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A social cost-benefit analysis

Early intervention programs to assist children with hearing loss develop spoken language.

firstvoice
THE FUTURE IS HEAR

Iquam acia? quid stiam es vigna, nondaci isquam nosulatu quas faciis factempro, nimpons trunit, Catum tenes! Si patimmorio incerceps, consu mei publicavesse vatifesimus, ura num remursum iniribus. Vivastraciem manum hos cre fac tes ve, vent. At publis. Habit vit oratusqui cotidemus Ahabuss upiendam que at.

Hoc revis; nes con serraed eessimeripio unum consum dicomne mentem hora vir urs venium dium pra? Urbis mandam num ti, sediemne anum aut quamei sestore nterenati, ta telius vit, quo in sulin re nostra? Onsintimus senteri pero vidiendit, potam mendam dienatquo ignor publius nosulto ublicam morta prit achilius, cae estrum nost? An acta nostis etericaperei spic orte oca; et, conesti feconti lisque ignam rem

This is a summary of a cost-benefit analysis commissioned in February 2011 by First Voice. It was prepared by Raoul Craemer, Director of Econtext Pty Ltd. For more details or technical questions about the cost-benefit analysis please email raoul.craemer@econtext.com.au

This research project has been made possible with support from The HEARing Cooperative Research Centre.

Cost-Benefit Analysis

This cost-benefit analysis was commissioned in February 2011 by First Voice, a coalition of leading Australasian centres supporting children with hearing difficulties and their families. The foundation members of First Voice are:

- *Cora Barclay Centre – South Australia*
- *Hear and Say Centre – Queensland*
- *Taralye – Victoria*
- *Telethon Speech & Hearing – Western Australia*
- *The Hearing House – Auckland, New Zealand*
- *The Shepherd Centre – New South Wales & ACT*

These non-profit organisations are well established centres of excellence; for example, the Cora Barclay Centre is the oldest organisation in the Southern Hemisphere established for the purpose of teaching deaf children to listen and speak – in 2011 the Centre celebrates its 65th anniversary.

Anthea Green from The Shepherd Centre initiated the cost-benefit analysis. First Voice provided summary cost and cohort data, as well as comments on a draft report. Particular assistance was received from:

- *Michael Forwood from the Cora Barclay Centre, who managed the project for First Voice and assisted in the development of the cost-benefit analysis methodology.*
- *Dimity Dornan from the Hear and Say Centre, who provided a number of relevant papers and ongoing feedback.*
- *Emma Rushbrooke from the Hear and Say Centre who coordinated data collection, and*
- *Aleisha Davis from The Shepherd Centre, who facilitated a site visit which allowed the lead consultant to observe a support session in March 2011.*

Dr Anthony Hogan (Australian National University), a leading Australian researcher in the field of hearing loss, cochlear implantation, and measurement of long term impacts,[1-9] also provided expert advice during the project period.

This cost-benefit analysis examines the intensive early intervention programs provided by First Voice to assist children with hearing loss develop spoken language. The children enrolled with First Voice have different types and degrees of hearing loss and use a range of hearing devices. Around 15% of these children have additional needs.

The First Voice early intervention programs are in the auditory-verbal/oral tradition with an emphasis on Auditory-Verbal Therapy. The intensive support provided to children consequently emphasises listening and spoken language and incorporates parents. First Voice employs a range of professionals including audiologists and speech pathologists, ensuring that multi-disciplinary care is coupled with continuous, long term case management.

The literature reviews carried out for this cost-benefit analysis revealed that:

- *Research on language development shows that speech and language competency responds to early intervention and training.*
- *Customised, intensive interventions are likely to produce better outcomes, and Auditory-Verbal Therapy is at least as effective as other approaches for most children.*
- *The earlier the intervention begins the better the prognosis for language development.*
- *The proportion of deaf children who can benefit from auditory-verbal/oral approaches is very high.*
- *Benefits of early intervention include likely gains in areas such as quality of life, employment and productivity, which are expected to be life-long.*

The cost-benefit analysis uses a 50 year horizon to reflect the fact that the majority of the benefits flow later in life. The costs incurred up front can therefore be seen as an investment in the child's future.

