Factors Impacting Language Outcomes of Children with Unilateral Hearing Loss: A Multi-State Perspective

EHDI Conference

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Disclaimer
The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

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ODDACE
OUTCOMES & DEVELOPMENTAL DATA
ASSISTANCE CENTER FOR EHDI PROGRAMS

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Today's Topics

- Compare language outcomes based on laterality and hearing levels
- Summarize characteristics of children with unilateral hearing differences
- Identify characteristics associated with better language outcomes in children with unilateral hearing differences

Description of Database

- Data obtained from 17 different programs participating in ODDACE
  - www.colorado.edu/center/oddace
- ODDACE: CDC-supported project collecting language outcome data on deaf and hard-of-hearing children birth to 3 across the United States

ODDACE
OUTCOMES & DEVELOPMENTAL DATA
ASSISTANCE CENTER FOR EHDI PROGRAMS

ODDACE Project Objectives

- Partners have accurate and standardized data on outcomes of children who are D/HH
  - Database created for each participating program
  - Annual report provided summarizing program data
- Increased understanding of factors that impact developmental outcomes at the state and national level
  - Combine program databases to obtain a large, diverse, representative sample

Participating States

- Arizona
- Colorado
- Florida
- Idaho
- Illinois
- Indiana
- Maine
- Massachusetts
- North Dakota
- South Dakota
- Tennessee
- Texas
- Vermont
- Wisconsin
- Wyoming

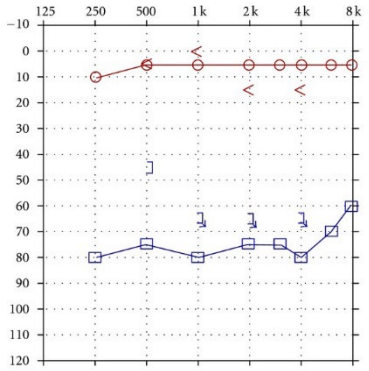
Assessment Components

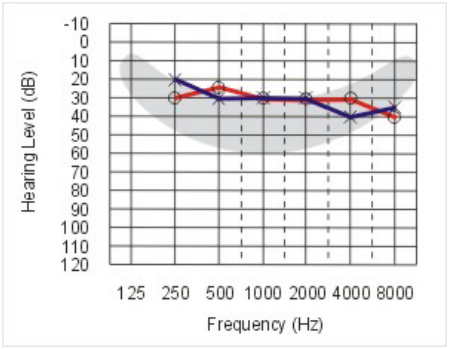
- Demographic form
- Audiologic information
- Developmental Assessment of Young Children (DAYC-2)
- MacArthur-Bates Communicative Development Inventories

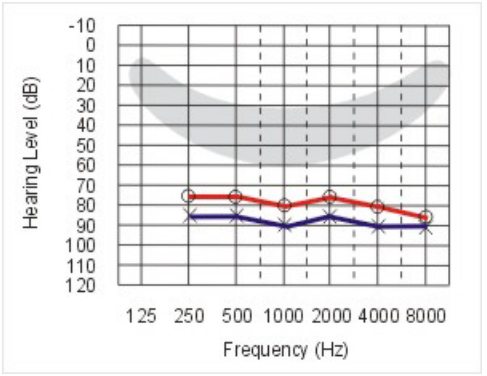
Question 1

Is there a difference in language scores for children with hearing differences that are:

