



uOttawa

Children with unilateral hearing loss: A glimpse at clinical practice, outcomes, and parent experiences

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Disclosure

- No conflicts of interest related to any research
- Phonak sponsorship for travel/accommodations for this conference



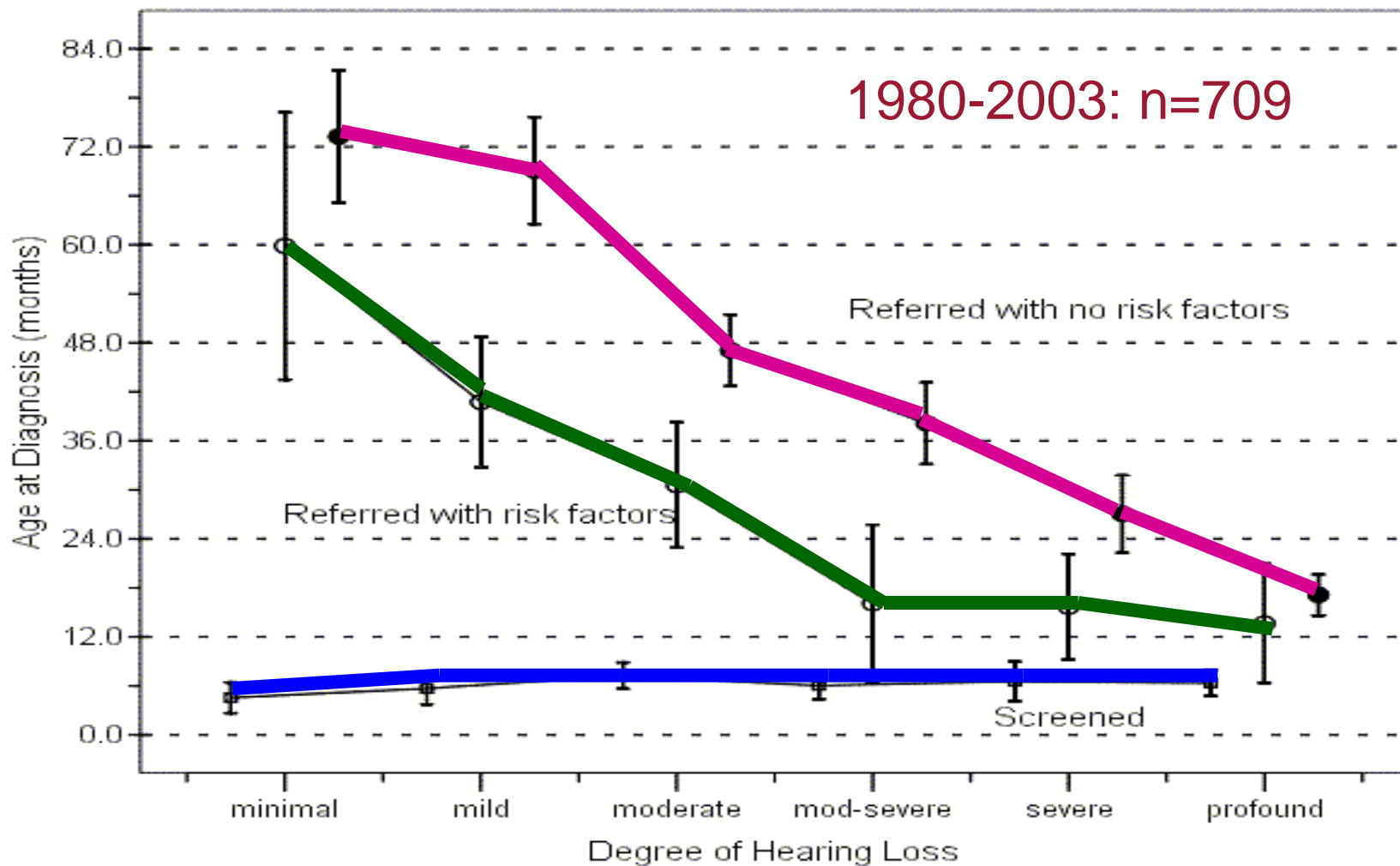
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- Children's Hospital of Eastern Ontario (CHEO)
Audiology Team





Age at Diagnosis by Degree and Route





Audiologists' perspectives

I would say that my concept of the impact of unilateral hearing loss has really changed. I treat unilaterals more seriously than I ever used to. We used to kinda say, oh, unilateral, he'll compensate, he'll compensate...

Now I tell parents, ... they will develop speech and language just like a child with two ears, generally speaking. but I do tell the parents that they are more at risk, certainly at school and in acquiring language because they are going to have much more trouble in noise and much more trouble with distance.



Audiologists' perspectives

And the old standard [applies]... a hearing loss is a hearing loss, is a hearing loss to the parent.

I need more [information] on unilaterals, I feel more comfortable with bilaterals than I do with unilaterals. In terms of saying this is what I should do. I have a harder time...



New challenges from newborn hearing screening:

Children with mild bilateral
and **unilateral** hearing loss (MUHL)



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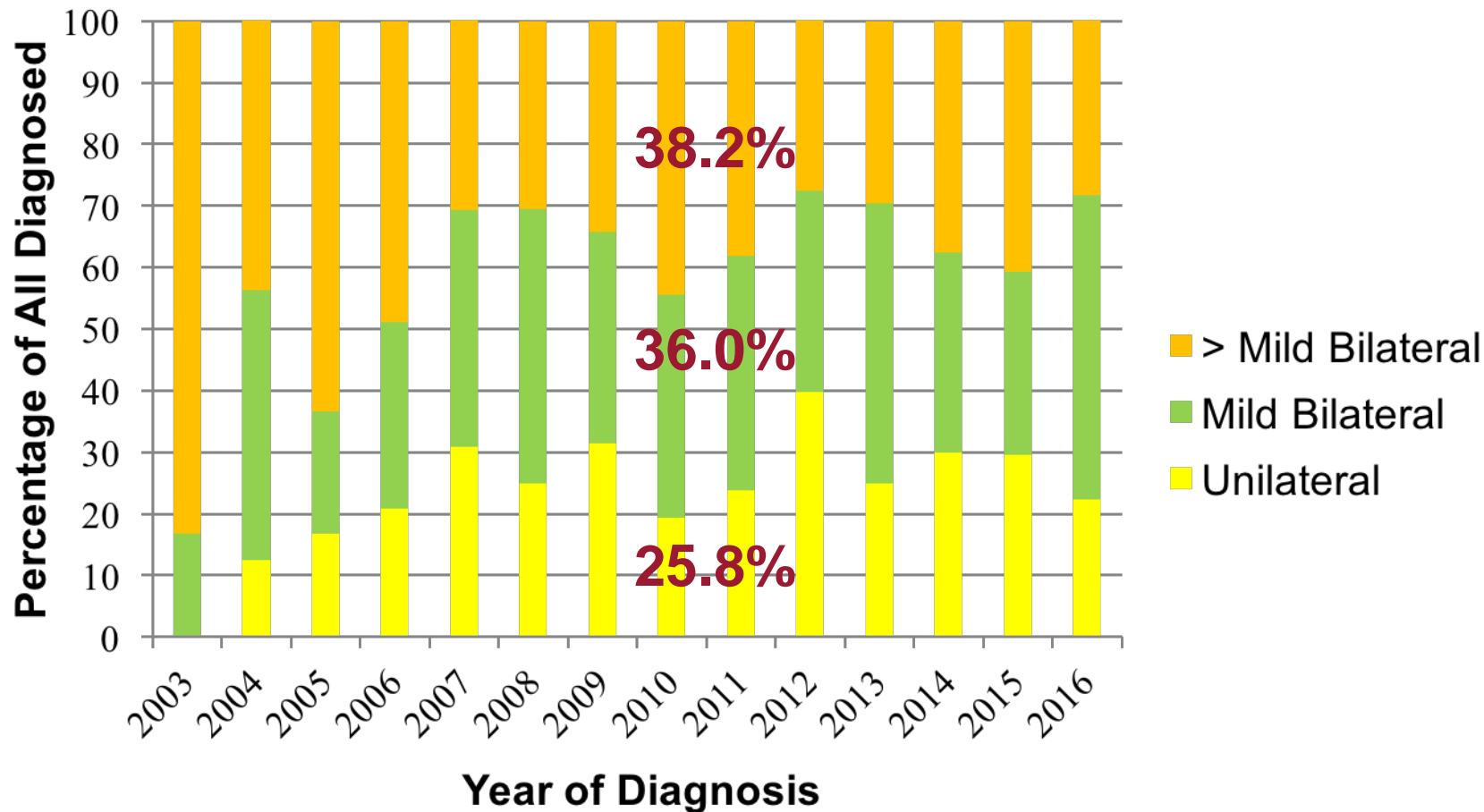
Ottawa context

- Screening 2002/2003
- ~14,000 babies annually
- > 95% coverage
- Ontario protocol – 2 stage hospital and/or community screen
- Diagnostic audiology: Children's Hospital of Eastern Ontario (CHEO)



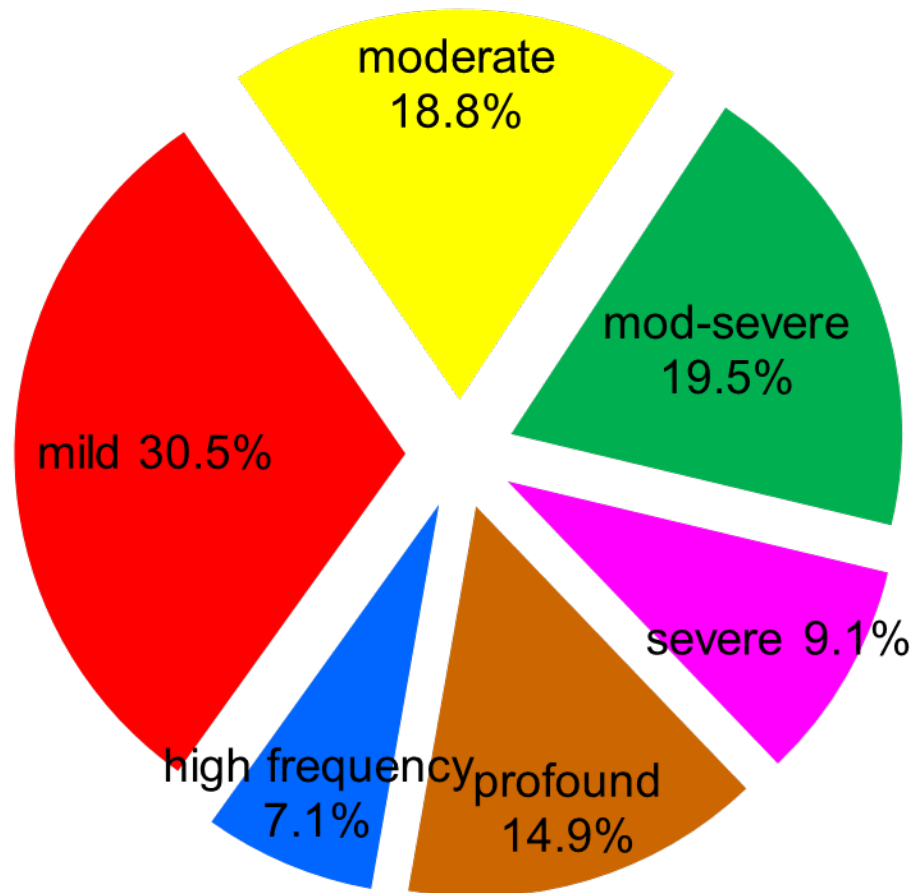


Profile of HL for children diagnosed at CHEO n=598





Degree of HL (impaired ear) for 154 children with UHL at diagnosis (2003-2016)





