

# Meeting EHDI 1-2-3 vs. 1-3-6: A Comparison of Language Outcomes

EHDI Conference

March 6, 2023

## **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).

# Acknowledgement

This project was funded by the Centers for Disease Control and Prevention (CDC)

Specifically, via cooperative agreement CDC-RFA-DD20-2005, NCBDDD Outcomes and Developmental Data Assistance Center for EHDI Programs (ODDACE)





University of Colorado  
Boulder

## Presenters/Authors

Allison Sedey, Ph.D.

University of Colorado-Boulder  
Colorado School for the Deaf and the Blind  
Allison.Sedey@colorado.edu

Caitlin Berry, M.A.

University of Colorado-Boulder  
Caitlin.Berry@colorado.edu

Christine Yoshinaga-Itano, Ph.D.

University of Colorado-Boulder  
Christie.Yoshi@colorado.edu

## Background: EHDI 1-3-6 Guidelines

- The Joint Committee on Infant Hearing (JCIH) in 2000 recommended
  - Hearing screening by 1 month of age
  - Identification/confirmation of hearing differences by 3 months of age
  - Intervention by 6 months of age
- Commonly referred to as the EHDI 1-3-6 guidelines

## Background: EHDI 1-3-6 Guidelines

- In 2019 the JCIH suggested that states meeting 1-3-6 might consider setting a new target of 1-2-3 months
- Transitioning to a 1-2-3 target may be quite challenging
- Will the time and resources needed to achieve this more ambitious 1-2-3 target result in better language outcomes?

# Today's Topics

- Examine predictors of language outcomes including meeting versus not meeting EDDI 1-3-6 guidelines
- Compare language outcomes of children meeting EDDI 1-3-6 guidelines to those meeting 1-2-3

# Project Database



- All data were collected under the ODDACE public health surveillance project
- Funded by the CDC
- 17 programs across 15 states participating
- Provides programs with outcome data
- Combines data across programs to examine factors that impact developmental outcomes
- See: [www.colorado.edu/center/oddace](http://www.colorado.edu/center/oddace)

# Participating States

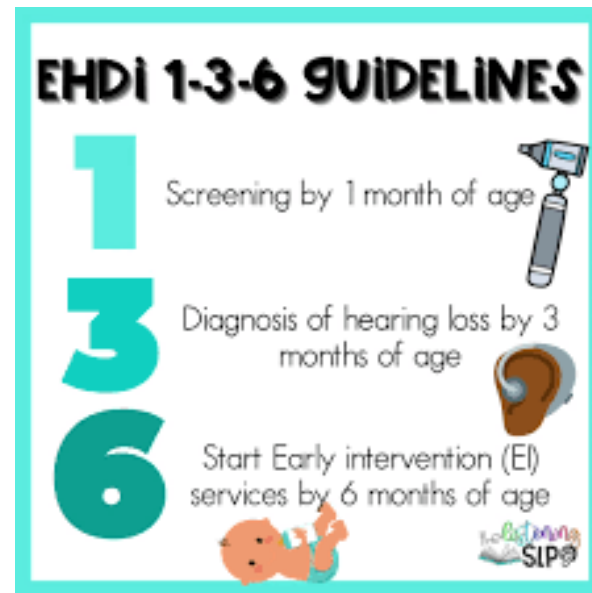
- Arizona
- Colorado
- Florida
- Idaho
- Illinois
- Indiana
- Maine
- Massachusetts
- North Dakota
- South Dakota
- Tennessee
- Texas
- Vermont
- Wisconsin
- Wyoming



# Question 1

What factors are associated with better language outcomes?

Does meeting EHDI 1-3-6 guidelines make a positive difference in language scores?



