

Sound Outcomes: First Voice 2015 speech and language data

Overview of findings from the 2015 dataset

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1. Overview

First Voice is an association for centres in Australia and New Zealand which provide listening and spoken language early intervention services for children with hearing loss. Member organisations collect standardised data for children and their families receiving services, including results of a range of internationally endorsed assessments of children's total language, auditory comprehension, expressive communication, vocabulary and speech ability.

The First Voice Sound Outcomes dataset contains the outcomes of 696 children with hearing loss enrolled in its members' services. This is the largest data set for children with hearing loss receiving listening and spoken language early intervention in Australia and New Zealand.

Outcome data is collected from the centres annually for the previous calendar year, enabling First Voice to conduct large-scale research to evaluate and improve services and outcomes for children with hearing loss. This high-level summary report presents the key findings from the analysis of 2015 data, collated for the Sound Outcomes project. This work was approved by a University of Queensland Human Research Ethics Committee.

1.1 Summary

1.1.1 Spoken language outcomes

On average, 84% of children in the general population achieve scores within or above the normal range on the standardised assessments¹ employed to measure the children's outcomes.

The 696 children receiving services from First Voice Centres have a hearing loss in one or both ears, and that nearly a fifth have an additional disability. Their achievement on key standardised assessments are listed below

- **Total language:** 73% of children achieved a standard score within or above the average range for typically hearing children.
- **Auditory comprehension:** 76% of children achieved a standard score within or above the average range for typically hearing children.
- **Expressive communication:** 74% of children achieved a standard score within or above the average range for typically hearing children.
- **Vocabulary:** 81% of the children scored within or above the normal range for the age-matched typically hearing population.
- **Speech clarity:** 76% of children achieved a standard score within or above the average range for typically hearing children.

1.1.2 Children in the sample

Children in the study met the following criteria for inclusion:

- under the age of six years as at December 31st 2015;
- received listening and spoken language early intervention services from a First Voice centre during the 2015 calendar year; and had
- completed one or more assessments during the 2015 calendar year.

Parents/caregivers had each provided written consent for their child's data to be included in the study.

Children in the study were assessed according to the First Voice protocol which includes standardised and non-standardised assessments. Results from standardised assessments are described in this report, as this allows us to compare the results of these children with those in the wider population.

The 696 children who participated in this study are described below:

- 78% of children had bilateral hearing losses and 22% unilateral hearing losses;
- 17% of children have an additional disability which the child's clinical team determined impacts on their learning, with a 12% having a suspected additional disability impacting on their learning);

- 71% speak English only, while 18% speak/use English and another language. 8% speak/use a language other than English (with or without a further language other than English) as their primary language (the assessment language). 3% of children had no language information listed;
- Most children (69%) were using either two hearing aids or two cochlear implants;
- Children had, on average, received 2.2 years of early intervention service. 13% had received less than six months of service by the 31st of December 2015; and
- children were enrolled for service at their First Voice Centre for at an average age of 1-year.

2. Background

2.1 First Voice

First Voice is the regional body for centres providing listening and spoken language early intervention for children with hearing loss in Australia and New Zealand. Member centres include:

- Cora Barclay Centre (South Australia);
- Hear & Say (Queensland);
- The Hearing House (New Zealand);
- The Shepherd Centre (New South Wales, Tasmania and the Australian Capital Territory);
- Taralye (Victoria), and
- Telethon Speech & Hearing (Western Australia).

One of the key strategic objectives of First Voice is to collect, analyse and release annual outcome data for children enrolled in their listening and spoken language early intervention. The purpose of this work is to develop a dataset which can be used to inform service development and improvement.

2.2 Assessment Protocol

A core assessment protocol is employed across all First Voice Centres. Assessments are selected from the protocol based on a child's stage of development, the type of performance being measured and the test's clinical relevance.

Centres use additional assessments (over and above those in the core protocol) to suit the needs of their children, families and clinicians. Not all children, including some with additional disabilities, are able to be assessed using standardised assessments.

All language assessments are administered in English as per the tests' protocols – and therefore the tests measure a child's performance in English.