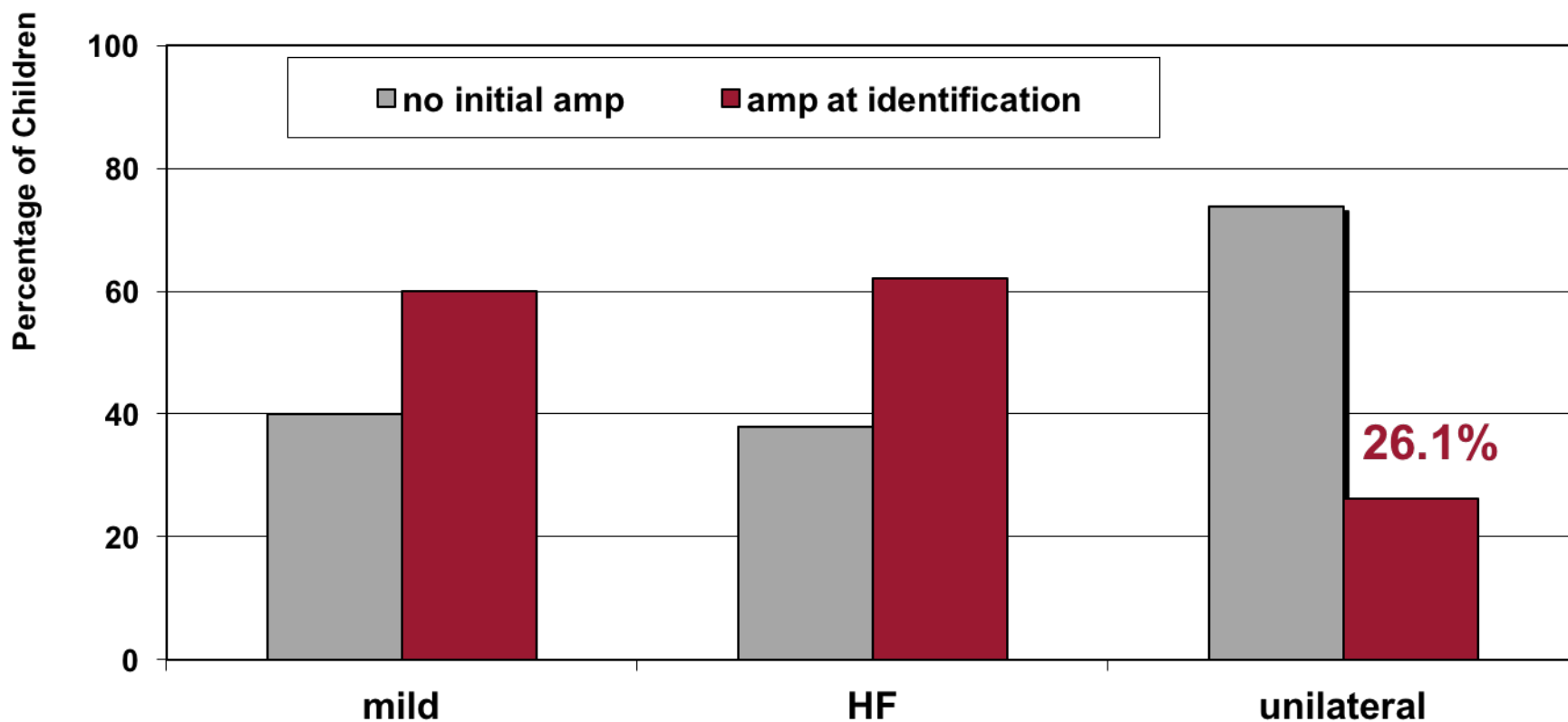
2010 – what we learned

- **Cohort identified 1990-2006**
 - *291 of 670 = UHL/mild bilateral*
 - *255 with chart info - **n=46** with UHL*

- **Age diagnosis = 60.4 months** (IQR: 50.3–82.3)
 - *only 20% screened*



Amplification recommendation by HL at identification (n=255)





Amplification practices

- 91.4% overall received a recommendation for amplification over time....
- For mild bilateral: Amplification decision related to:
 - ✓ *Age of identification* ($p < 0.001$)
 - ✓ *Better ear hearing* ($p = 0.002$)
 - *Not related to worse ear hearing* ($p = 0.84$)
- For UHL: Amplification decision:
 - *Not related to age identification* ($p = 0.96$)
 - *Not related to degree of hearing loss* ($p = 0.23$)



Amplification use

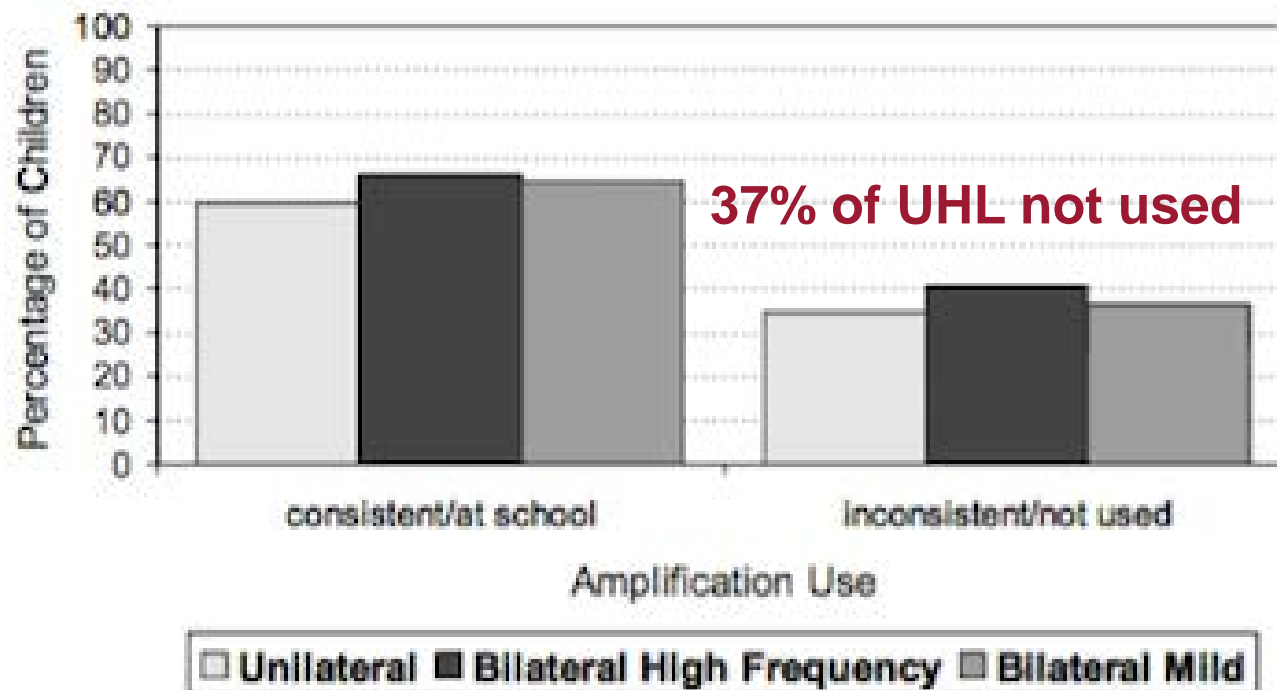
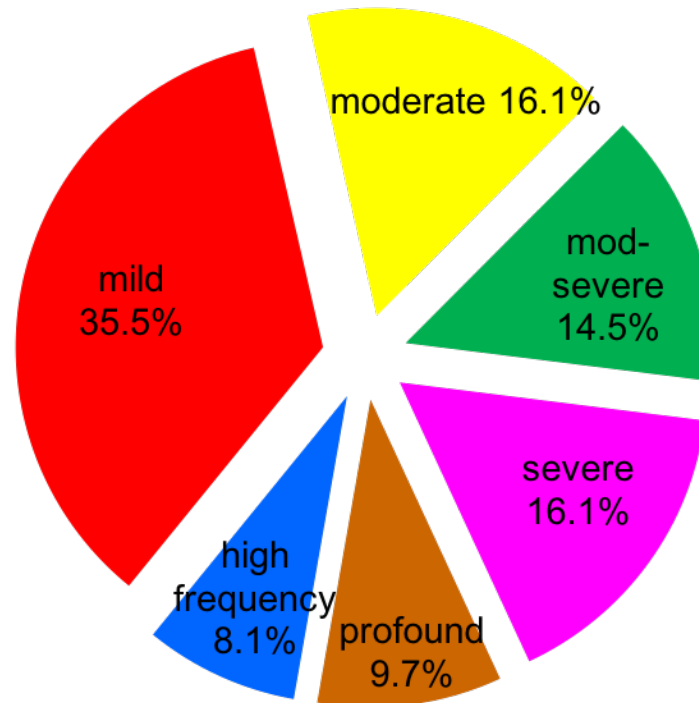
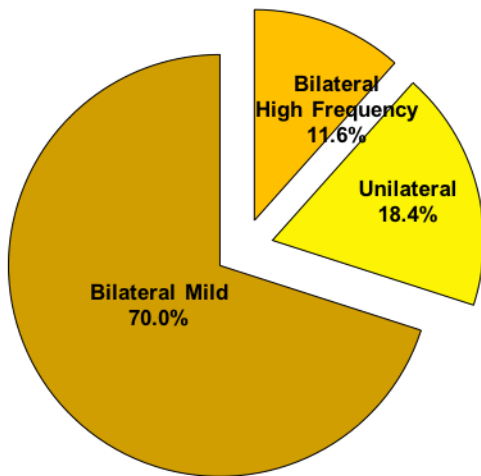


Fig. 7. Amplification use by degree of hearing loss (at most recent audiogram).



