Language Outcomes of Children with Bilateral Hearing Loss: A Multi-State Perspective

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Disclosure

- None of the authors have **relevant financial or nonfinancial relationships** in the products or services described, reviewed, evaluated or compared in this presentation

Disclosure

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Today's Topics

- Describe NECAP, a CDC-supported national outcomes database project
- Summarize participant characteristics
- Present language outcome data for children with bilateral and unilateral hearing loss
- Identify characteristics of children with more successful language outcomes

NECAP Project Overview

- CDC-supported project to collect language outcome data on deaf and hard-of-hearing children birth to 4 across the United States
  - Establish individual state databases
  - Establish national database
  - Explore feasibility of interfacing with existing EHDI databases

States Represented in Results

- Arizona
- California
- Florida
- Idaho
- Indiana
- Maine
- Minnesota
- New Mexico
- North Dakota
- Oregon
- Texas
- Utah
- Wisconsin
- Wyoming

Assessment Components

- Demographic form
- Release of audiologic information
- Minnesota Child Development Inventory
- MacArthur-Bates Communicative Development Inventories
- Additional assessments on request (e.g., play, listening skills, speech intelligibility, etc.)

MacArthur-Bates Communicative Development Inventories

- Parent report instrument
- Words arranged in semantic categories
- Parents indicate words their child can produce in spoken and/or sign language
- Raw scores are converted to age scores using the 50th percentile

MacArthur-Bates Communicative Development Inventories

- Words and Gestures (396 words)
  - 8 to 18 months language level
- Words and Sentences (680 words)
  - 16 to 30 months language level
- Inventory selection is based on the child's estimated productive vocabulary size

Assessments Completed

- 1,705 assessments completed
- 989 children assessed 1 to 6 times

Portion of Database Analyzed

- Chronological age 8 to 39 months
- Completed the MacArthur Communicative Development Inventory
- Correct inventory selected for child's vocabulary size
- Most recent assessment
- 705 children/assessments

Inclusion Criteria

- Multiple regression indicated that presence of additional disabilities and number of ears affected (unilateral vs. bilateral loss) were significant predictors of language outcomes ($p < .001$)

Participant Criteria

- Children with unilateral vs. bilateral hearing loss were considered separately
- Children with additional disabilities thought to affect speech/language development were excluded from these analyses