- Unilateral vs.
- Bilateral mild/mod vs.
- Bilateral mod-sev to profound







Number of Participants

- 683 children (DAYC-2 outcomes)
  - Bilateral = 440
  - Unilateral = 243

- 607 children (MacArthur outcomes)
  - Bilateral = 387
  - Unilateral = 220

Participant Criteria for Language Outcomes Analysis

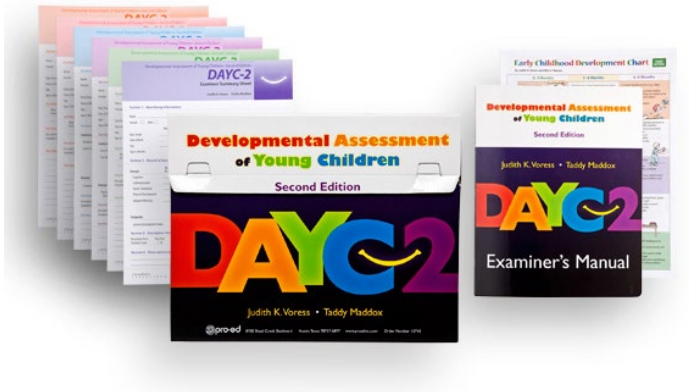
- No disabilities thought to affect speech or language development
- Most recent assessment

Language Outcomes Analysis: Participant Characteristics

- Chronological age
  - Range = 2 to 36 months
  - Mean = 22 months
- Gender
  - Boys = 53%
  - Girls = 47%

Developmental Assessment of Young Children - DAYC-2

- Based on observation and parent report
- Examined Receptive and Expressive Language subscales
- Adapted to reflect abilities in both spoken and sign language



MacArthur-Bates Communicative Development Inventories

- Assesses diversity of vocabulary
- Parent-report instrument
- Includes both spoken and signed expressive vocabulary

Comparison by Laterality and Degree

- Three groups
  - Unilateral
  - Bilateral: Mild/Moderate
  - Bilateral: Mod-Sev through Profound

- Statistical analysis to compare groups:
  - One-Way ANOVA

Results: Comparison by Laterality and Degree

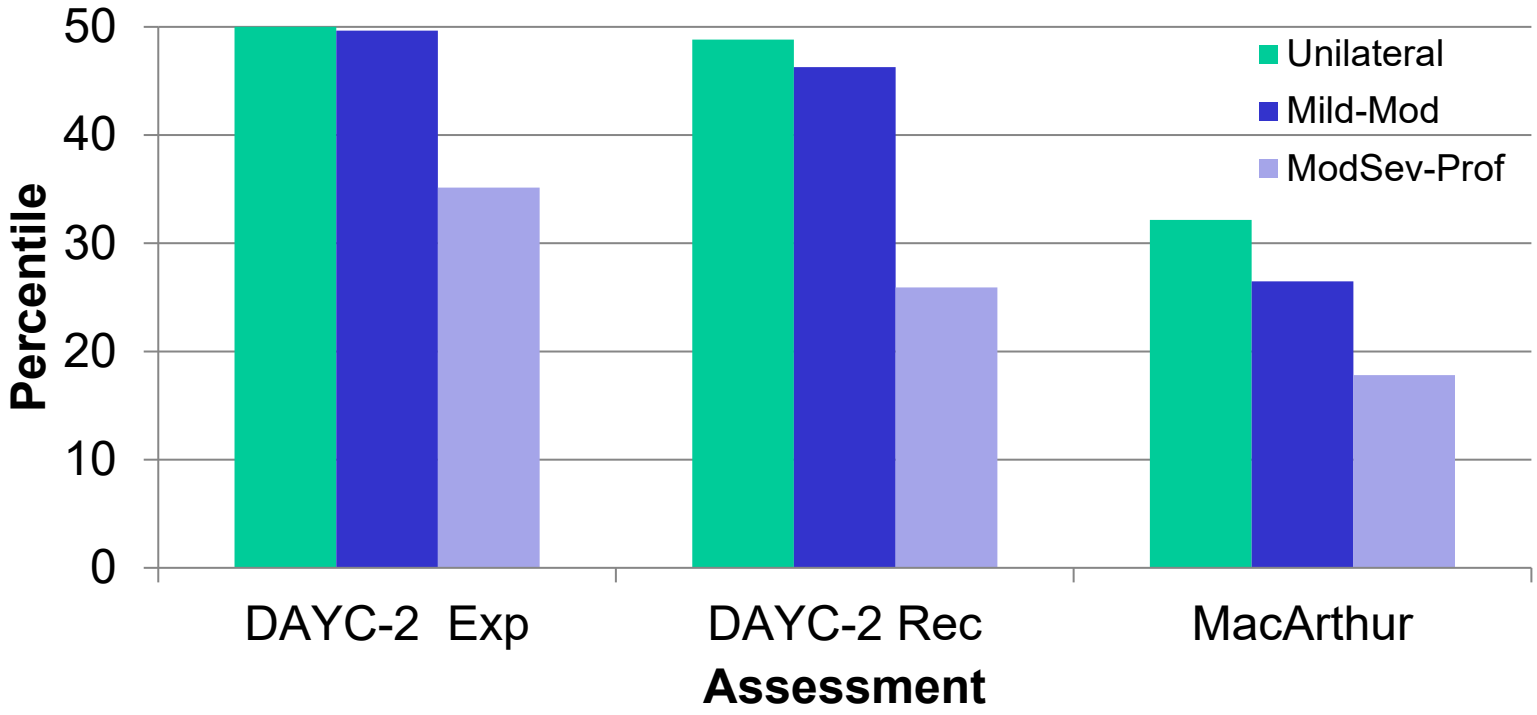
DAYC-2: Receptive and Expressive subscales

