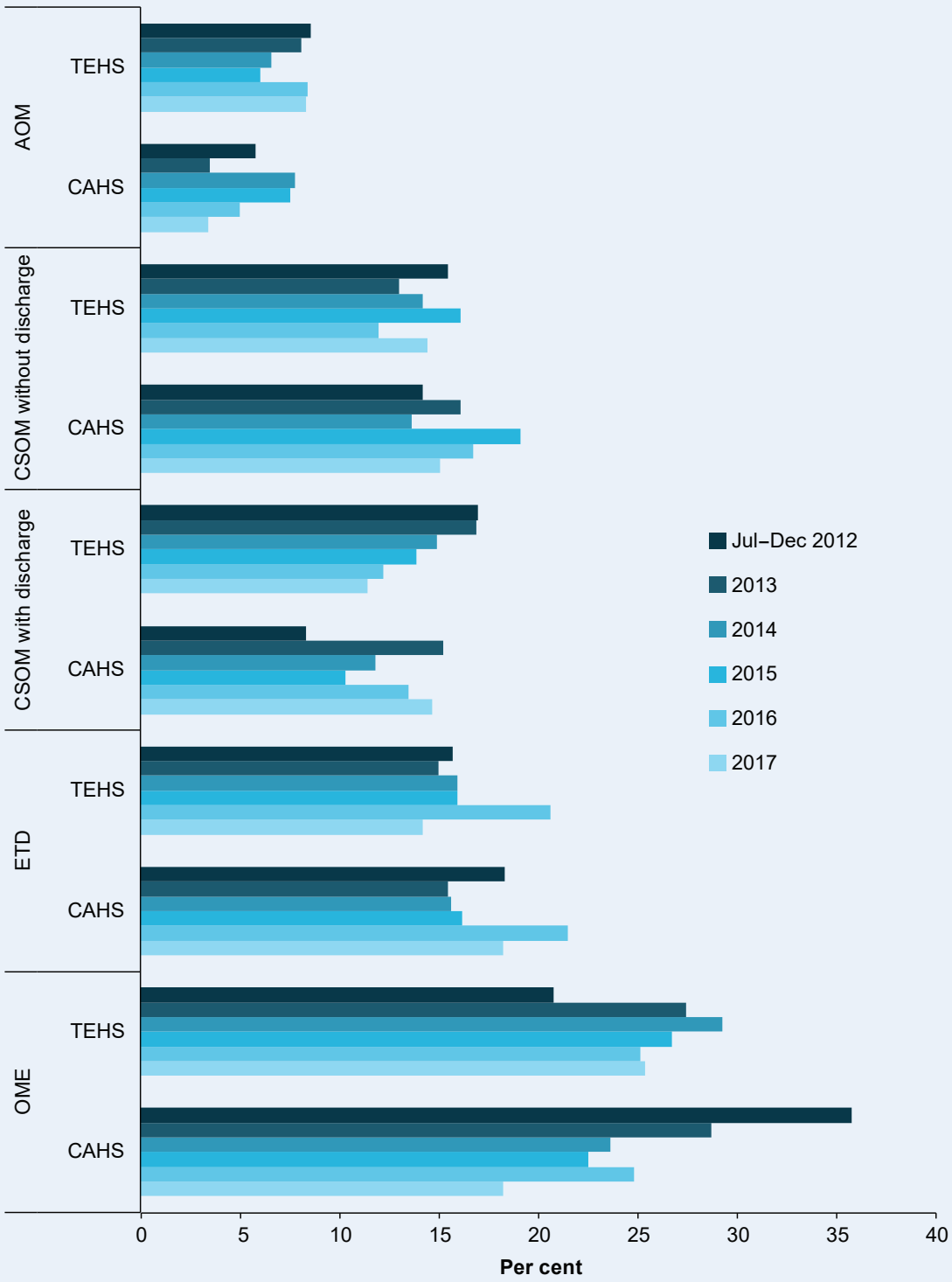


Source: Table S6.4.

In contrast to the patterns of hearing impairment and hearing loss across the 2 regions, there was more variation in the distribution of ear conditions (Figure 6.6). Notably, from July 2012 to December 2017:

- the proportion of OME increased in TEHS, from 21% to 25%, but decreased from 36% to 18% in CAHS
- the proportion of CSOM with discharge decreased in TEHS, from 17% to 11%, but increased in CAHS from 8% to 15%
- the proportion of ETD increased in both regions from 2012 to 2016 (from 18% to 22% in CAHS, and from 16% to 21% in TEHS) but decreased in 2017, to 18% for CAHS and 14% for TEHS.