# Number of Participants

- 597 children (DAYC-2 outcomes)
  - Bilateral = 404
  - Unilateral = 193
- 532 children (MacArthur outcomes)
  - Bilateral = 358
  - Unilateral = 174

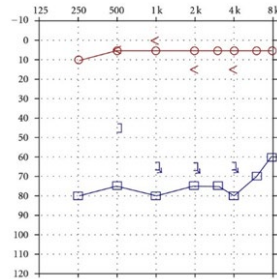
# Participant Criteria for Language Outcomes Analysis

- Birth to 3
- Unilateral or bilateral hearing differences
- All levels of hearing difference
- Any home language
- Any communication mode
- No disabilities thought to affect speech or language development
- Most recent assessment

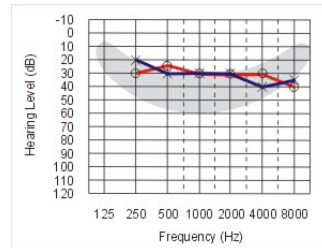
# Language Outcomes Analysis: Participant Characteristics

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

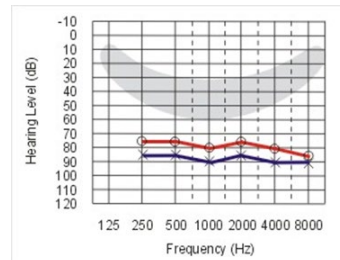
# Hearing Levels



Unilateral = 32%



Bilateral: Mild & Moderate = 45%



Bilateral: Mod-Sev to Prof = 23%

# Participant Characteristics

- English is spoken and/or written language of the home = 90%
- Hispanic ethnicity = 41%
- White race = 87%
- Hearing parents = 90%
- Average # of EI sessions per month = 4.2

# Communication Approach

Approach	Percent
Spoken language	88%
Spoken only	53%
Spoken w/ occasional sign	35%
Sign with spoken language	12%
Sign only	1%

# Meeting EHDl Guidelines

EHDl guideline category	Percentage
Identification by 3 months	77%
Intervention by 6 months	69%
Meets 1-3-6	62%

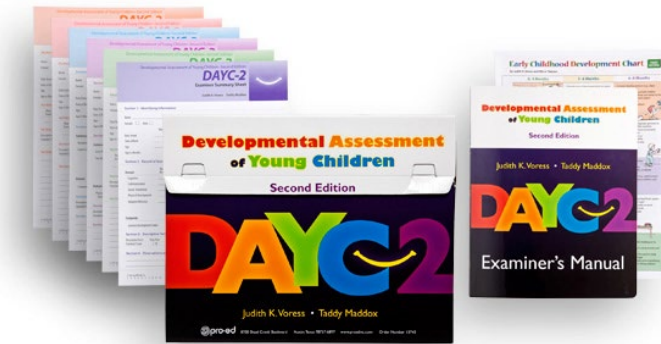


# Assessment Components

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

# 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



# 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

## Three Models: Outcome Variable

- Three predictive models each examining a different language outcome
  - DAYC-2 Expressive Language
  - DAYC-2 Receptive Language
  - MacArthur Expressive Vocabulary
- Used percentile scores for each measure

# Significant Predictors of Language Outcomes

Significant predictors of all 3 language measures ( $p < .01$ )

- Primary caregiver years of education
- Mild and Mod hearing levels vs. Mod-Sev to Profound
- Meeting EHDI 1-3-6 guidelines
- Not significant:
  - Unilateral vs. Mild and Mod bilateral