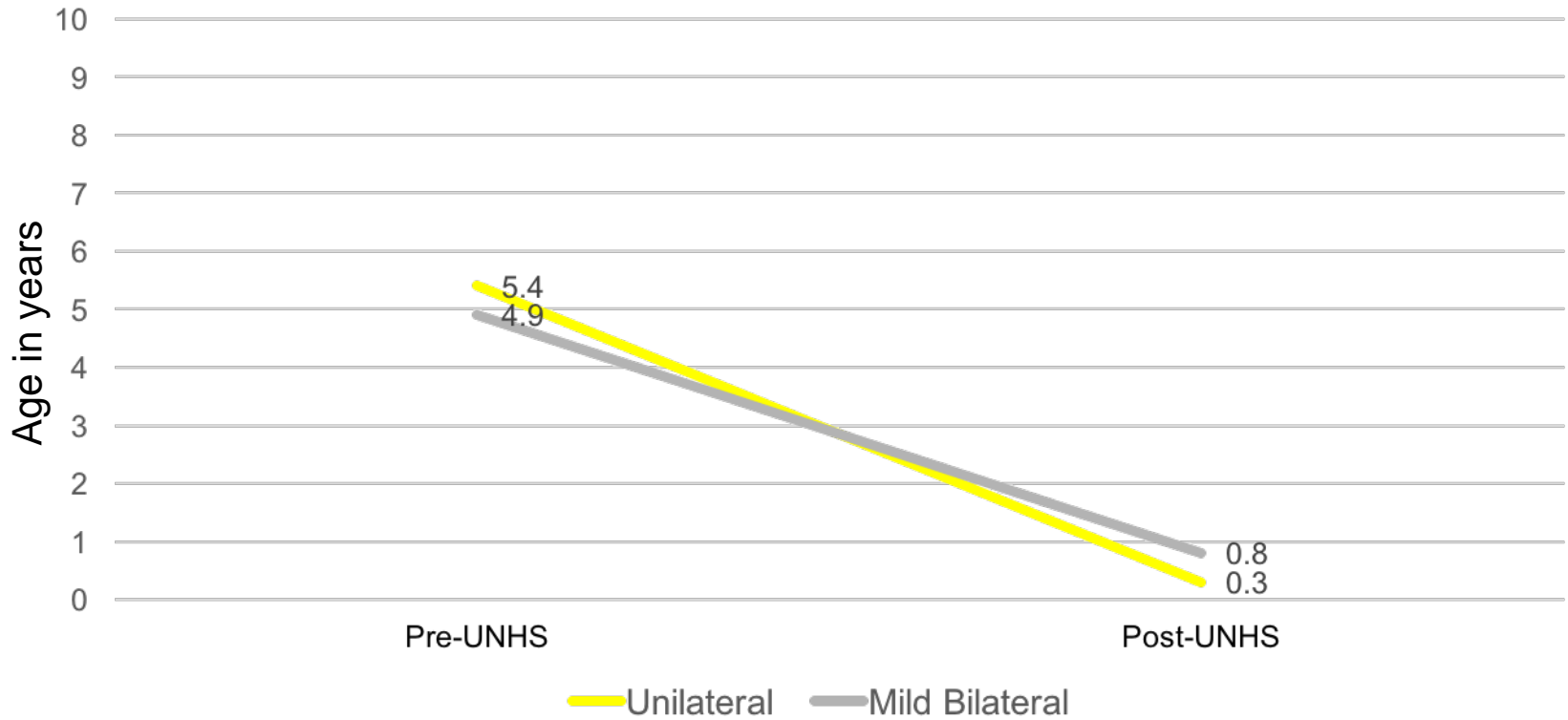
2014 – what we learned

- Cohort identified 1990-2010
 - 46.3% (381 of 823) presented with UHL/mild bilateral loss (n=62 UHL)



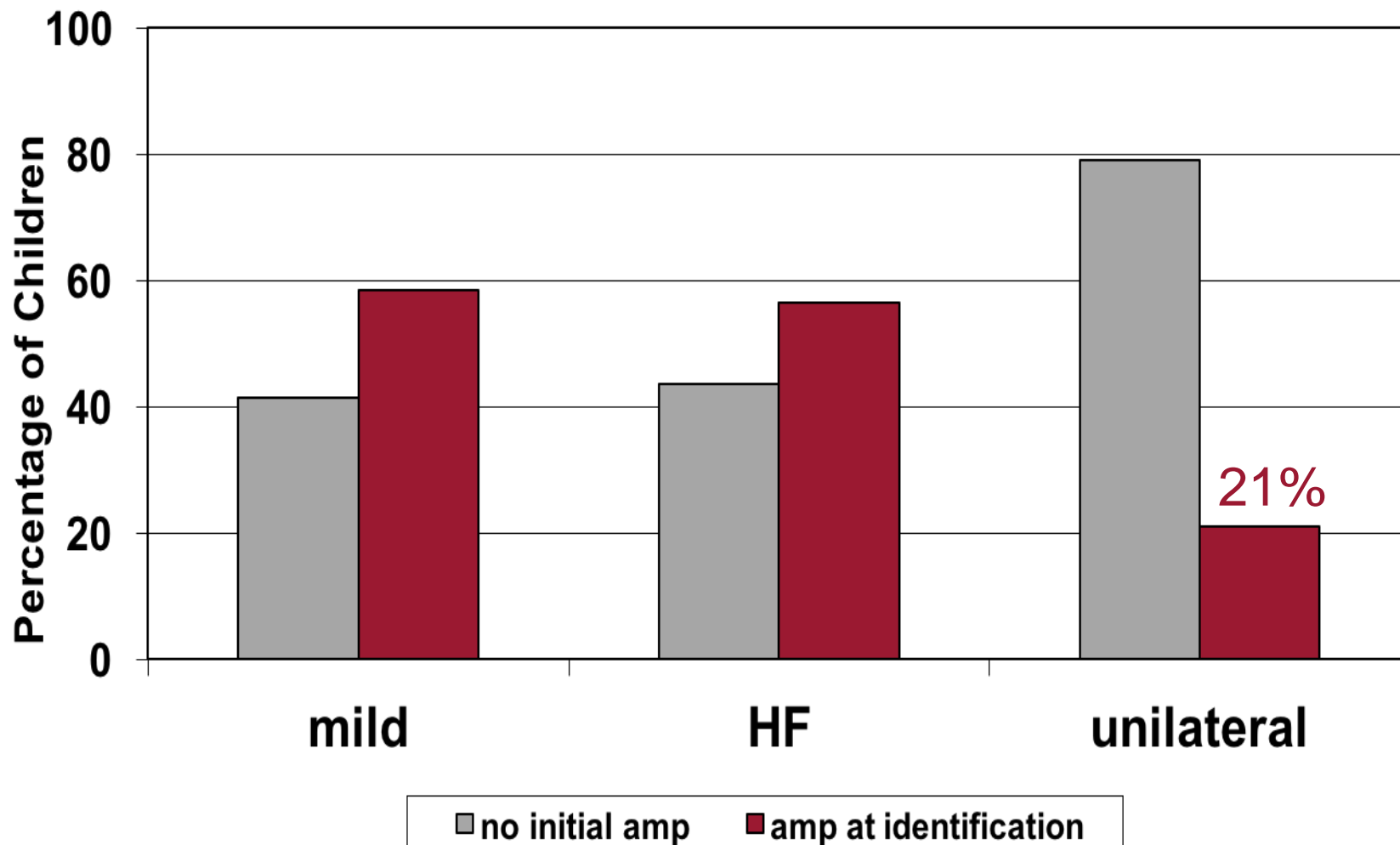


Age at diagnosis pre vs post-UNHS



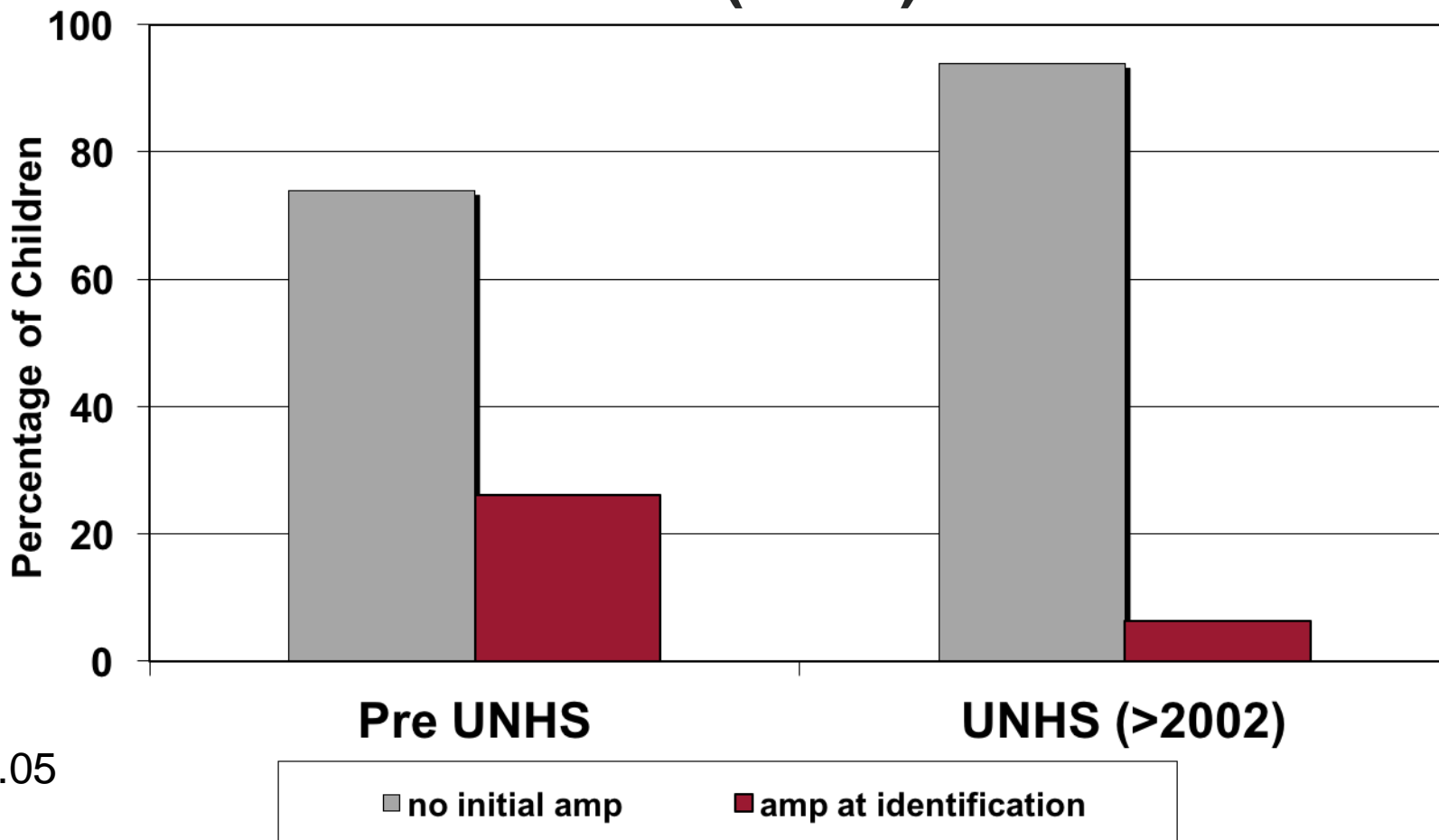


Amplification recommendation by HL at identification (n=337)