Figure 6.6: Distribution of specific ear conditions among children and young people who received a service in Central Australia (CAHS) and the Top End (TEHS)



Source: Table S6.4.

7 Progress against benchmarks

The Hearing Health Program has put into place performance indicators and benchmarks to monitor the outcomes achieved through the program. The targets are set jointly by the Australian and Northern Territory Departments of Health through the Northern Territory Health Implementation Plan (Council on Federal Financial Relations 2016).

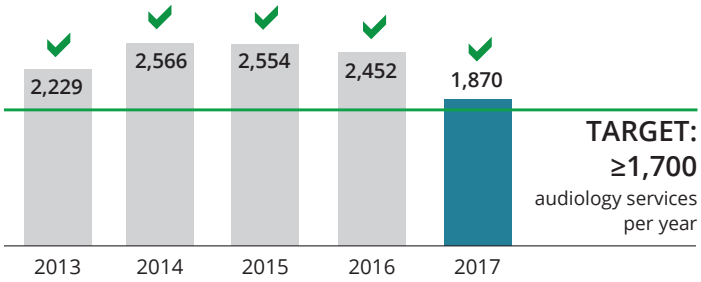
Some targets are set to be met on an annual basis, and others are set for a longer time period. For those set annually, they can be assessed as to whether or not they have been met. For long-term targets, they can only be assessed as to whether or not they are on track to be met at this point in time.

Service delivery

Note that the Northern Territory Health Implementation Plan does not include targets for ENT services.

Indicator:
Audiology services provided

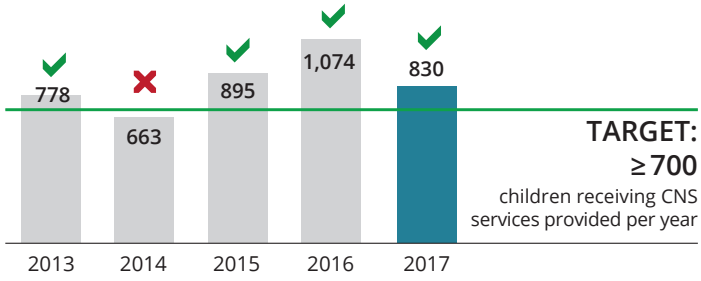
The number of **audiology services** per year



Number of audiology services provided, 2013–2017

Indicator:
CNS services provided

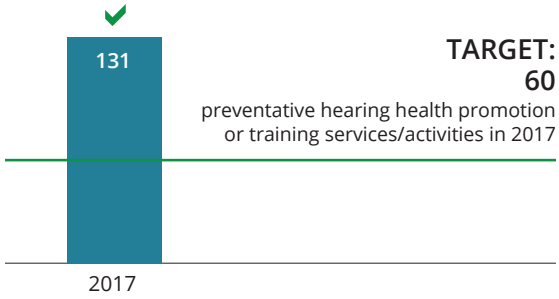
The number of children receiving complex case management services from **CNSs** working with primary health-care services



Number of children receiving CNS services, 2013–2017

Indicator:
Health promotion

Delivery of hearing health promotion or training services and activities



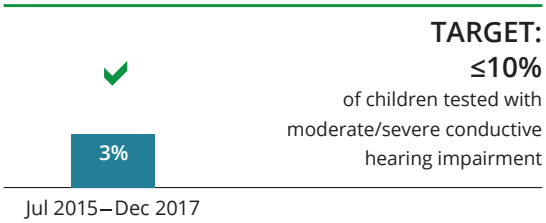
Number of activities/sessions provided in 2017

Health outcomes—hearing impairment

The benchmarks on this page are long-term targets to measure health outcomes between July 2015 and December 2018, and can only be assessed as to whether or not they are on track to be met at this point in time.

