Special session: Intervention and outcomes of children detected with hearing loss

- Longitudinal outcomes of children with hearing loss: early vs later intervention … *Ching TYC*
- Speech-language development of children identified through UNHS … *Mukari SZ*
- Auditory threshold amelioration during the first year of life in severely/profoundly deaf children … *Trevisi P*
- Communication development in early-identified children with mild and unilateral loss … *Fitzpatrick EM*

National Acoustic Laboratories

THE HEARING CRC

Longitudinal Outcomes of children with hearing impairment (LOCHI): 5-year outcomes

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National Acoustic Laboratories, HEARing CRC

HEAL 2014, Cernobbio - June 5-7, 2014. Special Session.

Why LOCHI?

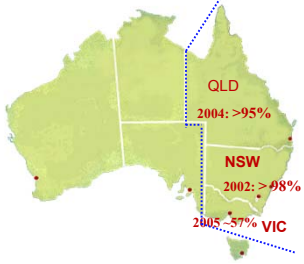
- Congenital hearing loss greatly reduces children's language, psychosocial skills, academic attainment and life chances *(Thompson et al, 2001; Moeller et al, 2007; Nelson et al, 2008).*

- UNHS aims to alleviate huge burden of disability
- 2008 US Preventive Services Task Force
  - "Moderate certainty that net benefit of screening all newborn infants for hearing loss is moderate"
  - Based on a single quasi-randomised trial
- Research on population outcomes scant

Australian Hearing

In 2005,

Longitudinal
Outcomes of
Children with
Hearing
Impairment …

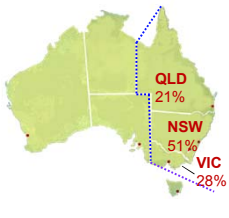


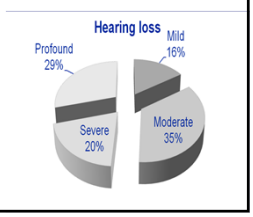
Aims

- Does UNHS and early intervention improve language outcomes, at *a population level*?
- What factors influence outcomes?
- Does early performance predict later outcomes?

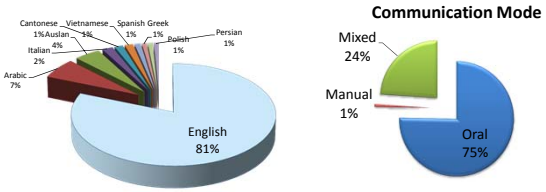
Method

- About 460 families from 3 states,
- ~ 53% received intervention before 6 months
- ~ 20% with non-English speaking background
- ~ 37% have additional disabilities

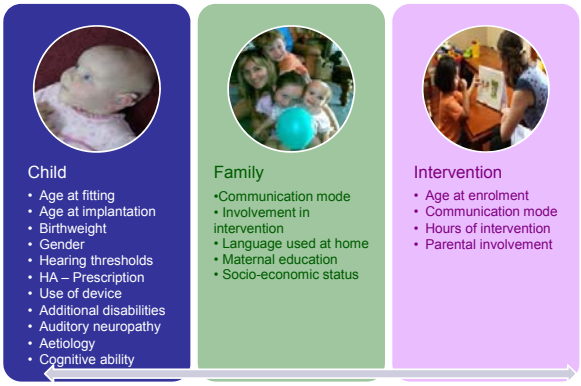




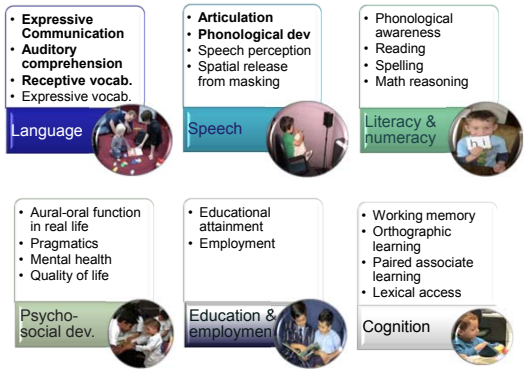
Language use and communication mode at home