3. Findings from the 2015 data

3.1 Demographics

3.1.1 Client characteristics

In 2015, First Voice centres provided data for the 696 children who met the criteria for study and whose families had consented to participate. The distribution of clients from each First Voice Centre is as follows:

First Voice Centre	Number of children	Percentage of total
Cora Barclay Centre	70	10.0%
Hear and Say	224	32.2%
The Hearing House	30	4.3%
The Shepherd Centre	226	32.5%
Taralye	89	12.8%

Telethon Speech and Hearing	57	8.2%
TOTAL	696	100%

Table 1 Number of Children from each centre

The total number of children included in the cohort is slightly higher (n=696 children) than for the 2014 year (n=628).

Just over half the children (51%) were recorded as female and the remainder were listed as male. This gender breakdown is slightly different to that of the Longitudinal Outcomes of Children with Hearing Impairment (National Acoustic Laboratories, 2014) and to data from Australian Hearing (Australian Hearing, 2015) in which fewer children were reported as female (47.4% in the Australian Hearing example).

Children included in the cohort were aged between birth and six years of age at the end of 2015, with a smaller group from 0-1 years (8%) and from 5-6 years (13%) than for the ages between 1 and 5 years (16-22% in each age year).

The majority of children in the sample speak English as their primary language (71.4%) while nearly a fifth (17.7%) speak English and another language (signed or spoken) and 8.2% of children speak a language other than English, with or without a further non-English language (signed or spoken). No language data was recorded in 2.7% of cases.

The aetiologies of children's hearing losses were varied, congenital non-genetic (23.1%), genetic non-syndromic (19.5%), syndromic (8.4%) and those whose hearing losses were acquired (4.4%). Nearly half of the children had either not undergone testing to establish the cause of their hearing loss (26.0%) or had aetiological testing but no cause of the hearing loss could be found (18.6%).

Age at enrolment

Advances in technology and the introduction of newborn screening of hearing have provided children improved access to the sounds of speech at the earliest possible age. A growing body of evidence demonstrates the positive impact this has on children's later language outcomes (Ching 2013, Fulcher 2012, Dettman 2013, Geers 2013, Yoshinaga 2004).

The average age at enrolment for children in the sample was 1.0 years (SD=1.12). This is later than the 6 months age recommended in the Early Hearing Detection and Intervention guidelines of the Joint Committee on Infant Hearing (2007).

3.1.2 Level of hearing loss

Hearing losses are commonly categorised by based on left and right pure tone averages from the child's audiogram across four frequencies (0.5, 1.0, 2.0 and 4.0 kHz). Where a hearing loss is bilateral, the degree of loss is taken from the better ear.

Of the 696 children within the cohort, the majority (77%) were recorded as having a bilateral hearing loss while 22% of children had a unilateral hearing loss. In a small number of cases (1%) it was not possible to determine whether the hearing loss was bilateral or unilateral in nature from the information provided.

The levels of hearing loss for children with bilateral hearing loss in the dataset is described in Figure 1. Children with unilateral hearing losses were less likely to have their hearing loss categorised as 'mild' than those with a bilateral hearing loss (3% of cases with a unilateral hearing loss compared with 26% for bilateral cases). Unilateral cases were also less likely to be categorised as 'profound' (15% compared with 27% of bilateral cases).

Data used to calculate hearing levels were made available for 53% of children with unilateral hearing loss and 58% of children with bilateral hearing loss.

