2022-23 Pre-Budget Submission – Investment Proposal to support the expansion of Sound Scouts

28 January 2022

Summary of recommendation

Issue	The rate of hearing loss among children entering school is on the rise and without early screening and appropriate interventions there can be lifelong adverse effects to education, employment, health and mental health and social participation.
Solution	Invest funding to support preventive solutions that increase a greater uptake of screening, including: 1. Boost Sound Scouts capacity to deliver more testing and screening for children in schools; 2. Procure 1,000 Sennheiser HD300 headphones which will see a greater uptake in public schools, where there are challenges for children and teachers to test in quiet environments; and 3. Supporting the development of a new innovative technology solution that trains the brain to listen in noise.
Investment	**$5.5 million over 3 years.**

Introduction

Sound Scouts is an innovative hearing screening application that tests for hearing loss in children through a fun, interactive game using a mobile device. It has been specifically designed to test for sensorineural hearing loss (SNHL), conductive hearing loss (CHL) and listening difficulties in noise (a major cause of which is auditory processing disorder) in children aged from 4 years. It can also be used for teenagers and adults.

Hearing loss can have a significant impact on a person's ability to communicate, be aware of and enjoy their environment, and function fully across most parts of their life. Hearing loss is a chronic health condition experienced by approximately 1 in 6 Australian adults, and this number is expected to increase to 1 in 4 Australian adults by 2050, as a consequence of demographic ageing. [1]

More than one in 10 school-age children from lower socioeconomic backgrounds experience hearing loss (11.5%). Targeted ear and hearing screening programs offer an opportunity to identify hearing loss during critical learning years and seasons, mitigating longer-term effects on education, and social and mental health. Whilst newborns are tested for hearing loss, there is no general regular testing afterwards and therefore hearing loss is often not detected until students leave school. Sound Scouts is supporting earlier detection of hearing loss in children in the schools that utilise the app to conduct school entry screening.

Sound Scouts has been delivering screening since 2015 targeting children aged between 4 and 17 years of age. In 2018, Sounds Scouts was awarded an Australian Government funded contract to facilitate screening across school children making the app free to schools. Since January 2019, Sound Scouts has reached more than 1,900 schools (mainly primary schools) and screened over 75,500 children.

[1] https://www.hcia.com.au/hcia-wp/wp-content/uploads/2017/08/Social-and-Economic-Cost-of-Hearing-Health-in-Australia_June-2017.pdf

In 2021, during the height of the COVID pandemic, Sound Scouts tested nearly 29,000 children during a time when there were widespread closures of schools across NSW and Victoria. While COVID-related disruptions impacted Sound Scouts ability to reach its target number of students, the model proved flexible enough to reach a sizeable number of children in a very difficult operating environment.

Research undertaken by Macquarie University in 2017-18 and published in 2021, included a survey which found users supported the impact of Sound Scouts and were willing to utilise the app. People surveyed liked the app as it was seen as a 'non-medical' way of identifying hearing loss, it is now seen more as a home or educator model of care.

In a more recent survey conducted by Sound Scouts, the overall rating of the app was positive, with 92 per cent of respondents rating their experience as good, very good or excellent. Furthermore, 75.4 per cent of respondents indicated that children unexpectedly received a fail or borderline result suggesting that hearing loss was not always obvious, even to caregivers such as teachers.[2]

Problem

The issue of hearing loss is a common condition around the world and there is a plethora of research and data to support how significant and widespread the issue of hearing loss is. Despite this, there are a limited number of reliable audiological sources for the prevalence of hearing loss specifically in Australia (as is the situation for most other developed countries).

In addition to the health impacts, the economic costs of hearing loss are significant. The last financial costs of hearing loss and the cost to the Australian economy conducted by Hearing Care Industry Association (HCIA) in 2017 was estimated at $15.9 billion. [3]

Sound Scouts engaged Macquarie University Centre for the Health Economy in 2017 to undertake a review to look at the cost effectiveness of the Sound Scouts app solution, by comparing the benefits and costs of administering Sound Scouts to a five-year-old child at home, to the current environment where children are mostly tested for hearing loss if someone (e.g., a teacher) suspects potential hearing loss.[4]

The report found using the implicit federal government cost effectiveness threshold as the value of one quality-adjusted life-year (QALY), there is an approximate $10 return in benefits associated with improved child health-related quality of life (HRQoL) for every $1 spent on costs associated with using Sound Scouts and the subsequent treatment pathway costs.[5]

However, benefits associated with Sound Scouts may be underestimated. Due to data limitations, the economic evaluation model did not account for the potential value of improved childhood development, improved educational outcomes, or improved lifetime income and economic productivity associated with early diagnosis of childhood hearing loss.