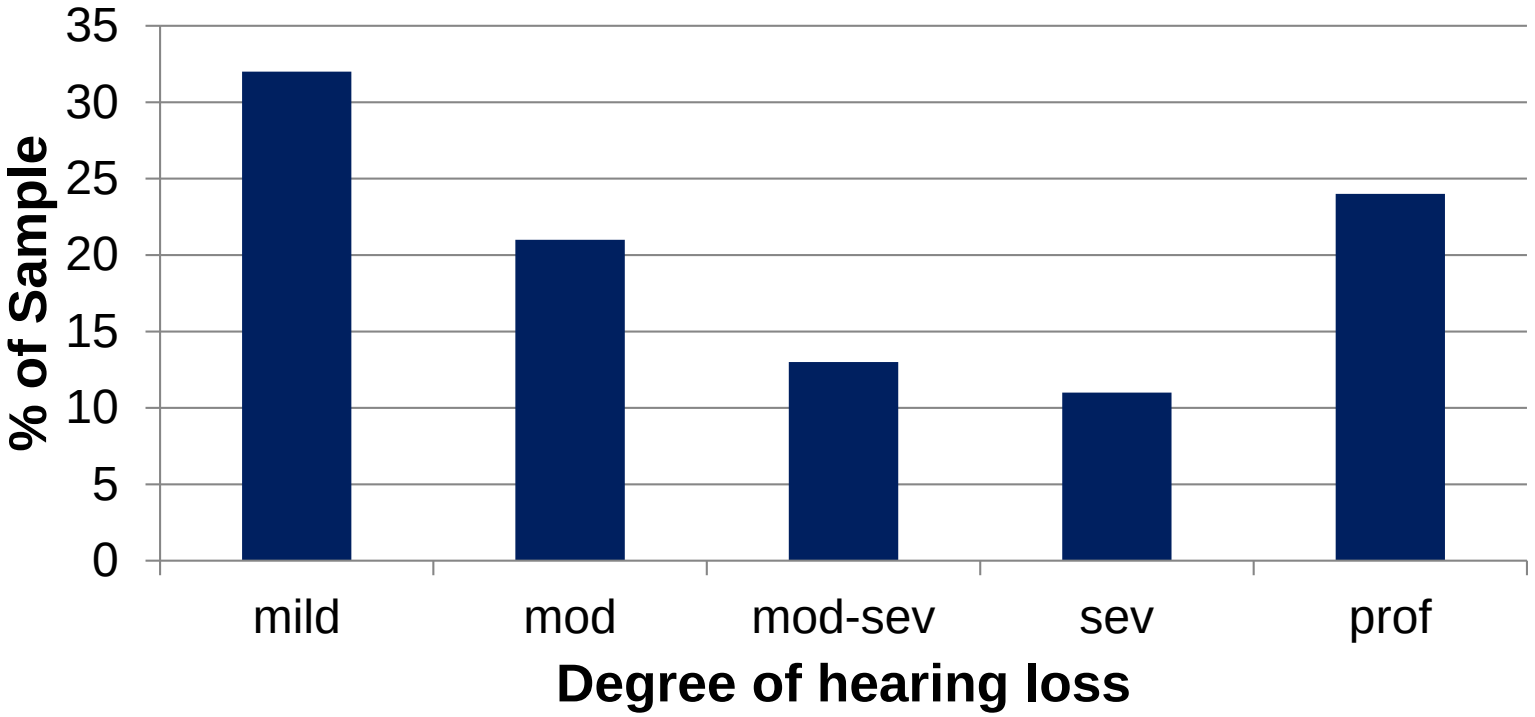
Study 1: Inclusion Criteria

- Bilateral hearing loss
- No additional disabilities thought to affect speech/language development
- Most recent assessment
- Correct version of MacArthur selected
- N = 549

Study 1 – Bilateral Hearing Loss: Participant Characteristics

- Chronological age
  - Range = 8 to 39 months
  - Mean = 24.5 months
  - SD = 8 months
- Boys = 53%; Girls = 47%
- English = 89%; Spanish = 11%

Degree of Hearing Loss (available for 429 children)



Study 1 – Bilateral Hearing Loss: Participant Characteristics

Type of Amplification Used	% of children
None	12%
Hearing aid	66%
Bone conduction hearing aid	3%
Cochlear implant	19%

Study 1 – Bilateral Hearing Loss: Participant Characteristics

Age at…	Mean (mos)	Range (mos)
Identification	4.7	.25 to 38
Amplification	7.4	.5 to 39
Intervention	7.3	.25 to 38

*57% of children met the EHDI guidelines of identification by 3 months of age and intervention by 6 months of age

Study 1 – Bilateral Hearing Loss: Participant Characteristics

Communication mode of the primary caregiver	% of primary caregivers
Spoken language only	31%
Spoken language; very occasional sign	42%
Spoken + sign language	22%
Sign only	6%

Study 1 – Bilateral Hearing Loss: Participant Characteristics

Highest degree completed	% of primary caregivers
Less than HS	12%
High school diploma	40%
Vocational or Associates	18%
Bachelor's degree	22%
Graduate degree	8%