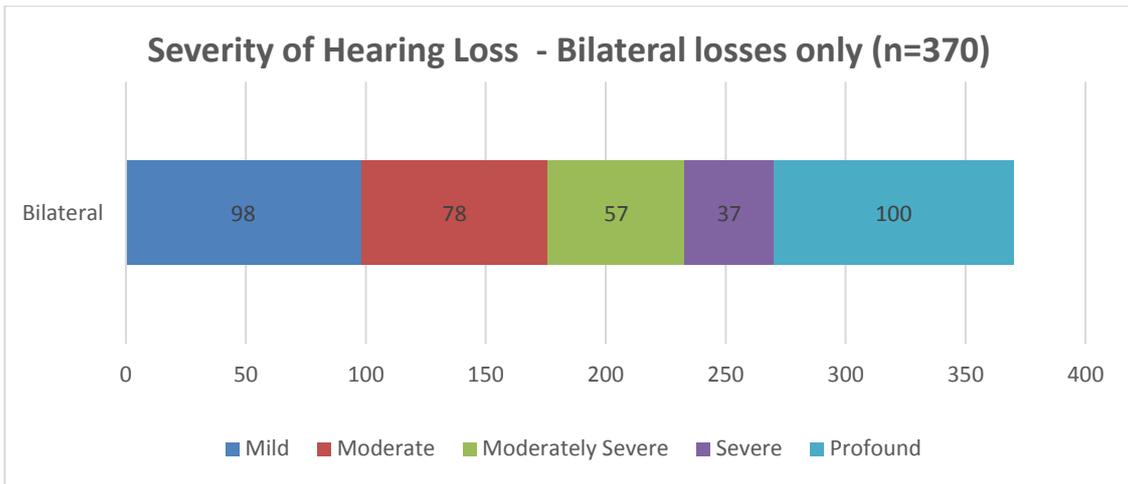


Figure 1 Severity of hearing loss for bilateral losses

Key: Mild 21-40dB; Moderate 41-55dB; Moderately Severe 56-70dB; Severe 71-90dB; Profound 91+dB (in the better ear)

3.1.3 Devices used

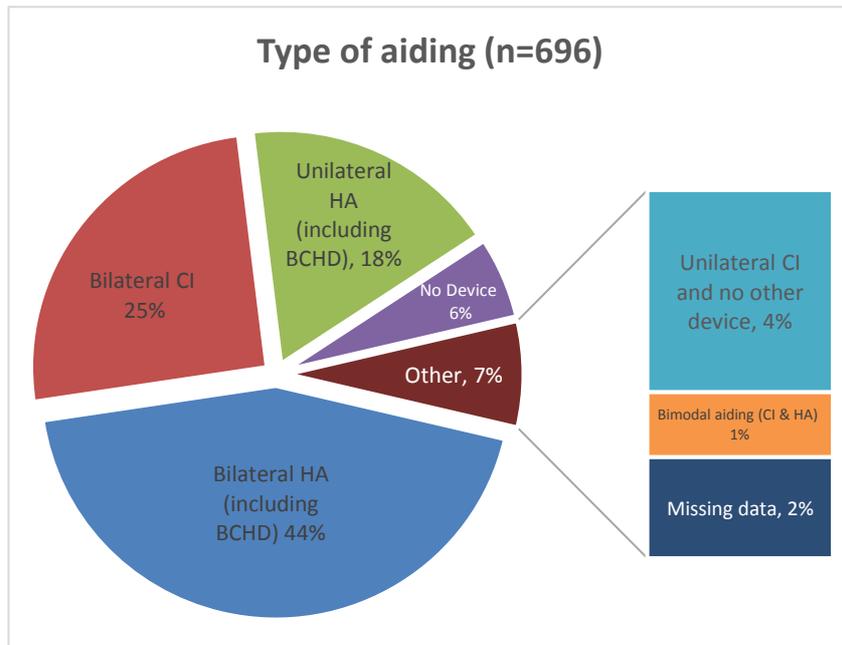


Figure 2 Type of aiding

Key: BCHD – Bone Conduction Hearing Device; CI – Cochlear Implant; HA – Hearing Aid

The majority of children in the sample use bilateral hearing aids (44%), followed by those using bilateral cochlear implants (25%). Smaller numbers of children in the group use a unilateral hearing aid (18%), no device (6%), a single cochlear implant with no other device (4%) or bimodal devices, which means they use one cochlear implant and one hearing aid (1%).

3.1.4 Additional disabilities that impact on learning

17% of children in the sample were diagnosed with an additional physical or cognitive disability that their medical and clinical team judged would impact on their learning. A further 12% of children were suspected of having an additional physical or cognitive disability that their medical and clinical team judged would impact on their learning, but a diagnosis had not yet been confirmed.

3.2 Spoken language outcomes

Spoken language outcomes have been calculated based on all standardised assessment data for children within the sample. The assessment results reported were all completed in the 2015 calendar year.

