

# Integrating Ohio Early Hearing Detection and Intervention (EHDI) with state-level data systems to assess longitudinal outcomes for children who are deaf/hard of hearing

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Department of  
Developmental Disabilities



# Funding Support

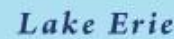


- CDC-funded Disability Research and Dissemination Center grant U01DD001007

# Objective of current study

- **Assess developmental outcomes of children who are deaf/hard of hearing (D/HH) identified through the Ohio EHDI program**
  - **Focus on language and early literacy**
- *Created a comprehensive longitudinal database of children born in the state of Ohio with permanent hearing loss by data across 3 state agencies*

## County Map

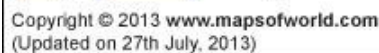







# INDIANA

P E N N S Y L V A N I A

**WEST VIRGINIA**

## KENTUCKY



 Intl. Boundary  
 State Boundary  
 County Boundary  
 State Capital  
 County Seat



ren's™  
come together

# Agencies Involved and Data System

## Ohio State Agencies

Department of Health (ODH)

Department of Developmental Disabilities (DODD)

Demographics, percent of time educated, attendance and absence days, disability condition, grade level, early childhood assessments, individualized education plans (IEP), educational labels, standardized assessments

Infant: Dates (screening, diagnosis) information regarding hearing loss (severity, laterality), risk factors, birth weight, GA, apgar, primary communication options, race, risk indicators  
Caregiver: education (mom and dad), insurance, race

(links with birth certificate)

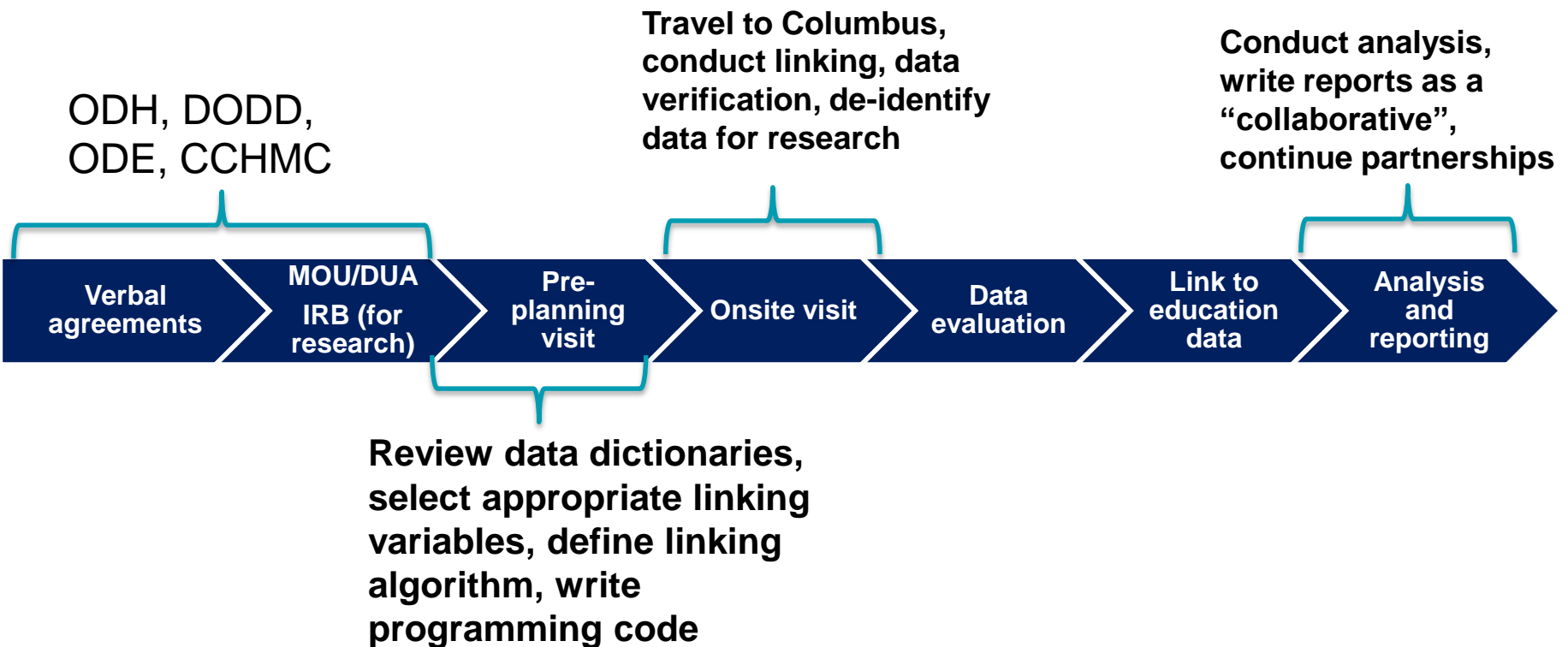
Screening and follow up

Dates, Individualized Family Service Plans information, documented delays, frequency & duration of services, service types, developmental disabilities