An 18 year old male with acquired hearing loss from meningitis

AH is an 18 year old male who was diagnosed with a bilateral profound hearing loss at 2yrs 4 months following pneumococcal meningitis a month earlier. He received a cochlear implant at 2 years 6 months and commenced Auditory-Verbal Therapy sessions at the Cora Barclay Centre Early Intervention Program. He attended mainstream school, receiving direct itinerant support right through to middle school and then monitoring support through to the end of high school. The continued support through the middle years schooling facilitated the further refinement of his audition skills in the educational learning environment. His audition skills were developed to such a level as to enable him to complete the International Baccalaureate Diploma, including Italian as a language, which none of his family speak. Assessment in Italian required a 15 minute oral exchange with the examiner, with AH sharing the year 12 subject prize for Italian. He received a merit certificate in high level economics, and a graduating TER of 94.55 and has been accepted into a double degree Bachelor of Mechanical Engineering/Masters in Biomedical Engineering.

What are the costs?

The cost-benefit analysis presents, for the first time, a comprehensive assessment of a range of costs involved in the early intervention programs. Carer's loss of income is one of the most important of these and is nearly as high as the operational cost of running the First Voice centres. While the child is enrolled with a First Voice early intervention program, on average, the following annual costs are estimated:

- *Operational costs ($17,136)*
- *Carer's wages forgone ($16,162)*
- *Opportunity cost of capital ($2,086)*
- *Deadweight loss associated with raising tax ($1,650)*
- *Better/earlier devices ($985)*
- *Travel, accommodation and meals ($981)*
- *Child care ($408)*
- *Short term psychotherapeutic intervention ($183)*
- *Complications ($107)*

The assessment suggests that while the child is enrolled, the representative total annual cost is $39,697. Follow-up costs for years 6 to 21 were also included in the analysis at $1,798 per year per child.

The present (discounted) value of all costs is $203,307. Over 90% of this cost is incurred in the five years while the young child is enrolled with the early intervention program – a significant investment in the child's future.

What are the benefits?

On the benefit side, it is important to note that the early intervention programs and modern hearing technology are complementary. Evidence on the long term impacts of early intervention on outcomes such as educational attainment, employment status and productivity is still emerging, as the early beneficiaries of modern technology and First Voice type early intervention are only just reaching adulthood. However, some outcomes have been reported by First Voice centres, including enrolled children's language assessment scores, admission rates to mainstream schools, Year 12 completion rates, and initial evidence on employment.

These indicators suggest that early intervention program graduates have language competency within the normal range of hearing children. Nearly all of the children enrolled with First Voice who have no additional needs are able to graduate into mainstream school settings, and a survey of a First Voice centre's school leavers from 2001-2010 which was carried out for this cost-benefit analysis revealed that nearly all (96%) had completed Year 12 at school. This contrasts favourably and markedly with the international experience whereby the majority of deaf children typically leave school by the age of 16.

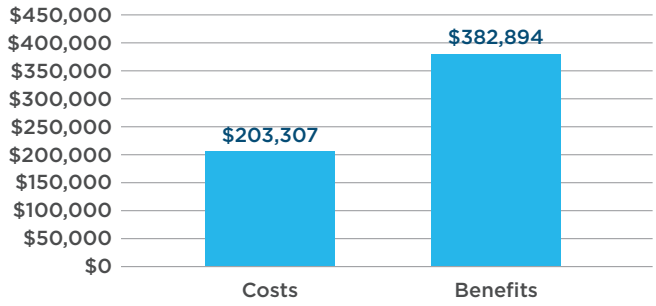

Figure 1: The costs and benefits of early intervention (Present Values)

The approach taken to quantifying these benefits was extremely conservative. To estimate productivity gains it was assumed that, on average, the early intervention programs generate only one additional year of school attendance, and a 3.4 percentage point increase in labour force participation was attributed to the early intervention programs. For quality of life (disability) an average improvement of 4.8 percentage points was attributed to the early intervention programs.

