



**Australian Government**

**Australian Institute of  
Health and Welfare**

**AIHW**

# Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory

July 2012 to  
December 2021





# Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory

July 2012 to  
December 2021



**The AIHW is an independent statutory Australian Government agency producing authoritative and accessible information and statistics to inform and support better policy and service delivery decisions, leading to better health and wellbeing for all Australians.**

© The Australian Institute of Health and Welfare 2022



All material presented in this document is provided under a Creative Commons Attribution 4.0 International licence, with the exception of the Commonwealth Coat of Arms (the terms of use for the Coat of Arms are available at <https://www.pmc.gov.au/government/commonwealth-coat-arms>) or any material owned by third parties, including for example, design, layout or images obtained under licence from third parties and signatures. All reasonable efforts have been made to identify and label material owned by third parties.

The details of the relevant licence conditions are available on the Creative Commons website (available at <https://creativecommons.org>), as is the full legal code for the CC BY 4.0 license.

A complete list of the Institute's publications is available from the Institute's website [www.aihw.gov.au](http://www.aihw.gov.au).

ISBN 978-1-76054-997-8 (Online)

ISBN 978-1-76054-998-5 (Print)

DOI: 10.25816/h5rn-0623

### **Suggested citation**

Australian Institute of Health and Welfare (2022) *Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory: July 2012 to December 2021*, catalogue number IHW 266, AIHW, Australian Government.

### **Australian Institute of Health and Welfare**

Board Chair

Mrs Louise Markus

Chief Executive Officer

Mr Rob Heferen

Any enquiries about or comments on this publication should be directed to:

Australian Institute of Health and Welfare

GPO Box 570

Canberra ACT 2601

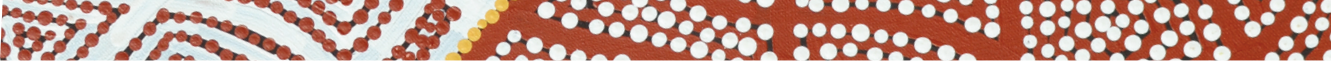
Tel: (02) 6244 1000

Email: [info@aihw.gov.au](mailto:info@aihw.gov.au)

Published by the Australian Institute of Health and Welfare.

**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](http://www.aihw.gov.au) for any amendments.**





# Contents

**Summary** ..... **v**

**1 Introduction** ..... **1**

    Why is ear and hearing health important? ..... 2

        What is ear and hearing health? ..... 2

        Impact of poor ear and hearing health ..... 2

    Ear and hearing health in the Northern Territory ..... 2

        Australian Government-funded Hearing Health Program in the Northern Territory ..... 3

        How do children and young people move through the Northern Territory hearing health system? ..... 4

        About this report ..... 5

        About the data in this report ..... 6

**2 Service delivery** ..... **7**

    Health education, promotion and prevention ..... 8

    Outreach audiology ..... 9

    ENT teleotology services ..... 11

    Clinical Nurse Specialist services ..... 13

    Impact of COVID-19 ..... 15

**3 Ear conditions and hearing health status** ..... **16**

    Ear conditions ..... 17

        Age and sex differences ..... 18

        Changes over time in ear health among children and young people ..... 20

        Ear conditions among CNS service recipients ..... 21

    Hearing status ..... 22

        Hearing loss ..... 24

        Hearing impairment ..... 26

        Changes among children who received 2 or more services between 2012 and 2021 ..... 29

**4 Demand for ear and hearing health services and other follow-up services** ..... **31**

    Follow-up services required after audiologist visits ..... 32

    Follow-up services required after ENT teleotology services ..... 33

    Waiting list for audiology and ENT teleotology services ..... 33



**5 Regional analysis .....34**  
Hearing loss ..... 35  
Hearing impairment ..... 37  
Ear conditions ..... 39

**6 Progress against benchmarks .....41**  
Service delivery ..... 42  
    Audiology services ..... 42  
    CNS services ..... 42  
    Health promotion services and activities..... 43  
Health outcomes ..... 43  
    Hearing impairment..... 43  
    Middle ear conditions ..... 44

**Appendix A: About the Hearing Health Program data collections .....45**  
Data collection, management and reporting ..... 45

**Appendix B: Data quality statement .....46**  
Outreach audiology data collection summary ..... 46  
ENT teleotology data collection summary..... 46  
CNS data collection summary ..... 47  
Child Health Check Initiative (CHCI) data collections summary..... 47

**Acknowledgments .....48**

**Abbreviations .....49**

**Symbols .....49**

**Glossary.....50**

**References.....52**

**List of tables .....53**

**List of boxes .....53**

**List of figures .....53**

**Related publications .....56**



## Summary

Ear and hearing health is vital for overall health and quality of life. Ear disease and associated hearing loss can have long-lasting impacts on education, wellbeing and employment.

Aboriginal and Torres Strait Islander children are more likely than non-Indigenous children to experience ear and hearing problems. A number of factors contribute to the poorer ear and hearing health of Indigenous children, including lack of access to health services, household overcrowding and second-hand smoke exposure.

Since 2012, the Australian Government has funded the Northern Territory Government to deliver hearing health outreach services to Indigenous children and young people aged under 21 in the Northern Territory—mainly through the National Partnership on Northern Territory Remote Aboriginal Investment (for children aged under 16); and through the Healthy Ears—Better Hearing, Better Listening Program. These outreach services include audiology services, ear, nose and throat (ENT) Teleotology services, and Clinical Nurse Specialist (CNS) services.

This report presents new data for hearing health outreach services provided in 2021, and includes time trends for the period July 2012 to December 2021.

### How many children received services?

- In 2021, 125 training sessions for hearing health education, promotion and prevention activities were provided to health-care staff.
- A total of 1,987 Indigenous children and young people received at least 1 audiology, Clinical Nurse Specialist (CNS), or ear, nose and throat (ENT) teleotology service in 2021. From July 2012 to December 2021, a total of 37,804 services were provided to more than 9,500 children and young people.
- In 2021, 2,290 outreach audiology services were provided to 1,979 Indigenous children and young people. From July 2012 to December 2021, a total of 20,851 services were provided to a total of 9,401 children and young people.
- 703 ENT teleotology services were provided to 635 Indigenous children and young people in 2021. From July 2012 to December 2021, a total of 8,245 services were provided to a total of 4,144 children and young people.
- In 2021, CNSs conducted 1,139 visits to 1,018 children. From July 2012 to December 2021, a total of 8,708 services were provided to a total of 5,572 Indigenous children.

**Figure 1: Number of Indigenous children and young people who received audiology, CNS or ENT teleotology service in 2021**



Sources: Tables S2.1, S2.3 and S2.5.

## Hearing health is improving among children and young people who received outreach services between 2012 and 2021

The percentage of Indigenous children and young people with at least 1 ear condition decreased by 10 percentage points, from 66% (483 of 727 children and young people) to 56% (1,113 of 1,987 children and young people).

Among children and young people who received audiology services, the proportion with hearing loss decreased by 16 percentage points, from 55% (388 of 710 children and young people) to 39% (776 of 1,979 children and young people).

**Figure 2: Ear and hearing health improvements between 2012 and 2021**



Sources: Tables S3.1 and S3.6.

Among 4,334 Indigenous children and young people who received at least 2 audiology services between 2012 and 2021, 3,063 had hearing loss at their first service, and of those, 1,943 (63%) had improved—this is a change from bilateral to unilateral hearing loss or from unilateral hearing loss to no hearing loss.

Between 2012 and 2021, among 1,944 Indigenous children who received at least 2 audiology services and had hearing impairment at their first service, 1,414 (73%) had improved—moving to a lower degree of hearing impairment or to no hearing impairment.

## Many children and young people are still waiting for hearing health services

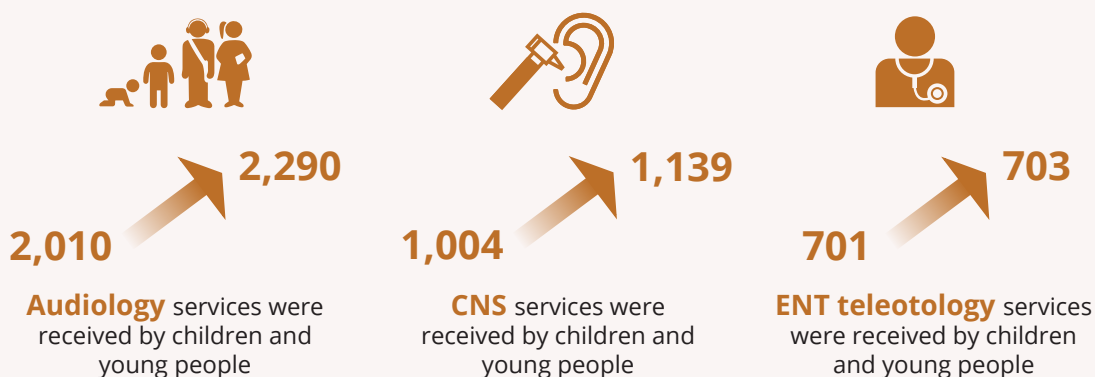
At December 2021, there were 3,403 Indigenous children and young people on the audiology waiting list. Among them, 1,571 were new referrals and 1,832 were recalled for further follow-up after receiving an initial audiology service. There were 1,835 children and young people on the waiting list for ENT teleotology services. Among them, 1,190 were new referrals and 645 were recalled for further follow-up after receiving initial ENT teleotology services. Large number of new referrals may be the result of increased awareness of the importance of early detection of ear disease.

## What was the impact of COVID-19?

Across audiology, CNS and ENT, the number of services received dropped slightly between 2019 and 2020. This was largely due to a decrease in services between March and April 2020, coinciding with the introduction of restrictions imposed to control the spread of COVID-19. The number of services increased again in 2021, especially between February and May 2021.

**Figure 3: Number of services increased in 2021**

**Between 2020 and 2021, the number of services increased:**



Sources: Tables S2.1, S2.3 and S2.5.

## Is the Hearing Health Program meeting its benchmarks?

Service delivery benchmarks for hearing health are set in the Northern Territory Remote Aboriginal Investment (NTRAI) Health Implementation Plan for audiology, CNS and health promotion and training activities. These are measured by the number of services per year.

Health outcomes in this program are measured every 3 years (July 2012 – June 2015, July 2015 – December 2018 and January 2019 – December 2021). All benchmarks in the first 2 periods were met. In 2021, all 3 service delivery targets were exceeded and the hearing impairment target was met. Of the 4 targets related to middle ear conditions, 2 targets –children aged 0–5 with chronic suppurative otitis media (CSOM) and 6–15 with chronic suppurative otitis media (CSOM) – were met.

Progress against benchmarks is presented in Table 1.

**Table 1: Progress against benchmarks, 2021**

Target	Outcome
<b>Service delivery targets</b>	
At least 1,700 audiology services per year	2,290 audiology services provided in 2021
At least 700 children receiving CNS services per year	1,018 children received CNS services in 2021
At least 60 hearing health promotion or training services/activities per year	125 hearing health promotion or training services and activities provided in 2021
<b>Health outcome targets—hearing impairment</b>	
Less than 7.5% of children tested with moderate/severe conductive hearing impairment, Jan 2019 – December 2021	2.6% of children tested with moderate/severe conductive hearing impairment, Jan 2019 – Dec 2021
<b>Health outcome targets—middle ear conditions</b>	
Less than 7% of children (0–5) with CSOM, Jan 2019 – December 2021	6.1% of children (0–5) with CSOM, Jan 2019 – Dec 2021
Less than 7% of children (6–15) with CSOM, Jan 2019 – December 2021	5% of children (6–15) with CSOM, Jan 2019 – Dec 2021
Less than 5% of children (0–5) with dry perforation, Jan 2019 – December 2021	6% of children (0–5) with dry perforation, Jan 2019 – Dec 2021
Less than 9% of children (6–15) with dry perforation, Jan 2019 – December 2021	13.1% of children (6–15) with dry perforation, Jan 2019 – Dec 2021

CNS = Clinical Nurse Specialist; CSOM = chronic suppurative otitis media





# 1

## Introduction

## Why is ear and hearing health important?

Hearing loss is more prevalent among Aboriginal and Torres Strait Islander people than among non-Indigenous Australians, and continues to be an important health and social issue. In 2018–19, Indigenous children aged 0–14 were twice as likely to have a long-term ear/hearing problem than non-Indigenous children, and 3 times as likely to have otitis media (AIHW 2020, based on data from ABS health surveys).

## 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. Otitis media refers to all forms of inflammation of the middle ear, and can commonly be caused by infection or Eustachian tube dysfunction (ETD). The Eustachian tube functions to equalise the pressure in the middle ear to atmospheric pressure and impairment of this function is known as Eustachian tube dysfunction. Eustachian tube function can be impaired for a number of reasons, most commonly occurring in childhood when the Eustachian tube is developing. 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 than in 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 2021).

## Ear and hearing health in the Northern Territory

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

- the disease progression of otitis media, a chronic condition for many clients
- the acceptance in many communities of otitis media as normal because it is common



- living conditions in some parts of the Northern Territory—for example, inadequate housing, household overcrowding and related hygiene issues
- second-hand smoke exposure
- delays in assessment and treatment due to the inability to find children in communities during outreach visits because of the high mobility of Indigenous families or concerns about the cultural safety of services
- the vast geographical spread of Indigenous communities, which makes access to services difficult
- the difficulty in recruiting and retaining a specialist workforce


Living in remote areas may affect access to general and ear health services: there are fewer medical practitioners per capita, and less access to general practitioners and other health professionals (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 Aboriginal and Torres Strait Islander 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 ENT teleotology services that are part of the hearing health outreach services. 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 hearing services. The hearing health outreach services mentioned throughout this report refer to all of the Australian Government-funded programs that stemmed from the CHCI in the Northern Territory since July 2007.

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

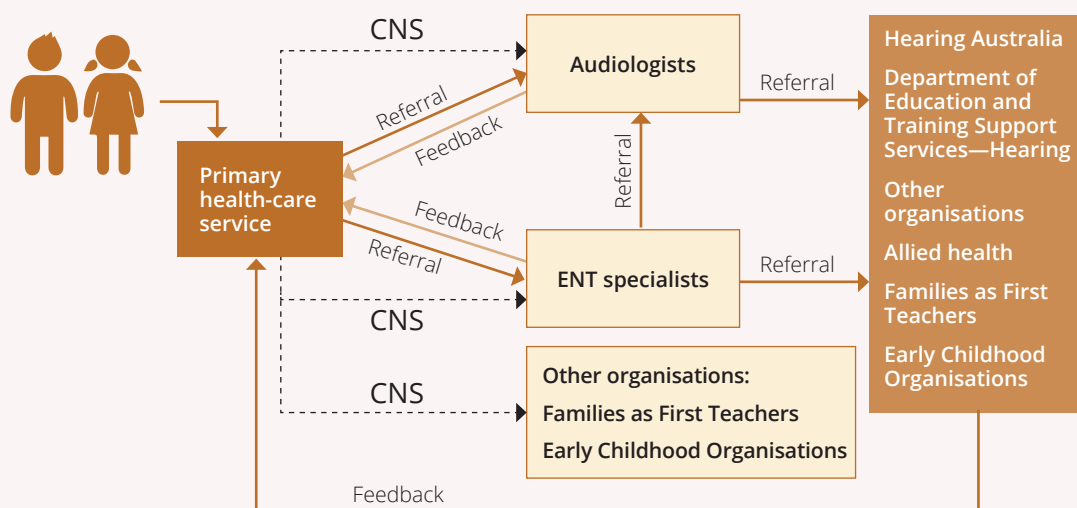
1. Health education, promotion and prevention
2. Outreach audiology
3. ENT teleotology
4. Clinical Nurse Specialists (CNS)—Case Management and Health Promotion.