course information, late testing, assessments, IEP

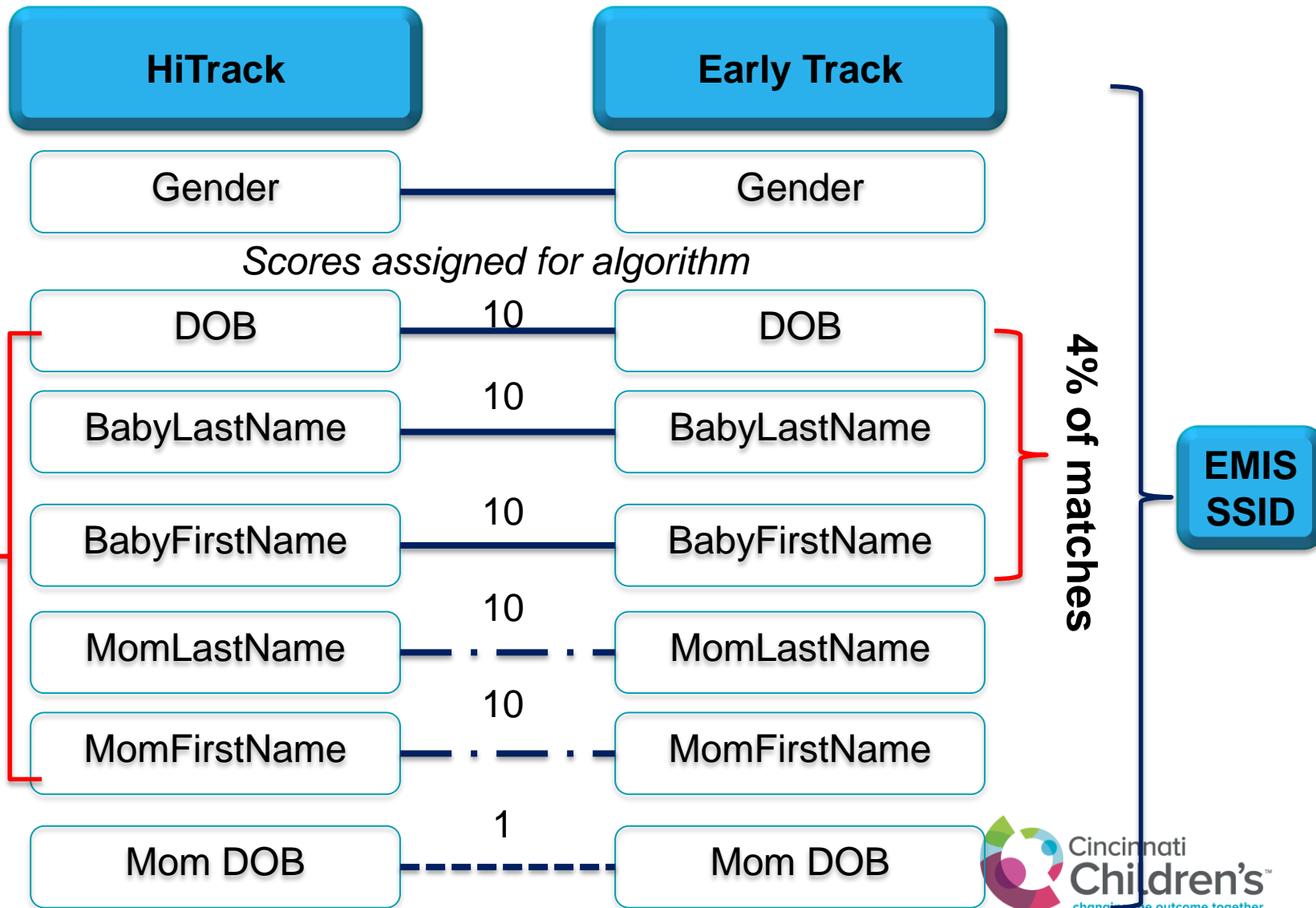
System (EMIS)

# Process



MOU – Memorandum of Understanding; DUA data use agreement  
MOA – Memorandum of Agreement  
IRB – Institutional Review Board

# Linking methods





# Actual data catchment of children identified with permanent hearing loss in state of Ohio

**HiTrack - ODH**

1746 infants

**Early Track- DODD**

1262 infants/children (72.3%)