- No significant diff between UHL and mild-mod
- Significant diff ($p < .001$) between UHL and mod-sev through profound
- Significant diff ($p < .001$) between mild/moderate and mod-sev through profound

MacArthur: Expressive Vocabulary

- Significant diff ($p < .05$) between all three groups

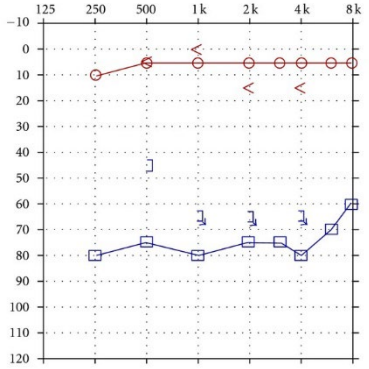
Mean Language Percentiles: Unilateral and Bilateral

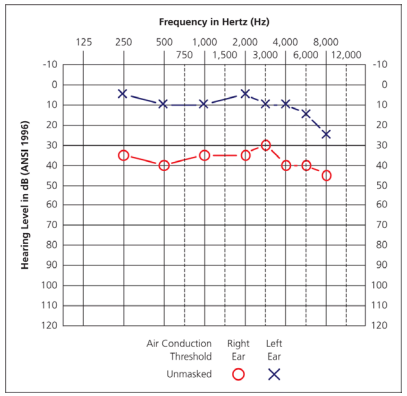


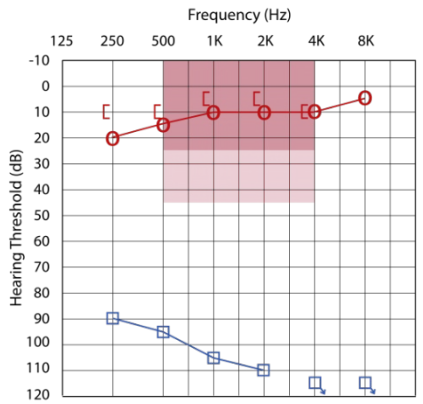
Mean percentile for hearing children in the normative sample = 50

Question 2

What factors are associated with better language outcomes in children with unilateral hearing differences?