Where a child had more than one assessment of a particular type (e.g. PLS-5) during the calendar year, the most recent assessment result was used for analysis.

To cover a range of outcome measures, the following total and subtest scores were used for this analysis. These assessments provide data on children's performance across a range of language measures (total language, expressive communication and auditory comprehension, vocabulary) and speech results.

Assessment Type	Test used across age groups	Measure reported
Language	Preschool Language Scales (PLS-5), age 0:0 – 6:0	Total language score
	Clinical Evaluation of Language Fundamentals (CELF-P2), age 3:6 to 6:0	Core language score
	Clinical Evaluation of Language Fundamentals (CELF-4), age 5+	Core language score
Expressive communication	Preschool Language Scales (PLS-5), age 0:0 – 6:0	Expressive communication
	Clinical Evaluation of Language Fundamentals (CELF-P2), age 3:6 to 6:0	Expressive language index
	Clinical Evaluation of Language Fundamentals (CELF-4), age 5+	Expressive language index
Auditory comprehension	Preschool Language Scales (PLS-5), age 0:0 – 6:0	Auditory comprehension
	Clinical Evaluation of Language Fundamentals (CELF-P2), age 3:6 to 6:0	Receptive language index
	Clinical Evaluation of Language Fundamentals (CELF-4), age 5+	Receptive language index
Vocabulary	Peabody Picture Vocabulary Test (PPVT-IV), age 2:6 – 6:0	Overall Standard Score
Speech Performance	Goldman-Fristoe Test of Articulation (GFTA 2), age 2:0 – 6:0.	Percentile Rank

Table 2: Key measures of performance by assessment

The results depicted in figures 3 and 4 have the children in the study sample classified as 'below the average range', 'within the average range' or 'above the average range'.

Scores reported in Figure 3 relate to standard scores (which have a mean of 100 and a standard deviation (SD) of 15). The average achievement range is within one standard deviation of the mean as represented by standard scores between 85 and 115. Scores of less than 85 represent performance below the average range and scores greater than 115, represent performance above the average range.

By convention, in the general population just over two thirds of children (68%) score in the typical range, with an additional 16% scoring above and below this range. Thus, 84% of children in the general population would be expected to score within or above the typical range.

The children in the study sample all have a hearing loss in one or both ears, including some children with one or more additional disabilities who had completed one or more standardised assessments during the period. The general population used as a comparison group in the key measures described below includes very few, if any, children with hearing loss or additional needs. Given this, the results below indicate that this group of children are performing similarly to their peers even with their additional needs.

Given those differences, the results below show that this group of children are performing similarly to their peers on the key measures described.

The following figure depicts the percentage of children in the study sample that were classed as being above, below or within the typical range for their language and vocabulary.