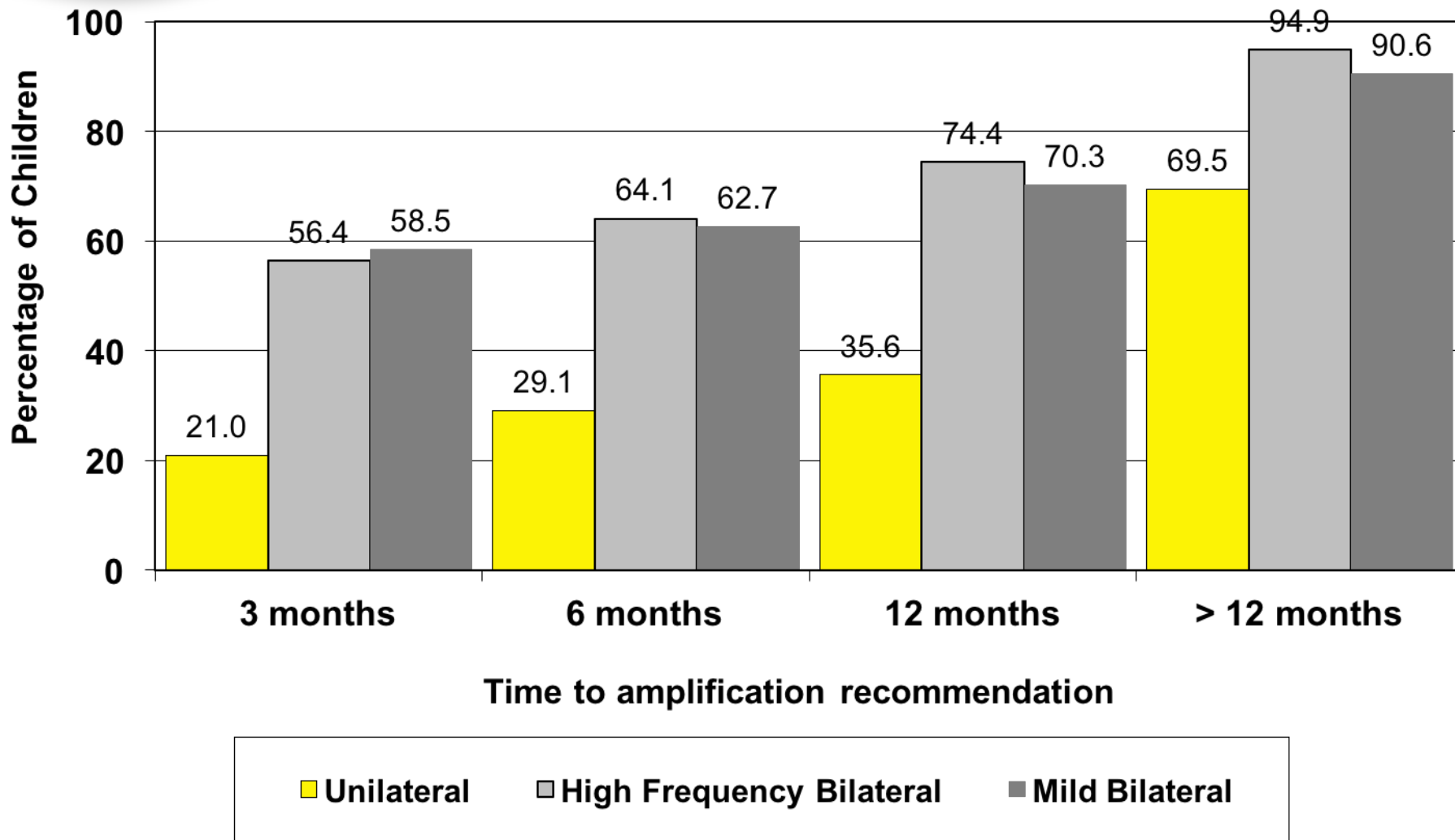




Amplification recommendation for children with **unilateral HL** at confirmation (n=62)



P > .05





Why the uncertainty?

- Lack of evidence of benefit
- Concerns about masking 'good' hearing' particularly in young children
- Not so successful with amplification use



Amplification decisions

Does age of HL identification matter?

- Mild bilateral HL better ear
 - ✓ *24% greater chance of amp rx for each additional year older at diagnosis (OR=1.24 ; 95% CI: 1.13 to 1.36)*
 - ✓ *263% greater chance if diagnosed > age 4 vs < age 4 (OR 3.63; CI 2.10 to 6.27)*
- Did not apply to UHL group



Amplification decisions Does severity of HL matter?

- Mild bilateral HL
 - *8% greater chance of amp rx for every decibel increase in better ear. OR=1.08 (95% CI: 1.04 to 1.12)*
 - *Did not apply to poorer ear*
- Did not apply to UHL group (impaired ear)

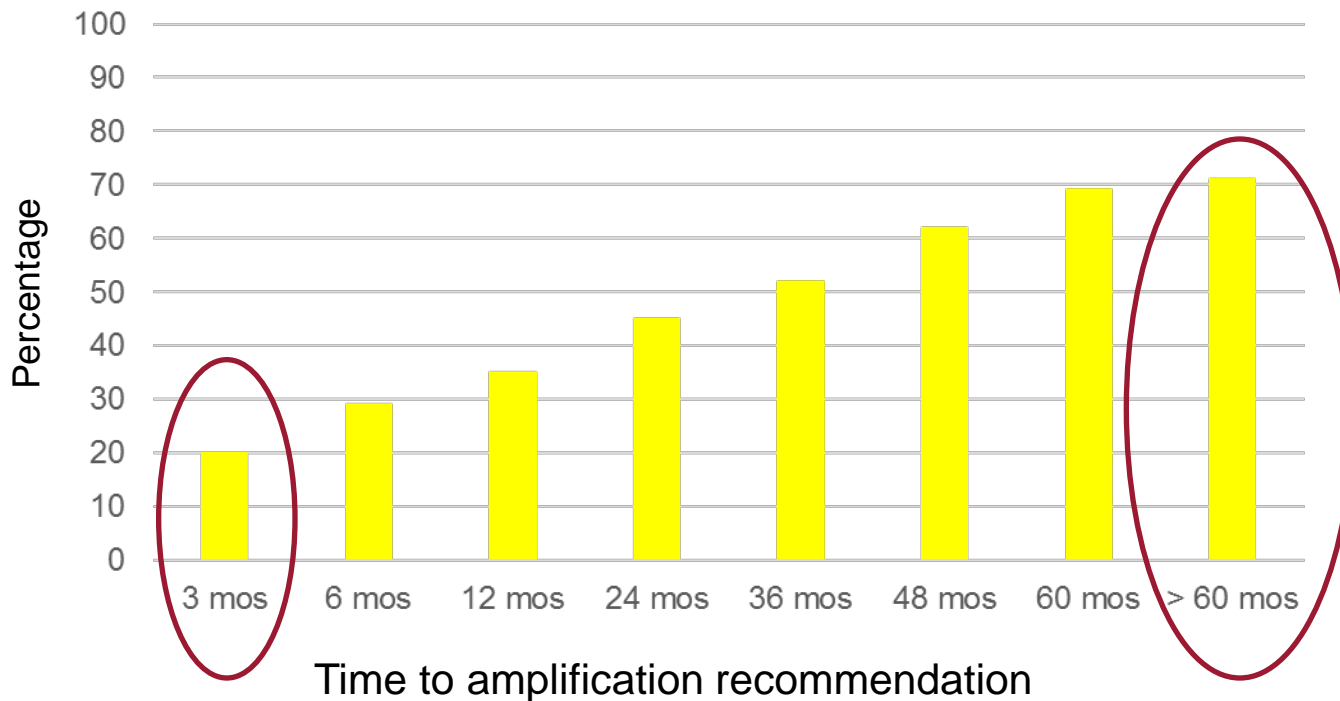


UHL 2017 what we learned

- Cohort diagnosed 2003 to 2015 (n=108)
- Onset = **54.6%** congenital/early onset
- Age diagnosed = **13.9 months** (IQR: 2.8, 49.0)
- Age amplification = **42.9 months** (IQR: 20.1, 63.1)



Unilateral hearing loss 2003-2015 (n=108)



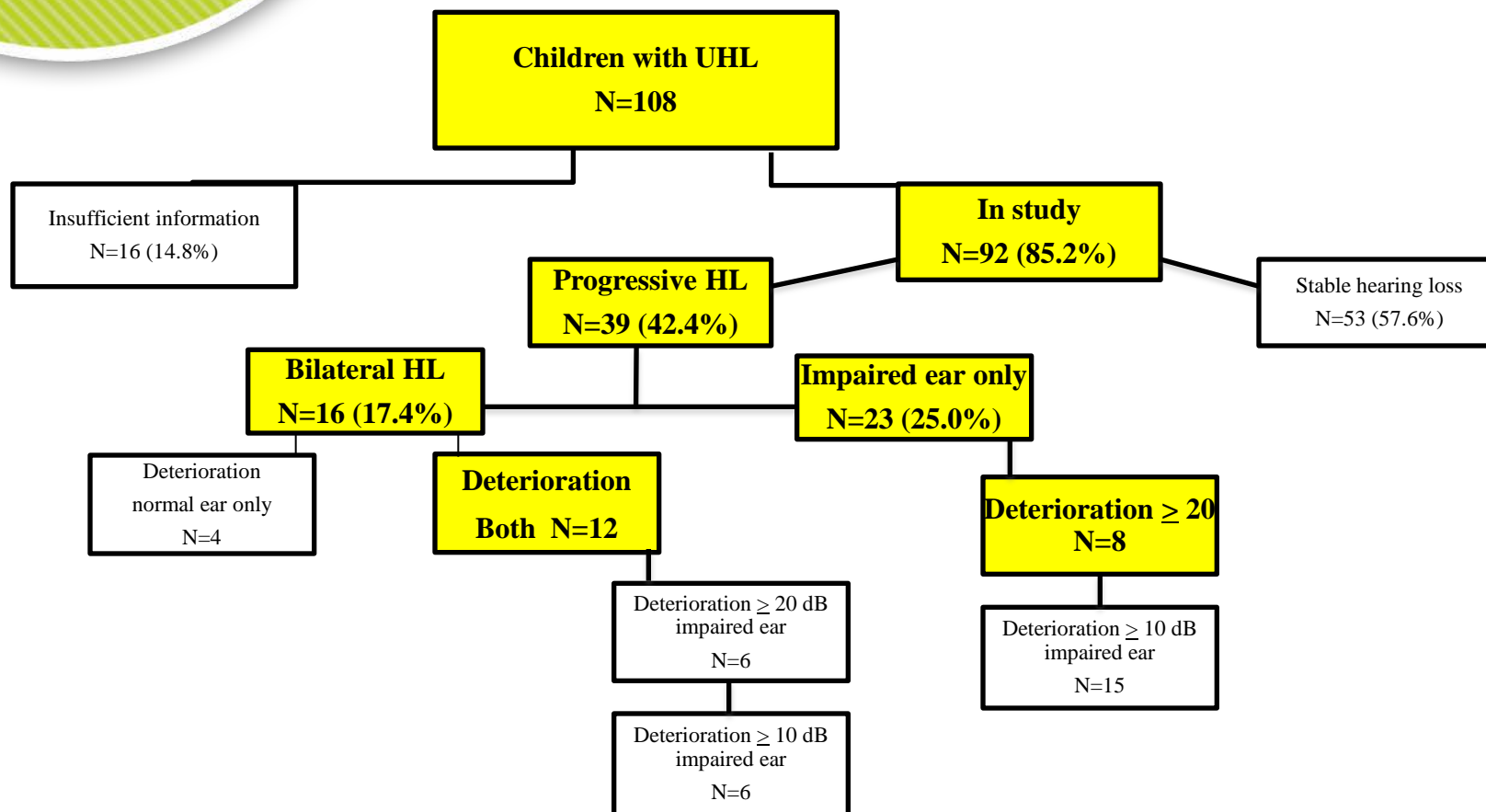


Figure 1. Children with progressive hearing loss in impaired and normal hearing ear