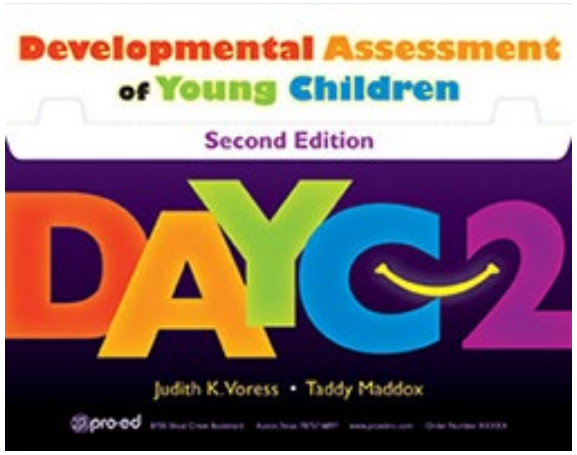






Number of Participants

DAYC- 2 = 206



MacArthur CDI = 197

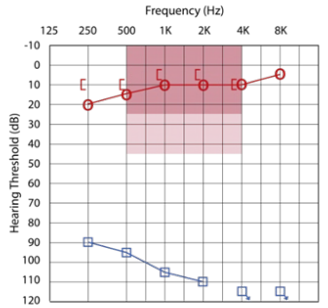
Language Outcomes Analysis: Participant Characteristics

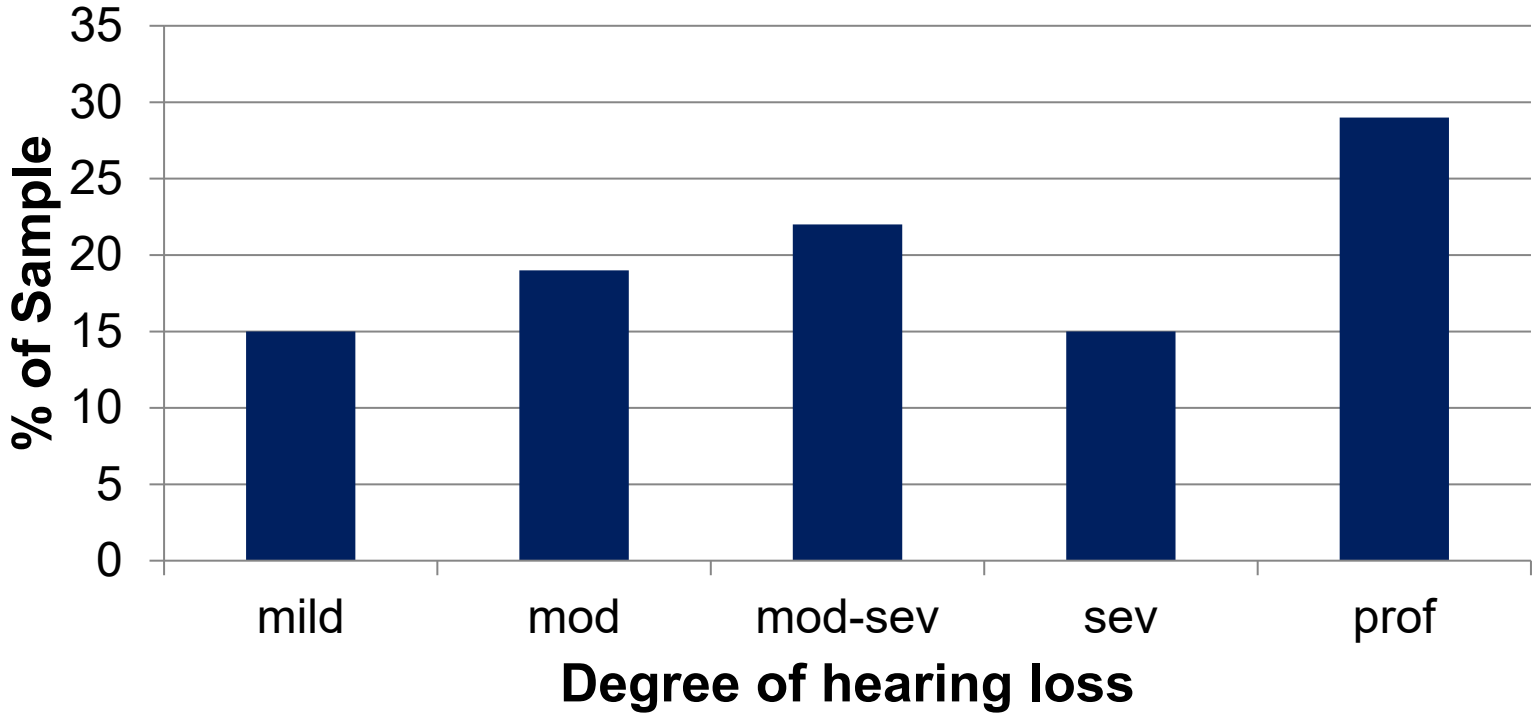
- Chronological age
  - Range = 1 to 36 months
  - Mean = 21 months
- Gender
  - Boys = 52%
  - Girls = 48%
- Affected ear
  - Right = 56%
  - Left = 44%