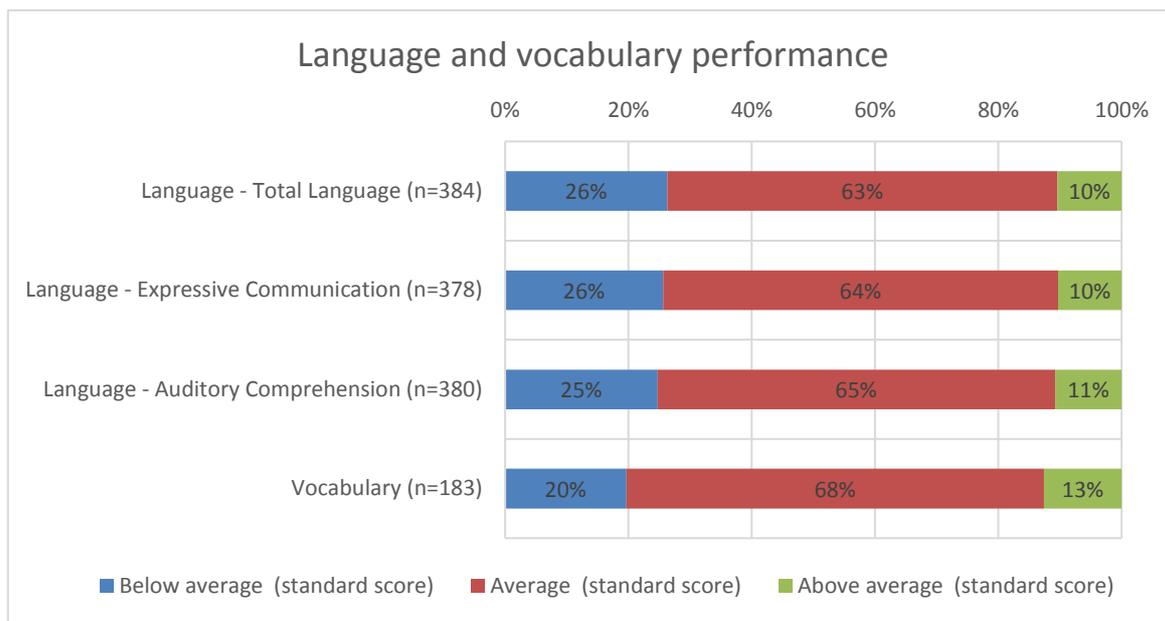


Figure 3: Language and vocabulary

The following figure depicts the percentage of children in the study sample that were classed as being above, below or within the typical range for their speech clarity.

Scores described reported in Figure 4 are, below, relate to percentile ranks. The average range for percentile ranks is between 16 and 84. Accordingly, a percentile rank of less than 16 represents below average performance and a rank above 85, represents above average performance.

Speech data was available for 143 children in the group.

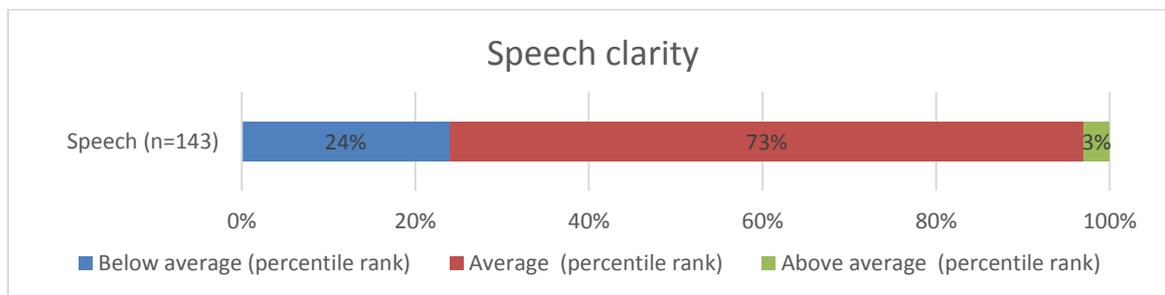


Figure 4: Speech clarity

4. Summary

The results of this analysis show that in 2015 the majority of children enrolled in First Voice early intervention programs achieved language and speech scores in the average range and above when compared with their peers with typical hearing.

The key features of the early intervention programs used by First Voice members include:

- A focus on early diagnosis, early amplification and immediate enrolment into early intervention programs.
- Family-centred listening and spoken language programs with a focus on empowerment of parents/caregivers to create environments promoting listening and spoken language development.
- Ongoing assessment and review of the outcomes achieved to inform the future direction of therapy interventions.

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6. Glossary

Technical terms used within this report are contained below.

Aetiology	The cause or set of causes; in the case of this report this refers to cause(s) of a child or young person's hearing loss.
Audiometric data	Audiometric data is about a person's hearing acuity given variations in sound intensity and pitch (frequency). The database collects information at 0.5, 1.0, 2.0 and 4.0 kHz wherever possible, and at higher frequencies for children and young people whose hearing loss meets the criteria for inclusion as a 'high frequency hearing loss'.
Bilateral hearing loss	Hearing loss affecting both ears.
Confirmation of hearing loss	For the purposes of this database, this is the date at which the hearing loss was first diagnosed.
Cochlear implant	A cochlear implant is an implanted electronic device which provides a sense of sound to the recipient by directly stimulating the auditory nerve with current pulses, rather than via amplified sound as occurs in hearing aids.
Unilateral hearing loss	Hearing loss affecting one ear.