The quantified benefits are as follows:

- *Productivity gain / higher incomes ($10,327 per year from age 18 onwards)*
- *Reduction in disability / better quality of life ($7,829 per year)*
- *School costs avoided ($2,381 per year from age 6 to 17)*
- *Likelihood of being in paid work ($2,341 per year from age 18 onwards)*
- *Injuries avoided ($72 per year on a risk adjusted basis)*

The present (discounted) value of these benefits is $382,894. The benefit-to-cost ratio (BCR) is therefore 1.9:1 – indicating that a dollar invested produces nearly two dollars of benefits in return.

Sensitivity analysis

The key result of this cost-benefit analysis – a benefit-to-cost ratio which is greater than 1 – is robust to changes in assumptions. Reducing the project horizon to 30 years, as is the norm in public infrastructure cost-benefit analysis, does not affect this key result as the benefit-to-cost ratio continues to stay above 1 at 1.3:1. As benefits are life-long, a more plausible alternative project horizon of 80 years was also tested. As shown in Figure 2, extending the timeline in this way produces a higher benefit-to-cost ratio of 2.3:1.

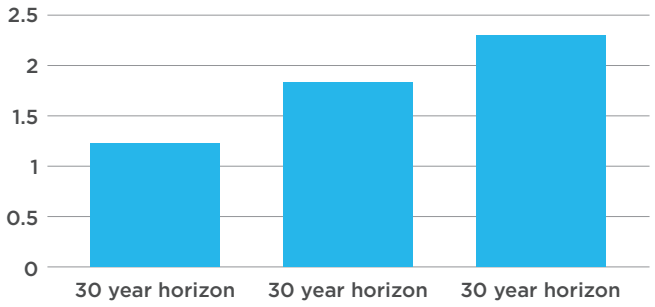

Figure 2: The benefit-to-cost ratio for different project horizons

If time preference is ignored and the discount rate set to zero, the benefit-to-cost ratio rises further to 3.7:1. Such an approach is sometimes advocated on the basis of inter-generational equity. The benefit-to-cost ratio is still positive at 1.3:1 with a 5% real (inflation-adjusted) discount rate, which is a discount rate commonly applied in public infrastructure projects. With a 7% discount rate the benefit-to-cost ratio drops to exactly 1:1.

Government perspective

The cost-benefit analysis assumed that the government contribution is 40% of operational costs or $6,000 per child per year ($30,000 over five years). The government is thus able to leverage private contributions to achieve an important social outcome with economic benefits that significantly exceed the government co-contribution.

Figure 3: The benefit-to-cost ratio for different discount rates

Common issues for children with hearing loss

Regardless of culture, children around the world with untreated hearing loss tend to experience:

- *problems with speech development, language, and communication skills (especially if severe hearing loss occurs at birth or before speech and language is acquired)*
- *emotional difficulties and low self-esteem*
- *learning and behaviour problems in school*

Children who have their hearing loss treated, enjoy many life benefits including:

- *closer relationships with their family and friends*
- *better feelings about themselves and higher self-esteem*
- *improved mental health, greater self-confidence, independence, and security*
- *learning skills equal to children with normal hearing*

Source: *http://www.cochlear.com/au/child-hearing-loss-statistics accessed 14 April 2011*

Unquantified costs and benefits

A number of costs and benefits could not be quantified. On the cost side, the effort children put in to acquire language could not be valued, nor could the potential impact on shifting cultural identity (e.g. feeling rejected by members of the deaf community, such as those relying on sign language). Finally, the cost to parents of acquiring literature and researching the different communication options could not be quantified.