Participant Characteristics

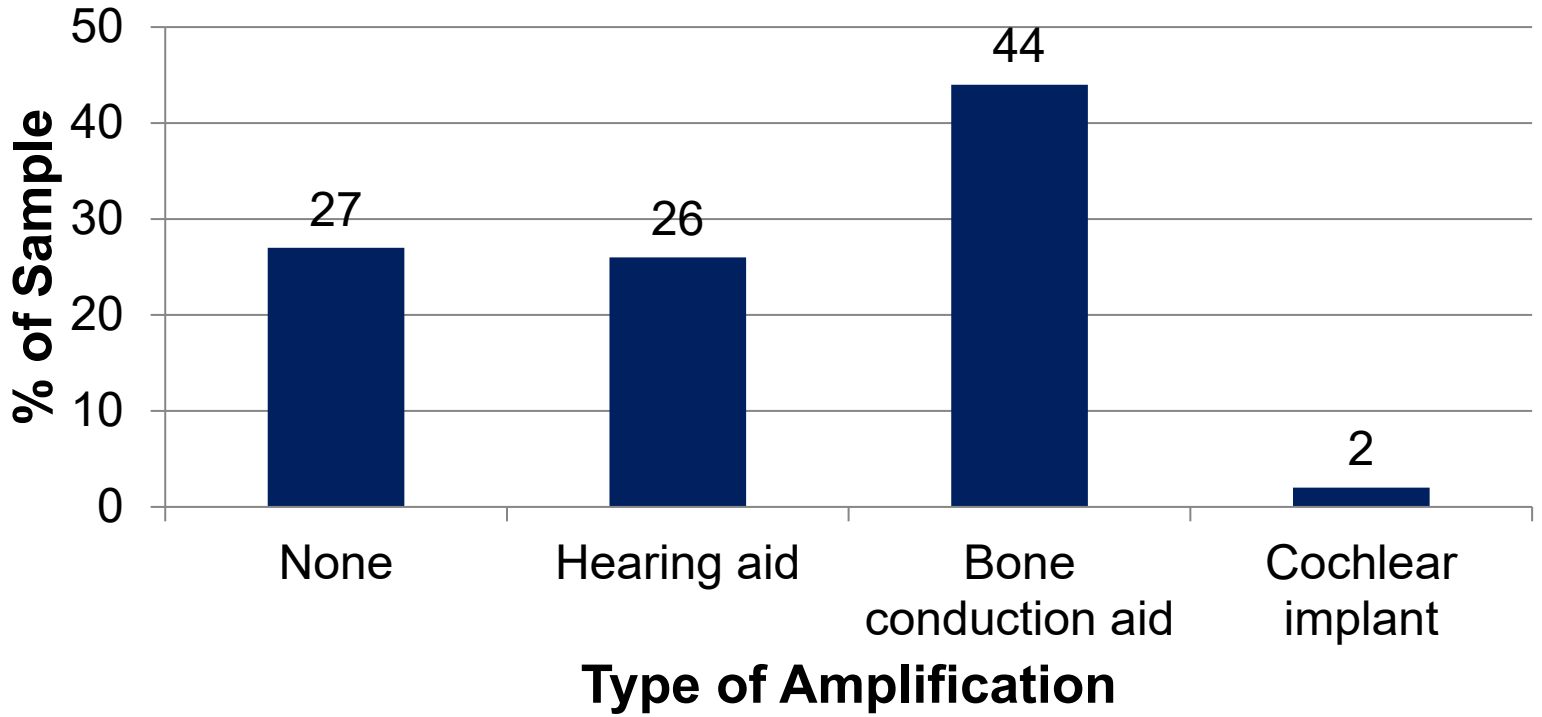
- English is spoken and/or written language of the home = 87%
- Hispanic ethnicity = 44%
- White race = 84%
- Hearing parents = 95%