Further research reviews have found late diagnosis of childhood hearing loss is associated with significant delays in speech and language development, and literacy development. When left

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[2] Cutler H, 2018, Economic evaluation of Sound Scouts, Centre for the Health Economy, Macquarie University

[3] https://www.hcia.com.au/hcia-wp/wp-content/uploads/2017/08/Social-and-Economic-Cost-of-Hearing-Health-in-Australia_June-2017.pdf

[4] Cutler H, 2018, Economic evaluation of Sound Scouts, Centre for the Health Economy, Macquarie University

[5] The federal government cost effectiveness threshold can be interpreted as the price the federal government is willing to pay for one QALY.

undetected, hearing loss can negatively affect academic achievement, and social and emotional development[6].

Even mild forms of hearing loss can significantly interfere with the reception of spoken language and academic achievement. Children with central auditory processing disorder (CAPD) also have difficulty interpreting speech, and are often inattentive, easily distracted, and find listening to instructions difficult. This can lead to a child being misdiagnosed with an attention disorder, and inappropriately treated with medication.

Australian research suggests undetected hearing loss in children can also lead to lifetime economic problems [7]. Hearing loss increases non-participation in employment later in life, and those with hearing loss are over-represented among low-income earners. International research supports these conclusions.

Hearing loss in children can also significantly affect quality of life. It can cause fatigue in children and increase their risk of developing anxiety and depression. Reduced language can also limit a child's ability to interact with peers, creating social isolation and reduced social activity for a child, leading to feelings of exclusion.

Overall, research has found children with hearing loss experience a reduced HRQoL, including children with mild hearing loss and children with unilateral hearing loss. It can also significantly reduce the parent's HRQoL due to greater stress placed on them from developmental delays in their children.

The rates of hearing loss amgost Aboriginal and Torres Strait Islander children is well documented. In 2018–19, based on self-reported data from the National Aboriginal and Torres Strait Islander Health Survey (NATSIHS), an estimated 14% (111,700) of Indigenous Australians had a long-term ear/hearing problem. The proportion was the same for men and women (14%), and similar for *Remote* (13%) and *Non-remote* (14%) areas. [8]

Ear and hearing problems increased with age. Indigenous Australians aged over 55 had the highest proportion of ear/hearing problems (34%), with deafness accounting for the majority of problems (30%). Children aged 0–14 were more likely to have otitis media than older age groups (2.6% compared with 0.2%–1.0%, respectively). [9]

A study of ear and hearing screening data conducted between 1998 and 2004 in three primary schools in Western Australia showed that up to 42% of Aboriginal children living in urban areas had middle ear disease, and 19.1% of all children exhibited hearing loss, more than double the rate in the non-Indigenous population. Prevalence risk of middle ear disease and hearing loss typically increases with remoteness. However, a comparative study of 408 urban and 438 regional Aboriginal primary school children (aged 3–15 years) from Western Australia showed evidence of OM in 30.7% of the urban cohort and 15.5% of the regional cohort. Other studies have shown that up to 91% of Aboriginal children living in very remote areas have a middle ear abnormality. [10]

Whilst Sound Scouts is having a positive impact in schools providing both education and hearing loss detection, it has also identified that the issue of noisy environments is a significant challenge, with almost 15 percent of children who fail the Sound Scouts test struggling to hear in noise. For example, in a noisy environment where sound is coming from multiple directions – such as in a classroom – a child with listening difficulties in noise (potentially caused by Spatial Processing Disorder) will struggle to distinguish or understand a voice that is right in front of them. That's because their brain has trouble filtering out non-essential sounds.

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[6] https://www.hcia.com.au/hcia-wp/wp-content/uploads/2017/08/Social-and-Economic-Cost-of-Hearing-Health-in-Australia_June-2017.pdf
[7] https://www.mq.edu.au/newsroom/2017/08/21/aussie-start-up-using-game-based-technology-to-spot-child-hearing-loss-a-hidden-aussie-health-scourge/
[8] https://www.aihw.gov.au/reports/australias-health/indigenous-hearing-health
[9] https://www.aihw.gov.au/reports/australias-health/indigenous-hearing-health
[10] https://www.phrp.com.au/issues/december-2021-volume-31-issue-5/risk-factors-for-school-children-not-passing-ear-and-hearing-screening-in-australia/