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

The hearing health outreach services are available to all Indigenous children and young people aged under 21 in the Northern Territory. In 2021, there were an estimated 29,796 Indigenous Australians aged under 21 in the Northern Territory (ABS 2019).

As illustrated in Figure 1.1, children and young people generally enter the Northern Territory public hearing health system through the primary health-care sector. From this starting point, referrals can be made to audiologists and ENT specialists. CNS services can also provide referrals to audiologists, or to other organisations. After children have been seen by audiologists or ENT specialists, they can be sent for follow-up in primary care, referred to other community-based support organisations, or referred to visiting rehabilitation support services through Hearing Australia or the Northern Territory 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 from July 2012 to December 2021 on hearing health outreach services provided to the Aboriginal and Torres Strait Islander children and young people aged under 21 in the Northern Territory. 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 *Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory: July 2012 to December 2020*, 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, supplementary tables are referenced using the prefix 'S' (for example, Table S2.1). These supplementary tables are available at: <https://www.aihw.gov.au/reports/indigenous-australians/hearing-health-outreach-services-for-atsi-children/data>



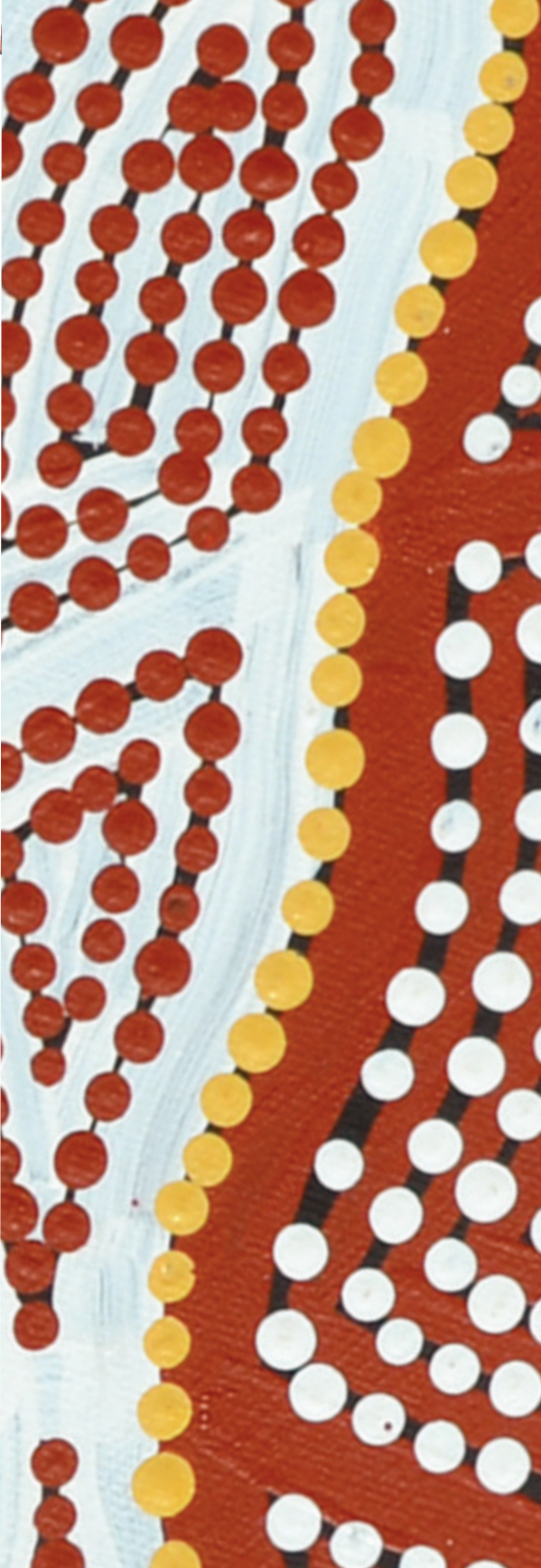
## About the data in this report

The data used in this report are collected from the hearing health outreach services funded by the Department of Health. The data refer to more than 9,500 Indigenous children and young people aged under 21 who received services between July 2012 and December 2021. This accounts for approximately 32% of the Northern Territory Indigenous population in this age group.

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 specialist ear nurses. Since January 2013, children and young people have been prioritised according to their need for services, which means that those with identified ear and hearing health issues are more likely to be captured in the data collection.

While the services under the NTRAI hearing health program are available for children and young people aged 0–20, the data in this report include a small number of service recipients aged 21 in the outreach audiology data collection who attended follow-up services. Service recipients aged 21 are included in the totals where relevant. Data disaggregated by age groups relate to service recipients aged under 21.

See Appendix A for more information about the hearing health program data collections. See Appendix B for information on data quality statements.



# 2

## Service delivery

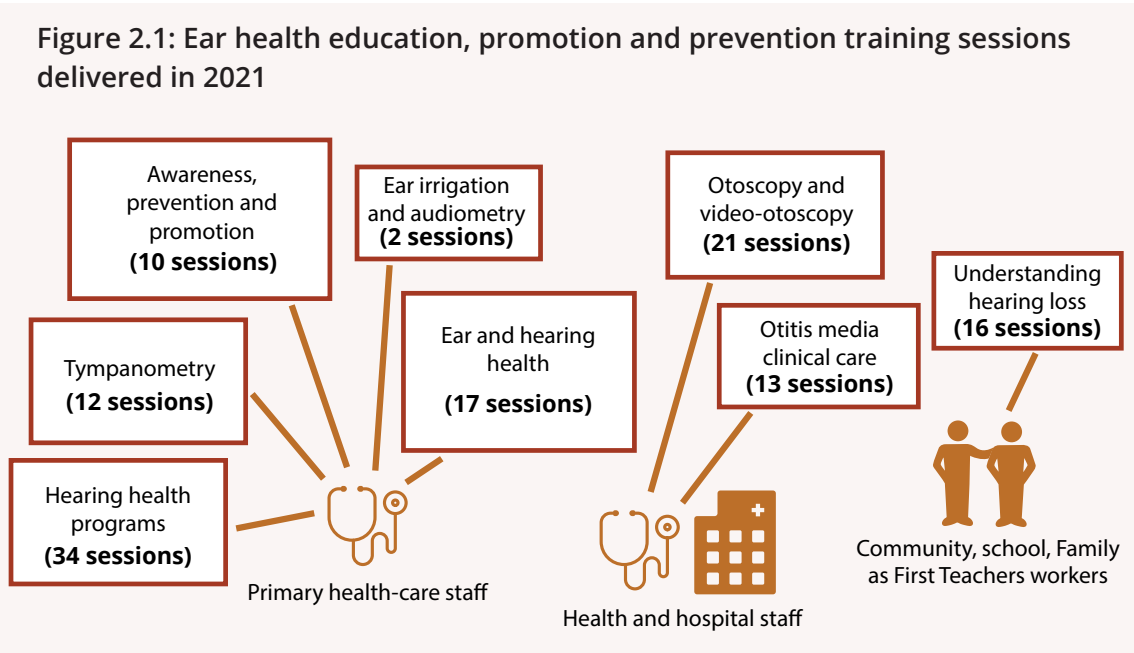


# Health education, promotion and prevention

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

- training for Aboriginal and Torres Strait Islander community hearing workers—including to prevent primary infection
- ear health promotion material such as handouts, posters and audiovisual messages
- a health promotion hip-hop music video addressing ear health
- development of various health promotion videos with key ear and hearing health messages and medication compliance, and a health education video with key messages regarding surgical intervention for grommet insertion.

In 2021, 125 training sessions for hearing health education, promotion and prevention activities were provided to health-care staff. The target audiences for these activities are illustrated in Figure 2.1.



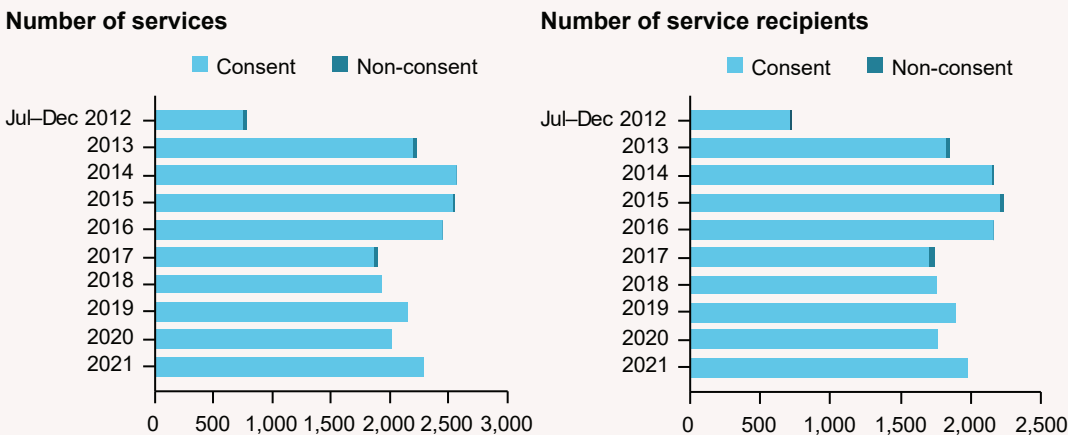
# Outreach audiology

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 or Aboriginal and Torres Strait Islander health practitioner.

Consent to share information with the AIHW is required from parents or guardians of service recipients. The demographic information in this report, apart from the number of services and service recipients, represents only 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 A and Appendix B for more information.

- In 2021, 2,290 audiology services were provided to 1,979 service recipients (Figure 2.2).
- From July 2012 to December 2021, a total of 20,851 services were provided to a total of 9,401 service recipients.
- The numbers of audiology services and service recipients decreased slightly between 2019 and 2020, then increased again in 2021.

**Figure 2.2: Number of outreach audiology services and service recipients, July 2012 to December 2021**

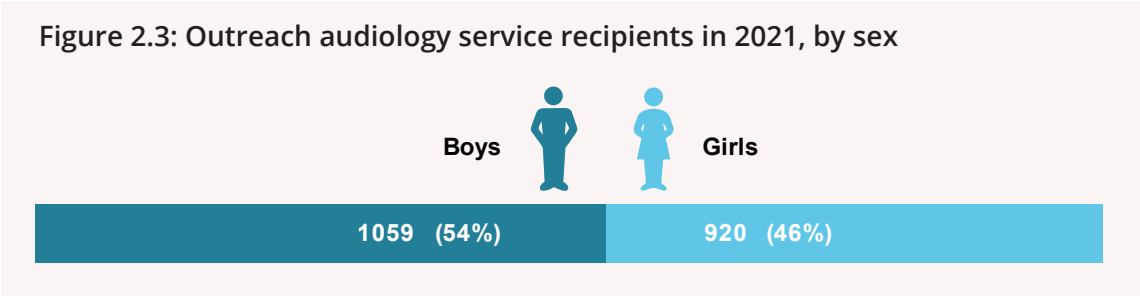


**Notes**

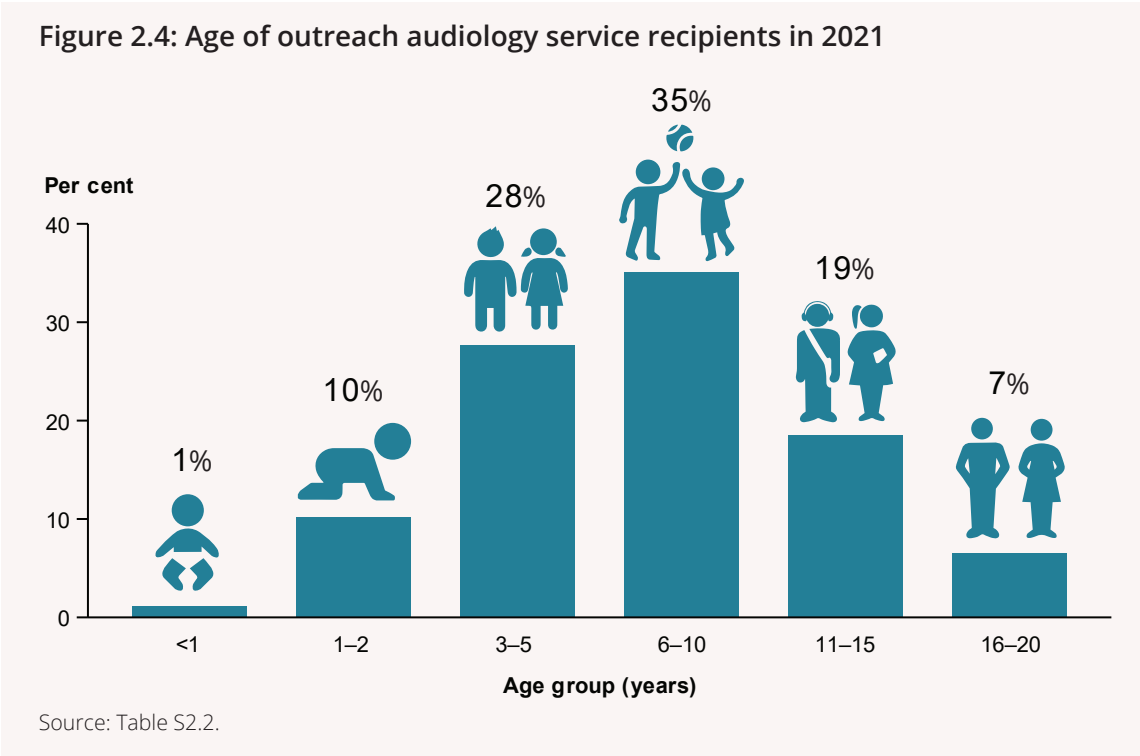
1. The total number of service recipients in July 2012 to December 2021 combined does not sum to the calendar years because some children and young people received services in multiple calendar years; these services recipients were counted only once in the total.
2. Data include service recipients aged 21 who attended follow-up services.
3. Data from 2012 to 2019 for audiology services and service recipients may differ from previous reports as a result of revisions and improvements in the audiology data collection.

Source: Table S2.1.

Generally, rates of non-consent to share information for audiology services are low, and from 2018 to 2021 there were no cases of non-consent for audiology service recipients. In 2021, more boys than girls received audiology services (1,059 and 920, respectively) (Figure 2.3).



In 2021, about 1 in 3 (35%) service recipients were aged 6–10 (Figure 2.4).