Hearing Level in Affected Ear

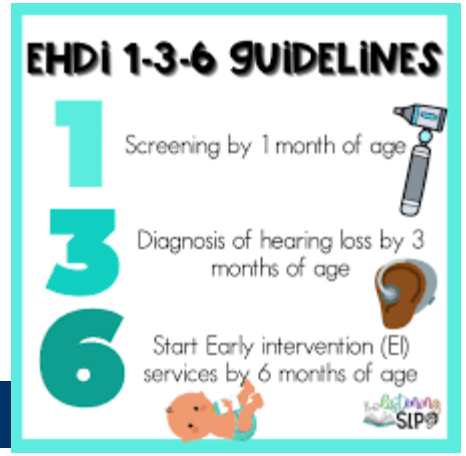




Amplification Use



Meeting EHDI Guidelines



EHDI guideline category	Percentage
Identification by 3 months	76%
Intervention by 6 months	61%
Meets 1-3-6	54%

Amount of Intervention

- 62% of families receive EI services once or twice a month
- Mean = 2.9 sessions per month

➢ Children with bilateral loss in ODDACE: Mean = 5.1 sessions per month

Determining Predictors of Language Outcomes

- Model selection approach
  - Forward-backward stepwise
  - Determines which predictors contribute significantly to the model, balancing model fit with complexity
- Statistical Analysis:
  - Linear regression

Factors NOT Associated with Language Outcomes

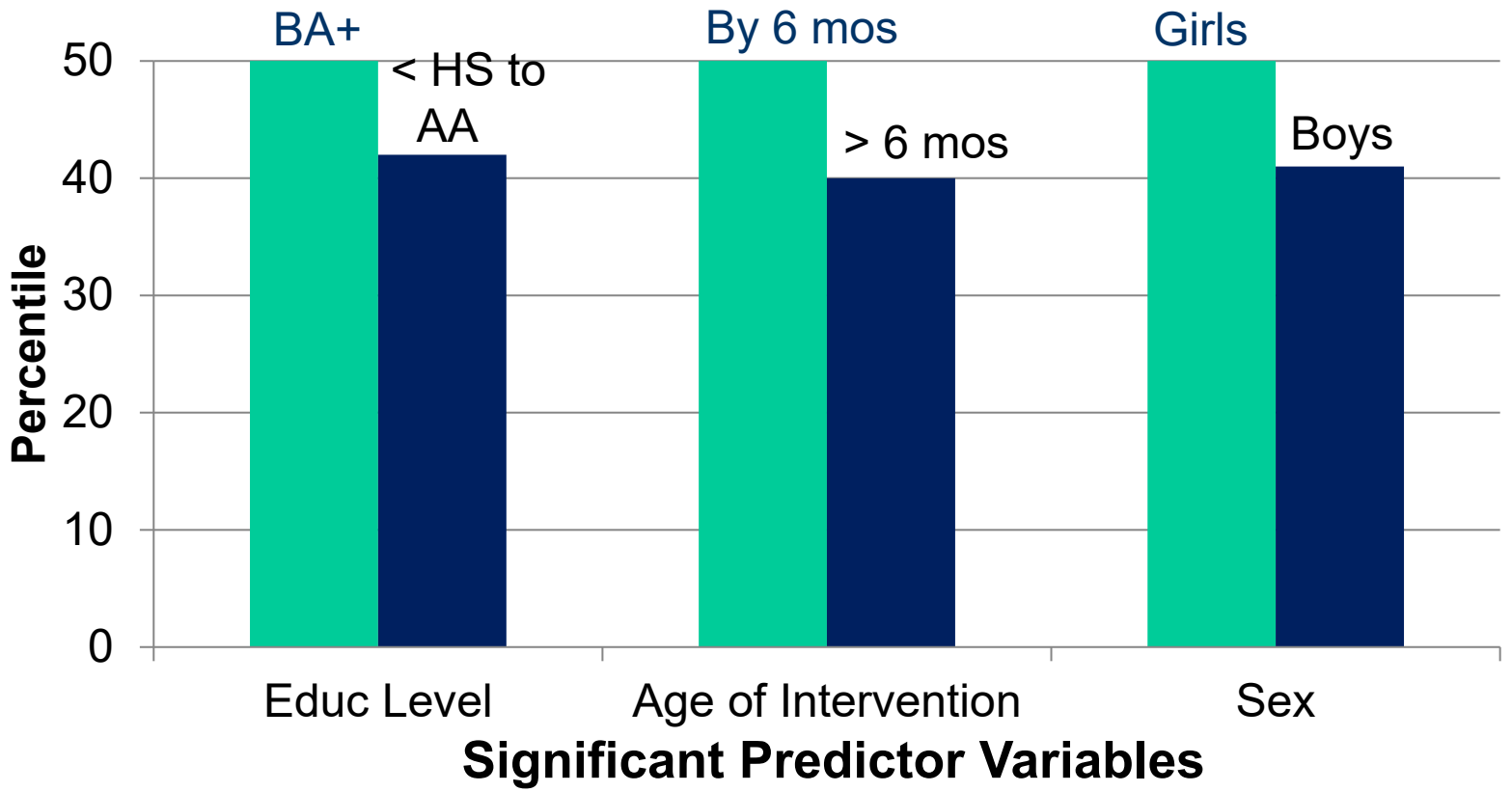
- Affected ear (right vs. left)
- Degree of loss in affected ear
- Presence of auditory neuropathy
- Home language (English vs. Spanish)
- Parents' hearing status (deaf vs. hearing)
- Use of amplification (something vs. none)