**502 records linked to ODE records**

447 students with pre-K

424 Kindergarten

163 1<sup>st</sup>/2<sup>nd</sup> grade

**EMIS**

484 not  
linked



***Born between January 1, 2008 through December 31, 2014***



# Demographic characteristics

	All infants N=1746	linked to EI N=1262	linked to ed N=502
<b>Gender- Male</b>	51.1%	53.7%	56%
<b>Race</b>			
Caucasian	70.3%	75.4%	79.1%
Black/AA	13.1%	12.3%	13.6%
Hispanic	4.6%	4.4%	2.8%
<b>Gest age (wks)</b>	37.4 (3.3)	37.4 (3.3)	37.4 (3.3)
<b>Birth weight (g)</b>	2969 (824)	2972 (828)	2968 (852)
<b>Born Premature</b>	21.7%	22.4%	23.1%
<b>Mom education</b>			
< HS	12.5%	11.7%	11.8%
HS/GED	22.3%	21.5%	23.3%
Some college	27.1%	29.2%	28.9%
College grad	23.7%	27.2%	29.5%
missing	14.4%	10.5%	6.6%

# Hearing characteristics

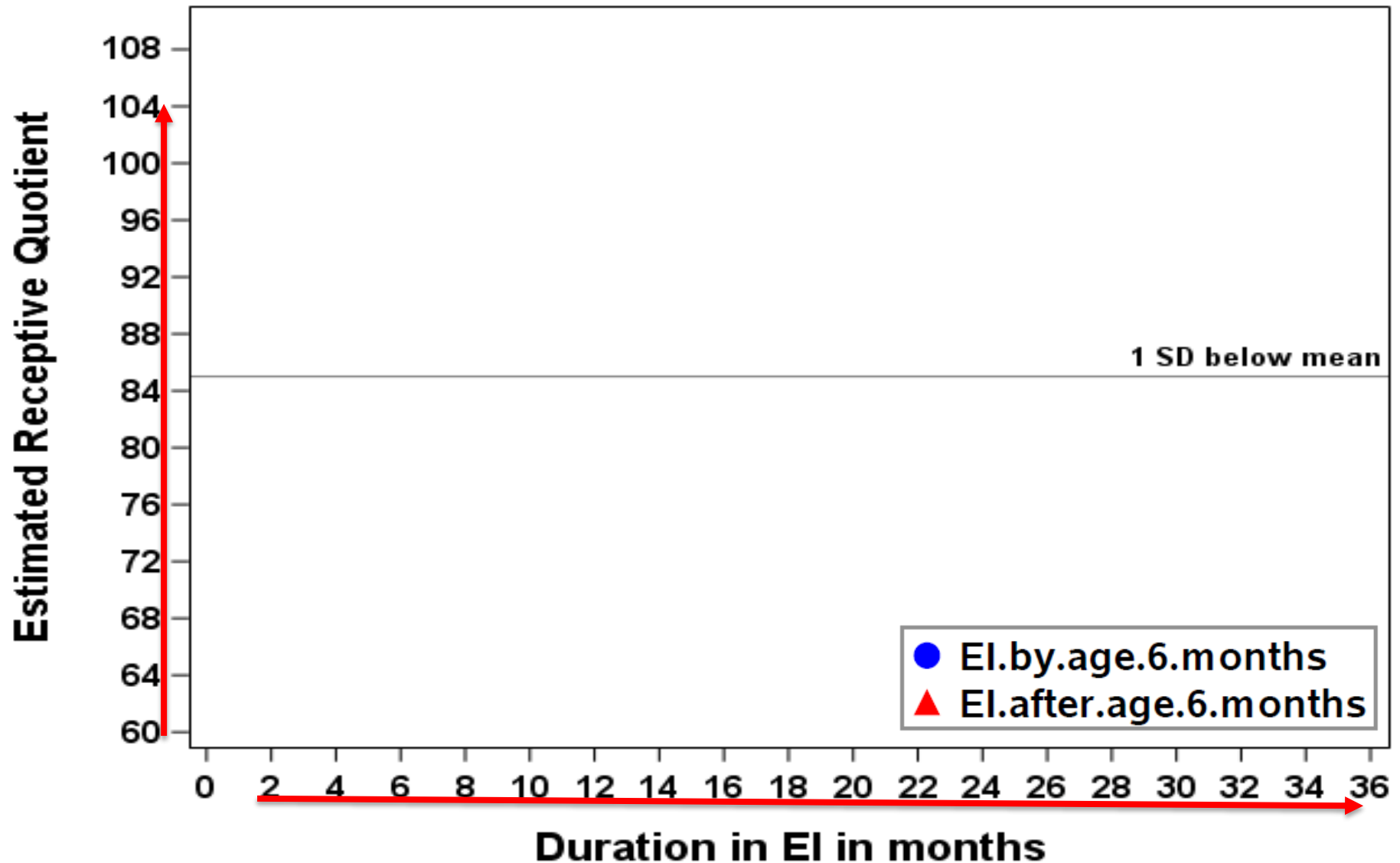
	All infants N=1746	linked to EI N=1262	linked to ed N=502
<b>Median age HL confirmed</b>	3.9 mo (IQR 1.9-9.6)	3.9 mo (IQR 1.9-9.0)	3.9 mo (IQR 1.8-9)
<b>Risk Indicator</b>	38.6%	40.2%	45.6%
<b>Bilateral HL</b>	73.6%	75.6%	76.9%
<b>Degree of loss</b>			
Mild	29.8%	29.6%	30.5%
Moderate	14.8%	15.4%	15.7%
Mod- Severe	12.8%	13.4%	11.7%
Severe	6.6%	6.7%	7.8%
Profound	27.1%	28.6%	25.8%
<b>Diagnosed conditions</b>	----	28%	37.7%
<b>EI by age 6 mo</b>	----	56.5%	59.5%