Determining Language Quotient

Language Age/Chronological Age x 100

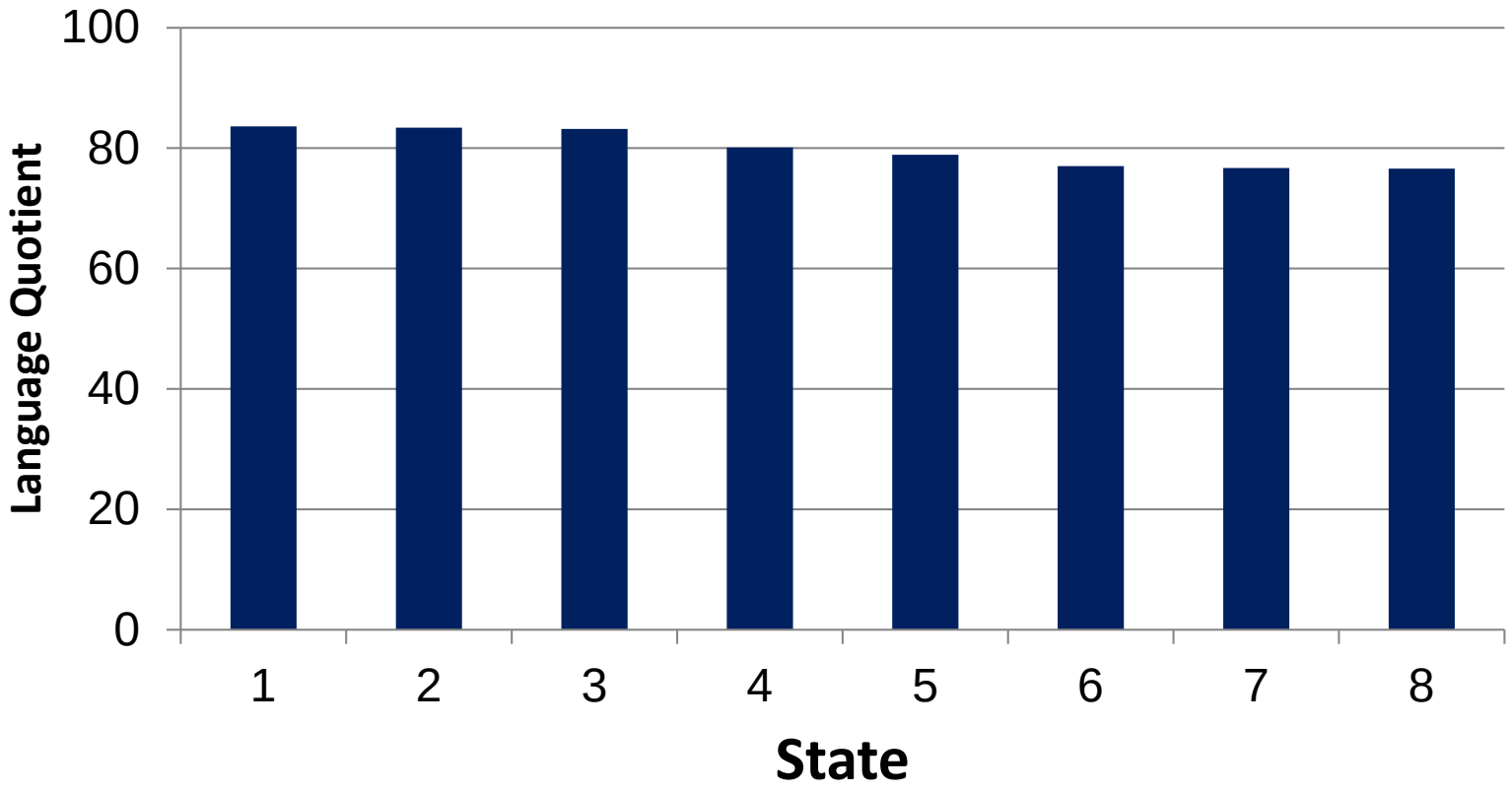
- If LQ = 100, Language Age = CA
- If LQ < 100, Language Age < CA
- If LQ > 100, Language Age > CA

LQs of 80+ are within the normal range compared to hearing children

Study 1 – Bilateral Hearing Loss: Language Outcomes (n = 549)

- MacArthur-Bates Language Quotient
  - Range = 30 to 178
  - Mean = 78
  - SD = 21
- Percentage of children with LQ of 80+
  - 43%