Indicator:
Hearing impairment

Number of children tested with moderate or severe conductive **hearing impairment**

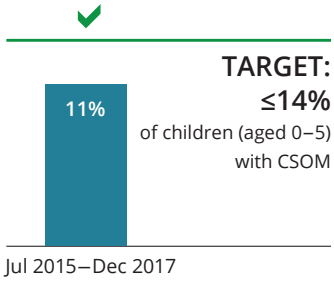


Number of children had moderate or severe conductive hearing impairment from July 2015 to December 2017

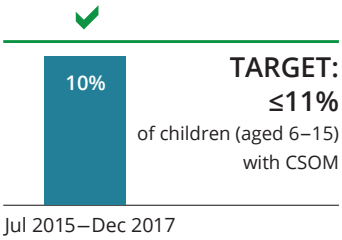
Health outcomes—middle ear conditions

Indicator:
Children with CSOM

Proportion of children who received an audiology check or CNS service who were found to have **CSOM**



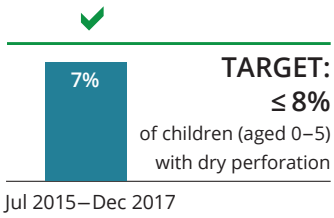
Number of children (aged 0–5) with CSOM, July 2015 to December 2017



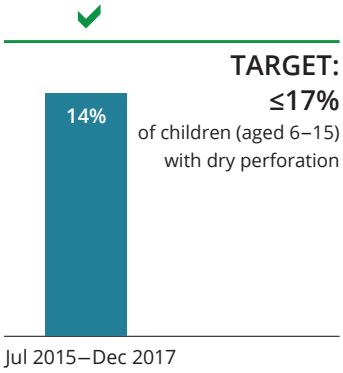
Number of children (aged 6–15) with CSOM, July 2015 to December 2017

Indicator:
Children with dry perforation

Proportion of children who received an audiology check or CNS service who were found to have **dry perforation**



Number of children (aged 0–5) with dry perforation, July 2015 to December 2017



Number of children (aged 6–15) with dry perforation, July 2015 to December 2017

Appendix A: Supplementary tables

In comparison with previous reports in the series, this version is more condensed, and a set of supplementary tables accompanies this report to maintain the level of detail found in previous hearing health reports. The figures presented throughout this report mention accompanying supplementary tables that contain data corresponding to the figures. Supplementary tables are available at: <https://www.aihw.gov.au/reports/indigenous-health-welfare-services/nt-hearing-program-2012-2017/data>.

The supplementary tables also contain updated data from all tables from the previous versions of the report, including the following tables from the report—*Northern Territory Remote Aboriginal Investment: Ear and Hearing Health Program July 2012 to June 2016*, that were **not** referenced to in this report:

Previous report table number	Table name	Corresponding supplementary table number
Table F3.5	Age group by degree of hearing impairment, children and young people who received outreach audiology services, July 2012 to 2017	Table S3.13
Table 5.2	Average and maximum number of CNS services received, and proportion of children who received 1 service, July 2012 to 2017	Table S2.9
Table F5.2	Type of clinical services provided at CNS visits, July 2012 to 2017	Table S2.10
Table F5.3	Contact made with other service providers at CNS visits, and presence of interpreter at service, July 2012 to 2017	Table S2.11
Table F5.6	Degree of hearing impairment, Indigenous children in the CNS and audiology programs, July 2012 to 2017	Table S3.25
Table F6.5	Hearing loss status among children and young people with any ear condition, who received an audiology, ENT or CNS service, July 2012 to 2017	Table S3.23
Table F6.6	Ear condition by degree of hearing impairment among children and young people who received an audiology, ENT or CNS service, 2017 (%)	Table S3.22
Table F6.10	Progress of children and young people with middle ear conditions between the initial and last service, August 2007 to 2017	Table S3.26
Table 7.2	Change in degree of hearing impairment between first and last audiology services among young people aged 21 and over and who had left hearing health programs at 31 December 2017	Table S5.3

Appendix B: About the Hearing Health Program data collections

Data collection, management and reporting

The AIHW was commissioned by the Department of Health to collect, manage and report on data from ear and hearing health outreach services in the Northern Territory.

These data are collected using paper data collection forms. Health professionals responsible for providing services complete a form with information about the child or young person's demographic characteristics; types of services provided; community where the service was provided; date of service; examination results; and medical interventions and recommendations.

How much data the AIHW receives on each child or young person depends on whether the child or young person's parent or guardian provides consent to share the information. There are 2 scenarios for the provision of data under the consent requirements:

- If consent is given, all de-identified data are sent to the AIHW.
- If consent is not given, a limited amount of aggregate information is provided to the AIHW. This includes the number of services provided and the number of children and young people receiving a service by 5-year age group, sex, and community where the service was provided.