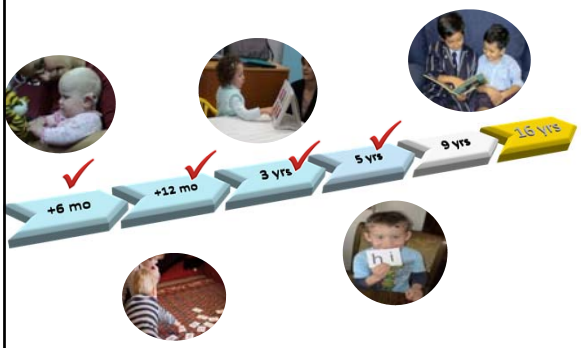
We collect a range of information,



And measure children's outcomes …



At multiple intervals as they grow

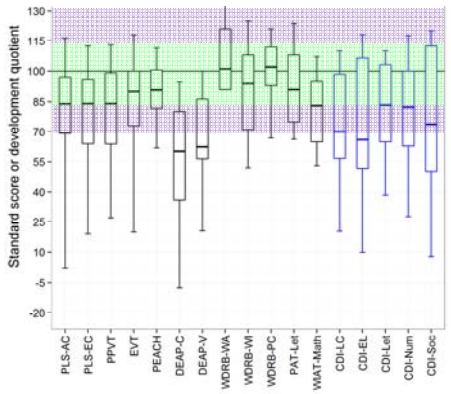


AT 5 YEARS,

Hearing devices at age 5 years

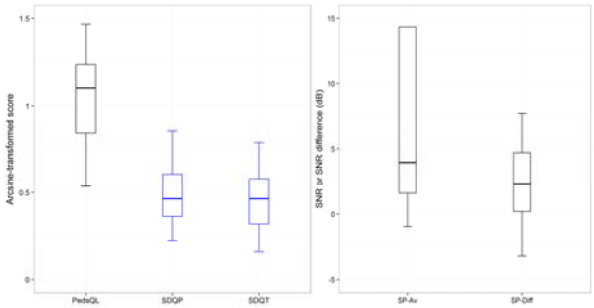
	No CI	One CI	Two CIs
No HA	12	14	93
One HA	20	56	-
Two HAs	272	-	-
	304	70	93

Age 5 Test scores: 25th, 50th, 75th percentiles…



Psychosocial skills

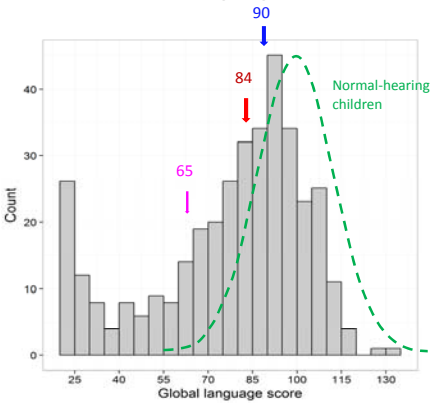
Speech perception



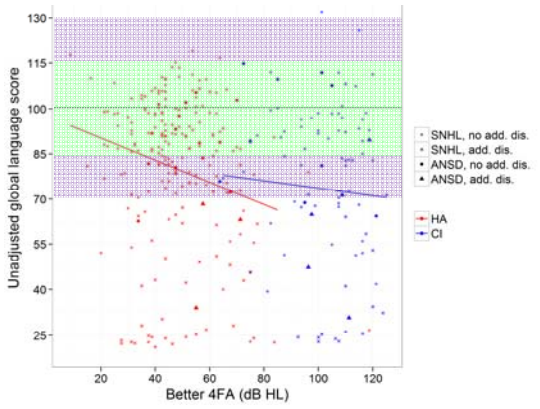
To analyse results,

- Combine 20 test scores into a global language score using factor analysis,
- Fit regression models separately for
  - Children using hearing aids
  - Children using cochlear implants

Distribution of Global language Scores



Global language scores



Predictor variables

- Age at first fitting
- Age at CI activation
- 4FA hearing loss
- Gender
- Birthweight
- Presence of additional disabilities
- Presence of auditory neuropathy
- Hearing aid prescription
- Non-verbal cognitive ability
- Maternal education
- Socio-economic status
- Communication mode in early intervention

Children with hearing aids

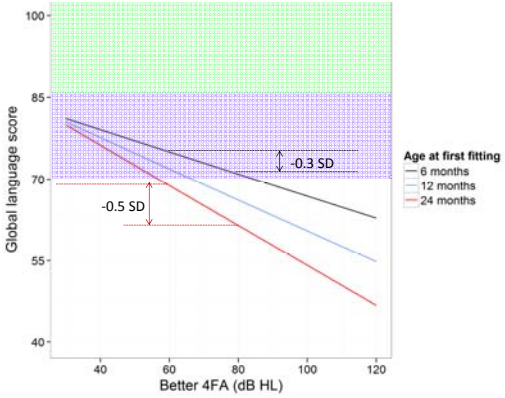
Significant Predictors for 243 children with HA

Impact of category change. For continuous variables, variation as per specification.