# Significant Predictors Language Outcomes

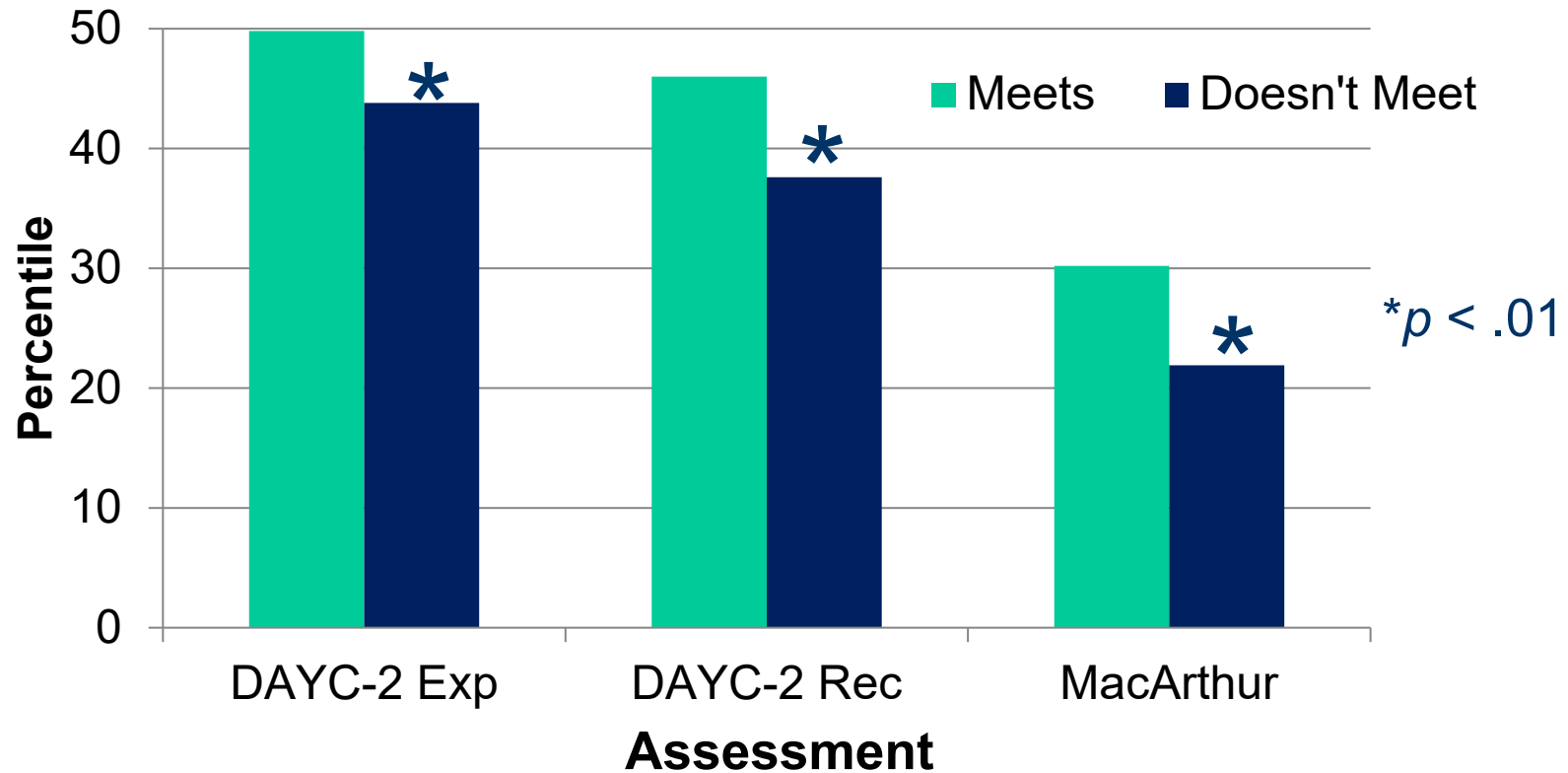
Significant predictor ( $p < .01$ ) of DAYC-2 but not MacArthur

- Girl vs Boy (girls higher percentile scores)
- MacArthur has separate norms for girls and boys so accounts for sex differences

Significant predictor ( $p < .01$ ) of MacArthur but not DAYC-2

- As chronological age increases, vocabulary percentile decreases (gap widens with age)