To focus on a particular speaker in a noisy environment a listener needs to separate or unjumble the stream of signals that arrive simultaneously at the ears from various locations around them. This skill, referred to as auditory stream segregation, relies on neural processes within the auditory pathways of the brain and usually develops with age. However, some children fail to develop normal auditory stream segregation skills, despite having normal, or near-normal sound detection thresholds. As a result, distinguishing important speech (such as their teacher's voice) from background noise (like classmates talking or sports field noise) can be extremely challenging. Even if the child understands enough of the signal to infer the meaning of the message, the effort required may be so great that no mental resources are left for learning and remembering. Reduced understanding resulting from such listening difficulties, especially in the classroom, impacts on learning, and hence on opportunities in life.[11]

Solution

The recently launched World Health Organization World Report on Hearing recommends that all countries implement school screening programs to ensure early detection of ear disease and hearing loss. [12]The current absence of these programs can be attributed to the costs associated with administering screening programs and the relative perceived benefit of newborn hearing screening programs already in place in many high-income countries.

In response to the above, the solution is simple and cost effective – it requires additional investment from the Federal Government to build on Sound Scouts proven, track-record of success, so we can reach more children and young people across Australia, to identify hearing issues early and set more children up for success later in life.

This submission seeks funding to support the following key initiatives:

Recommendation 1: Boost Sound Scouts capacity to deliver screening in more Australian schools

Extend Sound Scouts capacity to deliver more hearing education and screening. Sound Scouts is proposing to create local testing teams in each state and territory to increase screening capacity, which will ultimately lead to more young Australians being tested.

Sound Scouts already engaged a Coordinator in NSW which has led to increased uptake in this jurisdiction. The coordinator contacts schools to introduce the Program. This includes discussing the need for hearing screening, the requirements for testing (including technology) and scheduling test days. The coordinators will also explain the care pathway to the school representative which often includes information on the services of Hearing Australia. Following introduction to the Program schools will typically continue to run the screening program independently. Therefore, Sound Scouts will engage dedicated Sound Scouts Coordinators to work across each remaining state and territory. The Co-ordinators will be supported by screening staff who will conduct the in-school screening.

Finally, we recommend the appointment of one National Manager to sit across all staff in a national coordinating role. We anticipate that this boost in our capacity will allow us to reach more schools and result in an additional 40,000+ tests each year.

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[11] Ashburner, J., Ziviani, J., & Rodger, S. (2008). Sensory processing and classroom emotional, behavioral, and educational outcomes in children with autism spectrum disorder. *Am J Occup Ther, 62*(5), 564-573

[12] https://www.who.int/news-room/events/detail/2021/09/15/default-calendar/launch-of-hearing-screening-considerations-for-recommendations

Recommendation 2: Invest in more quality headphones for Australian students

Procure 1,000 Sennheiser HD300 headphones to distribute to public schools unable to purchase the recommended headphones required to ensure reliable test results and an improved user experience.

These headphones will be distributed through the additional Sound Scouts Coordinator in each state and territory.

Using the Index of Community Socio-Educational Advantage, and in further consultation with government, we would look to target the lower 1,000 socio economic schools across the country.

Distributing the recommended headphones will enable those schools with limited resources to participate in the testing program with the inability to purchase headphones often stated as a barrier to participation. The use of recommended headphones improves the standardisation of the collected data and enables the remote review of tests by the Sound Scouts teams and clinicians to be more effective. Sound Scouts has also released an update allowing adults with hearing loss to supervise testing however this feature is only accessible to those using the recommended headphones.

Recommendation 3: Support the development of innovative solution to hearing in noise issue

Sound Scouts will build a new treatment solution to help children from any language background who are experiencing auditory-based listening difficulties, to function in noisy environments through computer game play.

A new computer game – referred to as the Language Independent LiSN & Learn (LI L&L) - will be designed and evaluated by Macquarie University and developed and distributed by Sound Scouts. There will be significant improvements to this new computer game that will be introduced in respect to the virtual environment created, the target and distractor stimuli presented and player engagement strategies which the existing solution Sound Storm has failed to address.

This development is a joint partnership between the private sector, academia and potentially government. Already, our industry partner, Sonova has committed $270,000 to the program.

Sound Scouts has invested $100,000 to support the preliminary research, design and development of this new treatment solution but with additional Government investment we can accelerate the design and implementation with a release of the new treatment by late 2022, early 2023.

How Sound Scouts works

Sound Scouts is an innovative hearing screening application that tests for hearing problems through a fun, interactive game using a mobile device. It has been designed to test for hearing loss and listening difficulties in noise in children aged from 4 years but can also be used for teenagers and adults.

Sound Scouts incorporates a series of hearing tests into an 8minute game-based solution, designed to keep children engaged throughout the testing process.