Significant Predictors of DAYC-2 Language Outcomes

- Sex
- Age of intervention
- Primary caregiver years of education

- Percent of variance in DAYC-2 percentiles accounted for by the model = 11%

Significant Predictors of DAYC-2 Receptive Language Percentile Scores



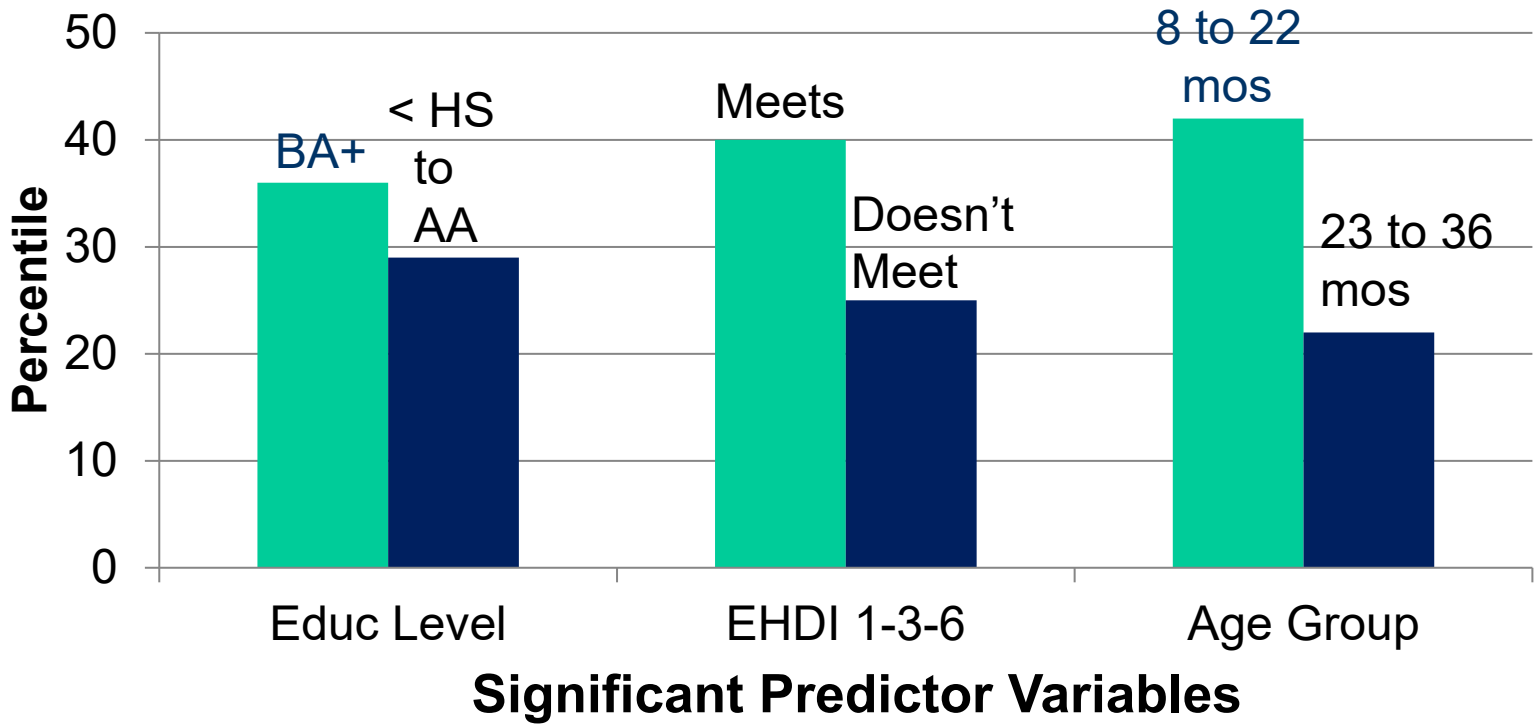
Mean percentile for hearing children in the normative sample = 50