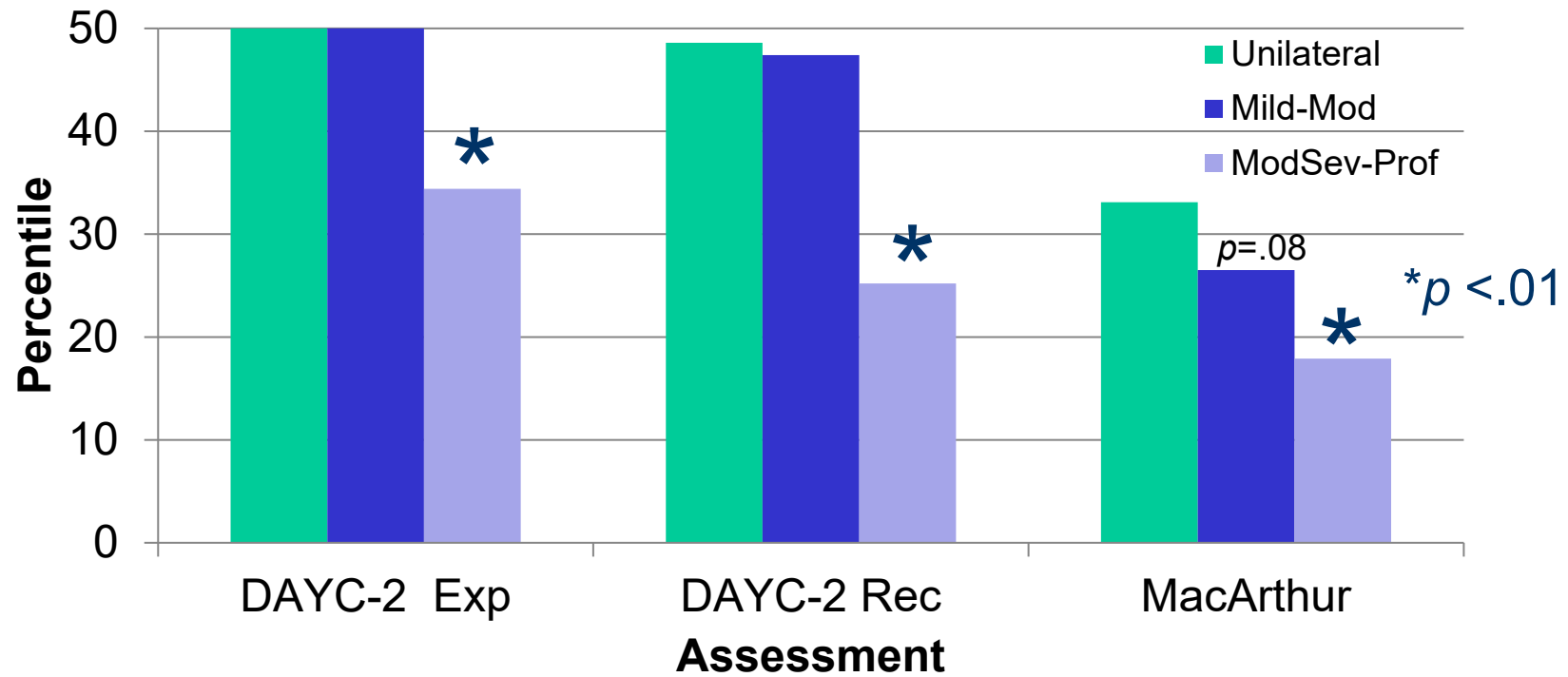
# Mean Language Percentiles: Meets EHDI 1-3-6 Guidelines