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

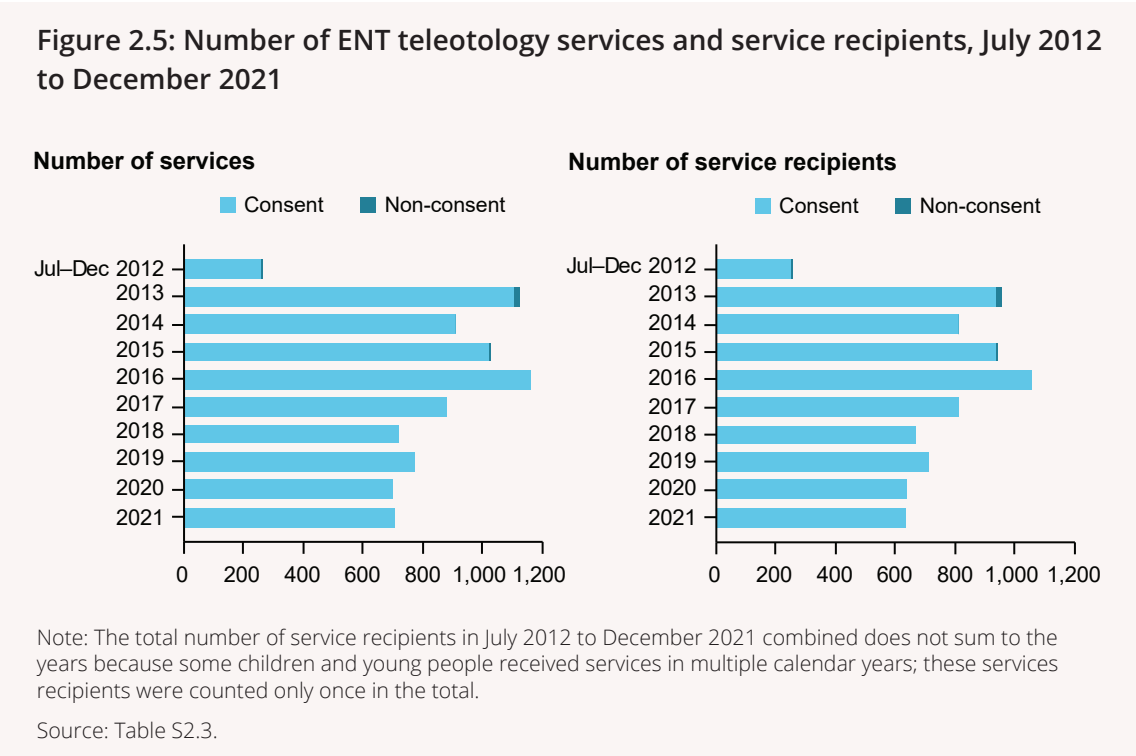


# ENT teleotology services

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 provides both hearing and full clinical assessments. Video-otoscopy is performed and images, clinical history, audiology assessment information and current treatment and management pathways are sent to the ENT Specialist at Royal Darwin Hospital and Alice Springs Hospital through a store and forward telemedicine model. Using the video sequences and clinical data, the ENT specialist provides advice, diagnosis, assessment and treatment recommendations (for example, medications, care coordination, surgery, hearing aids).

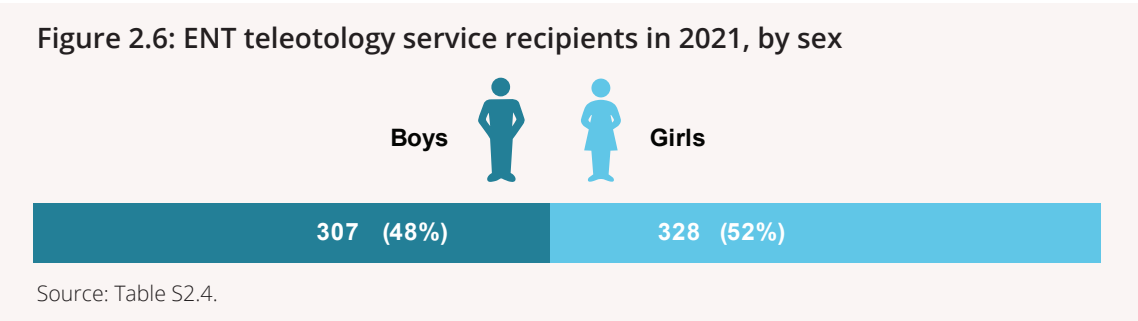
The availability of teleotology services in remote communities ensures that services are culturally safe and cost-effective, and eliminates time that families would otherwise be away from the community for specialist appointments. These services also increase access to ENT services for children and reduce the burden on tertiary centres where demand for ENT services is high.

- In 2021, 703 ENT teleotology services were provided to 635 service recipients (Figure 2.5).
- From July 2012 to December 2021, a total of 8,245 services were provided to a total of 4,144 service recipients.
- The numbers of ENT services and service recipients decreased slightly since 2019.

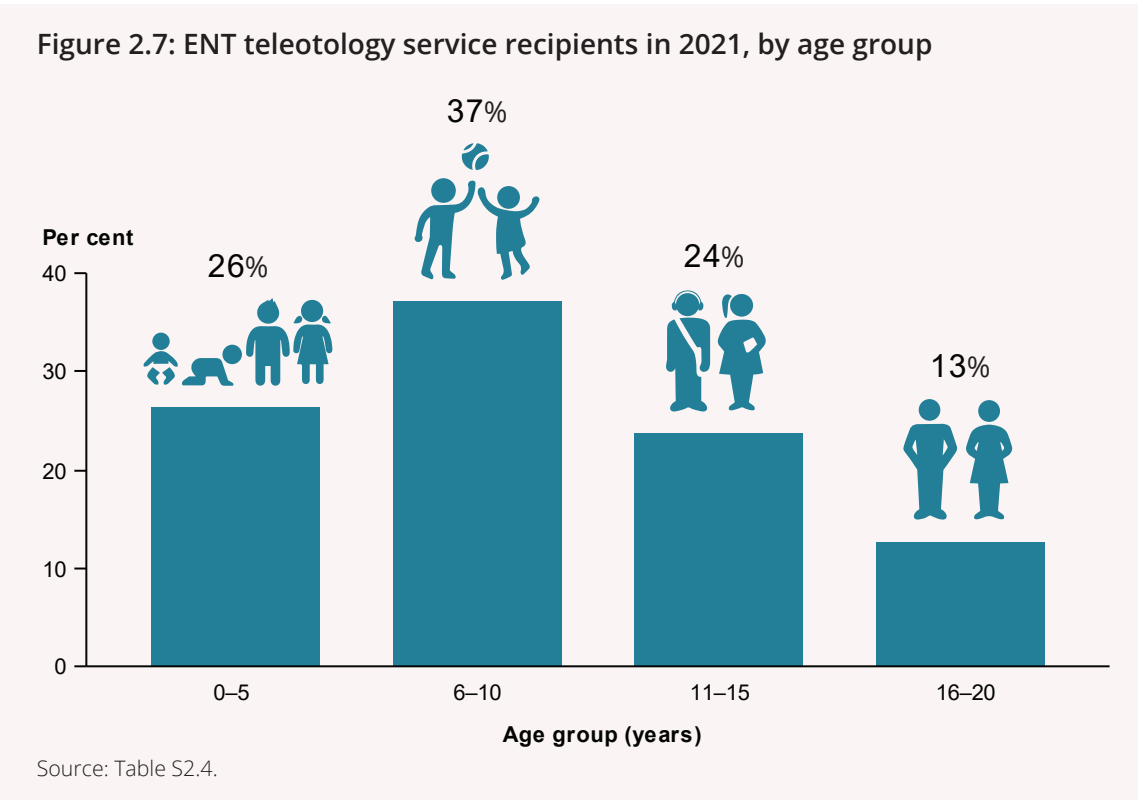


Rates of non-consent to share the information have been very low, and between 2016 and 2021 there were no instances of non-consent.

In 2021, the number of service recipients who were girls was slightly higher than the proportion who were boys (328 compared with 307) (Figure 2.6).



Among service recipients in 2021, the highest proportion (37%) were aged 6–10 (Figure 2.7).

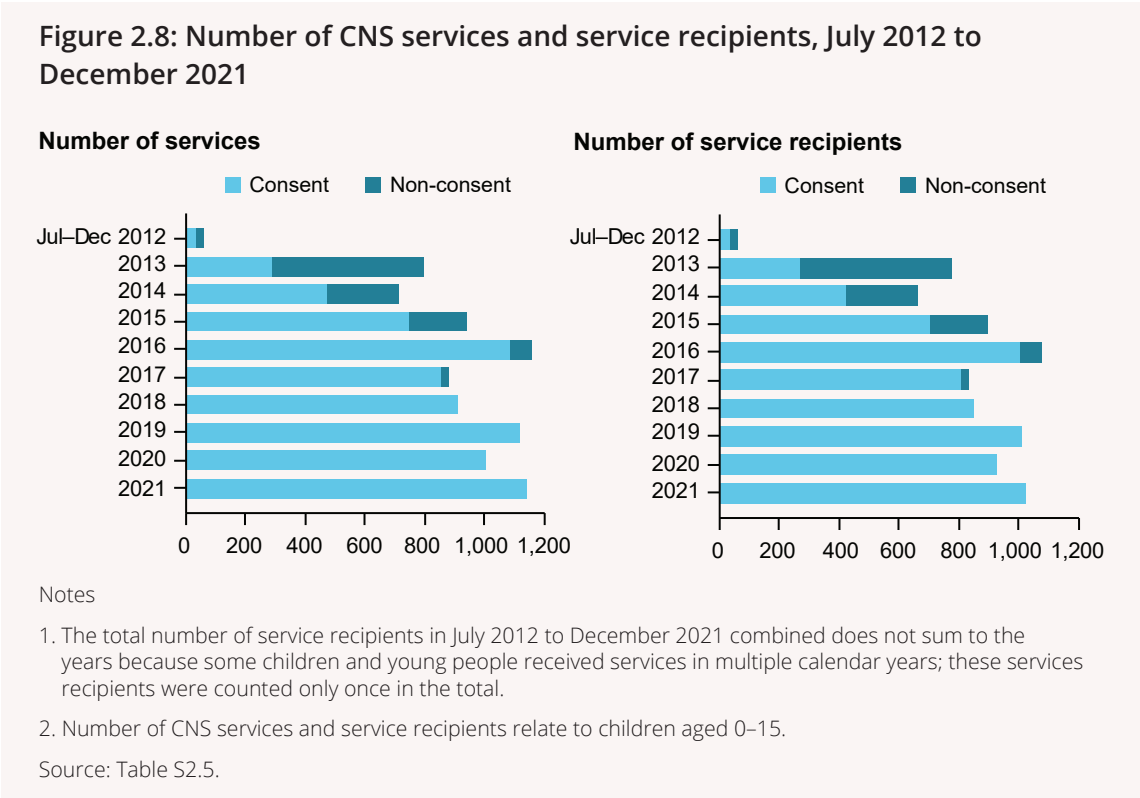


More information on ENT services, such as services recommended by ENT specialists, can be found in the supplementary tables online.

# Clinical Nurse Specialist services

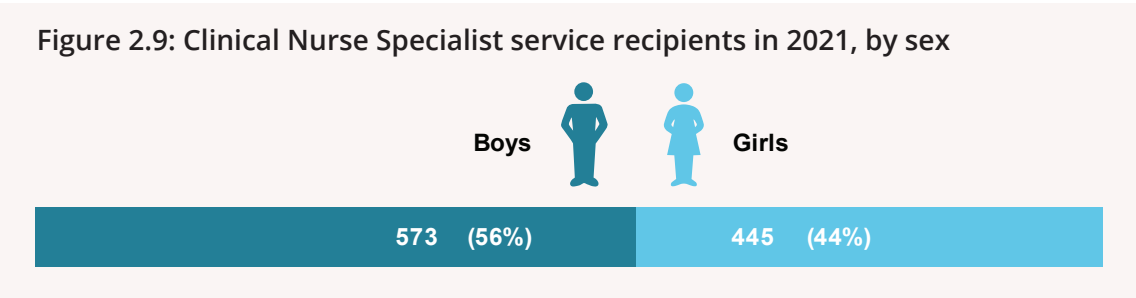
CNS services were developed in response to the challenges encountered in preventing ear disease and implementing clinical care for otitis media in the Northern Territory. The CNS is responsible for early identification and case management of high priority 0–5 year old children. The CNS oversees and coordinates the treatment, management and coordination of children with a prioritised need for care by acting as a central point of contact between primary health-care services and specialist resources.

- In 2021, 1,139 CNS services were provided to 1,018 service recipients (Figure 2.8).
- From July 2012 to December 2021, a total of 8,708 services have been provided to a total of 5,572 service recipients.
- The numbers of CNS services and service recipients decreased slightly between 2019 and 2020, but then increased again in 2021.

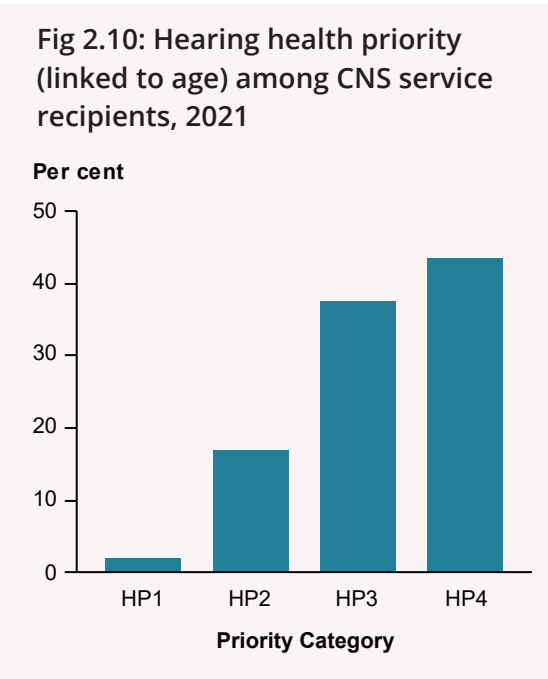


Caution should be taken when interpreting CNS data in 2013 and 2014 because non-consent rates for sharing information were high. However, non-consent rates have been decreasing over time. In 2015, the hearing health team in the Northern Territory Department of Health implemented a training program to improve consent rates, and this may explain the decrease in non-consent rates over time.

More boys than girls received CNS services in 2021 (573 compared with 445) (Figure 2.9).



The CNS services are available to Aboriginal and Torres Strait Islander children who have been assigned to a hearing health priority group (Figure 2.10)—priority is closely linked to age (see Box 2.1). Under the program children are automatically prioritised into appropriate categories.



**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 CNS service recipients in 2021: 4 in 5 children (81%) were aged 3–10, with younger age groups representing a smaller proportion of service recipients. Younger children represent a small portion of children reviewed for several reasons—the difficulty in assessing them (especially under 6 months); availability of appropriate audiology equipment to assess them; difficulty in locating some children as they do not attend school and may not attend other regular services.