Accessing Sound Scouts via the Internet provides a more convenient way to conduct a hearing screen for children compared to seeing an audiologist, particularly for those living in rural and remote communities. Combined with a relatively cheap price, it can promote equity of access to hearing screening in terms of geographical location, socio-economic status, cultural background and timeliness.

The Sound Scouts software has been designed to provide an immediate, automated report indicating the client's test results. Retests are recommended for those who fail to minimise false positives. Support staff at Sound Scouts review results to cross-check referrals to the appropriate health care pathways for early intervention.

Sound Scouts game

The Sound Scouts game utilises the latest game-based technology to collect valuable hearing data that is then automatically analysed against established norms, to determine if the child has a hearing issue.

Screening outcomes from Sound Scouts are either 'pass' (no hearing impairment detected), 'borderline' or 'fail'. If the child does not pass the test, Sound Scouts suggests the most likely type of hearing loss and provides details and recommendations for a follow-up assessment to a GP or an audiologist (typically Hearing Australia) or speech pathologist.

The Sounds Scouts Program is delivered and implemented by:

- Introducing the Service to schools across the country (via our Sales and Marketing team);
- Sound Scouts educators provide guidance, oversight and support of testing;
- Sounds Scouts staff run training webinars for those educators wanting more information about the Service, hearing loss and how the app works which often includes explaining how Hearing Australia's service can be accessed if a permanent loss is detected;
- Sounds Scouts creates and provides collateral for educators to share with students and parents;
- Sounds Scouts developers work across the website, the Platform and the App implementing improvements to ensure issues raised by customers are addressed;
- Sounds Scouts developed a Management Platform to make it easier for schools to test and manage large numbers of students (this enhancement is an example of what was asked for by the schools which we were happy to action); by doing this we have been able to make the service more robust and further encourage universal screening rather than targeted testing;
- Recent improvements removing the need for an adult with normal hearing to complete the calibration when testing with our recommended headphones, will better enable Aboriginal and TSI health workers (with hearing loss) to oversee testing;
- Sounds Scouts promote the Service via a range of channels including direct sales to schools across all states and territories and social media.

- review our data to ensure our test results continue to be reliable and scientifically robust (Sounds Scouts conducted a major review of more than 55,000 results at the end of 2020).
- maintain our registration as a medical device including our upscaled obligations to comply with Class 11A of the regulatory standards

Implementation and Costings

$5.5 million over three years - the below table sets out the indicative costings.

Recommendation 1: Boost Sound Scouts capacity to deliver screening in more Australian schools

	FY 2022-23	FY 2023-24	FY 2024-25	Total
• 1 National Sound Scout Manager	$135,000	$150,000	$150,000	$435,000
• Equipment (iPads)	$15,000	-	-	$15,000
• 5 State-based Coordinators (Victoria, South Australia, Queensland, Northern Territory/ Western Australia, Tasmania)	$425,000	$425,000	$425,000	$1,275,000
• 2 Screening Staff in each of the following jurisdictions - Victoria, South Australia, Queensland, Northern Territory, Western Australia, Tasmania	$558,600	$558,600	$558,600	$1,675,800
Total	$1,133,600	$1,133,600	$1,133,600	$3,400,800

Recommendation 2: Invest in more quality headphones for Australian students

	FY 2022-23	FY 2023-24	FY 2024-25	Total
• 1,000 Sennheiser HD300 headphones	$900,000	-	-	$900,000
Total	$900,000	-	-	$900,000

Recommendation 3: Support the development of innovative solution to hearing in noise issue

	FY 2022-23	FY 2023-24	FY 2024-25	Total
• University research team	$200,000	$200,000	$200,000	$600,000
• Sound Scouts management costs	$50,000	$50,000	$50,000	$150,000
• Sound Scouts Development Team	$150,000	$150,000	$150,000	$450,000
Total	$400,000	$400,000	$400,000	$1,200,000

About Sound Scouts

Sounds Scouts is an Australia innovation that was created through research and development conducted in collaboration with the Australian Government's National Acoustic Laboratory. It has been validated within the Australian population and provides users with referral pathways for early intervention, treatment and/or management of detected hearing loss.

Sound Scouts is an innovative hearing screening application that tests for hearing problems through a fun interactive game using a mobile device. It has been designed to test for hearing loss and listening difficulties in noise in children aged from 4 years but can also be used for teenagers and adults.

Sound Scouts incorporates a series of hearing tests into a 10-minute game-based solution designed to keep children engaged throughout the testing process.

Contact Details

Carolyn Mee
CEO
Sound Scouts
Phone: 0414 400 114
Email: carolyn@soundscouts.com.au