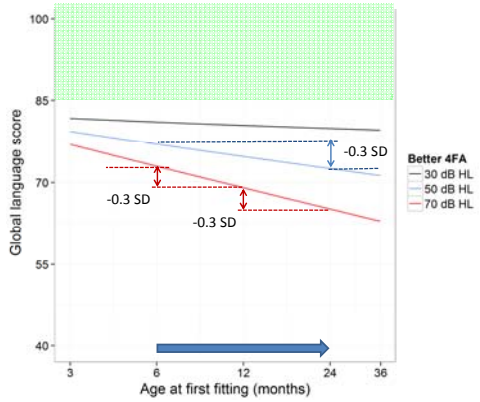
$R^2 = 0.77$

Predictor ($R^2 = 0.74$)	Significance (p)	p – value
Age first fit (log)	0.003	0.11
4FA hearing loss ($R^2 = 0.69$)	<0.001	0.002
Log Age first fit x 4FA	0.07	0.06
Cognitive ability/WNV	<0.001	<0.001
Gender	0.16	0.19
Birthweight	0.73	0.08
Other disability	0.04	0.13
Maternal education (uni re school)	<0.001	0.01
Socio-economic status (dec)	0.39	0.44
Communication mode (other re oral)	0.007	0.009
ANSD	0.59	
HA prescription	0.64	

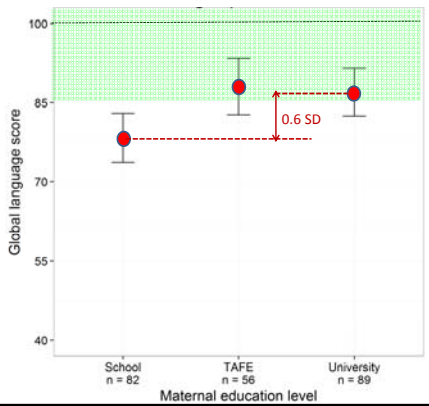
Effect of hearing loss, for different age at fitting



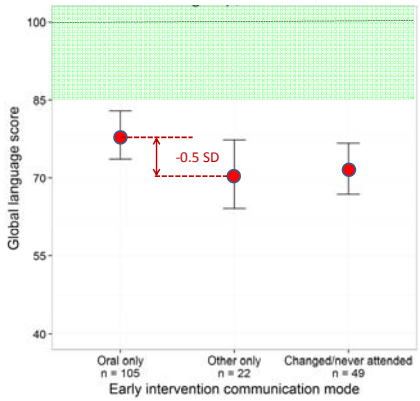
Effect of age at fitting, for different hearing loss



Maternal education



Communication mode in early education



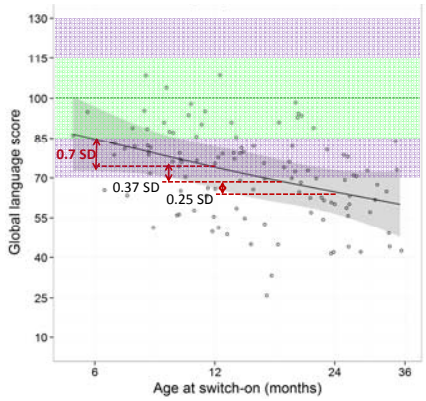
Children with cochlear implants

Significant Predictors for 114 children with CI

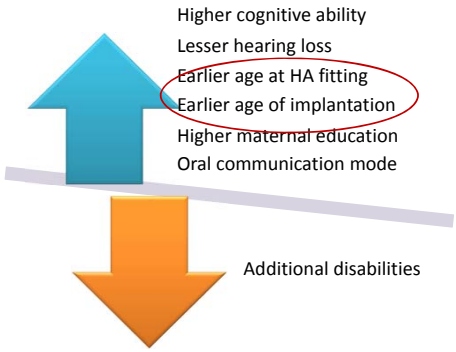
Impact of category change. For continuous variables, variation as per specification.