Mean Language Quotients Across States with 35 or More Assessments



Predicting Language Outcomes

- Linear regression used with MacArthur Language Quotient as the dependent variable
- Due to missing data (primarily on degree of hearing loss and mother's level of education), n = 323

Predicting Language Outcomes

- Independent variables that were NOT significant ($p > .05$) and removed from the final model:
  - Language of home (English vs. Spanish)
  - Gender

Predicting Language Outcomes

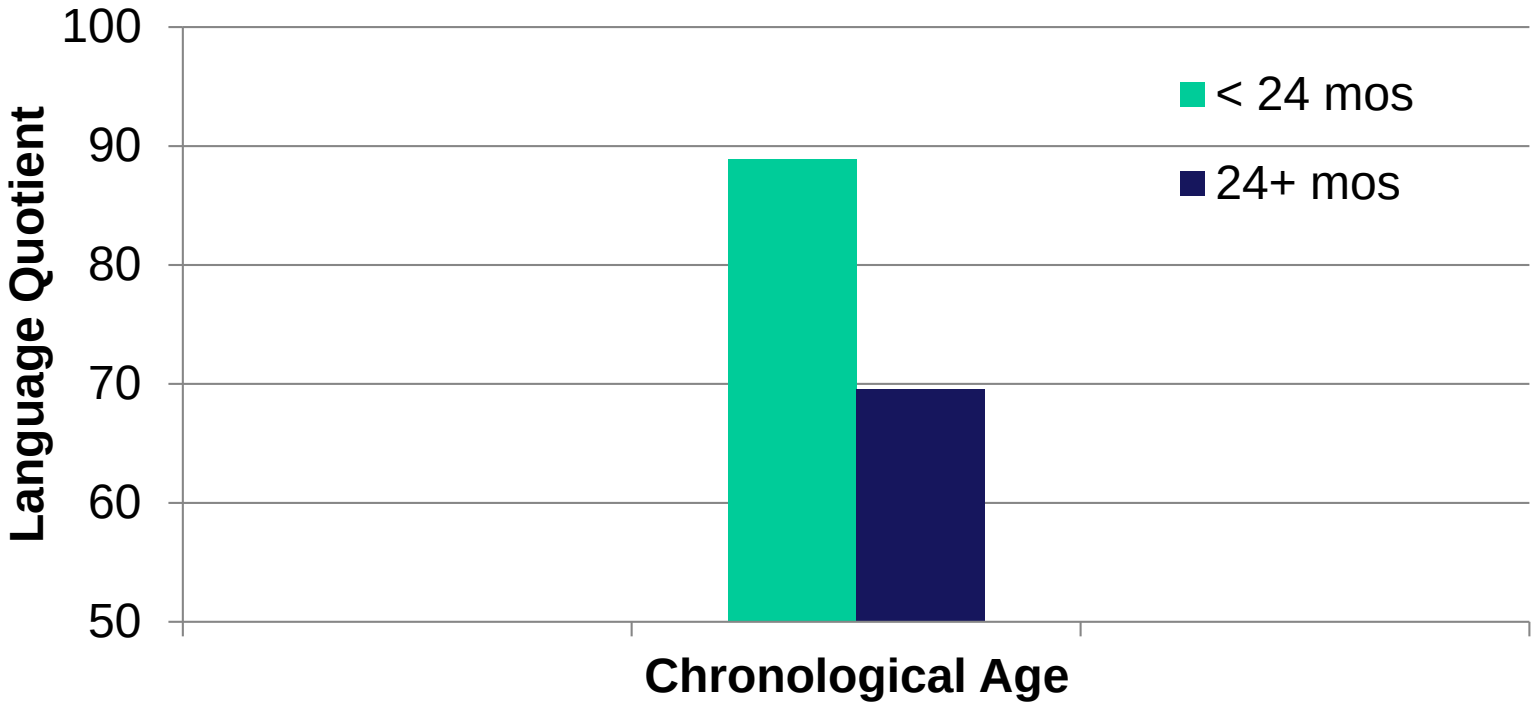
- Independent variables that WERE significant predictors ($p < .01$):
  - Chronological age
  - Degree of hearing loss (mild/mod vs. mod-severe to profound)
  - Mother's level of ed (< B.A vs. B.A or higher)
  - Meeting EHDI guidelines (identification by 3 months and intervention by 6 months)
  - Deaf adult in the home