New challenges from newborn hearing screening:

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Towards an Understanding of the Consequences of Mild Bilateral and Unilateral Childhood Hearing Loss (MUHL)



	12 months	24 months	36 months	48 months
Auditory Functioning	ELF		-	-
	-	-	CHILD	
	PEACH			
Speech-Language	MacArthur-Bates CDI			-
	Language sample			
	IDI	CDI		-
	-	-	-	PPVT
	-	-	-	PLS
	-	-	-	GFTA
Child-Family Functioning	-	CBCL	-	CBCL
	-	PSI	-	PSI
	Parents' perspectives interview			

Amplification use



2017 – MUHL multi-center study (n=69)

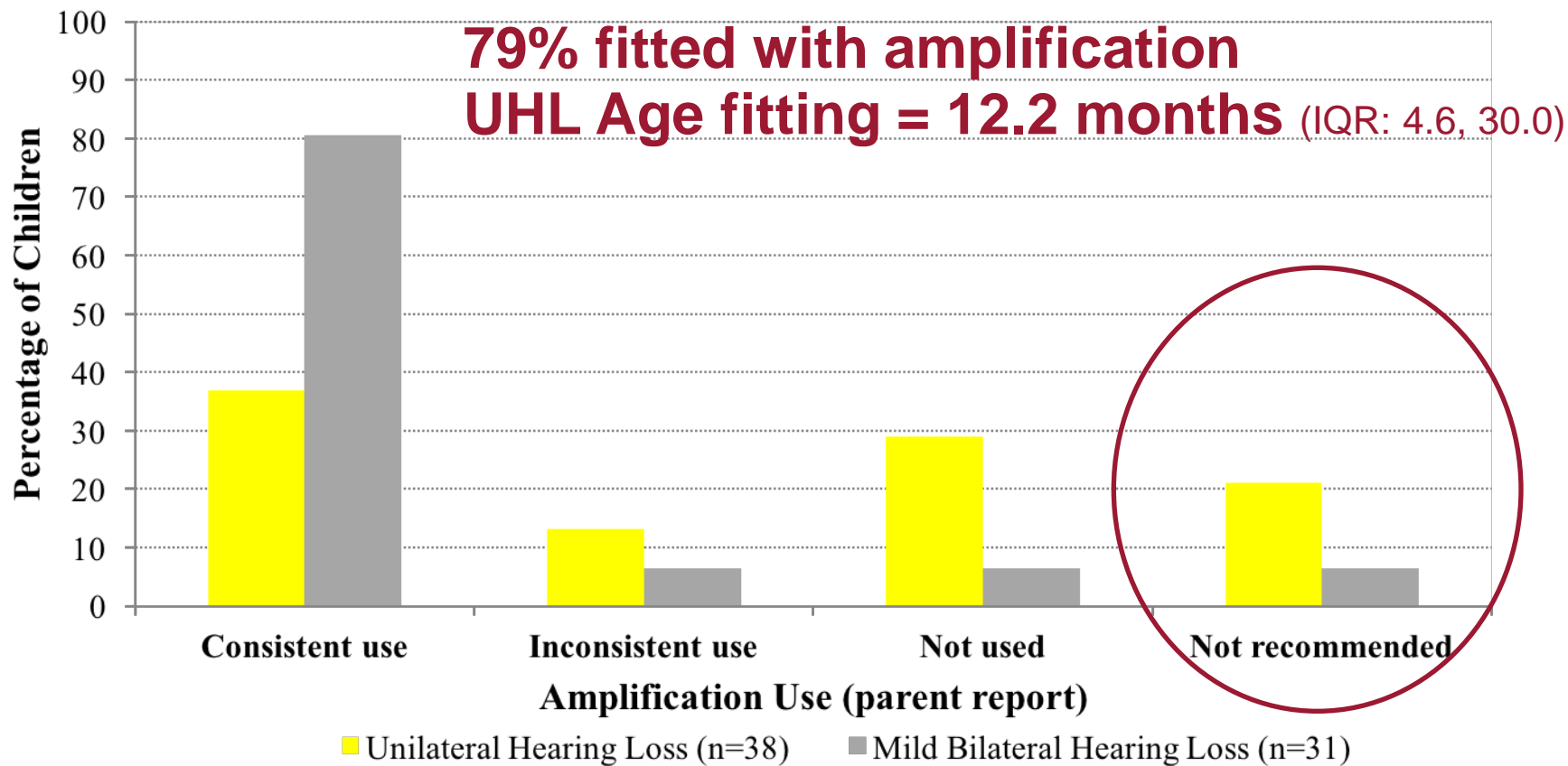
N=38 UHL; 31 mild bilateral ; 50 normal hearing

UHL group characteristics:

- Age diagnosed: **3.4 months** (2.0, 5.5)
- Age amp recommended: **6.7 months** (IQR: 4.6, 30.0)
- Age amp fitted: **12.2 months** (IQR: 7.2, 29.9)
- 23 with <70 dB HL + 11 severe + 4 profound,
- Age final assessment: 47.8 months (IQR: 38.8, 48.5)