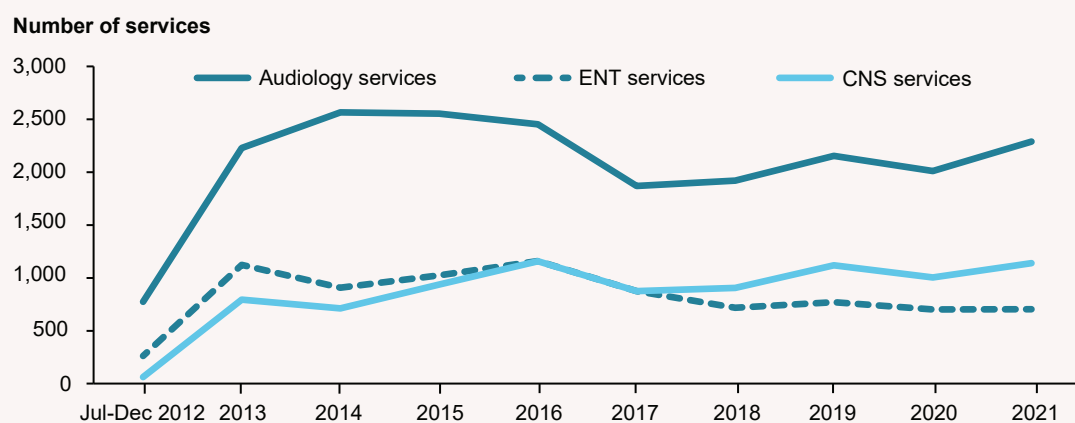
More information on CNS services can be found in the supplementary tables (S2.5 and S2.6).

## Impact of COVID-19

Early 2020 saw the emergence of a global pandemic of the novel coronavirus disease COVID-19. Restrictions imposed by the Australian and state and territory governments limited people's movement and activities to limit the spread of the disease, and many people changed their behaviour to protect themselves and others from the risk of exposure.

To 2016, the number of services were relatively steady for audiology, and increasing for ENT and CNS. However, in 2017, there were decreases across all 3 service types—largely due to shortages of available specialists to provide services in remote communities (AIHW 2018). Between 2017 and 2019, the number of audiology and CNS services both increased, while the number of ENT teleotology services fluctuated. Between 2019 and 2020, the number of services decreased across all 3 service types and then started to increase again in 2021 (Figure 2.11).

**Figure 2.11: Number of services provided, audiology, ENT and CNS, July 2012 – December 2021**



Sources: Tables S2.1, S2.3 and S2.5.



# 3

## Ear conditions and hearing health status



## Ear conditions

Two main types of ear conditions are captured in the hearing health outreach services: otitis media, and Eustachian tube dysfunction (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:

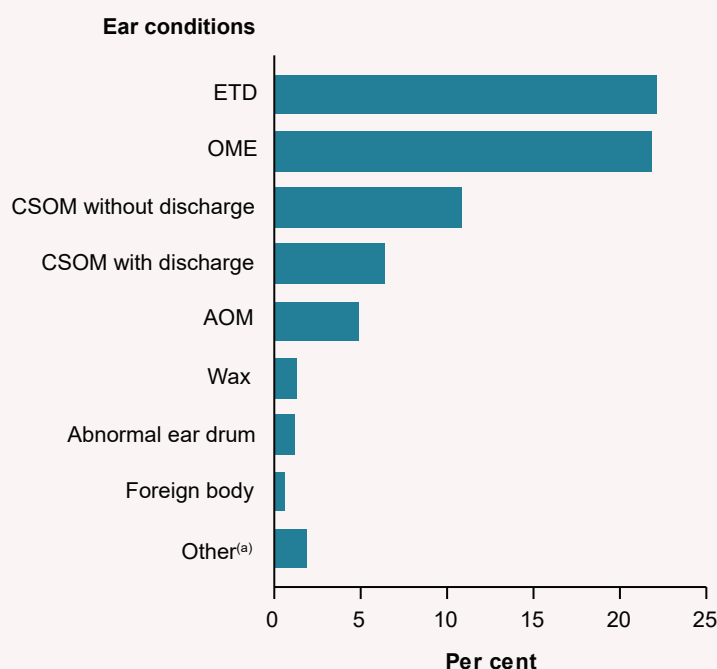
- **acute otitis media (AOM)**—the presence of fluid behind the eardrum plus at least 1 of the following: bulging eardrum, red eardrum, recent discharge of pus, fever, ear pain or irritability for less than 6 weeks
- **chronic suppurative otitis media (CSOM) with discharge**—a persistent suppurative 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 2021, 1,987 Indigenous children and young people received at least 1 audiology, CNS or ENT teleotology service. At their latest service, 1,113 children and young people were diagnosed with at least 1 type of ear condition. The proportion of children who were diagnosed with an ear condition has declined from 66% in 2012 to 56% in 2021, although the proportions of specific ear conditions have had small fluctuations over the years.

In 2021, the most common type of ear condition, among the 1,113 children diagnosed with an ear condition was Eustachian tube dysfunction (ETD) (22%, or 439 cases), followed by otitis media with effusion (OME) (also 22%, or 435 cases); chronic suppurative otitis media (CSOM) without discharge (11%, or 215 cases); and chronic suppurative otitis media (CSOM) with discharge (6%, or 128 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 2021**



AOM – acute otitis media; CSOM – chronic suppurative otitis media; ETD – Eustachian tube dysfunction; OME – otitis media with effusion.

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

Source: Table S3.1.



**Around 3 in 5 children and young people (56%) were found to have  $\geq 1$  ear condition**

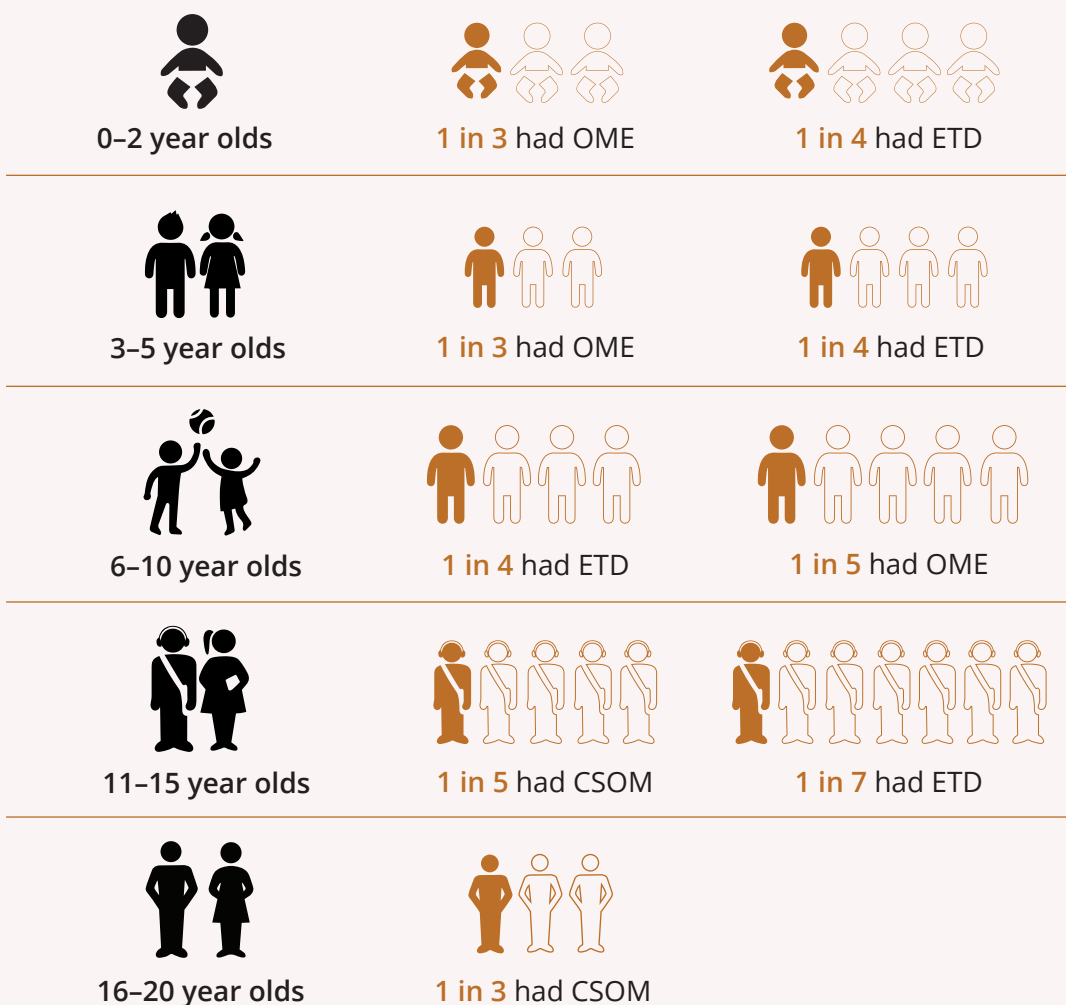
## Age and sex differences

The proportions of Indigenous children with ear conditions varied by age group.

Younger children who received a service had the highest proportion of ear conditions. In 2021, 68% of children aged 0–2 and 46% of children aged 16–20 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). The most common types of ear conditions differed among age groups in 2021, as shown in Figure 3.2. Similar patterns among age groups were seen in previous years.



**Figure 3.2: Most common ear conditions in children and young people who received at least 1 audiology outreach, CNS or ENT teleotology service in 2021, by age group**



Source: Table S3.2.

The following patterns were also observed:

- The proportion of otitis media with effusion and acute otitis media generally decreased with age.
- The proportion of Eustachian tube dysfunction generally fluctuated in early ages, but decreased for older children and young people.
- The proportion of chronic suppurative otitis media generally increased with age.
- The proportion of children and young people with no ear conditions generally increased with age.

## Changes over time in ear health among children and young people

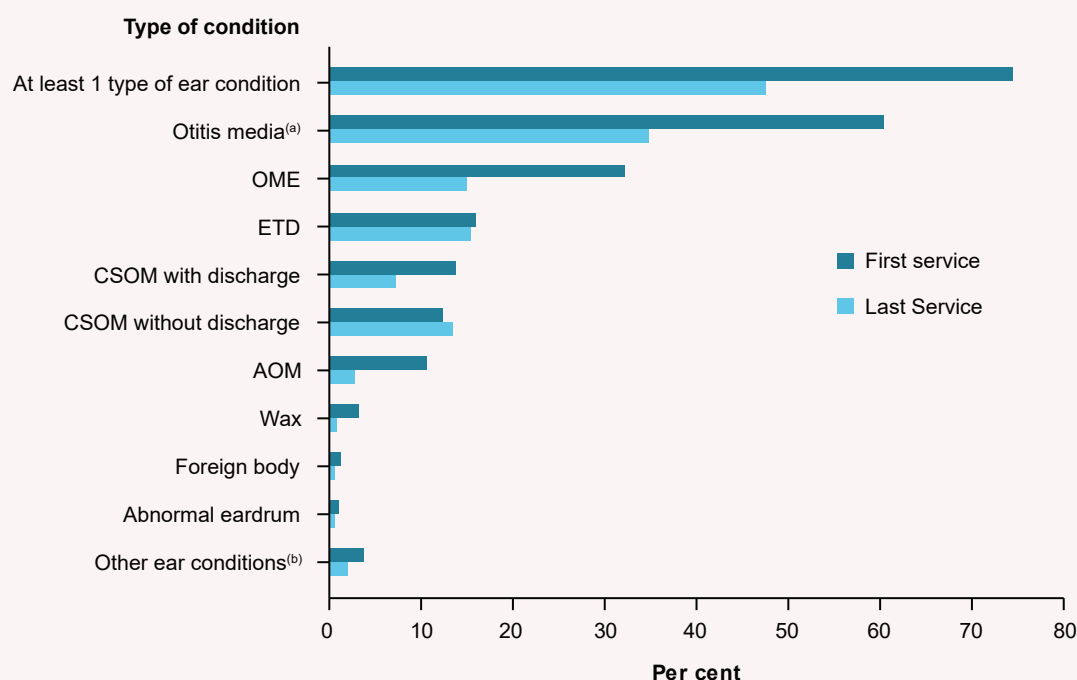
This section presents information about changes in ear conditions, hearing loss and hearing impairment among Indigenous children and young people who received 2 or more audiology services during the hearing health outreach services treatment pathway. This is one way to understand the effectiveness of 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 age.

This analysis includes only children and young people who received 2 or more services with a minimum interval of 3 months between their first and last service. A total of 4,942 Indigenous children and young people met this criteria.

For almost all conditions between July 2012 and December 2021, there was an improvement over time. Figure 3.3 shows the change in proportion of ear conditions between first and last services:

- The number of Indigenous children and young people with at least 1 type of ear condition decreased from 3,674 at their first service to 2,353 at their last service.
- The proportion of Indigenous children and young people with at least 1 type of ear condition decreased by 26 percentage points between the first and the last service (from 74% to 48%).
- There was a decrease in the proportion of Indigenous children with an ear condition between first and last services for the majority of middle ear conditions, except for chronic suppurative otitis media without discharge, for which there was a slight increase in the proportion between first and last service.

**Figure 3.3: Change in proportion of ear conditions between first and last hearing health service, among children who received at least 2 services, July 2012 to December 2021**



AOM – acute otitis media; CSOM – chronic suppurative otitis media; ETD – Eustachian tube dysfunction; OME – otitis media with effusion.

(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 1 ear condition.

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

Source: Table S3.3.

## Ear conditions among CNS service recipients

Indigenous children and young people who receive CNS services have 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 2021, there were 1,018 Indigenous children and young people who received a CNS service and consented to sharing information with the AIHW. Of those, 626 (62%) were diagnosed with at least 1 ear condition at their first CNS visit and 34% were found to have no ear condition (information was missing for the remaining 4%).



The most commonly diagnosed conditions were:

- Eustachian tube dysfunction (25%)
- otitis media with effusion (22%)
- acute otitis media (5.7%).

Among children who received a CNS service, the proportion diagnosed with otitis media with effusion was lower in 2021 than in 2020 (22% compared with 27%). The proportion of CNS service recipients who had Eustachian tube dysfunction was higher in 2021 than 2020 (25% compared with 20%), as was the proportion with AOM (5.7% compared with 4.4%).