Regression Analysis: Predicting Language Quotient

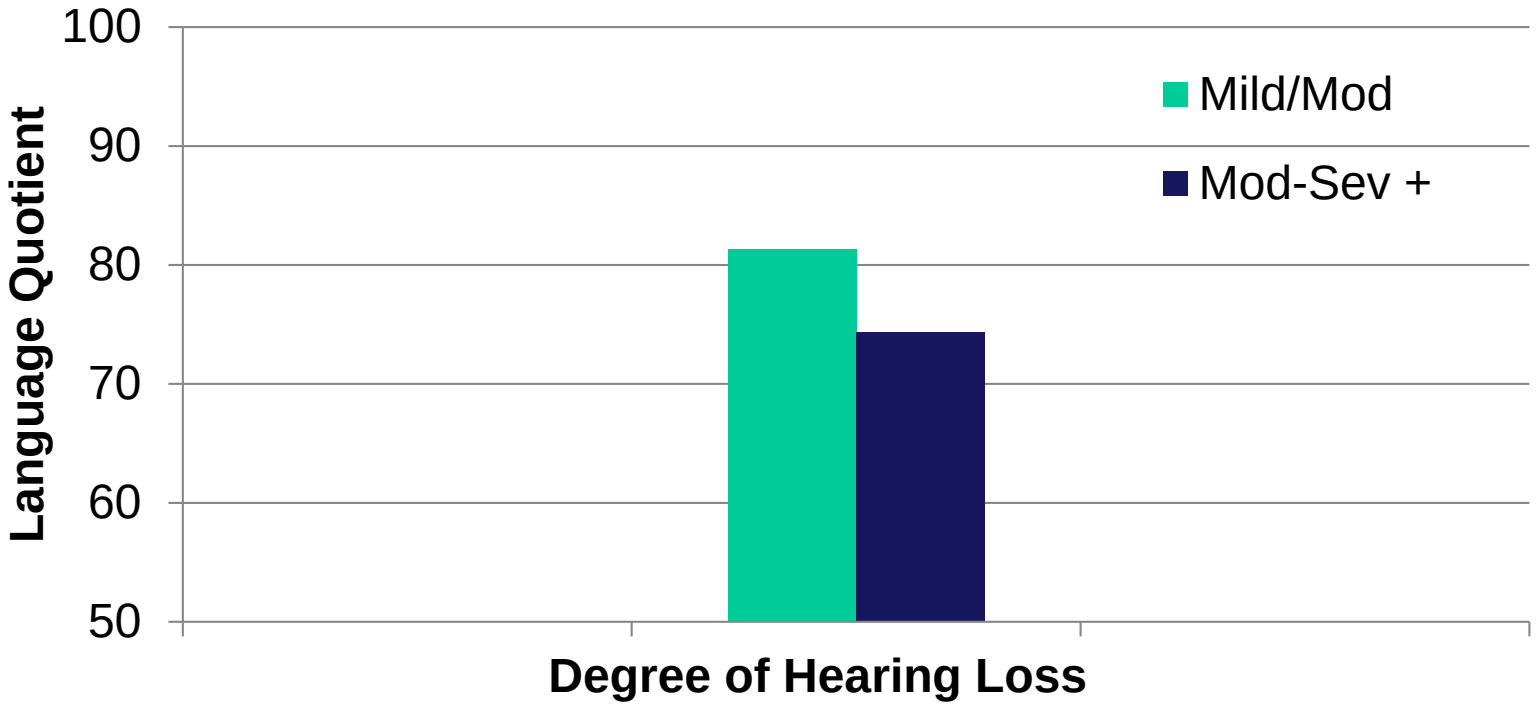
Independent variables	B (unstd coeff)	Beta (std coeff)	*p*
Chronological age	-1.26	-.48	<.001
Degree of loss (mild/mod vs. higher)	-6.59	-.16	<.001
Mother's education (<B.A. vs. B.A or above)	6.76	.16	.001
Meets EHDI guidelines	-6.04	-.15	.001
Deaf adult in the home	6.84	.14	.002