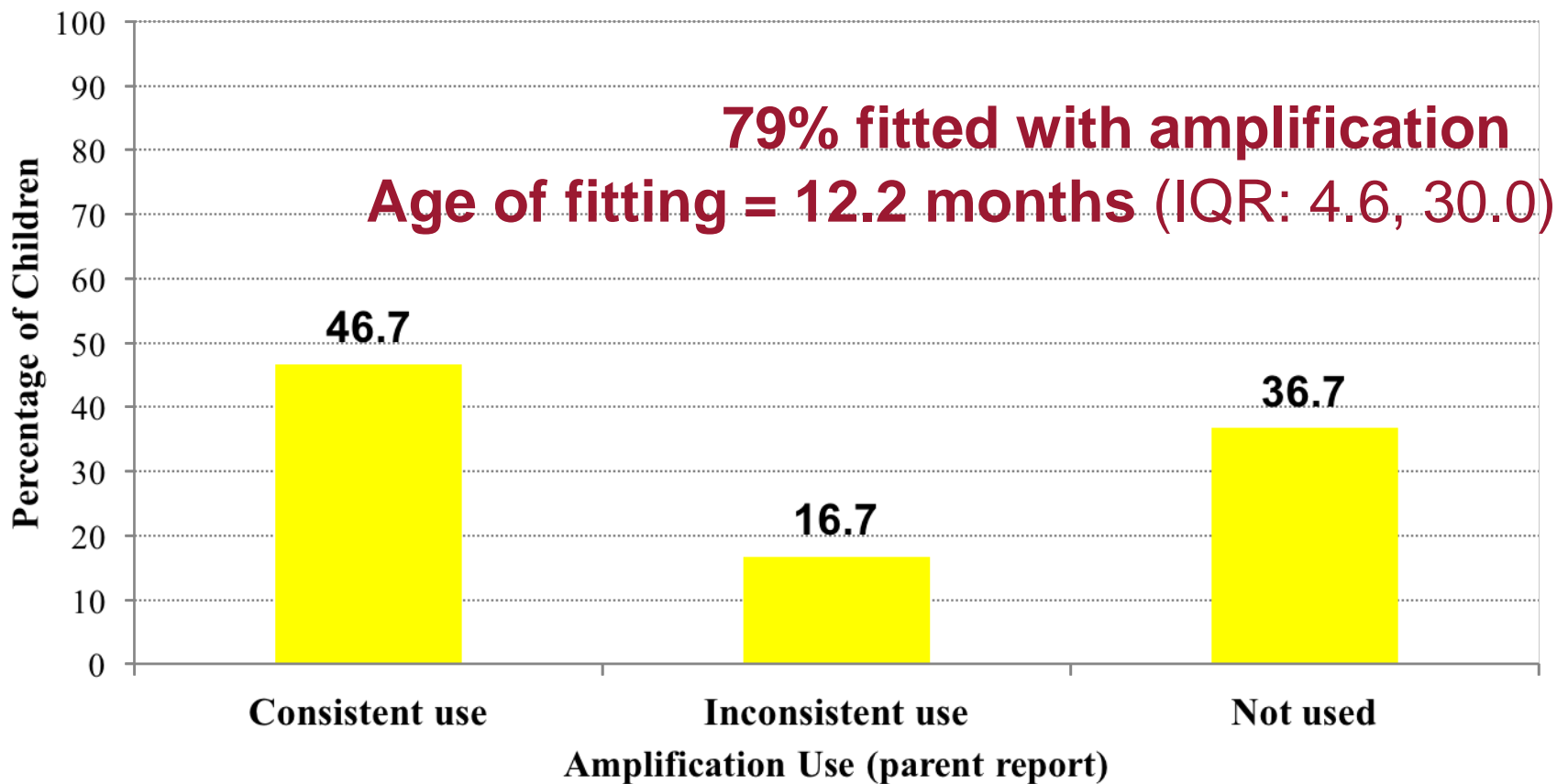


Amplification recommendations/use





Amplification use at age 4 years – UHL





PEACH



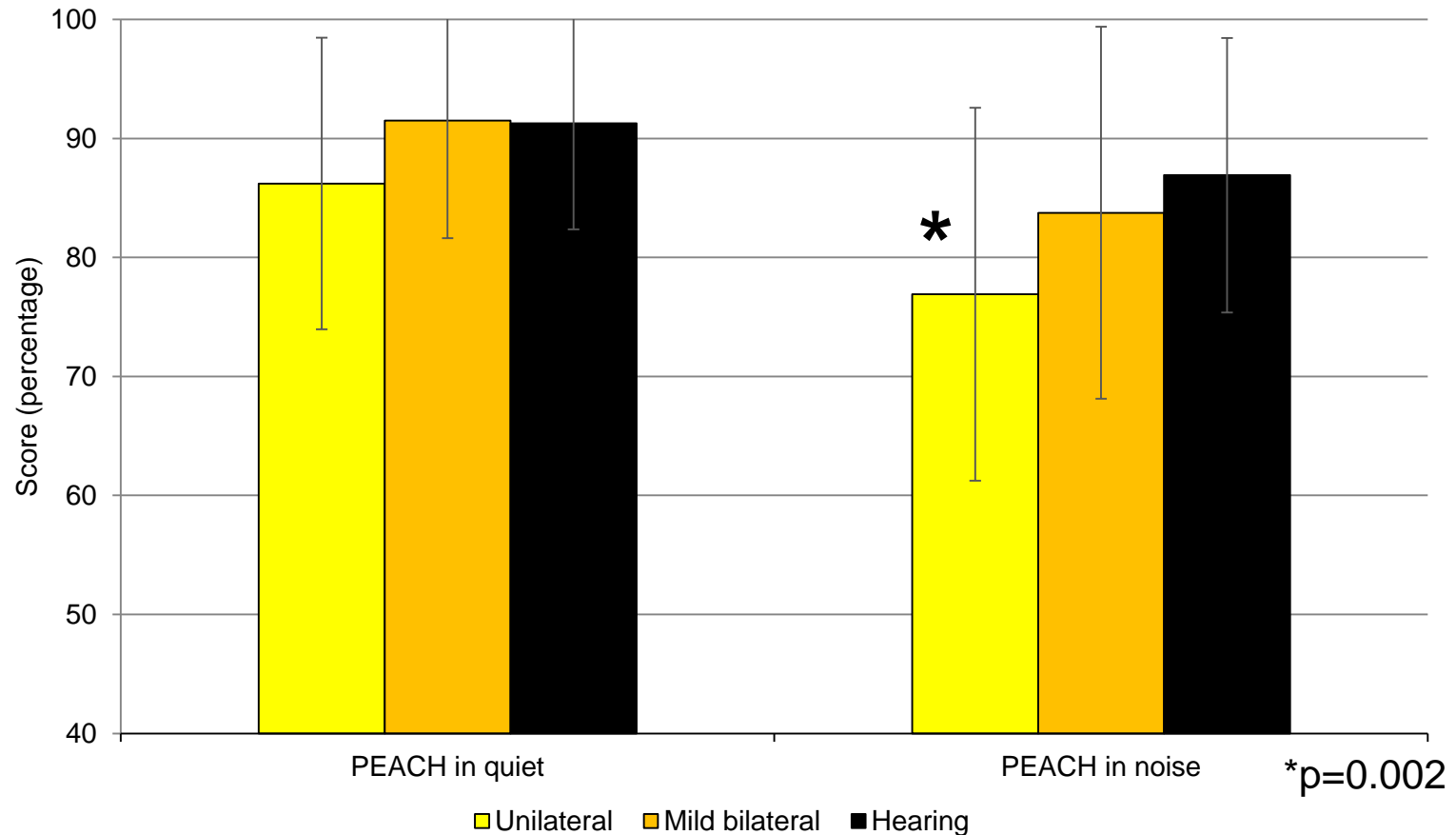
**Parents' Evaluation of Aural/Oral
Performance of Children
(P.E.A.C.H.)**

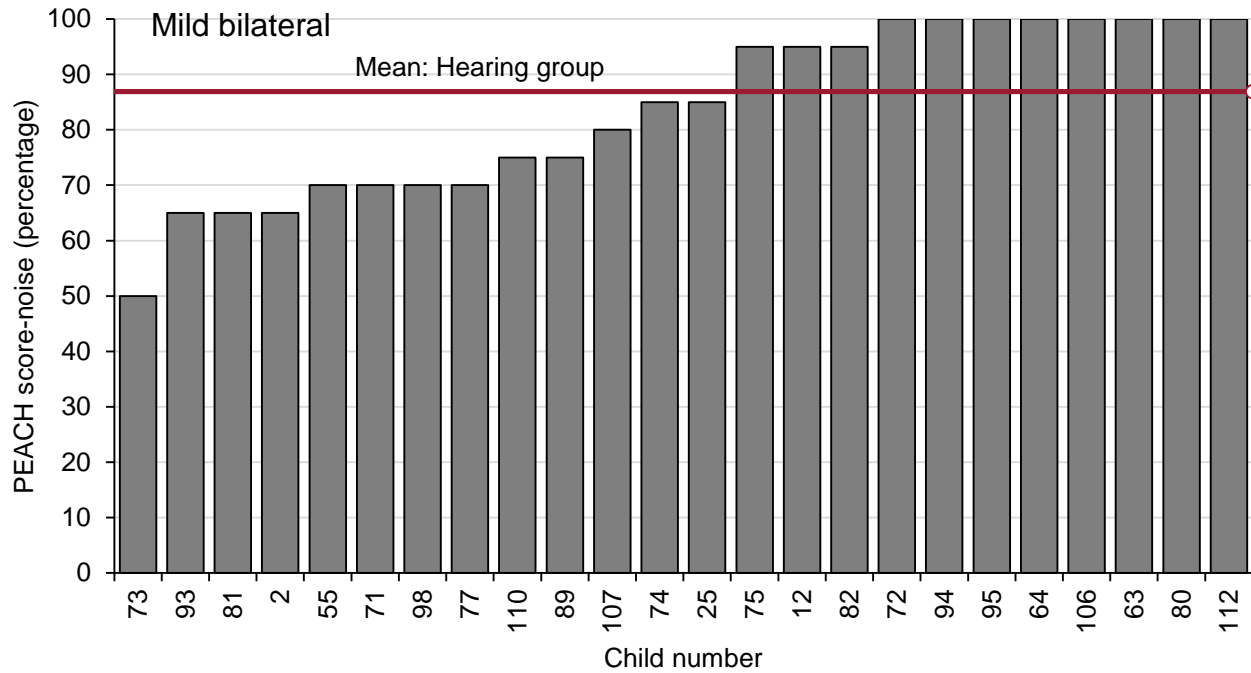
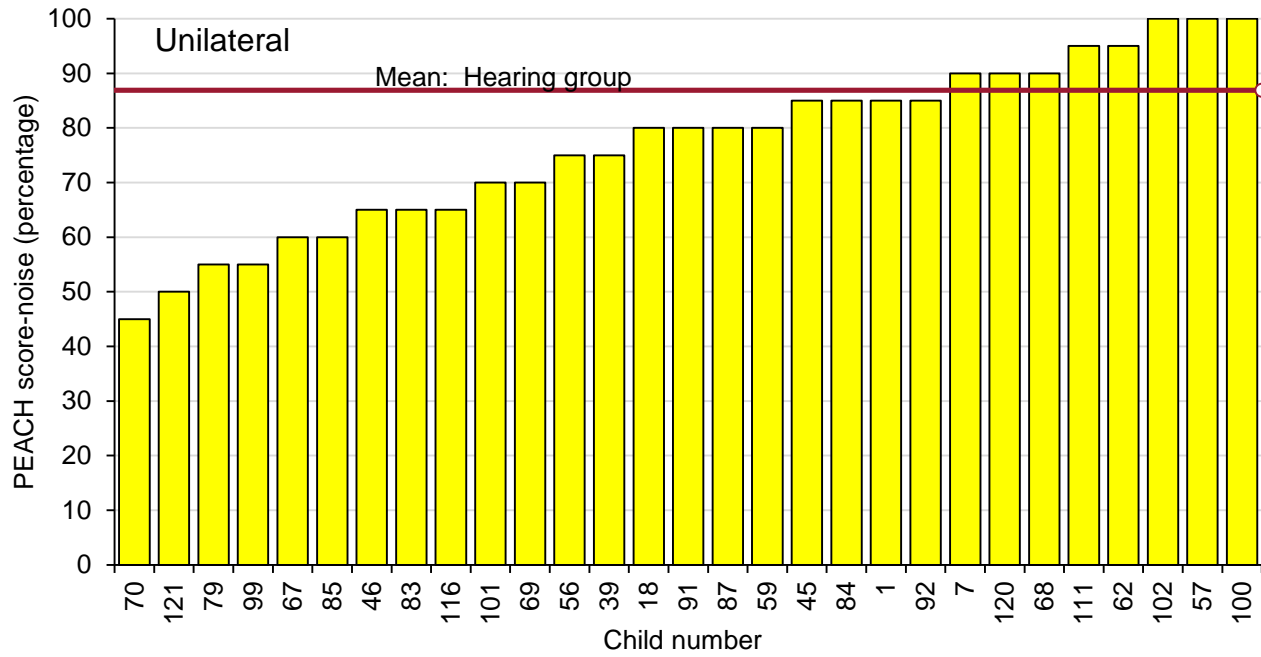
Developed by Teresa Ching & Mandy Hill

	Question	Never 0%	Seldom 1 - 25%	Sometimes 26 - 50%	Often 51 - 75%	Always 75-100%
1.	How often has your child worn his/her hearing aids and/or cochlear implant?	0	1	2	3	4
2.	How often has your child complained or been upset by loud sounds?	4	3	2	1	0
3.	When you call, does your child respond to his/her name in a quiet situation?	0	1	2	3	4
4.	When asked, does your child follow simple instructions or do a simple task in a quiet situation?	0	1	2	3	4
5.	When you call does your child respond to his/her name in a noisy situation when he/she can't see your face? (examples of responses include looks up, turns, answers verbally)	0	1	2	3	4