*Find out more in Table S3.4.*

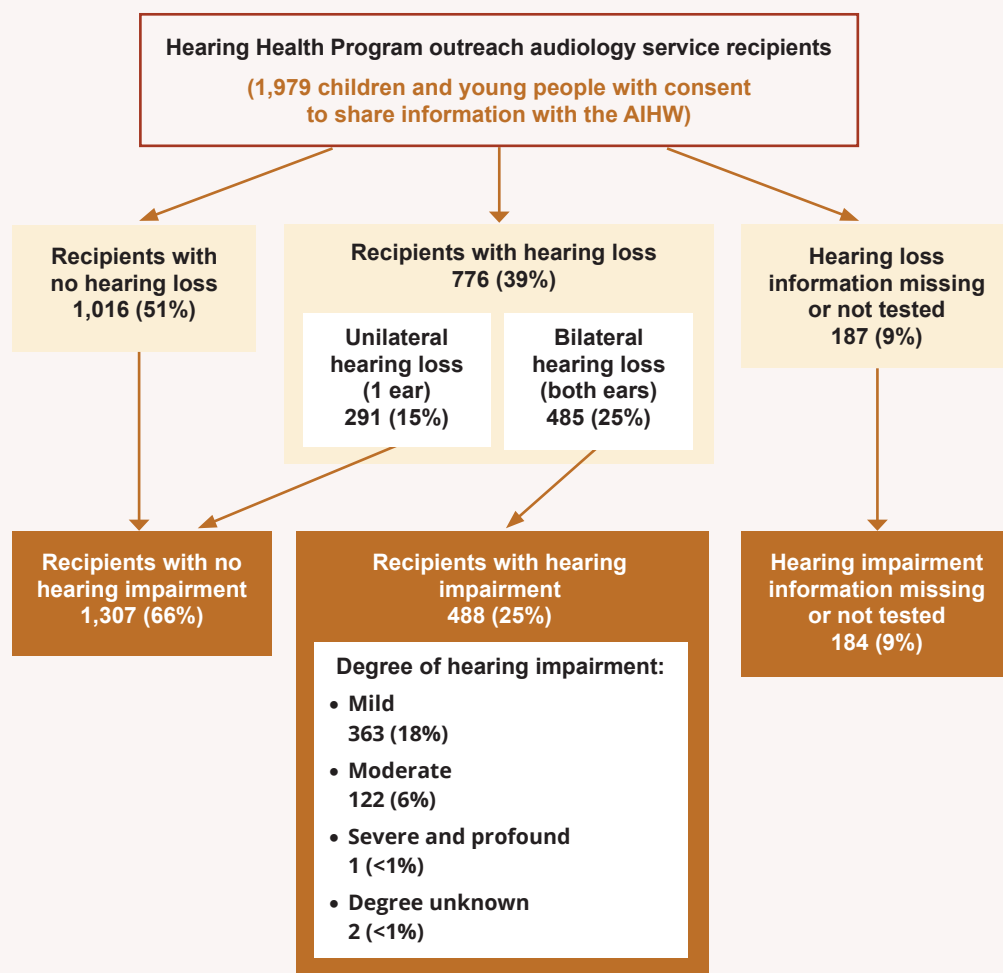
## Hearing status

Two measures of hearing status are used 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 better 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 3.4 shows the number and proportion of children and young people with hearing loss and hearing impairment among service recipients in 2021, and the relationship between each.

Figure 3.4: Hearing loss and impairment among Indigenous children and young people who received audiology outreach services (including CNS service recipients), 2021



Source: tables S2.1, S3.5 and S3.7.

## Hearing loss

There are 3 types of hearing loss: conductive, sensorineural and mixed (Box 3.2). Among the 1,979 Indigenous children and young people who received audiology outreach services in 2021, 39% had hearing loss:

- 22% had conductive hearing loss
- 1.1% had sensorineural hearing loss
- 0.9% had mixed hearing loss
- 15% had some form of hearing loss but type could not be determined.

Among the 1,979 Indigenous children and young people who received audiology outreach about 1,316 (or 66%) were visited by CNSs in 2021. Among these children, about 46% had some form of hearing loss—30% bilateral and 16% unilateral.

The proportion of children with hearing loss who received both audiology and CNS services, decreased by 34 percentage points between July 2012 and December 2021.

*Find out more in Table S3.6 and Table S3.8.*

### Variation by age and sex

Among Indigenous children and young people who received an audiology service in 2021, the proportion with hearing loss varied by age group (Figure 3.5). Among children aged 3–5, 50% had hearing loss, the highest proportion of any age group.

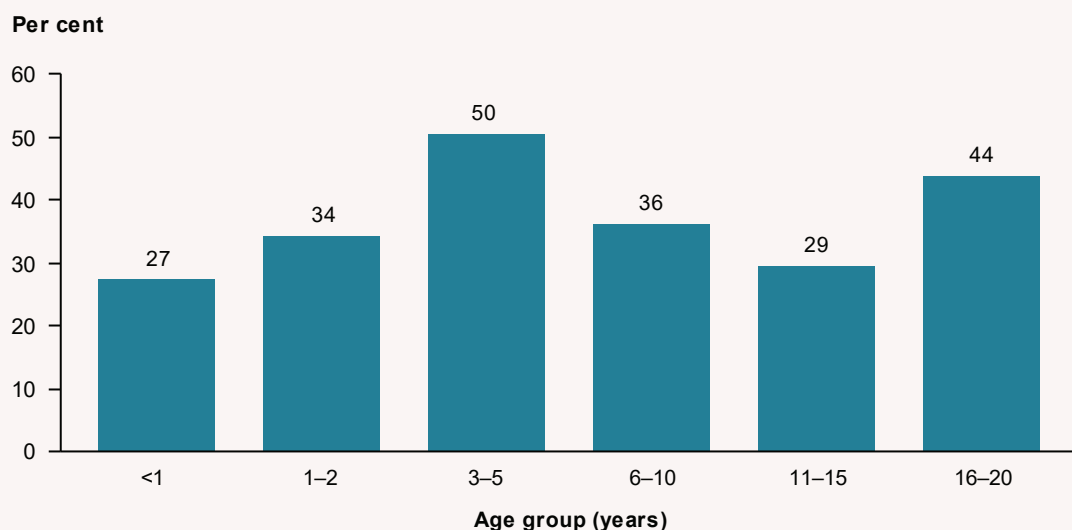
#### Box 3.2: Types of hearing loss

**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.

**Figure 3.5: Proportion of children and young people with hearing loss who received audiology services in 2021, by age group**



Source: Table S3.9.

Among the 776 children who received an audiology service in 2021 and had hearing loss, a slightly higher proportion were girls (Figure 3.6).

**Figure 3.6: Hearing loss among children and young people in 2021, by sex**

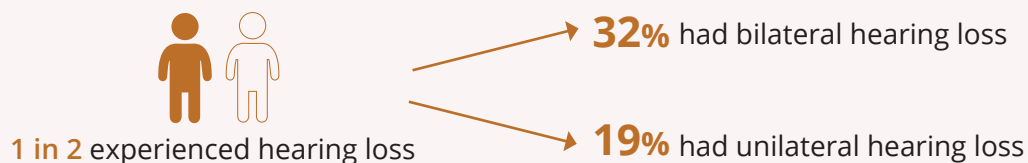


### Hearing loss among children and young people with ear conditions

Indigenous children and young people who had ear conditions were more likely to have hearing loss than those with no ear conditions (51% compared with 10% in 2021) (see Table S3.10). Among those with at least 1 ear condition, 32% had bilateral hearing loss and a further 19% had unilateral hearing loss (Figure 3.7).

**Figure 3.7: Hearing loss among children and young people in 2021 with ear conditions**

In **2021**, among children who were diagnosed with **at least 1** ear condition:



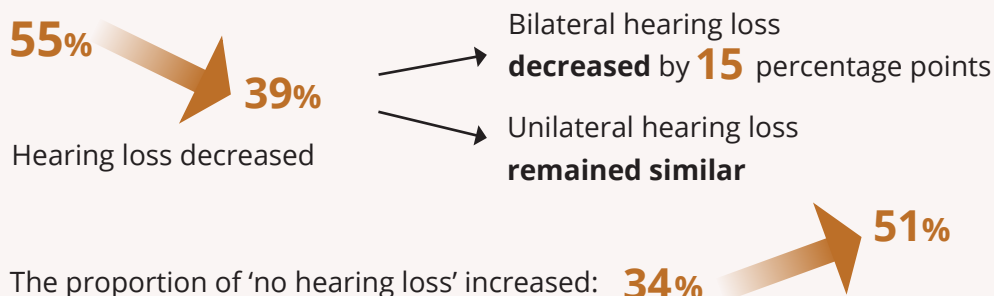
Source: Table S3.10.

## Trends

Among Indigenous children and young people who received an audiology service, the proportion with hearing loss decreased from 55% in July–December 2012 to 39% in 2021 (Figure 3.8).

**Figure 3.8: Hearing loss among service recipients over time**

When comparing service recipients from July–December 2012 and 2021:



Note: Information on hearing loss status was 'missing' for between 7.4% and 11.8% of service recipients in each year. These recipients were included in the denominator when calculating proportions with hearing loss.

Source: Table S3.5.

## Hearing impairment

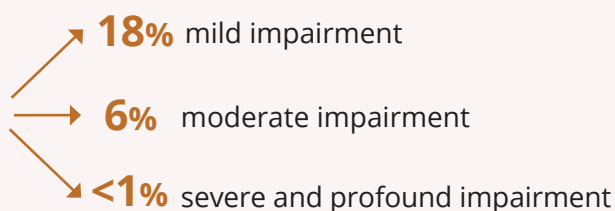
In this report, hearing impairment is defined as the degree of impairment associated with hearing loss in the 'better hearing ear', using a scale of mild, moderate, severe and profound (Australian Hearing, cited in Access Economics 2006). In 2021, 488 (25%) children and young people who received an audiology service had a hearing impairment (Figure 3.9).



Figure 3.9: Hearing impairment among service recipients in 2021

In 2021

**488 service recipients**  
had a hearing impairment



Source: Table S3.7.

### Variation by age and sex

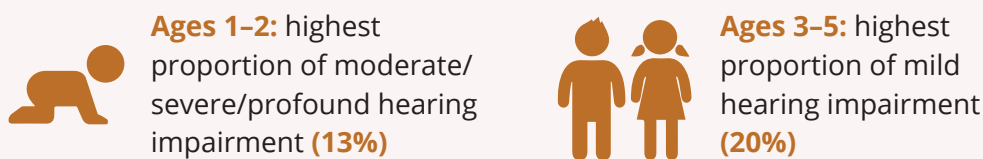
In 2021, among the 488 Indigenous children and young people who received an audiology service and had a hearing impairment, a slightly higher proportion were girls (Figure 3.10).

Figure 3.10: Hearing impairment in 2021, by sex



In 2021, the proportion of Indigenous children and young people with no hearing impairment generally increased with age, and hearing impairment tended to be more severe in younger than in older age groups (Figure 3.11).

Figure 3.11: Hearing impairment in 2021 for younger ages

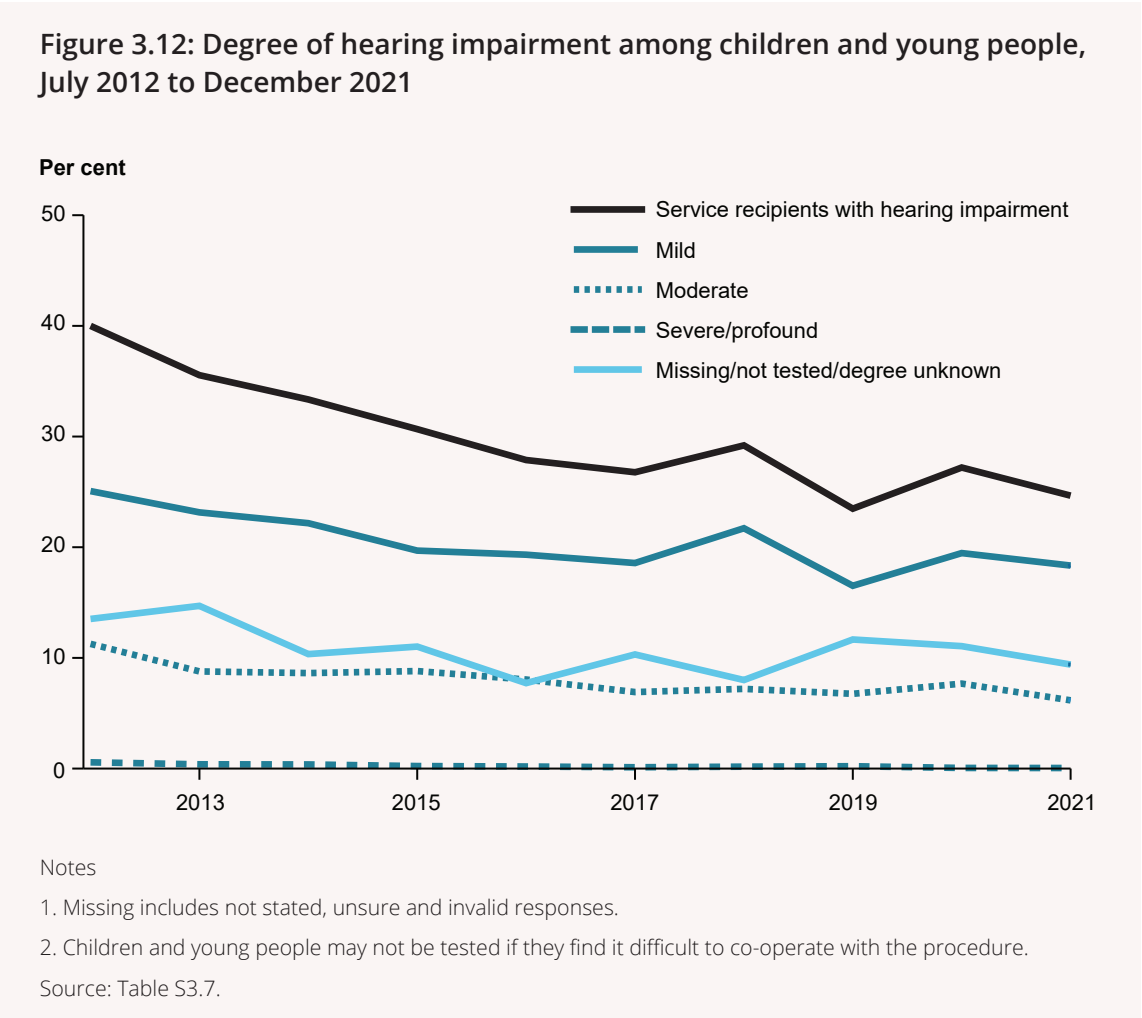


Source: Table S3.11.

The decrease in the severity of hearing impairment with age 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). 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 impairment.

### Trends

Among Indigenous children and young people who received outreach audiology services the proportion with a hearing impairment decreased, from 40% in 2012 to 25% in 2021 (Figure 3.12).



Some of the hearing impairment decrease over time could be due to the natural progression of ear disease, as previously discussed (see 'Variation by age and sex'). However, it may be more likely that the observed decrease is attributable 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 be measured only through an evaluation program, which is beyond the scope of this report.

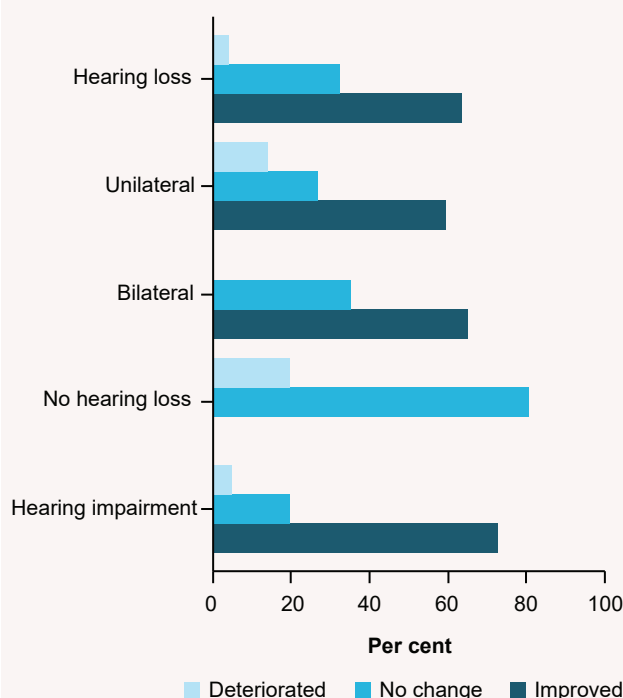
## Changes among children who received 2 or more services between 2012 and 2021

One way to examine hearing health changes over time 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).