Predictor (R^2 = 0.70)	Significance (p – value)	Impact
Age first switch on (log)	0.001	
4FA hearing loss	0.60	-0.06 (-0.30,0.17)
Cognitive ability/WNV (R^2 = 0.58)	<0.001	0.53 (0.37,0.69)
Gender (Female re male)	0.15	4.84 (-1.73, 11.42)
Birthweight	0.79	0.51 (-3.27,4.3)
Other disability	<0.001	-19.1 (-28.39,-9.83)
Maternal education (Dip re school) (university re school)	0.20	4.64 (-4.33,13.61) 8.28 (0.76,17.32)
Socio-economic status (dec)	0.40	2.3 (-3.05, 7.65)
Communication mode in Edn. (other re oral) (changed or nil re oral)	0.04	-12.38 (-24.5,-0.31) 2.56 (-7.42,12.55)

Delaying CI switch-on decreases language ability

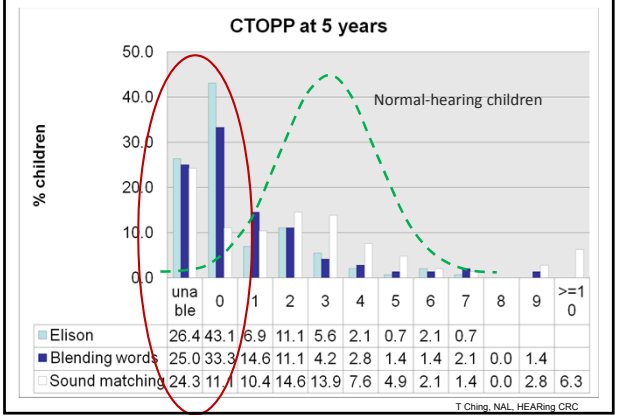


Yr 5 global language development …



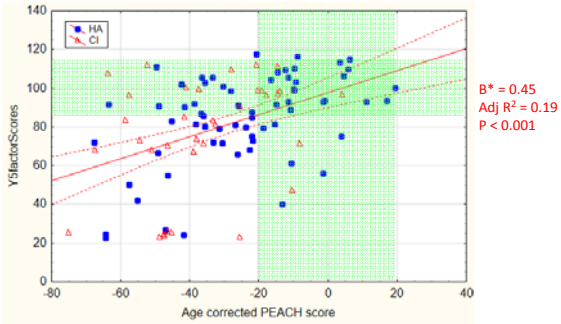
HEARING TO READ

Phonological awareness (n = 144)



FROM EARLY TO LATER OUTCOMES,

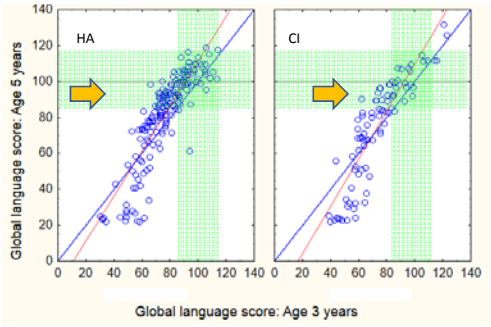
Early PEACH and 5-yr language



If early PEACH were the only predictor,

It accounted for
22% of total variance - HA
17% of total variance - CI

From 3 to 5 years,



What enable some children to close the gap?

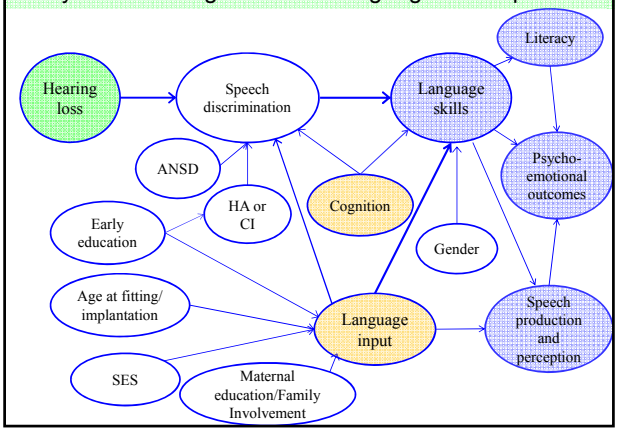
SUMMARY

Does UNHS improve outcomes?

Yes!

Early age at hearing-aid fitting
Early age at cochlear implantation

Why does hearing loss affect language development?



Does early performance predict outcomes at 5 years?

Yes!

- Early language ability was a significant predictor of language at 5 years
- Early Functional performance in real life (PEACH) was a significant predictor of language at 5 years.

To do …

- Streamline services to ensure early fitting and implantation
- Monitor early outcomes to identify children who may be "at-risk" of language impairment
  - Early functional performance
  - Objective evaluation of detection (+ discrimination)
- Devise evidence-based strategies for intervention

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