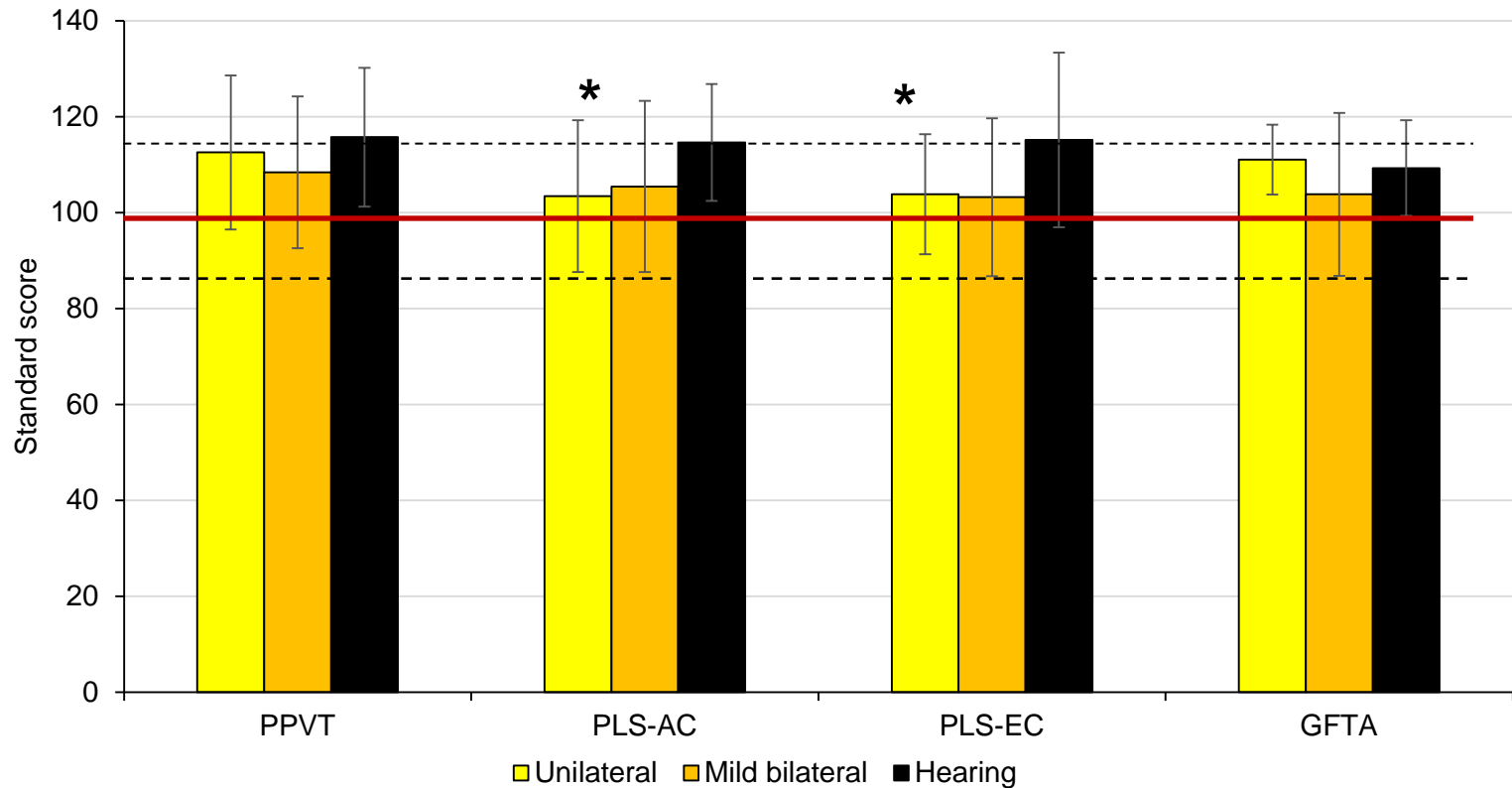
PEACH scores – UHL, mild bilateral, normal hearing at age 4







Language scores – UHL, mild bilateral, normal hearing at age 4





**Does amplification affect auditory/
language outcomes for preschool-
age children with UHL?**





UHL effect of amplification – MUHL preschool study

- Results showed no relationship ($p=0.49$)
 - *small sample*
 - *parent report*
- May see effect as children age or on other types of outcomes





**Does degree in impaired ear affect
outcomes for preschool age children
with UHL?**





UHL effect of severity of hearing loss -MUHL preschool study

- Results showed no relationship ($p=0.12$)
 - *small sample*





Parent Perspectives



- Interviews completed with 20 parents
- Themes:
 - *Lacking information at diagnosis*
 - *Need professional support (emotional care)*
 - *Support from other parents is important*
 - *Support for hearing aid use*



Parent perspectives



The audiologist said, if we like, we can go ahead and get the hearing aid, he's doing fine, but just to be sure, go ahead and get a hearing aid. But we started his daycare, and that was already a big transition for him, so we didn't want to introduce the hearing aid right then...

She wears it (hearing aid) all the time now. At the beginning to be honest, it was me forgetting, because as the parent you have to remember...



Parent perspectives



So, they said - adequate hearing for speech, and sent us away. And it's hard because I know... they have a huge caseload, and yes the hearing losses are more severe, but it's my kid, but to them, it's just one ear...

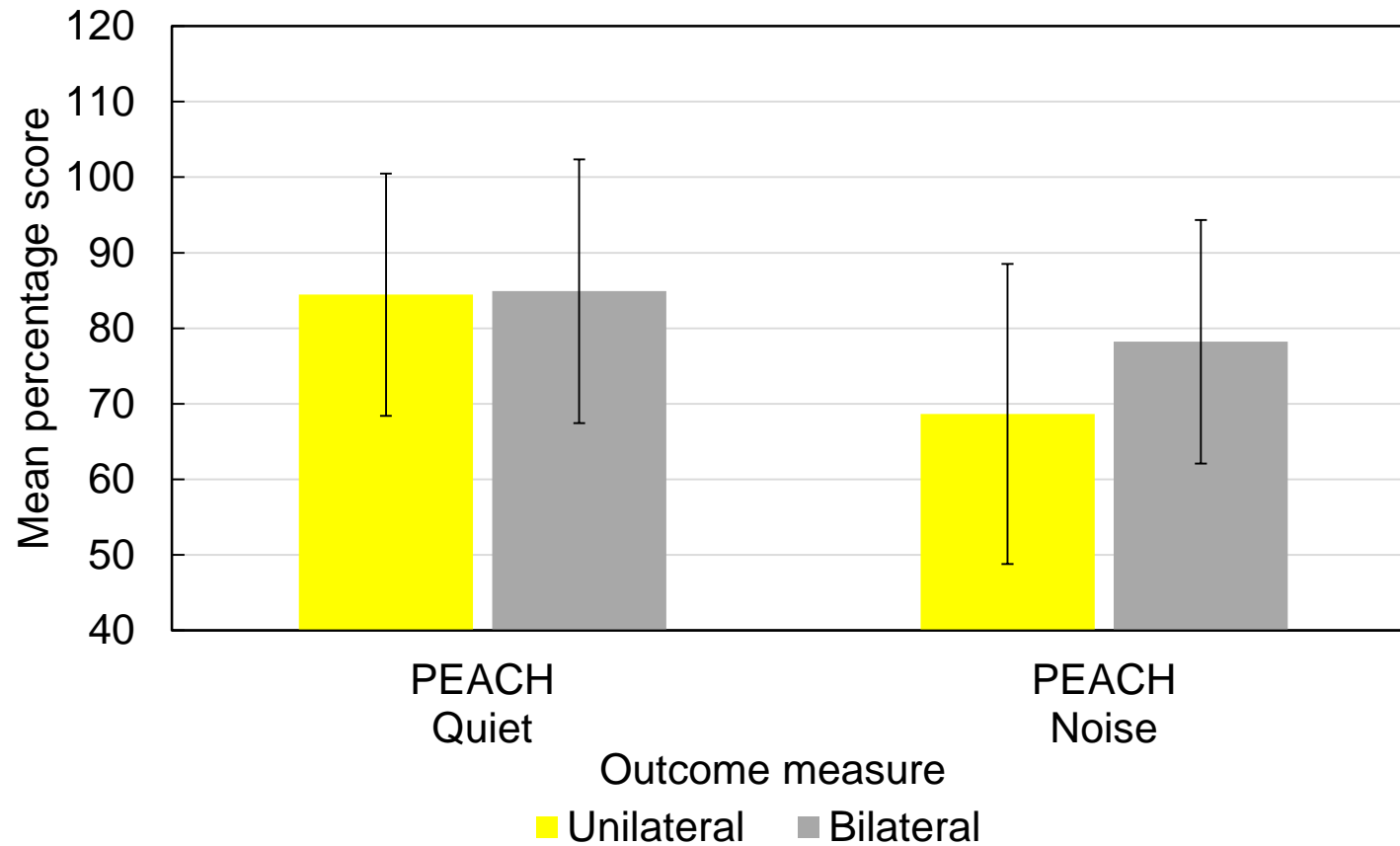


2017 Preliminary data: Early School Years

- **N=16 UHL**; 16 mild bilateral :
- Age diagnosed **5.0 months** (IQR: 4.0, 35.3)
- Age amp fitted: **37.4 months** (IQR: 28.8, 44.0)
 - *7 Hearing aids*
 - *7 FM – school*
 - *1 no amplification, 1 unknown*
- Assessed: 6 – 8 years