38% of the variance is explained by this model

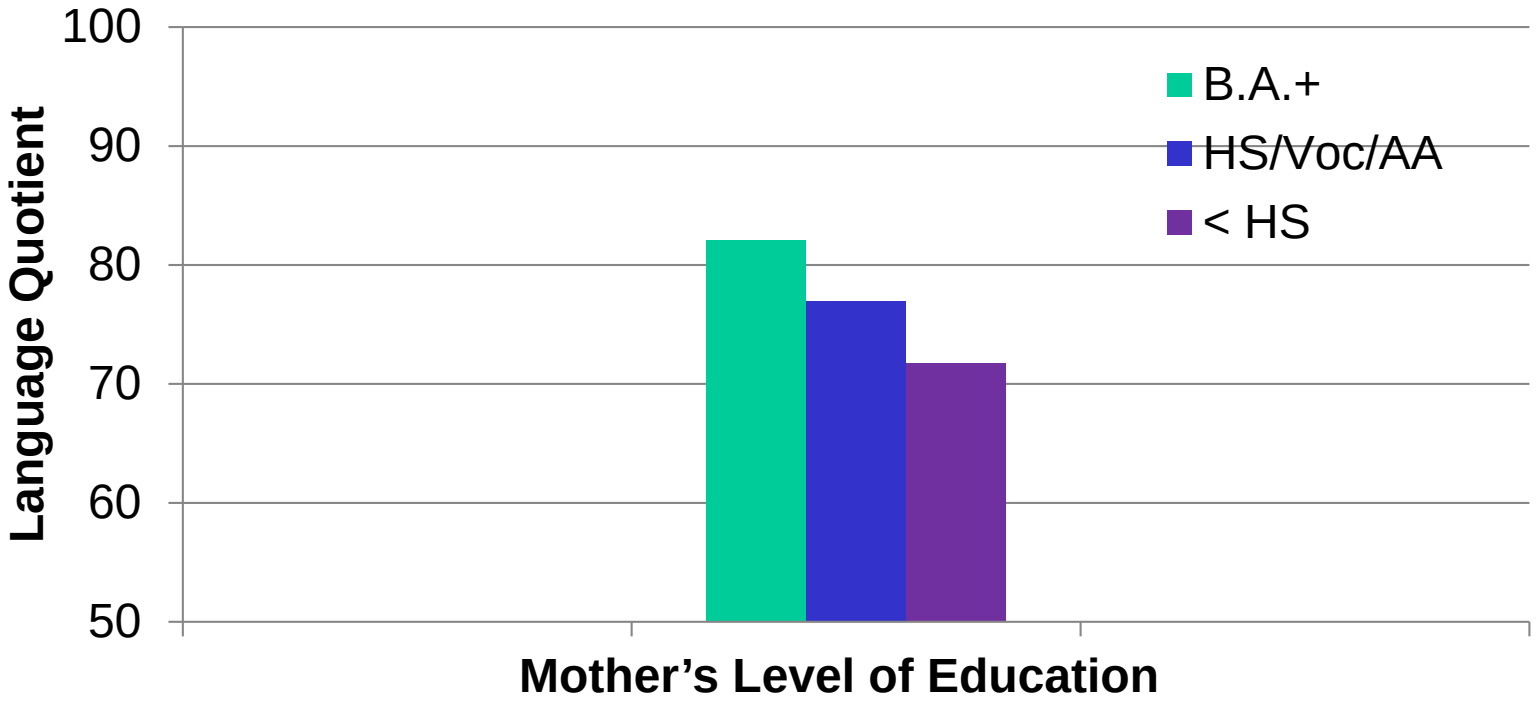
Chronological Age Group



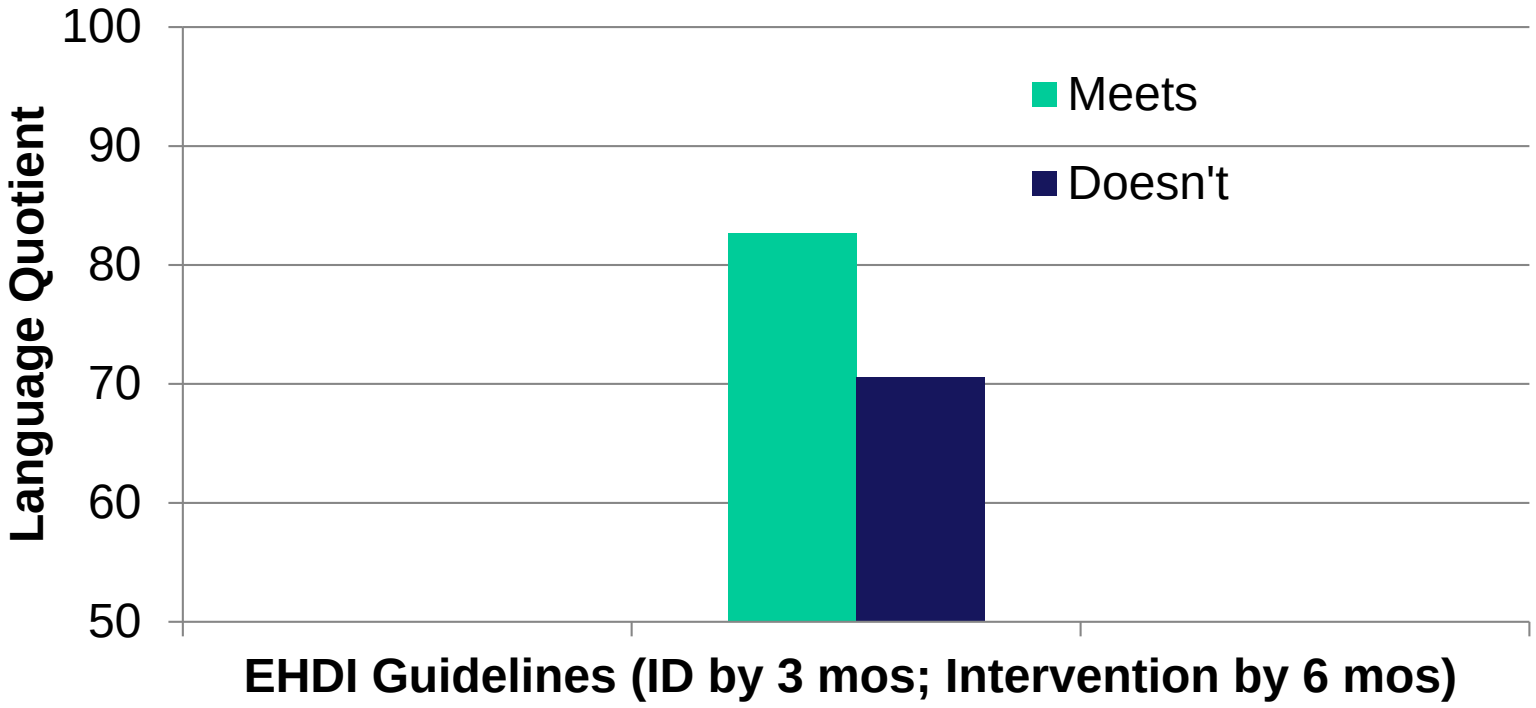
Degree of Hearing Loss



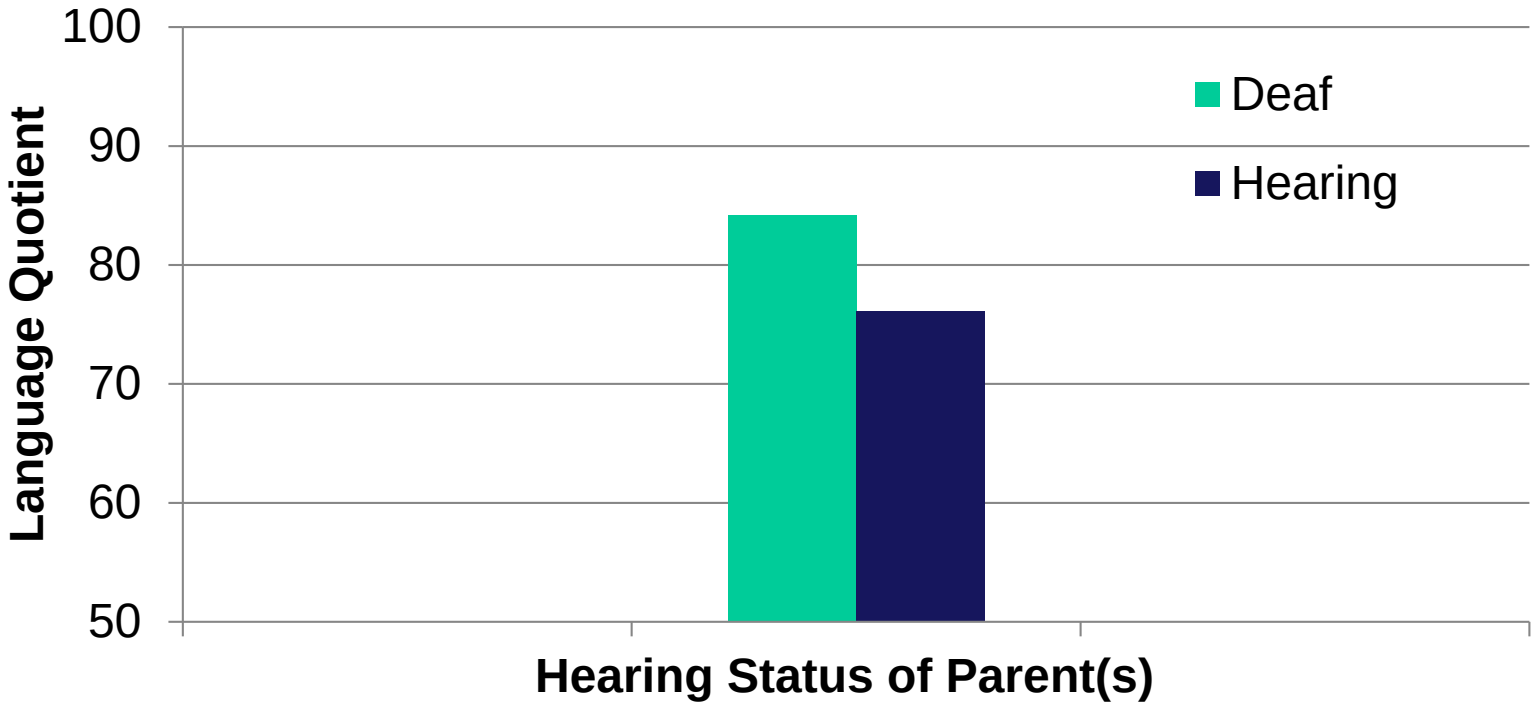
Mother’s Level of Education



Adherence to EHDI Guidelines



Deaf vs. Hearing Parent(s)



Conclusions

Acquiring an age-appropriate lexicon is a challenge for many children with bilateral hearing loss with 57% of the group demonstrating significant delays

Conclusions

- Typically language quotients were higher (by 6 to 19 points) for children who:
  - Were less than 2 years of age
  - Had mild or moderate hearing loss
  - Had mothers with B.A. degrees or higher
  - Were identified by 3 months and in intervention by 6 months of age
  - Had deaf parent(s)