# Language outcome

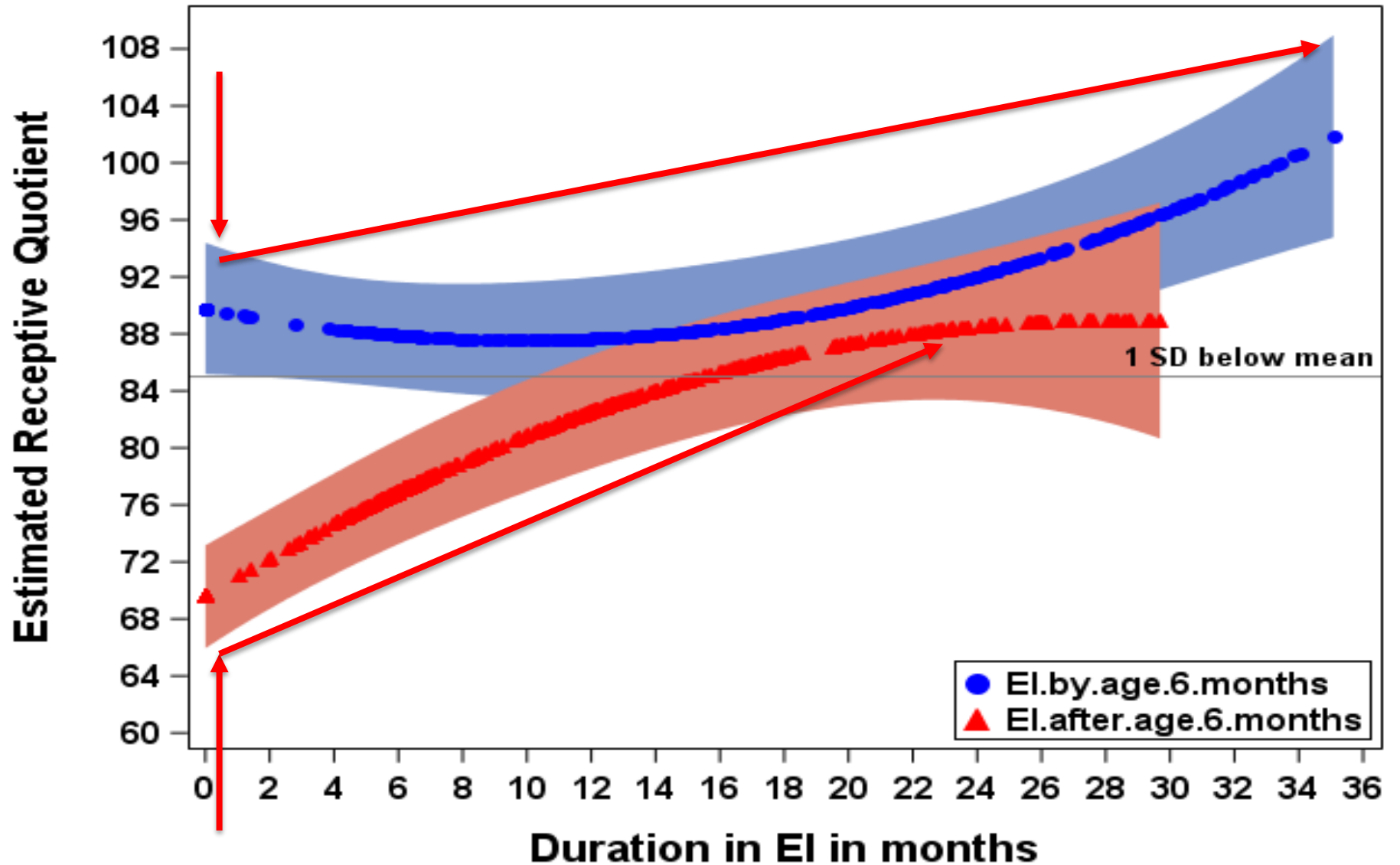
- SKI\*HI Language Development Scale (LDS)
  - 6 month intervals
  - Parent/observer report
  - Scored as age-appropriate units
- Language quotient (LQ) calculated
  - Unit completed divided by age-appropriate unit for child at time of assessment
  - Calculated for receptive and expressive language