Among the 4,334 Indigenous children and young people who received 2 or more outreach audiology services between July 2012 and December 2021, hearing health generally improved over the period (Figure 3.13):

- 1,943 children (63%) had an improved hearing loss status, with no change in status for 996 (33%) and the status of 124 (4%) had deteriorated.
- Among the 1,944 children with hearing impairment, 1,414 (73%) had improved capability and for 92 (5%) capability had deteriorated.

**Fig 3.13: Change in hearing loss and impairment among children who received at least 2 audiology services between July 2012 and December 2021**



Sources: Tables S3.12 and S3.13.

### 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 or (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, including:

- the effectiveness of medical interventions, including surgical 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

It should be noted that there are ‘missing’ and ‘not tested’ records that may confound results.



# 4

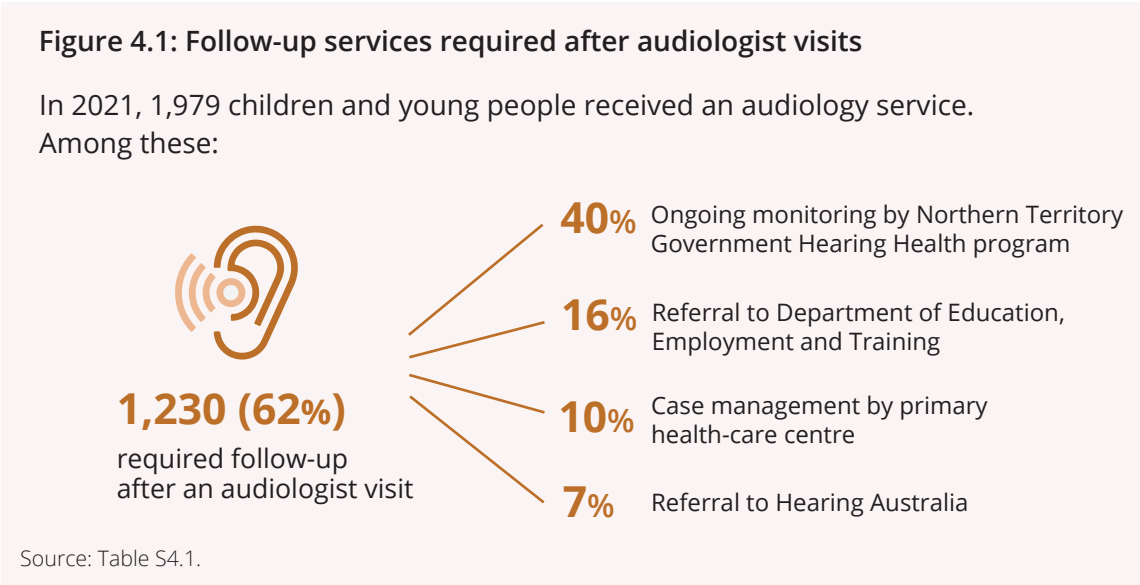
## **Demand for ear and hearing health services and other follow-up services**

The Australian Government-funded activities in the Northern Territory public hearing health system are valuable for children and young people. Since 2012, the number of children and young people accessing services has increased, along with data consent rates. 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.

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 Hearing Australia, to medical treatment such as ENT surgery.

## Follow-up services required after audiologist visits

In 2021, among 1,979 Indigenous children and young people receiving an audiology service, 62% required at least 1 further action for follow-up. (Percentages in the infographic Figure 4.1 below sum to over 62% because some children required more than 1 referral).





## Follow-up services required after ENT teleotology services

In 2021, among Indigenous children and young people receiving an ENT teleotology service 63% were given a recommendation for at least 1 further action for follow up. Two types of action are recommended by ENT specialists:

- surgery—the most common types recommended were myringoplasty and myringotomy (see Glossary).
- further follow-up—this is the main ENT action recommended through the ENT teleotology service. This was primarily for an ENT review or an audiological assessment.

## Waiting list for audiology and ENT teleotology services

Although many hearing health services have been provided, the demand for audiology services and ENT teleotology services remains high among Indigenous children and young people in the Northern Territory. This may be due to the following factors:

- ear disease is a chronic condition that often requires multiple service events over a number of years
- regular training and education sessions on ear disease and hearing loss are being delivered in the community, which has resulted in increased knowledge and awareness of ear disease and the impacts of hearing loss
- more effective identification of ear disease in the community and through Hearing Services auditing processes results in an increase in referrals
- restricted capacity of Northern Territory Hearing Services to provide frequent service to some communities due to availability of ear and hearing health-care staff
- cultural events, inclement weather, and school and public holidays restrict the capacity of the teams to travel to remote communities all year round
- the geographical location and vast spread of Indigenous communities make access to services difficult
- the high rates of mobility between communities for families can hinder efforts to locate children in a timely manner and provide appropriate ear and hearing health.

At the end of 2021, there were 3,403 Indigenous children and young people on the audiology waiting list. Of these, 1,571 were new referrals for audiology services and 1,832 were recalls for further audiology follow-up.

In addition, 1,835 Indigenous children and young people were waiting for ENT teleotology services in the Northern Territory. Of these, 1,190 were new referrals either from Primary Health Care physicians or from the audiology pathway, and required ENT intervention. There were 645 children and young people who had been reviewed but required additional follow-up by ENT teleotology services.





# 5

## Regional analysis

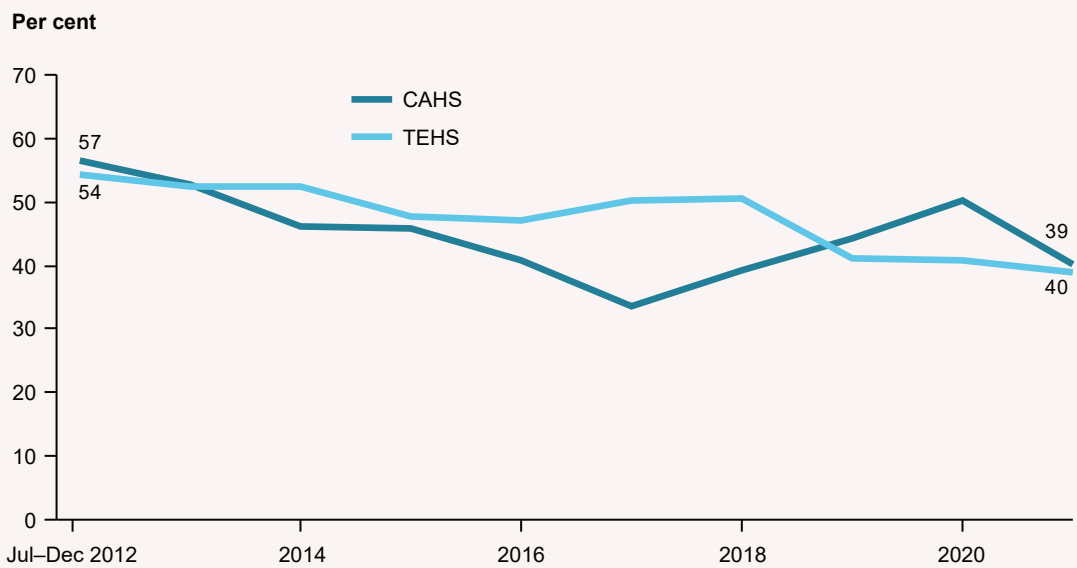
The Northern Territory has 2 main health service delivery regions: the Top End Health Service (TEHS) and the Central Australia Health Service (CAHS). This section presents the hearing health status of the children and young people who received outreach audiology, CNS or ENT teleotology services in these 2 regions. In 2021, 1,546 Indigenous children and young people within the TEHS and 433 within the CAHS received an audiology service.

## Hearing loss

Rates of hearing loss were generally similar for children in the TEHS and the CAHS between July 2012 and December 2016. However, in 2017 the difference in the proportion of children with hearing loss grew between the regions. In 2020, the gap between the TEHS and the CAHS widened, before narrowing again in 2021 (Figure 5.1). In 2021:

- Indigenous children in the CAHS had a slightly higher proportion of hearing loss (40%, or 174 children) than those in the TEHS (39%, or 602 children).
- The proportion of Indigenous children and young people with no hearing loss was slightly higher in the TEHS (52%, or 799 children) than in the CAHS (50%, or 217 children).

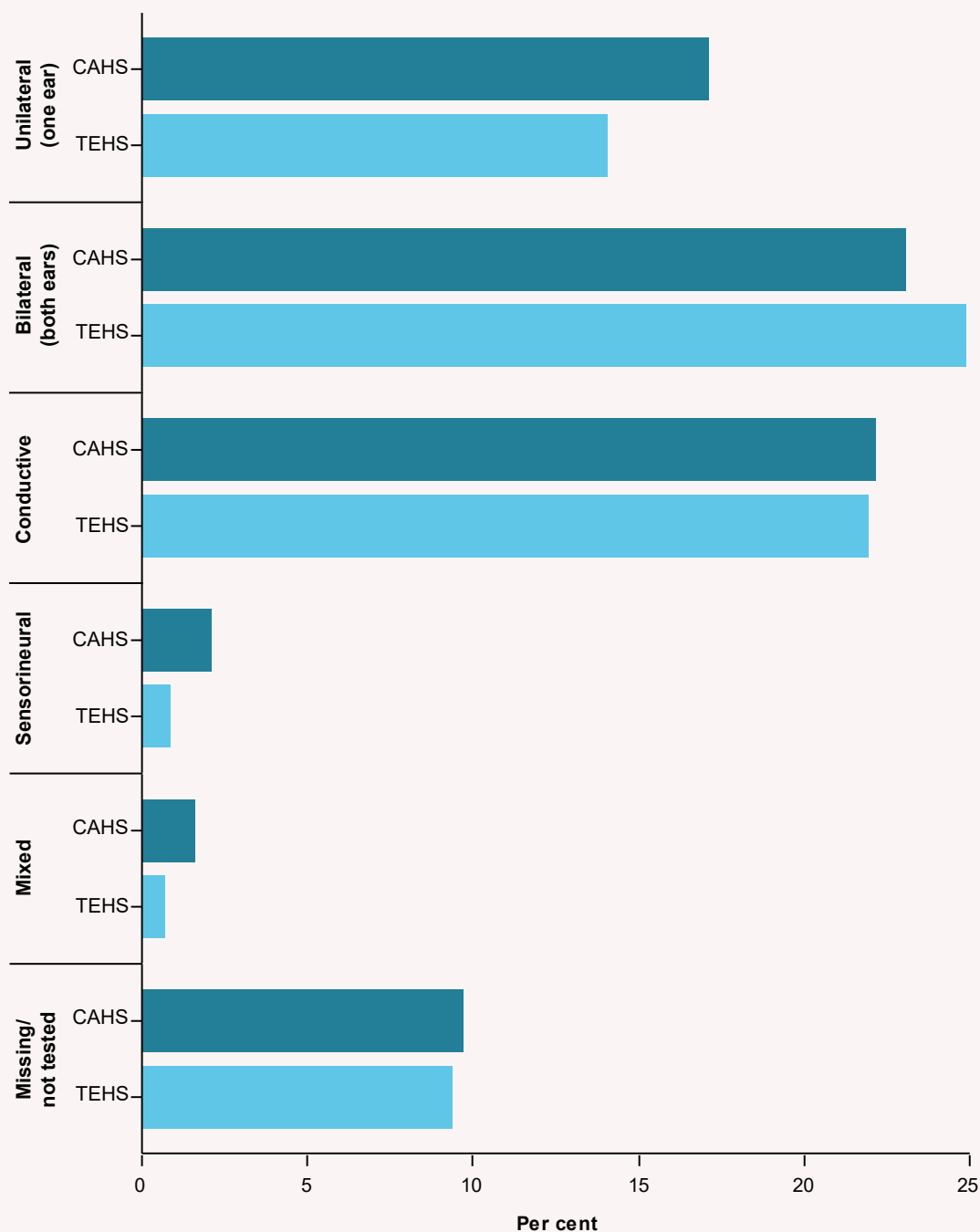
**Figure 5.1: Hearing loss among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), July 2012 to December 2021**



Source: Table S5.1.

When looking at specific types of hearing loss in 2021 (Figure 5.2), the proportions between children in the TEHS and the CAHS show smaller differences.

Figure 5.2: Types of hearing loss among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), 2021



Sources: Tables S5.1 and S5.2.

## Hearing impairment

Overall, for both TEHS and CAHS from July 2012 to December 2021:

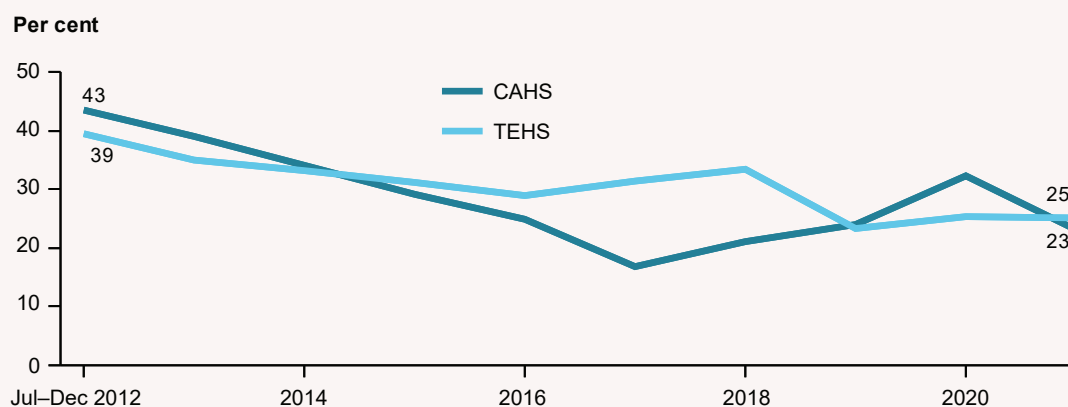
- the proportion of Indigenous children and young people with hearing impairment decreased over time, (Figure 5.3) by:
  - 14 percentage points for the TEHS
  - 20 percentage points for the CAHS
- the proportion of Indigenous children and young people with no hearing impairment increased over the years by:
  - 17 percentage points for the TEHS
  - 13 percentage points for the CAHS.

From July 2012 to December 2016, hearing impairment patterns across the years were similar for Indigenous children and young people who received services in the TEHS and the CAHS, but there was a deviation from these patterns from 2017.

In 2019, there was a similar proportions of hearing impairment among children and young people in the TEHS and CAHS had similar proportions of hearing impairment. The gap widened in 2020 and then narrowed again in 2021. In 2021, 23% of Indigenous children and young people receiving audiology services in CAHS had hearing impairment, compared with 25% of those in TEHS (Figure 5.3).