Throughout this report, the term 'services' refers to occasions of service. A child or young person may receive a number of services and have more than 1 record in each data collection. Each record in the collection corresponds to a single service, not to a single person.

More information on each of the Hearing Health Program data collections can be found in the Reference Material online at <https://www.aihw.gov.au/reports/indigenous-health-welfare-services/nt-hearing-program-2012-2017/notes>.

Appendix C: Data quality statement

For all Hearing Health Program data collections, the population included is not a random sample, nor is it representative of all Indigenous children and young people in the Northern Territory. The outreach audiology and ENT teleotology services are available to all Indigenous children and young people, but not all of them access these services. The CNS program is available only to Indigenous children who have a referral from a health professional.

As well, some of these services are more commonly accessed by individuals in remote areas. Therefore, results of analyses cannot be generalised to all Indigenous children and young people in the Northern Territory.

Due to differences in the scope of the programs covered in previous AIHW hearing health reports, analyses from individual reports should not be compared with analyses in subsequent annual reports.

Outreach audiology data collection summary

- This data collection included over 6,400 children and young people, aged under 21, who received Northern Territory outreach audiology services. This accounted for about 18% of the Northern Territory's Indigenous population of this age group (but was not a random sample).
- Hearing loss status was missing for about 9% of service participants who completed audiology assessments, and this should be considered when using and interpreting hearing health data.

ENT teleotology data collection summary

- This data collection included over 3,100 children and young people who were aged under 21 and received ENT teleotology services. This accounted for about 8% of the Northern Territory population of this age group (but was not a random sample).
- The methods of assessment used at ENT teleotology services differ from those for face-to-face consultations. Results of tests and subsequent diagnoses from teleotology services may be affected by the method of service delivery.

CNS data collection summary

- The data collection includes over 3,400 children aged under 21 and who received CNS services. This accounted for about 9% of the Northern Territory's Indigenous population of this age group (but was not a random sample).
- Prior to 2016, rates of non-consent were high for the CNS program (20% of services and 21% of children in 2015). However, there have been improvements in non-consent rates over time, and non-consent rates were 2.5% for services and 2.7% for children in 2017. This should be considered when interpreting CNS program analyses.

Full data quality statements for each data collection in the Hearing Health Program can be found online at: <https://www.aihw.gov.au/reports/indigenous-health-welfare-services/nt-hearing-program-2012-2017/notes>.

Glossary

acute otitis media: The general term for both acute otitis media without perforation and acute otitis media with perforation. It is the presence of fluid behind the eardrum plus at least 1 of the following: bulging eardrum, red eardrum, recent discharge of pus, fever, ear pain or irritability. A bulging eardrum, recent discharge of pus, and ear pain are the most reliable indicators of acute otitis media.

aural toilet: A procedure where an ear, nose and throat surgeon clears wax, debris or foreign bodies from the ear canal. It is often used in treating patients with recurrent infections of the ear canal.

bilateral hearing loss: Hearing loss in both ears.

chronic suppurative otitis media (CSOM) with discharge: A persistent suppurative discharge from the middle ear through a tympanic membrane (ear drum) perforation for more than 6 weeks. Importantly, the diagnosis of CSOM with discharge is appropriate only if the tympanic membrane perforation is seen and if it is large enough to allow the discharge to flow out of the middle ear space.

chronic suppurative otitis media without discharge: The presence of a perforation (hole) in the eardrum without evidence of discharge or fluid behind the eardrum. It is also known as 'inactive chronic suppurative otitis media', and also as 'dry perforation'.

conductive hearing loss: A deviation of hearing threshold from the normal range associated with reduced conduction of sound through the outer ear, tympanic membrane (eardrum) or middle ear, including ossicles (middle ear bones).