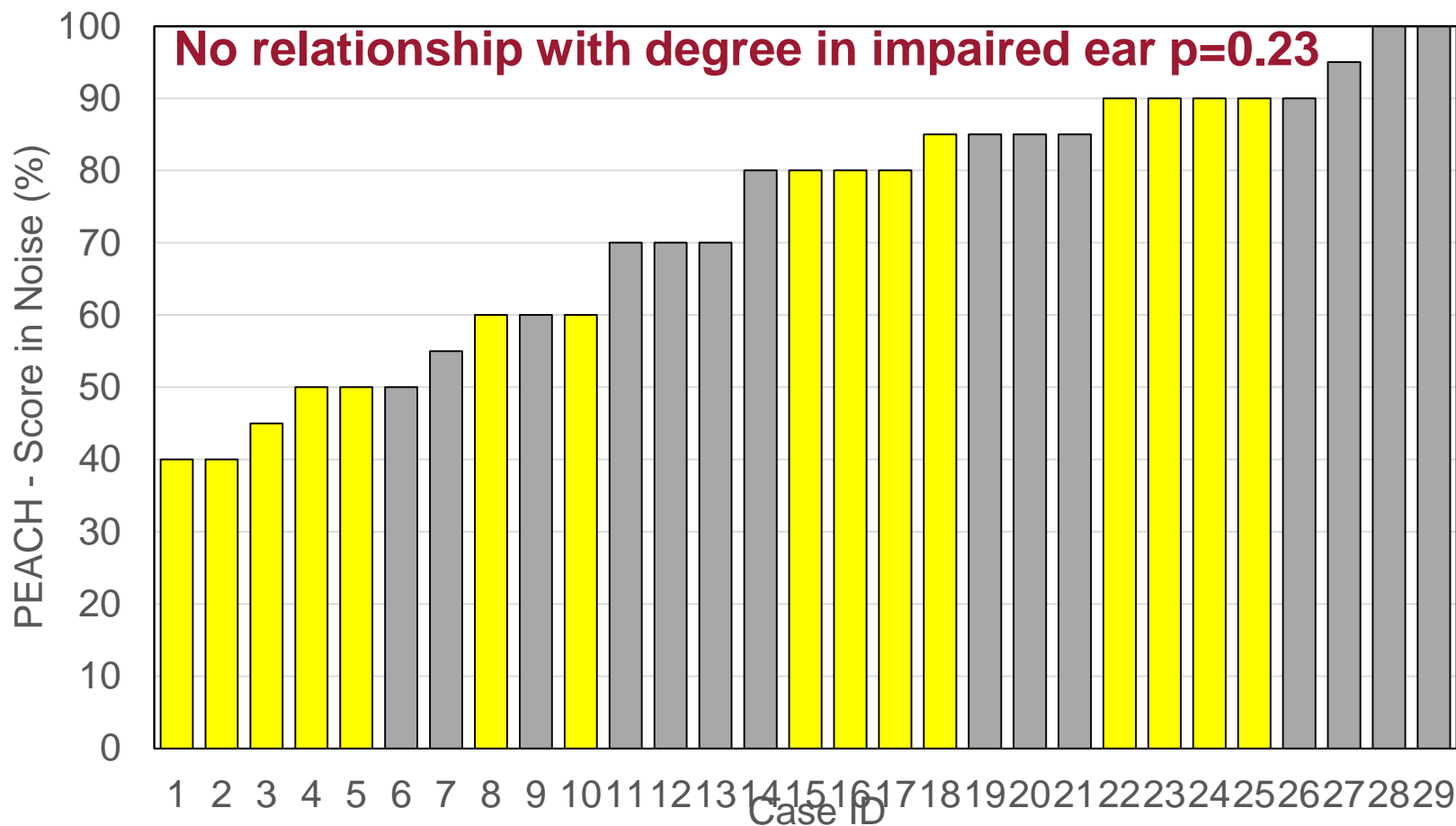


PEACH scores



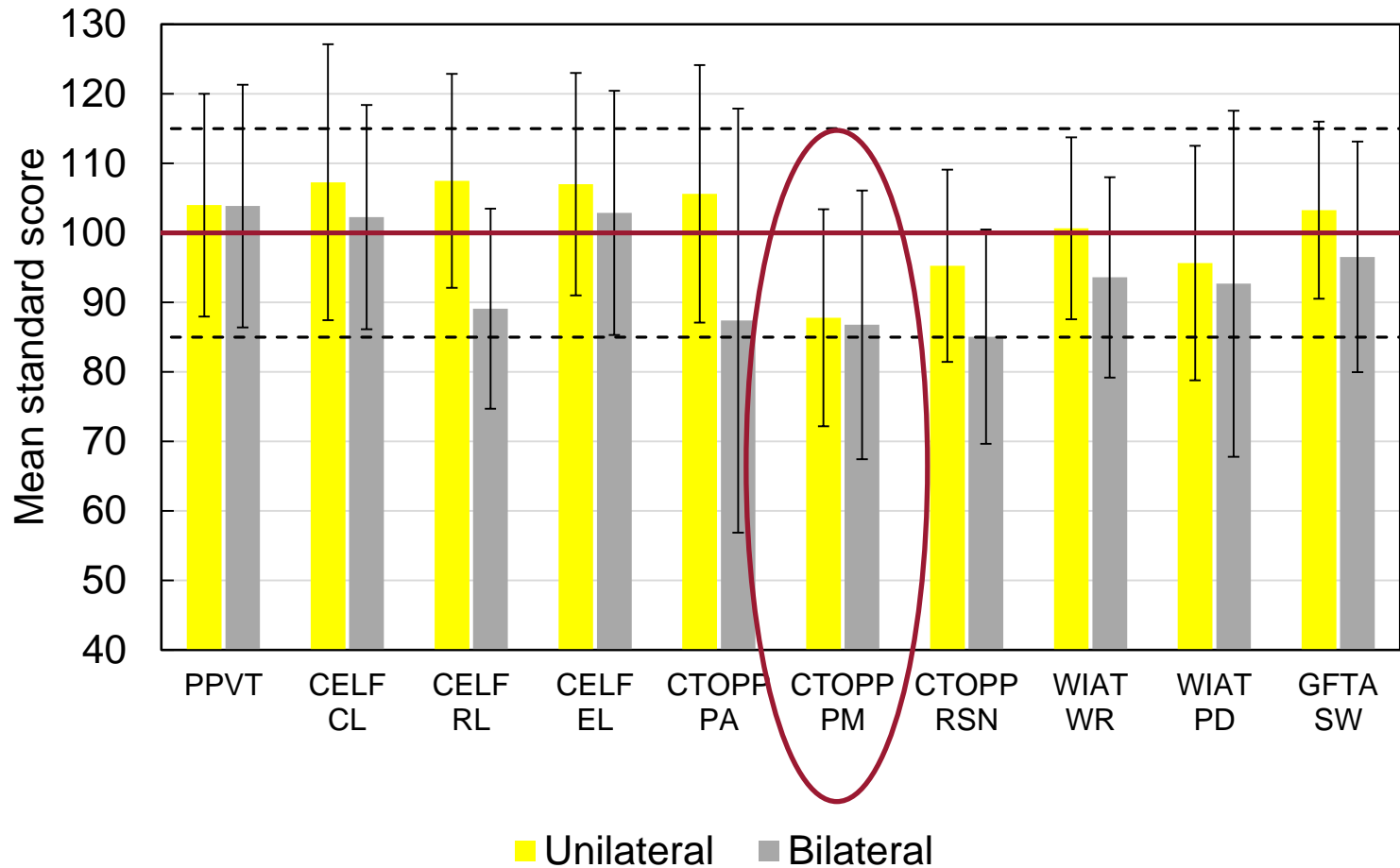


PEACH - Noise Individual scores



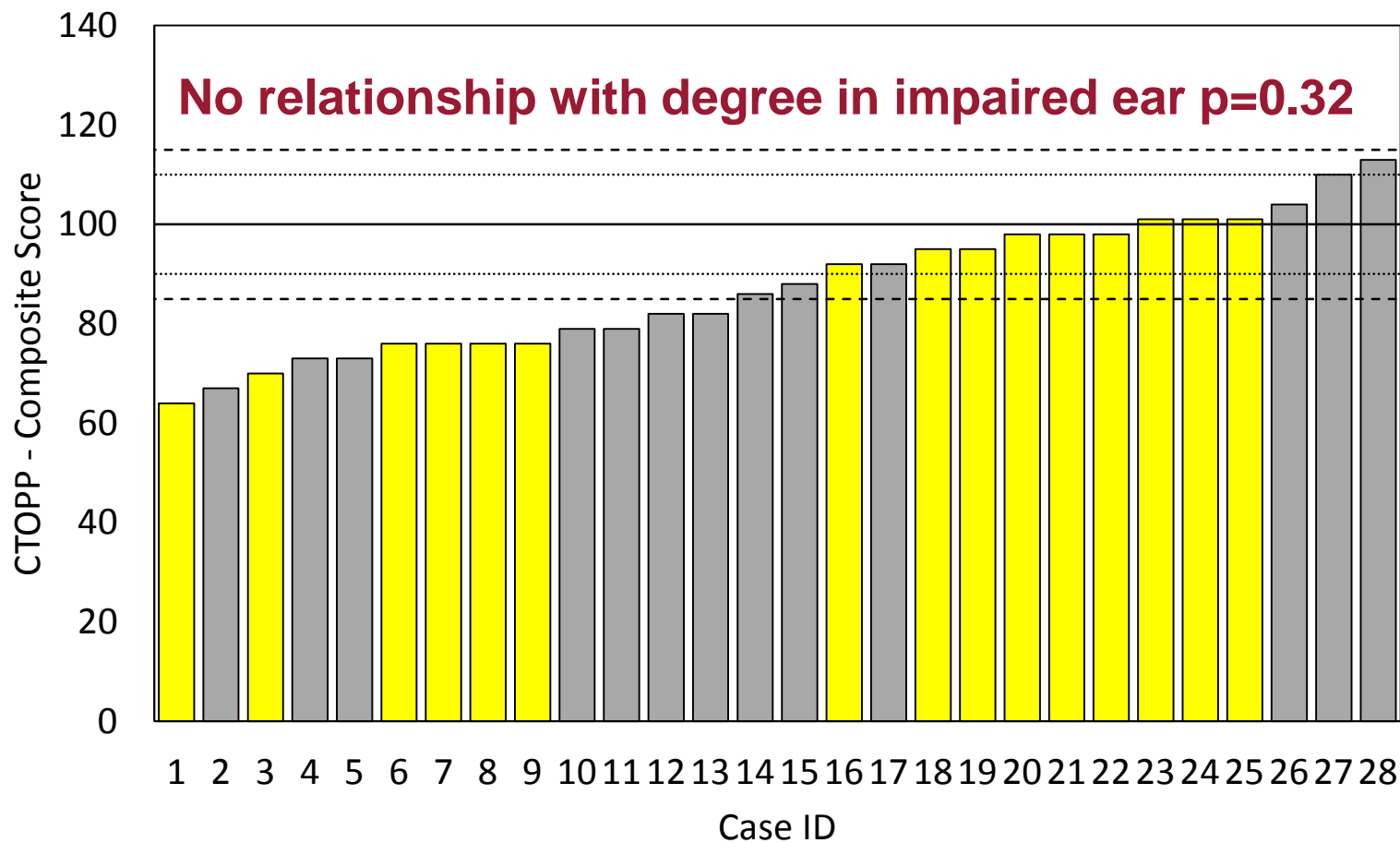


Language / Literacy Scores





CTOPP Phonological Memory Individual scores





Parents perspectives – MUHL School age

Adjusting to/learning about hearing loss

“So some of the early things that I thought we needed, I was nervous, I was scared for her... I needed that education to set my mind at ease, and ...sort of take some time to get the hearing aid, and get used to that she has to wear this thing potentially for the rest of her life”

“I was surprised that I wasn’t offered anything to help out, to get her hearing out of her other ear better, like the Bahas, the cochlear implants and stuff. Because she was doing so well, I guess they didn’t feel she needed it...”



Parents perspectives MUHL School age

Adjusting to hearing technology

"Oh [we noticed a difference] right away! Because she is in the French program, it really helped her with some of the words, we speak English at home....but French was a completely different language...the hearing aid made a huge difference"



What we know / don't know about children with UHL



- represent 20-25% diagnosed with permanent HL
- do not perform like their peers
- are now fitted early with amplification
- use of amplification in early years is a big challenge
- don't know the impact of amplification use on auditory/language development
- We need long-term studies on early-identified children





“It was mostly unclear from studies if hearing aids or school support mechanisms such as FM systems or IEPs were utilized or evaluated...”

Anne, Lieu, & Cohen, 2017. Speech and language consequences of unilateral hearing loss: A systematic review, Otol-Head Neck Surg., 57, 572-579, p. 573



CHEO





Towards understanding the consequences of mild bilateral and unilateral hearing loss (MUHL)

Thank you to Collaborating Centers

**Children's Hospital of Eastern Ontario, Ottawa
Pinecrest-Queensway Health Centre, Ottawa, Ontario
Western University Clinic, London, Ontario
Erin Oaks Centre, Toronto, Ontario
Preschool Services Branch, Ministry of Education, Ontario
Voice for Hearing-Impaired Children, Hamilton, Ontario**



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