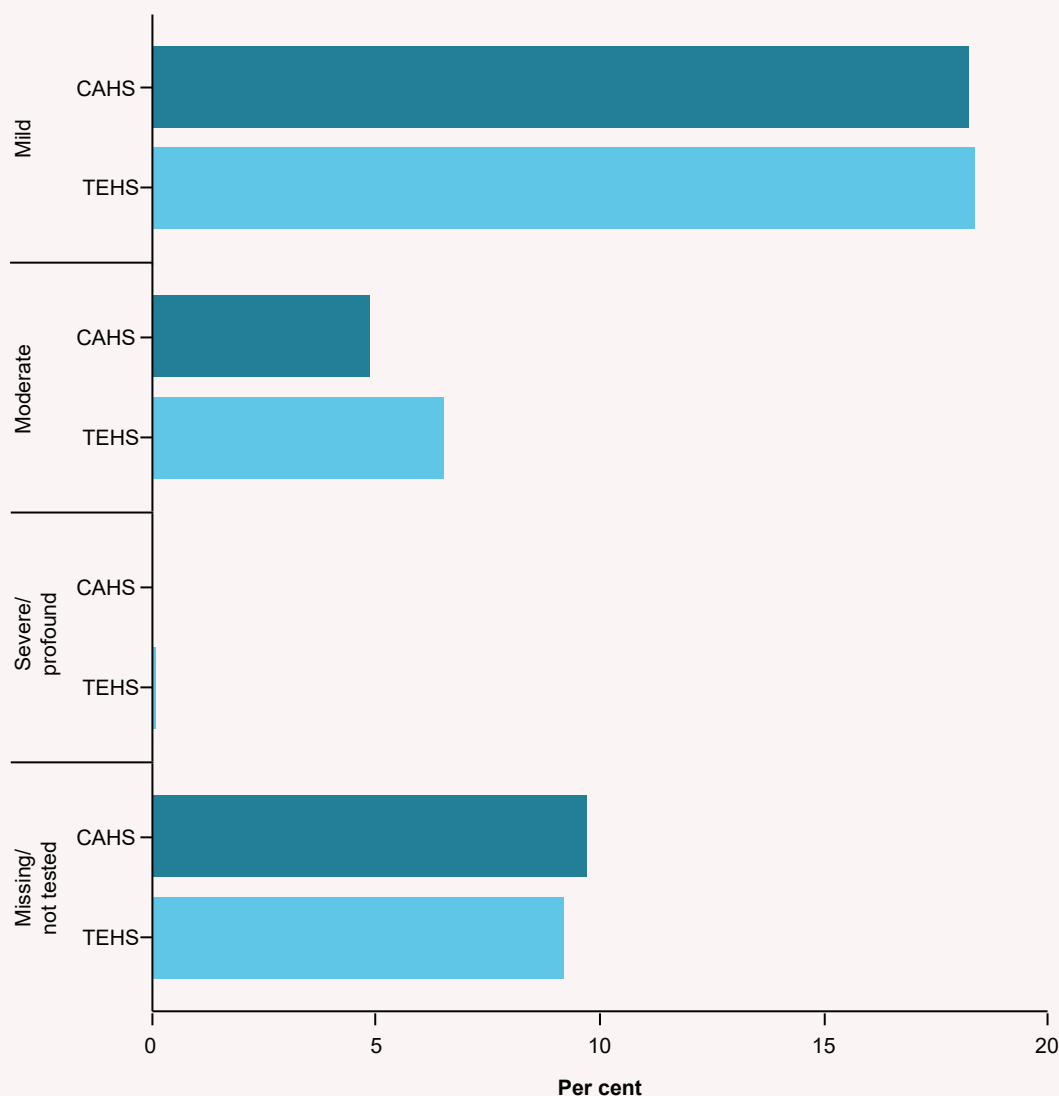
In 2021, proportions of children and young people with mild hearing impairment were the same in CAHS and TEHS (both 18%). The proportions of children with moderate hearing impairment were also slightly higher in the TEHS than in the CAHS (7% compared with 5%) (Figure 5.4).

**Figure 5.3: Hearing impairment among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), July 2012 to December 2021**



Source: Table S5.3.

Figure 5.4: Types of hearing impairment among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), 2021

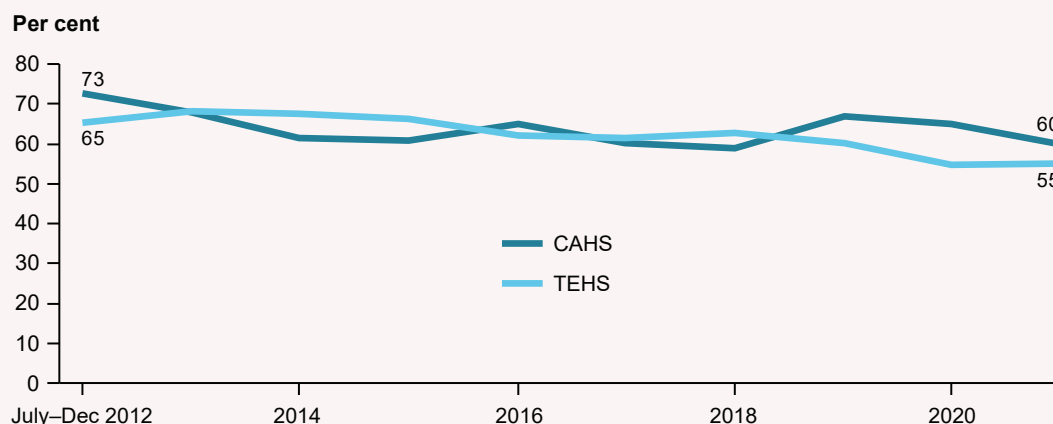


Source: Table S5.3.

## Ear conditions

Between July 2012 and December 2021, the proportion of Indigenous 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 55% in the TEHS and from 73% to 60% in the CAHS (Figure 5.5).

**Figure 5.5: 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), July 2012 to December 2021**

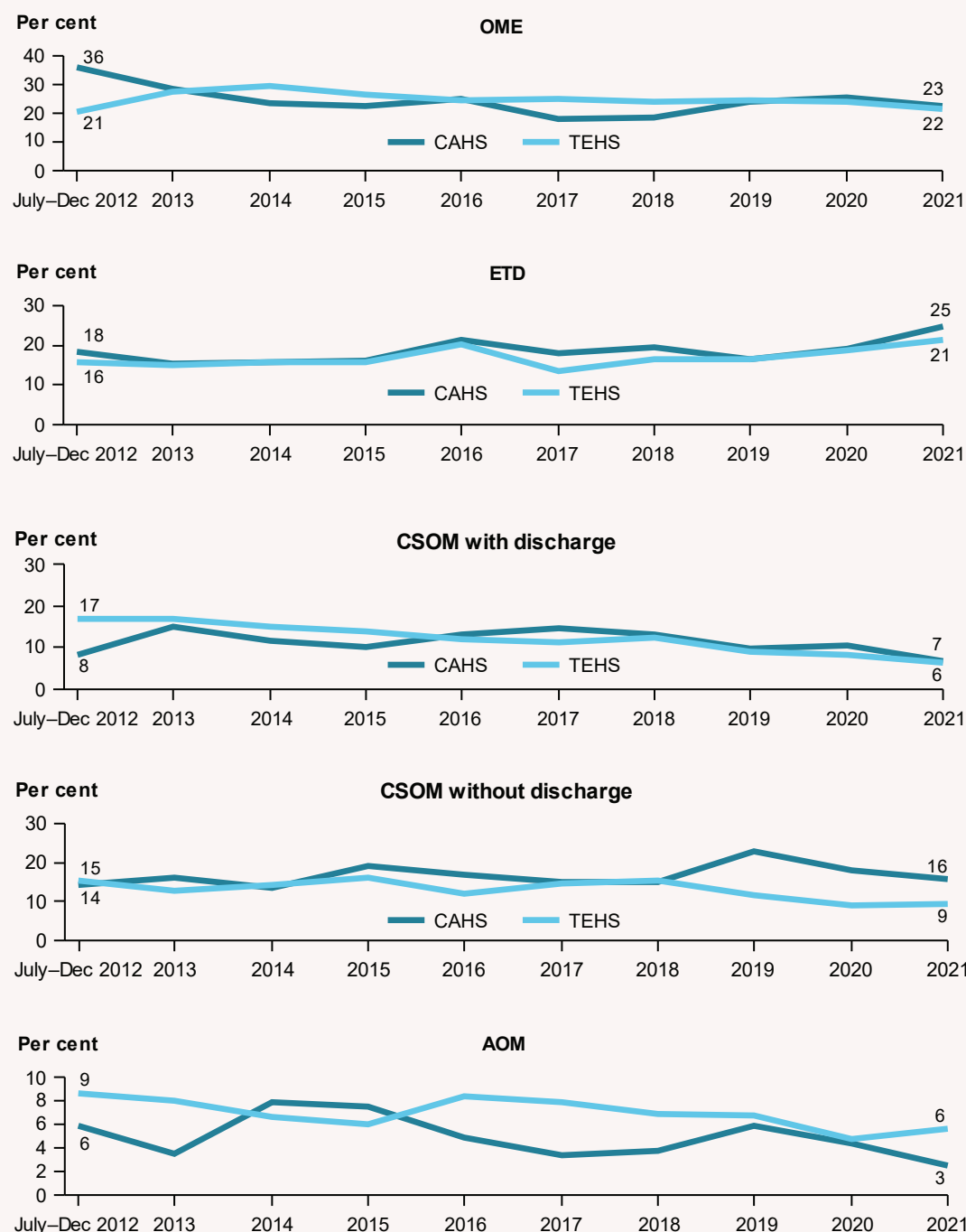


Source: Table S5.4.

The distribution of types of ear condition varied over time in both regions (Figure 5.6). For example, from July 2012 to December 2021:

- the proportion of Indigenous children with otitis media with effusion increased in the TEHS between 2012 and 2014 (from 21% to 29%), before decreasing and then remaining relatively steady at around 24% to 25% between 2016 and 2020, and falling to 22% in 2021. In the CAHS, the proportion decreased between 2012 and 2013 (from 36% to 29%), and ranged between 18% (in 2017) and 25% (in 2020), and falling to 23% in 2021.
- the proportion of Indigenous children with chronic suppurative otitis media with discharge decreased in the TEHS, from 17% to 6%. In the CAHS, from 2012 to 2020, the proportion fluctuated between 8% and 15%, but fell to 7% in 2021.
- in both TEHS and CAHS, the proportion of Indigenous children with Eustachian tube dysfunction was highest in 2021 (25% for CAHS and 21% for TEHS). Across the other years, it ranged between 16% and 21% for CAHS, and between 14% and 20% for TEHS.

**Figure 5.6: Distribution of specific ear conditions among children and young people who received a service in Central Australia (CAHS) and the Top End (TEHS)**



AOM – acute otitis media; CSOM – chronic suppurative otitis media; ETD – Eustachian tube dysfunction; OME – otitis media with effusion.

Source: Table S5.4.





# 6

## Progress against benchmarks

The Hearing Health Program uses performance indicators and benchmarks to monitor outcomes. 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).

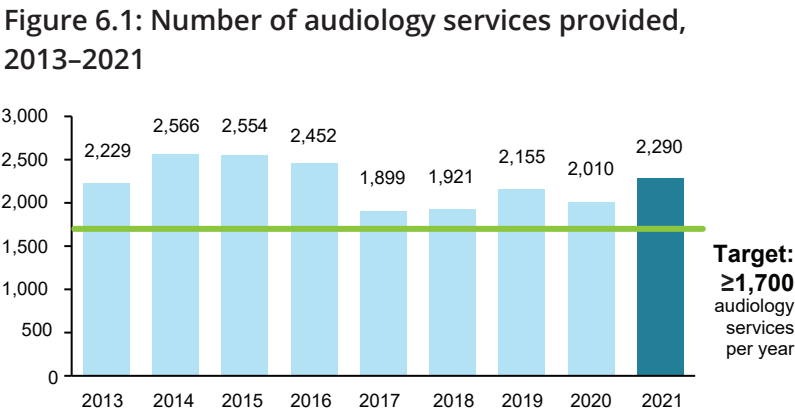
## Service delivery

Service delivery benchmarks for hearing health service delivery are set for audiology, CNS and health promotion and training activities. These are measured by the number of services per year. In 2021, targets for all of these services were exceeded. Note that the Northern Territory Health Implementation Plan does not include targets for ENT services.

### Audiology services

Indicator:  
Audiology services provided

The number of **audiology services** per year

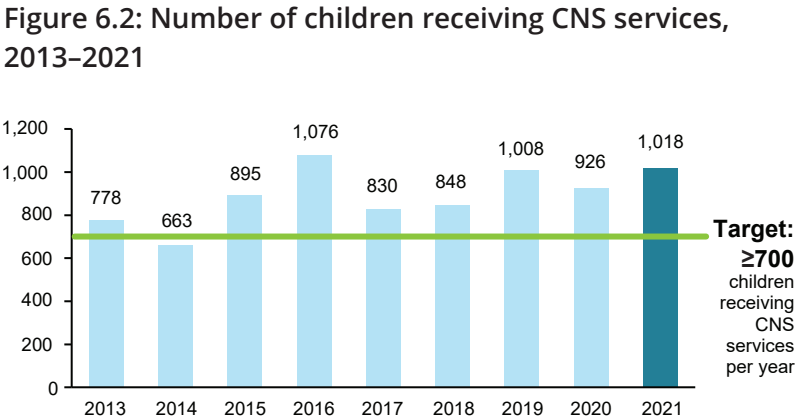


Note: Data on audiology services provided to children and young people in some years between 2013 and 2019 may differ slightly from previous reports as a result of revisions and improvements to data quality.

### CNS services

Indicator:  
CNS services provided

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

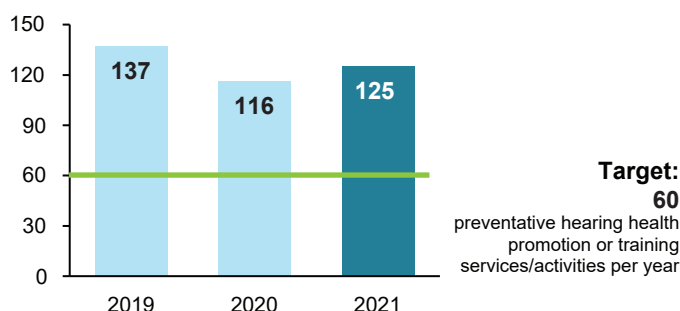


## Health promotion services and activities

### Indicator: Health promotion

Delivery of hearing health promotion or training services and activities

Figure 6.3: Number of services/activities provided January 2019 to December 2021



## Health outcomes

Health outcomes in this program are measured every 3 years (July 2012 – June 2015, July 2015 – December 2018 and January 2019 – December 2021). At the beginning of each period, the benchmarks for health outcomes were raised. All benchmarks in the first 2 periods have been met.