Mean percentile for hearing children in the normative sample = 50

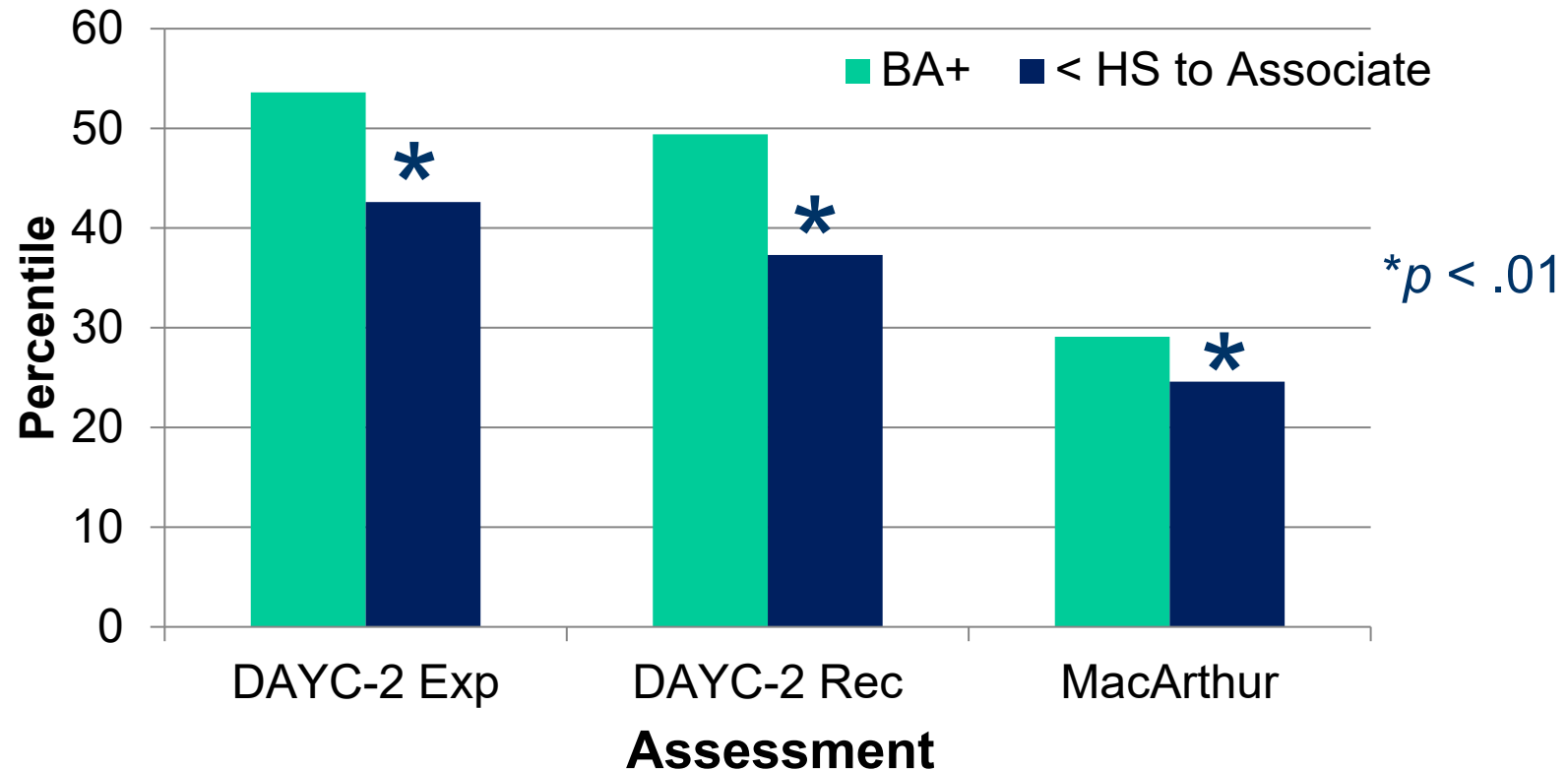


# Mean Language Percentiles: Unilateral and Bilateral



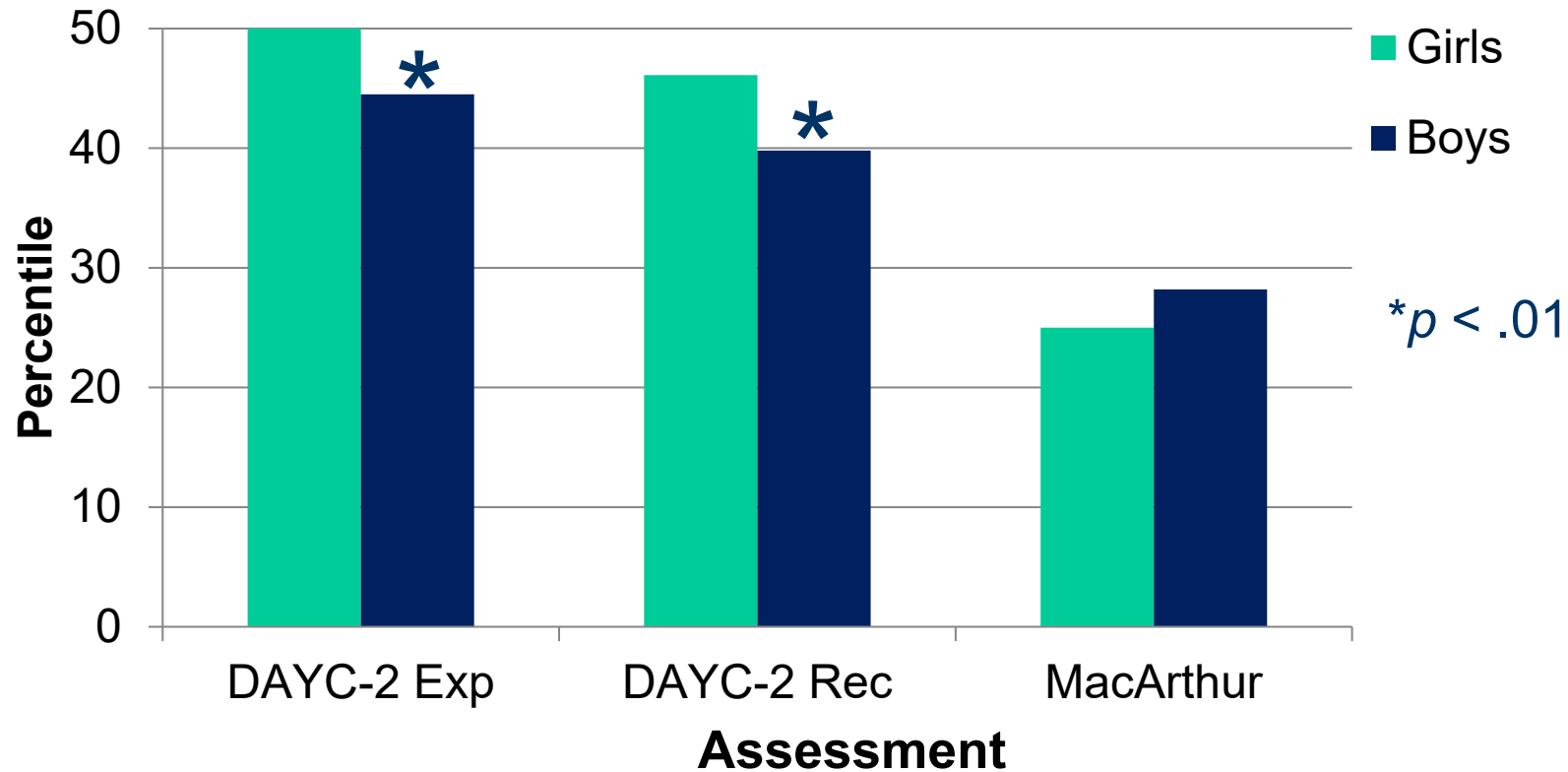
Mean percentile for hearing children in the normative sample = 50