*Tonelson, 1979; Meinzen-Derr, 2011; Calderon, 1998*

# Language over time by age at EI entry



# Language over time by age at EI entry



# Factors associated with language development

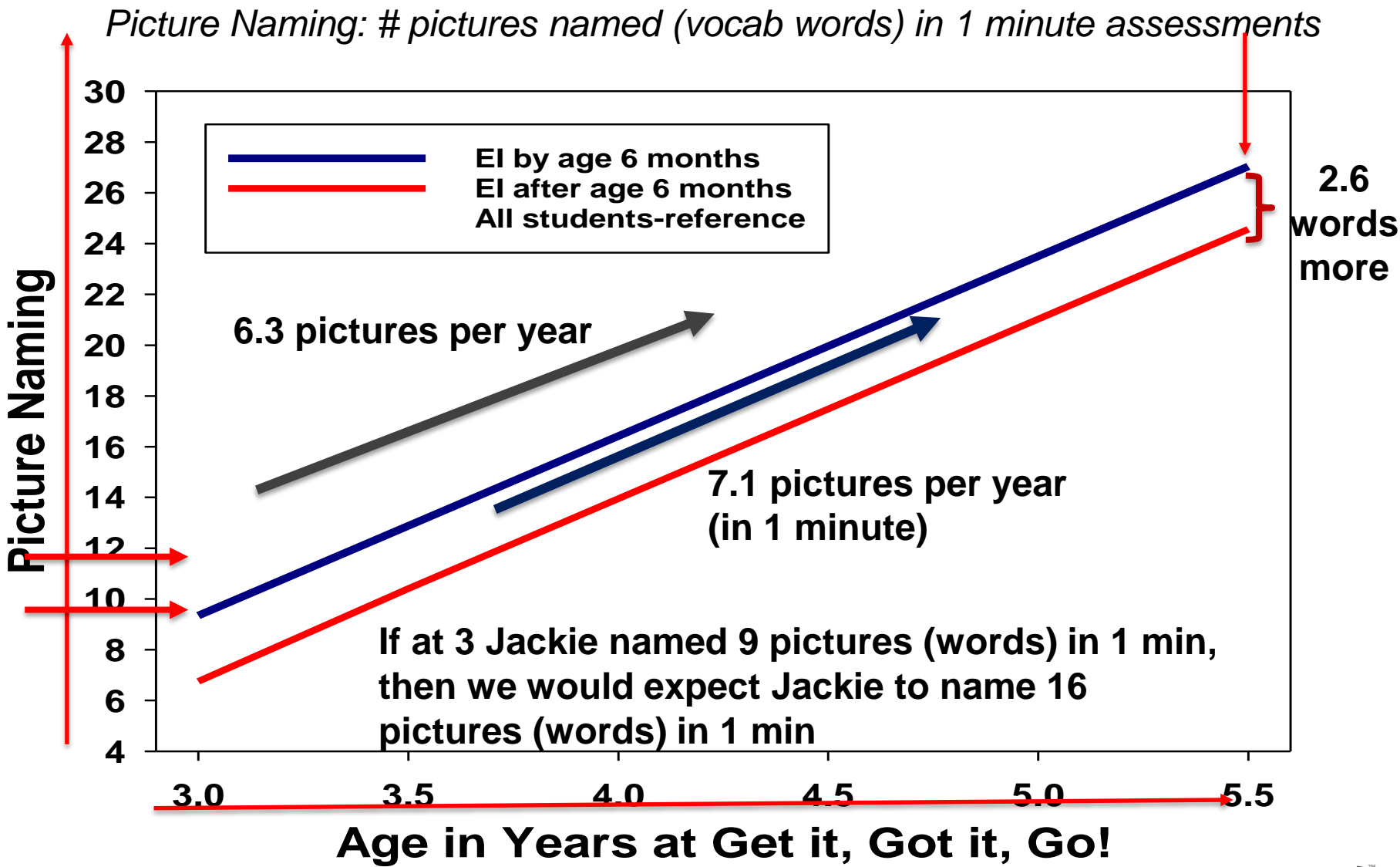
<i>Receptive LQ</i>	Adjusted $\beta$	SE	p
<div> <div> EI by age 6 months </div> <div> </div> </div>	18.1	3.2	<.0001
<div> <div>Severe-Prof HL</div> <div></div> </div>	-10.6	2.7	0.0003
<div> <div>Bilateral HL</div> <div></div> </div>	-10.8	2.8	0.0001
<div> <div>Presence of disability</div> <div></div> </div>	-7.8	3.1	0.012
<div> <div>Has risk indicator</div> <div></div> </div>	-13.5	2.7	<.0001
<div> <div>Mother college ed.</div> <div></div> </div>	6.5	2.4	0.008
<i>Expressive LQ</i>	Adjusted $\beta$	SE	p
<div> <div>EI by age 6 months</div> <div></div> </div>	20.9	3.2	<.0001
<div> <div>Severe-Prof HL</div> <div></div> </div>	-9.6	2.6	0.0002
<div> <div>Bilateral HL</div> <div></div> </div>	-9.8	2.8	0.0005
<div> <div>Presence of disability</div> <div></div> </div>	-7.9	3.2	0.013
<div> <div>Has risk indicator</div> <div></div> </div>	-14.2	2.6	<.0001
<div> <div>Mother college ed.</div> <div></div> </div>	7.9	2.4	0.001