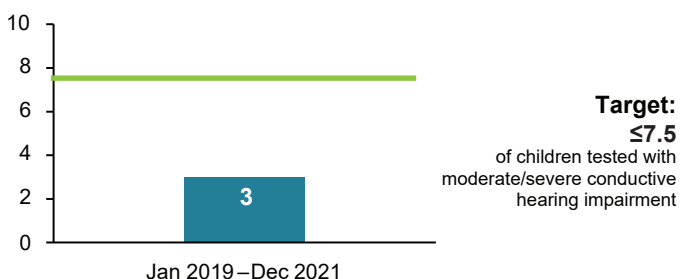
For the third period, January 2019 to December 2021, of the 4 targets related to middle ear conditions, two targets – children aged 0–5 and children aged 6–15 with chronic suppurative otitis media – were met.

## Hearing impairment

### Indicator: Hearing impairment

Proportion of children tested between January 2019 and December 2021 with moderate or severe conductive **hearing impairment**

Figure 6.4: Proportion of children with moderate/severe conductive hearing impairment, January 2019 to December 2021



# Middle ear conditions

**Indicator:**  
**Children with CSOM**

Proportion of children who received an audiology check or CNS service between January 2019 and December 2021 who were found to have **CSOM**

Figure 6.5a: Proportion of children (aged 0–5) with CSOM, January 2019 to December 2021

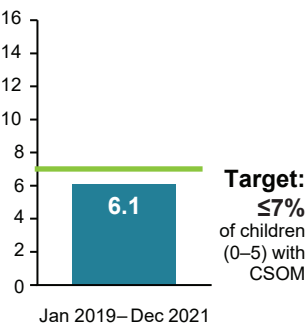
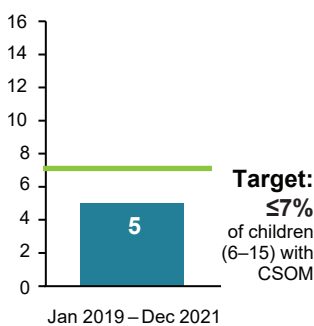


Figure 6.5b: Proportion of children (aged 6–15) with CSOM, January 2019 to December 2021



**Indicator:**  
**Children with dry perforation**

Proportion of children who received an audiology check or CNS service between January 2019 and December 2021 who were found to have **dry perforation**

Figure 6.6a: Proportion of children (aged 0–5) with dry perforation, January 2019 to December 2021

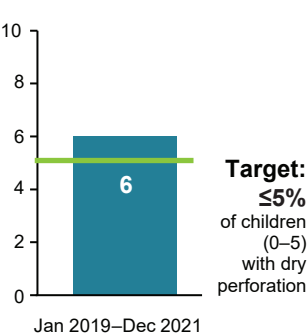
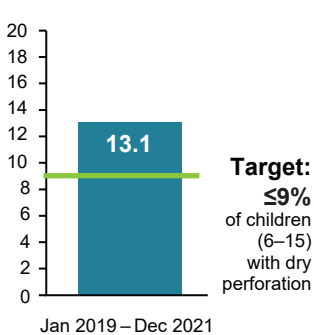


Figure 6.6b: Proportion of children (aged 6–15) with dry perforation, January 2019 to December 2021





# Appendix A: 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 the 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.

## Appendix B: Data quality statement

For all Northern Territory Remote Aboriginal Investment (NTRAI) Hearing Health Program data collections, the population included is not a random sample, nor is it representative of all Aboriginal and Torres Strait Islander children and young people in the Northern Territory. The outreach audiology and ear, nose and throat (ENT) teleotology services are available to all Indigenous children and young people, but not all of them access these services. The Clinical Nurse Specialist (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 about 9,500 children and young people, aged under 21, who received Northern Territory outreach audiology services between July 2012 and December 2021. This accounted for about 32% 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 in 2021, and this should be considered when using and interpreting hearing health data.
- The full data quality statement for the audiology data collection can be found online at: <https://meteor.aihw.gov.au/content/764412>

### ENT teleotology data collection summary

- This data collection included over 4,100 children and young people who were aged under 21 and received ENT teleotology services between July 2012 and December 2021. This accounted for about 14% of the Northern Territory Indigenous 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.
- The full data quality statement for ENT teleotology data collection can be found online at: <https://meteor.aihw.gov.au/content/764544>





## CNS data collection summary

- The data collection includes over 5,500 children aged under 21 who received CNS services between July 2012 to December 2021. This accounted for about 18% 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 since 2018 there were no cases of non-consent. This should be considered when interpreting CNS program analyses.
- The full data quality statement for the CNS data collection can be found online at: <https://meteor.aihw.gov.au/content/764414>

## Child Health Check Initiative (CHCI) data collections summary

- The data from August 2007 to July 2012 included in this report are from the CHCI data collections.
- Children who received child health checks or follow-up services were not a random sample of Indigenous children in the Northern Territory. Health checks and services were available only to children in prescribed areas of the Northern Territory and were provided on a voluntary basis.
- The full data quality statement for the CHCI data collections can be found online at: <https://meteor.aihw.gov.au/content/index.phtml/itemId/480005>





## Acknowledgments

This report was prepared by Ms Mai Nguyen, Ms Ruth Penm, Ms Isabella Stephens and Dr Jeanine Willson of the Australian Institute of Health and Welfare. The authors acknowledge Ms Pooja Chowdhary, Ms Elizabeth Hynes and Dr Fadwa Al-Yaman of the AIHW for their comments and guidance throughout the preparation of this report.

The Department of Health provided funds to support data collection and report production, and members of the Indigenous Health Division are gratefully acknowledged for their comments on this report.

Special thanks go to the many clinicians and administrators who supported the hearing health data collections included in this report. The feedback, assistance and cooperation of the Northern Territory Department of Health is greatly appreciated.



## 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
HP	Health priority
NT	Northern Territory
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

# Glossary

**acute otitis media (AOM):** 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 a clinician 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 (CSOM) 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).

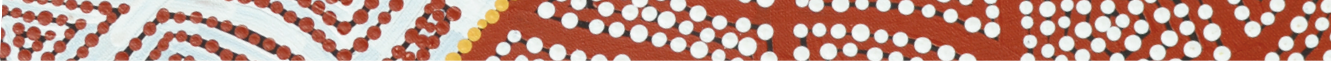
**Eustachian tube dysfunction (ETD):** Negative middle ear pressure associated with compromised equalisation impeding middle ear function and sometimes causing middle ear fluid accumulation.

**grommet:** A small tube surgically placed across the eardrum to re-establish ventilation to the middle ear. It is also called a '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 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 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 (eardrum).

**myringotomy:** Surgical incision into the eardrum, to relieve pressure or drain fluid.

**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', 'serous 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 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 Nurse specialists and audiologists obtain full diagnostic hearing assessments, assess middle ear function, diagnose middle ear conditions and recommend further actions and treatment to an ear, nose and throat (ENT) specialist through a store and forward data collection service delivery model.

**unilateral hearing loss:** Hearing loss in 1 ear.

## References

- ABS (Australian Bureau of Statistics) 2016. National Aboriginal and Torres Strait Islander Social Survey, 2014–15. ABS cat. no. 4714.0. Canberra: ABS. Viewed 23 June 2020, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4714.02014-15>.
- ABS 2019. Estimates and Projections, Aboriginal and Torres Strait Islander Australians. Canberra: ABS. Viewed 30 March 2022, <https://www.abs.gov.au/statistics/people/aboriginal-and-torres-strait-islander-peoples/estimates-and-projections-aboriginal-and-torres-strait-islander-australians/2006-2031>.
- Access Economics 2006. Listen hear: the economic impact and cost of hearing loss in Australia. Sydney: Access Economics.
- AIHW (Australian Institute of Health and Welfare) 2012. Northern Territory Emergency Response Child Health Check Initiative—follow-up services for oral and ear health: final report, 2007–2012. Cat. no. DEN 223. Canberra: AIHW.
- AIHW 2014a. Access to primary health care relative to need for Indigenous Australians. Cat. no. IHW 128. Canberra: AIHW.
- AIHW 2014b. Australia's health 2014. Australia's health series no. 14. Cat. no. AUS 178. Canberra: AIHW.
- AIHW 2014c. Stronger Futures in the Northern Territory: hearing health services 2012–2013. Cat. no. IHW 117. Canberra: AIHW.
- AIHW 2018. Northern Territory Outreach Hearing Health Program: July 2012 to December 2017. Cat. no. IHW 203. Canberra: AIHW
- AIHW 2020. Indigenous hearing health. Canberra: AIHW. Viewed 25 April 2021, <https://www.aihw.gov.au/reports/australias-health/indigenous-hearing-health>.
- AIHW & 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.
- Council on Federal Financial Relations 2016. Northern Territory Health Implementation Plan: National Partnership on Northern Territory Remote Aboriginal Investment. Canberra: Council on Federal Financial Relations.
- Health (Department of Health) 2020. [Australian Health Protection Principal Committee \(AHPPC\) coronavirus \(COVID-19\) statement on 18 March 2020](#). Canberra: Department of Health. Viewed 30 April 2021.
- Jervis-Bardy J, Sanchez L & Carney AS 2014. Otitis media in Indigenous Australian children: review of epidemiology and risk factors. *Journal of Laryngology and Otology* 128(S1):S16–27.
- WHO (World Health Organization) 2021. World report on hearing. Geneva: World Health Organization.

# List of tables

Table 1:	Progress against benchmarks, 2021	viii
----------	-----------------------------------	------

# List of boxes

Box 2.1:	Hearing health priority (HP) categories	14
Box 3.1:	Types of ear conditions	17
Box 3.2:	Types of hearing loss	24
Box 3.3:	Change in hearing capability across services	29

# List of figures

Figure 1:	Number of Indigenous children and young people who received audiology, CNS or ENT teleotology service in 2021	vi
Figure 2:	Ear and hearing health improvements between 2012 and 2021	vi
Figure 3:	Number of services increased in 2021	vii
Figure 1.1:	Clinical path of children and young people moving through the Northern Territory public hearing health system	5
Figure 2.1:	Ear health education, promotion and prevention training sessions delivered in 2021	8
Figure 2.2:	Number of outreach audiology services and service recipients, July 2012 – December 2021	9
Figure 2.3:	Outreach audiology service recipients in 2021, by sex	10
Figure 2.4:	Age of outreach audiology service recipients in 2021	10
Figure 2.5:	Number of ENT teleotology services and service recipients, July 2012 – December 2021	11
Figure 2.6:	ENT teleotology service recipients in 2021, by sex	12
Figure 2.7:	ENT teleotology service recipients in 2021, by age group	12
Figure 2.8:	Number of CNS services and service recipients, July 2012 – December 2021	13
Figure 2.9:	Clinical Nurse Specialist service recipients in 2021, by sex	14
Figure 2.10:	Hearing health priority (linked to age) among CNS service recipients, 2021	14
Figure 2.11:	Number of services provided, audiology, ENT and CNS, July 2012 – December 2021	15

Figure 3.1:	Types of ear conditions among children and young people who received an audiology, CNS or ENT teleotology service in 2021 . . . . .	18
Figure 3.2:	Most common ear conditions in children and young people who received at least 1 audiology outreach, CNS or ENT teleotology service in 2021, by age group . . . . .	19
Figure 3.3:	Change in proportion of ear conditions between first and last hearing health service, among children who received at least 2 services, July 2012 – December 2021 . . . . .	21
Figure 3.4:	Hearing loss and impairment among Indigenous children and young people who received audiology outreach services (including CNS service recipients), 2021 . . . . .	23
Figure 3.5:	Proportion of children and young people with hearing loss who received audiology services in 2021, by age group . . . . .	25
Figure 3.6:	Hearing loss among children and young people in 2021, by sex . . . . .	25
Figure 3.7:	Hearing loss among children and young people in 2021 with ear conditions . . . . .	26
Figure 3.8:	Hearing loss among service recipients over time . . . . .	26
Figure 3.9:	Hearing impairment among service recipients in 2021 . . . . .	27
Figure 3.10:	Hearing impairment in 2021, by sex . . . . .	27
Figure 3.11:	Hearing impairment in 2021 for younger ages . . . . .	27
Figure 3.12:	Degree of hearing impairment among children and young people, July 2012 to December 2021 . . . . .	28
Figure 3.13:	Change in hearing loss and impairment among children who received at least 2 audiology services between July 2012 and December 2021 . . . . .	29
Figure 4.1:	Follow-up services required after audiologist visits . . . . .	32
Figure 5.1:	Hearing loss among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), July 2012 – December 2021 . . . . .	35
Figure 5.2:	Types of hearing loss among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS) in 2021 . . . . .	36
Figure 5.3:	Hearing impairment among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), July 2012 – December 2021 . . . . .	37





Figure 5.4: Types of hearing impairment among children and young people who received outreach audiology services in Central Australia (CAHS) and the Top End (TEHS), 2021 .....38

Figure 5.5: 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), July 2012 – December 2021 .....39

Figure 5.6: Distribution of specific ear conditions among children and young people who received a service in Central Australia (CAHS) and the Top End (TEHS). ....40

Figure 6.1: Number of audiology services provided, 2013–2021 .....42

Figure 6.2: Number of children receiving CNS services, 2013–2021 .....42

Figure 6.3: Number of services/activities provided, Jan 2019 – Dec 2021 .....43

Figure 6.4: Proportion of children with moderate/severe conductive hearing impairment, January 2019 to December 2021 .....43

Figure 6.5a: Proportion of children (aged 0–5) with CSOM, January 2019 to December 2021 .....44

Figure 6.5b: Proportion of children (aged 6–15) with CSOM, January 2019 to December 2021 .....44

Figure 6.6a: Proportion of children (aged 0–5) with dry perforation, January 2019 to December 2021 .....44

Figure 6.6b: Proportion of children (aged 6–15) with dry perforation, January 2019 to December 2021 .....44


## 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 (Australian Institute of Health and Welfare) 2010. 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.
- AIHW 2018. Northern Territory Outreach Hearing Health Program: July 2012 to December 2017. Cat. no. IHW 203. Canberra: AIHW.
- AIHW 2019. Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory: July 2012 to December 2018. Cat. no. IHW 213. Canberra: AIHW.
- AIHW 2020. Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory. Cat. no. IHW 228. Canberra: AIHW.
- AIHW 2021. Hearing health outreach services for Aboriginal and Torres Strait Islander children in the Northern Territory. Cat. no. IHW 260. Canberra: AIHW.
- AIHW 2022. Ear and hearing health of Aboriginal and Torres Strait Islander people 2021. Cat. no. IHW 262. Canberra: AIHW.

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





This report is part of a series of annual reports that present information on hearing health outreach services provided to Aboriginal and Torres Strait Islander children and young people in the Northern Territory. In 2021 there were: 2,290 audiology services; 703 ear, nose and throat teleotology services; and 1,139 Clinical Nurse Specialist visits. Among children and young people who received at least 2 services between 2012 and 2021, 63% had improved hearing loss and 73% had improved hearing impairment.

[aihw.gov.au](http://aihw.gov.au)



Stronger evidence,  
better decisions,  
improved health and welfare