# Mean Language Percentiles: Primary Caregiver's Level of Education



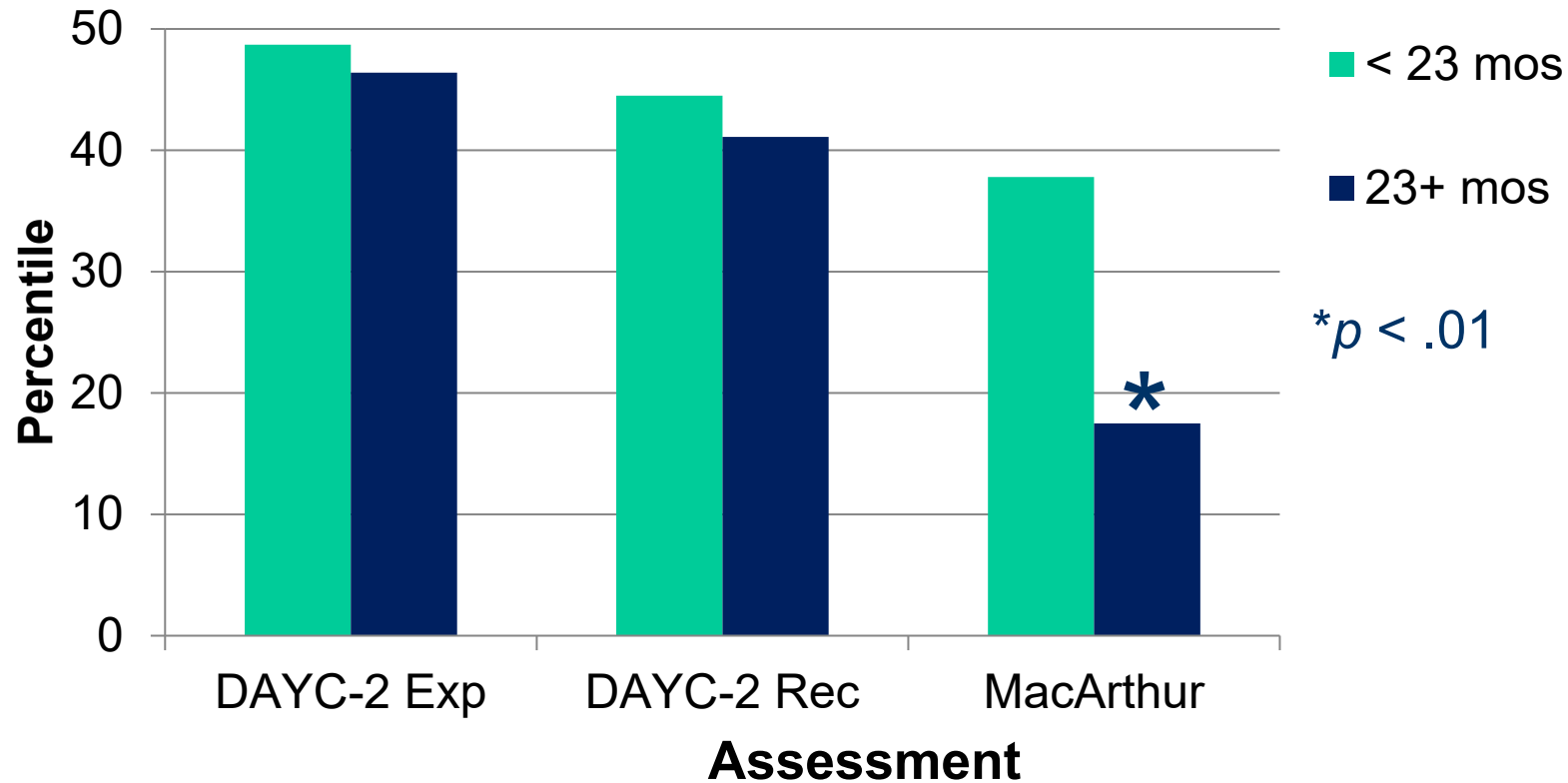
Mean percentile for hearing children in the normative sample = 50