# Early Literacy outcomes

- Get it, Got it, Go!
  - Monitors 3 Individual Growth and Development Indicators: **picture naming, rhyming, and alliteration**
  - Brief and standardized administration and scoring procedures
  - Each task is timed
  - Score = number correct (no maximum score)
  - Correlated with Peabody Picture Vocabulary and Preschool Language Scale



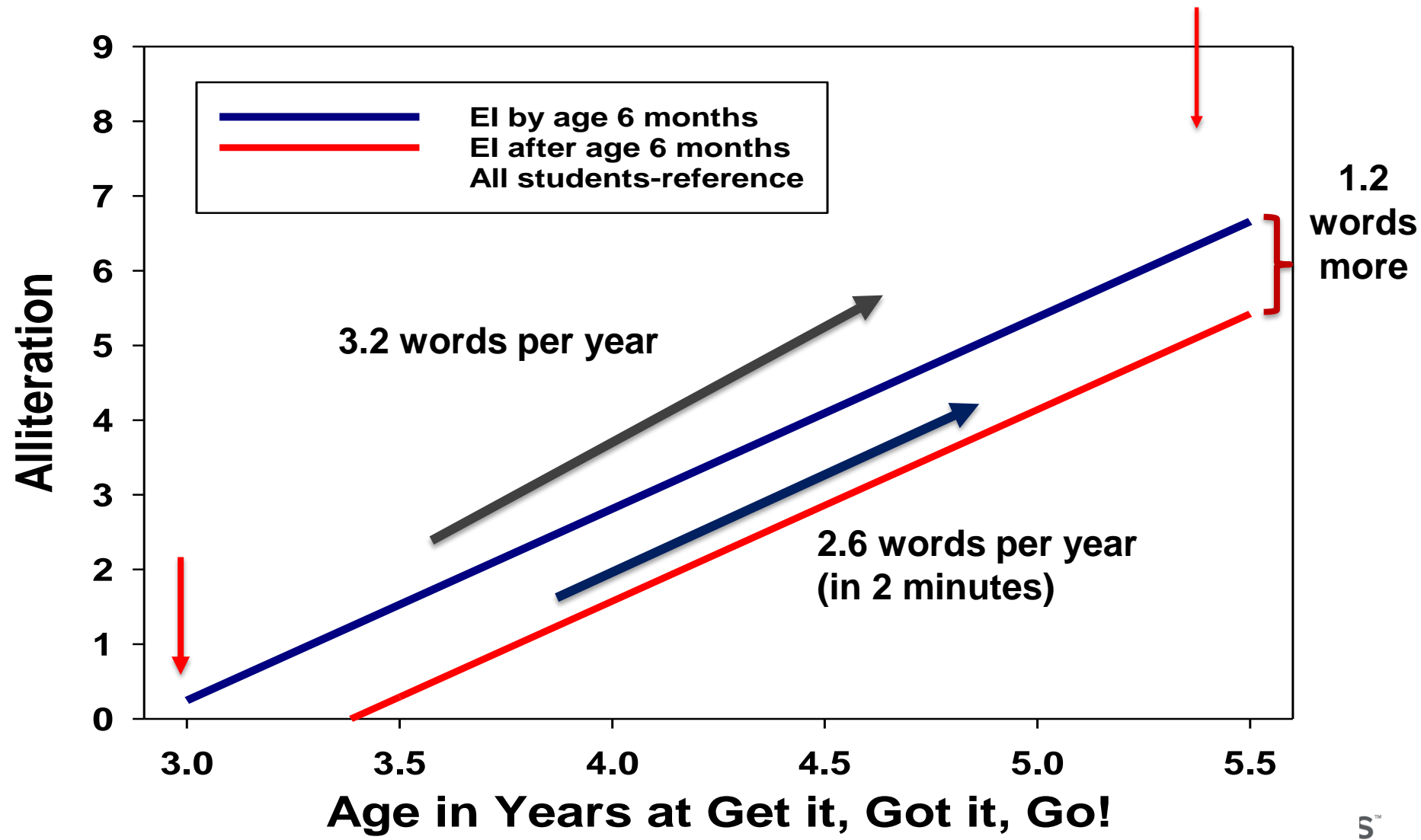
# Early literacy between D/HH and student-reference