Eustachian tube dysfunction: Negative middle ear pressure associated with compromised equalisation impeding middle ear function and sometimes causing middle ear fluid accumulation.

grommet: A small tube surgically placed across the eardrum to re-establish ventilation to the middle ear. It is also called 'ventilation tube', 'pressure equalisation (PE) tube', or a 'tympanostomy tube'.

hearing: The sense for perceiving sounds; includes regions within the brain where the signals are received and interpreted.

hearing impairment: Describes the degree of impairment associated with hearing loss in the 'better hearing ear', using a scale of mild, moderate, severe and profound. It is based on degree of deviation from normal thresholds in the 'better ear', calculated as a 3-frequency average of the threshold of hearing (in dB HL)—500 Hz, 1000 Hz and 2000 Hz.

hearing loss: Any hearing threshold response (using audiometry) outside the normal range, at any sound stimuli, in either ear. Hearing loss in a population describes the number of people who have abnormal hearing. Hearing loss may affect 1 ear (unilateral) or both ears (bilateral).

mild hearing impairment: 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. These people are able to hear and repeat words spoken in a normal voice at 1 metre. Counselling and hearing aids may be needed.

mixed hearing loss: Hearing loss that has conductive and sensorineural components combined.

moderate hearing impairment: 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. These people are able to hear and repeat words spoken in raised voice at 1 metre and have difficulty keeping up with conversations without using a hearing aid.

myringoplasty: The repair of a perforation of the tympanic membrane (ear drum).

otitis media: All forms of inflammation and infection of the middle ear. Active inflammation or infection is nearly always associated with a middle ear effusion (fluid in the middle ear space).

otitis media with effusion (OME): The presence of an intact eardrum and middle ear fluid without symptoms or signs of acute infection. Other terms used to describe OME include 'glue ear', 'serious otitis media' and 'secretory otitis media'. OME may be episodic or persistent.

profound hearing impairment: 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. These people are unable to hear and understand even a shouted voice. Hearing aids may help in understanding words. Additional rehabilitation is needed, and cochlear implants, lip-reading and sometimes signing are necessary.

sensorineural hearing loss: A deviation of hearing threshold from the normal range, attributable to problems in the inner ear or vestibulocochlear nerve.

severe hearing impairment: 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. These people 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.

suppurative: Pus produced in response to inflammatory bacterial infections.

teleotology: Method of offsite service delivery whereby specialists and audiologists provide full diagnostic hearing assessments, assess middle ear function, diagnose middle ear conditions and recommend further actions and treatment based on information provided to them electronically by an audiologist or an ENT nurse consultant.

unilateral hearing loss: Hearing loss in 1 ear.

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List of figures

List of tables

Related publications

The following AIHW publications on the Child Health Check Initiative Closing the Gap; National Partnership on Stronger Futures in the Northern Territory; and Northern Territory Remote Aboriginal Investment hearing health programs may be of interest:

- AIHW 2010 (Australian Institute of Health and Welfare). Health and wellbeing of young Australians: indicator framework and key national indicators. Bulletin no. 77. Cat. no. AUS 123. Canberra: AIHW.
- AIHW 2011. Ear and hearing health of Aboriginal and Torres Strait Islander children in the Northern Territory. Cat. no. IHW 60. Canberra: AIHW.
- AIHW 2012. Northern Territory Emergency Response Child Health Check Initiative: follow-up services for oral and ear health, final report, August 2007–June 2012. Cat. no. DEN 223. Canberra: AIHW.
- AIHW 2014. Stronger Futures in the Northern Territory: hearing health services 2012–2013. Cat. no. IHW 117. Canberra: AIHW.
- AIHW 2015. Hearing health outreach services to Aboriginal and Torres Strait Islander children and young people in the Northern Territory: 2012–13 to 2014–15. Cat. no. IHW 163. Canberra: AIHW.
- AIHW 2015. Hearing health outreach services to Indigenous children and young people in the Northern Territory: 2012–13 and 2013–14. Cat. no. IHW 149. Canberra: AIHW.
- AIHW 2017. Northern Territory Outreach Hearing Health Program, July 2012 to December 2016. Cat. no. IHW 189. Canberra: AIHW.
- AIHW 2017. Northern Territory Remote Aboriginal Investment: Ear and Hearing Health Program—July 2012 to June 2016. Cat. no. IHW 176. Canberra: AIHW.

These reports can be downloaded for free from the AIHW website at <http://www.aihw.gov.au/publications>. The website also includes information on ordering printed copies.

This report presents information on hearing health outreach services provided to Aboriginal and Torres Strait Islander children and young people in the Northern Territory. It shows that in 2017, 1,870 audiology, 876 ear, nose and throat teleotology and 876 Clinical Nurse Specialist services were provided. Among children and young people who received treatment, 55% had improved hearing loss and 65% had improved hearing impairment over subsequent visits.

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