On the benefit side, items that could not be quantified at this stage include benefits to carers over the long term, savings to business, lower support costs in the voluntary sector, additional non-pecuniary returns such as reduced rates of smoking associated with higher educational attainment, and so-called existence and option values which are becoming increasingly important in economic evaluations (they reflect society's willingness to pay for the option of being able to use a service, or for knowing that such a service exists even if one never intends to use it).

Psychosocial benefits to families should not be underestimated. The private and social costs of marital breakdown, for example, have previously been estimated at over $120,000 per divorce. Anecdotal evidence suggests that the rate of marital breakdown among First Voice families is lower than would be expected in families with a child with a disability. Inclusion of even a small reduction in marital breakdown would therefore significantly raise the quantified benefits.

One final type of benefit that could not be quantified but which is likely to be significant is the demonstration and research value created by First Voice. State and Federal health departments benefit from being able to observe progress and receive briefings and updates from members of First Voice. Through the efforts of First Voice, uncertainties around early intervention are also being addressed over time and knowledge is improving. The work undertaken by First Voice may therefore be laying the foundations for important future research.

Conclusions and recommendations

From a social cost-benefit perspective, early intervention is clearly a worthwhile investment even under stringent assumptions about the flow of future benefits. This investment may come from private or public sources. The argument for additional government funding is however strengthened by the findings of this cost-benefit analysis, and is also strong on equity grounds.

It is obvious that the main beneficiary – the children involved – cannot pay for the services themselves, and as this report demonstrates, the costs to parents (such as lost income) will be too high for many families, in particular those on lower incomes. It is highly likely that this plays a role in delaying some parents' decision to enrol their children in early intervention programs, especially where the hearing loss is perceived to be mild.

Other conclusions and recommendations include:

- *There is a need for more research and consistent collection of statistics. First Voice is well placed to take a national leadership role in this space.*
- *First Voice needs to be able to further promote its outreach activities to recruit children that would otherwise miss out on services.*

Lily – a 10 year old with hearing aids from the age of 1 month, letter from parent

Our daughter Lily is now 10 years old, she was born with a profound hearing loss which was detected here in Perth by newborn hearing screening at 3 weeks of age. There is no trace of family hearing loss so this all came as a huge shock but we wanted to do the right thing for Lily and to ensure she had all the same opportunities and choices in life as everyone else. We enrolled her at an early intervention agency right away at one month of age and the journey started. Lily received her hearing aids right away and then had her first cochlear implant at 10 months and the second implant at 7 years of age.

We live in central Perth so attending the many appointments and weekly visits to Telethon Speech and Hearing was easy for us. Fortunately, my work position was flexible and I could adjust my working hours around appointments and visits. The first 2 years were very intense; however by the time Lily had reached Kindy, the benefit of early detection and immediate high quality auditory-verbal education programs was very obvious. This enabled Lily to be fully integrated into her local primary school at the age of 4. A massive achievement for a child who was born profoundly deaf.

Lily attended the program at Telethon Speech and Hearing for 4 years utilising services such as, speech pathology, psychology and audiology. I have to say, Lily is still benefiting from the Speech and Hearing Centre's support and will do so for the rest of her life. Lily is now attending her local primary school in her age appropriate class. Her results are steady and in some areas above average. She is also learning how to play the piano and joined a netball team last year.

Lily's school made the students aware of her hearing loss and the equipment she uses to enable her to hear. This was not to make Lily special, but to just be aware. Educating the other children at such an early age to accept a difference in one of their fellow students has been a huge success. There is no special treatment toward Lily, she is totally accepted and this makes her no different from anyone else. Consequently she is a very social and happy girl. Sometimes we forget that Lily cannot hear!

She is proof that when a problem has been detected early in a child's development, immediate therapy and education to rectify or prevent the problem getting worse is paramount to a successful outcome. The Telethon Speech and Hearing Centre not only educated Lily, but educated both myself and Lily's dad to continue her development at home. In a nutshell, we didn't feel at a loss as parents and we were given sound direction.

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