# Mean Language Percentiles: Boys vs. Girls



Mean percentile for hearing children in the normative sample = 50

# Mean Language Percentiles: Younger vs. Older



Mean percentile for hearing children in the normative sample = 50

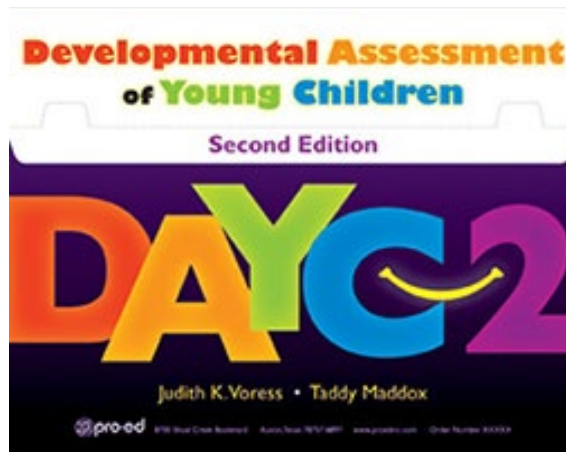
## Question 2

Do children who meet 1-2-3 demonstrate better language outcomes than children meeting 1-3-6 (but not 1-2-3)?



# Number of Participants

DAYC- 2 = 369



MacArthur CDI = 311



## EHDI 1-2-3 vs. 1-3-6

Controlling for sex, chronological age, degree/laterality of hearing levels, and primary caregiver's level of education...

There were NO significant differences in percentile scores for any of the three language measures for children meeting 1-2-3 vs. 1-3-6

# Conclusions

- Based on the results of this study, the higher levels of burden and stress on families, professionals, and systems to achieve a new target of 1-2-3 does not seem warranted



# Conclusions

---

- Meeting EHDI 1-3-6 guidelines is a significant predictor of language outcomes
- In this sample only 62% of children met these guidelines

# Conclusions

- Acquiring an age-appropriate lexicon is a challenge for many children with 42% of the children falling at or below the 10<sup>th</sup> percentile
- Gap between CA and vocabulary age increases over the birth to 3 period

# Research to Practice: What should we do?

- Understand vocabulary size benchmarks and share this info with families
- Average expressive vocabulary size in hearing children:
  - 12 months = 5 words
  - 18 months = 85 words
  - 24 months = 300 words

# Research to Practice: What should we do?

Even if a child is off to a great start...

- Assess language at 6-month intervals using norm-referenced instruments
- Include a rigorous and specific vocabulary test (e.g., the MacArthur CDI) in your test battery

## With Appreciation

*Thank  
you*



- 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