Significant Predictors of MacArthur Vocabulary Outcomes

- Chronologic age
  - 8- to 22-month-olds had higher percentiles than 23- to 36-month-olds
- Meeting EHDI 1-3-6 guidelines
- Primary caregiver years of education

- Percent of variance in MacArthur percentiles accounted for by the model = 27%

Significant Predictors of MacArthur Percentile Scores



Mean percentile for hearing children in the normative sample = 50

Conclusions

- Language scores on a general language test (the DAYC-2) were in the average range for children with UHL who did not have risk factors

- The MacArthur CDI was sensitive to gaps in vocabulary diversity in children with UHL
  - 31% of children were delayed (scoring at or below the 10th %ile)

Conclusions

- Children with UHL scored similarly to children with mild/mod bilateral hearing differences on a test of general language

- Children with UHL obtained higher scores than children with mild/mod bilateral hearing differences on a measure of expressive vocabulary diversity

Conclusions

Factors placing children with UHL at higher risk for language delay:

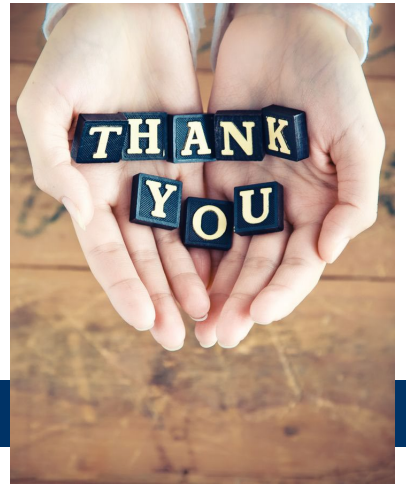
- Sex (boys)
- Later ages of intervention
- Not meeting EHDI 1-3-6 guidelines
- Lower levels of primary caregiver education
- Older chronologic ages (> 22 months)

Clinical Implications

Minimally, children with UHL should be evaluated at approximately 2 years old and again at transition to preschool

Rigorous and specific language tests (e.g., the MacArthur CDI) should be used as opposed to general language measures

With Appreciation



- to the families who shared their children's information with ODDACE
- to the interventionists who took the time to complete and send in the assessments
- to the ODDACE Assessment Coordinators
- to the ODDACE Project Assistants