\*after adjusting for confounders

# Early literacy between D/HH and student-reference

Alliteration: # words in 2 minute assessments



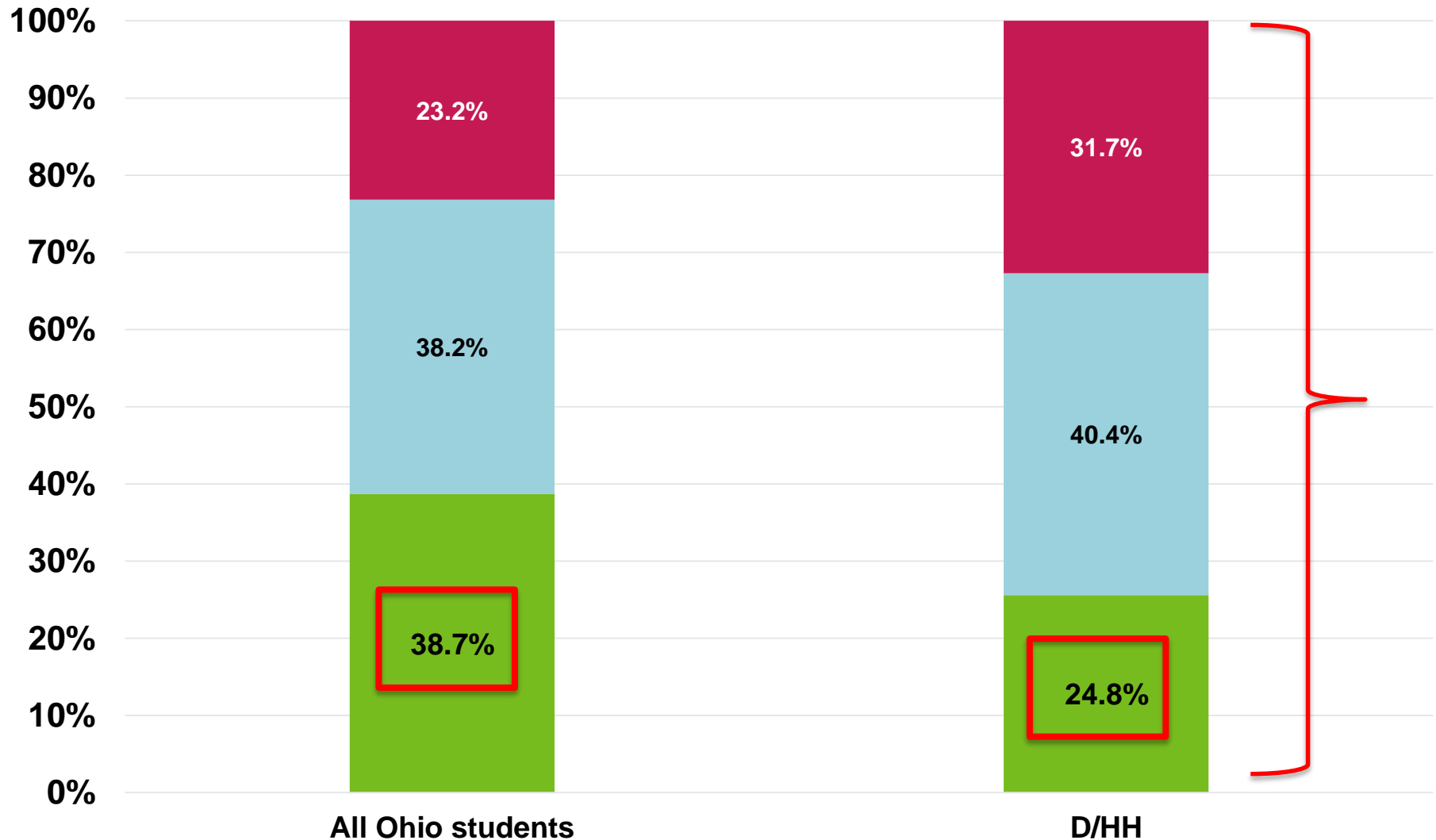
\*after adjusting for confounders

# Kindergarten Readiness

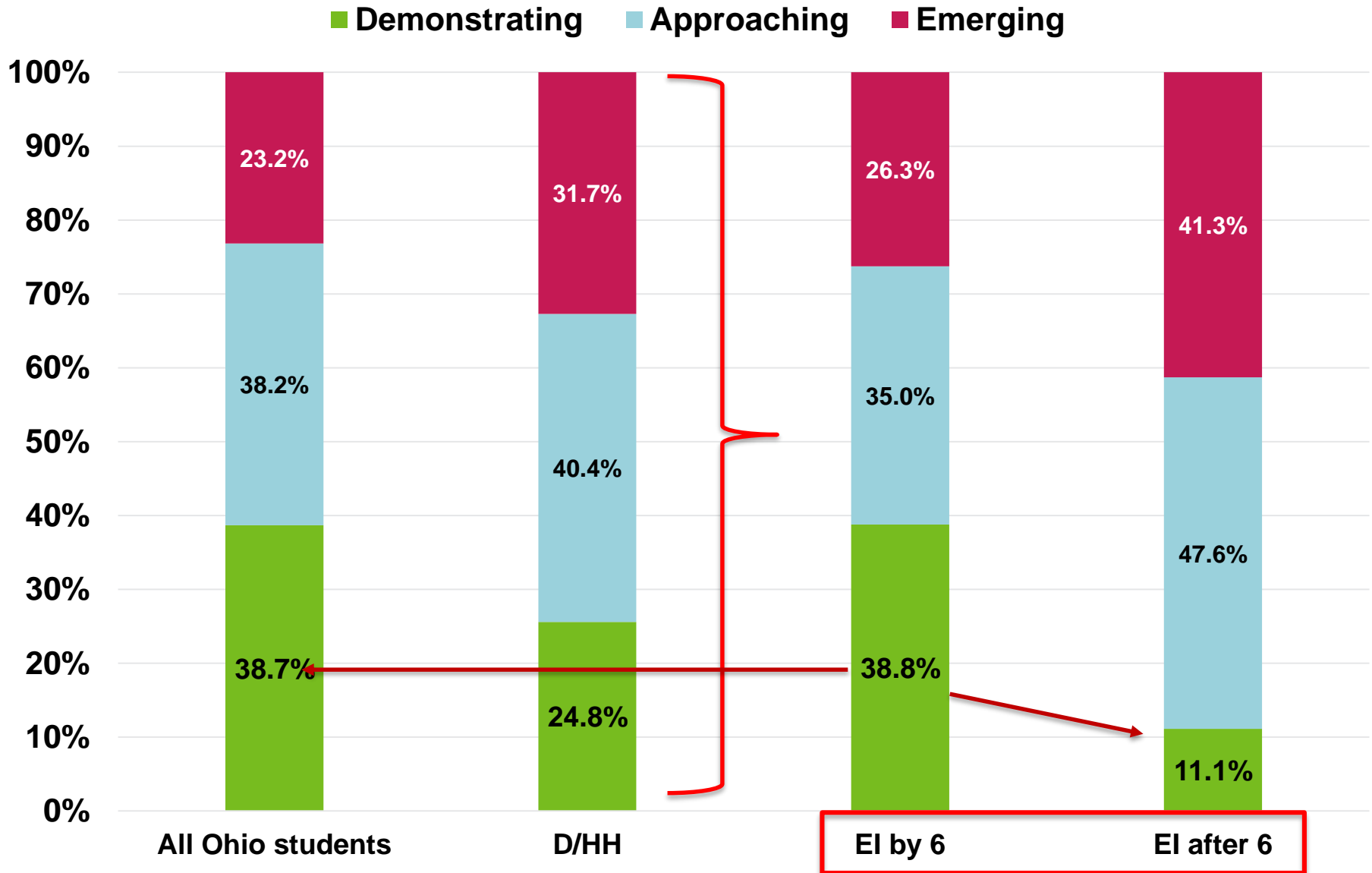
- Kindergarten Readiness Assessment
  - Language and literacy, mathematics, social foundations, and physical well-being and motor development
    - Demonstrating, approaching, emerging
- *Children assessed at beginning of the year, could be assessed towards end of year*

# Kindergarten Readiness

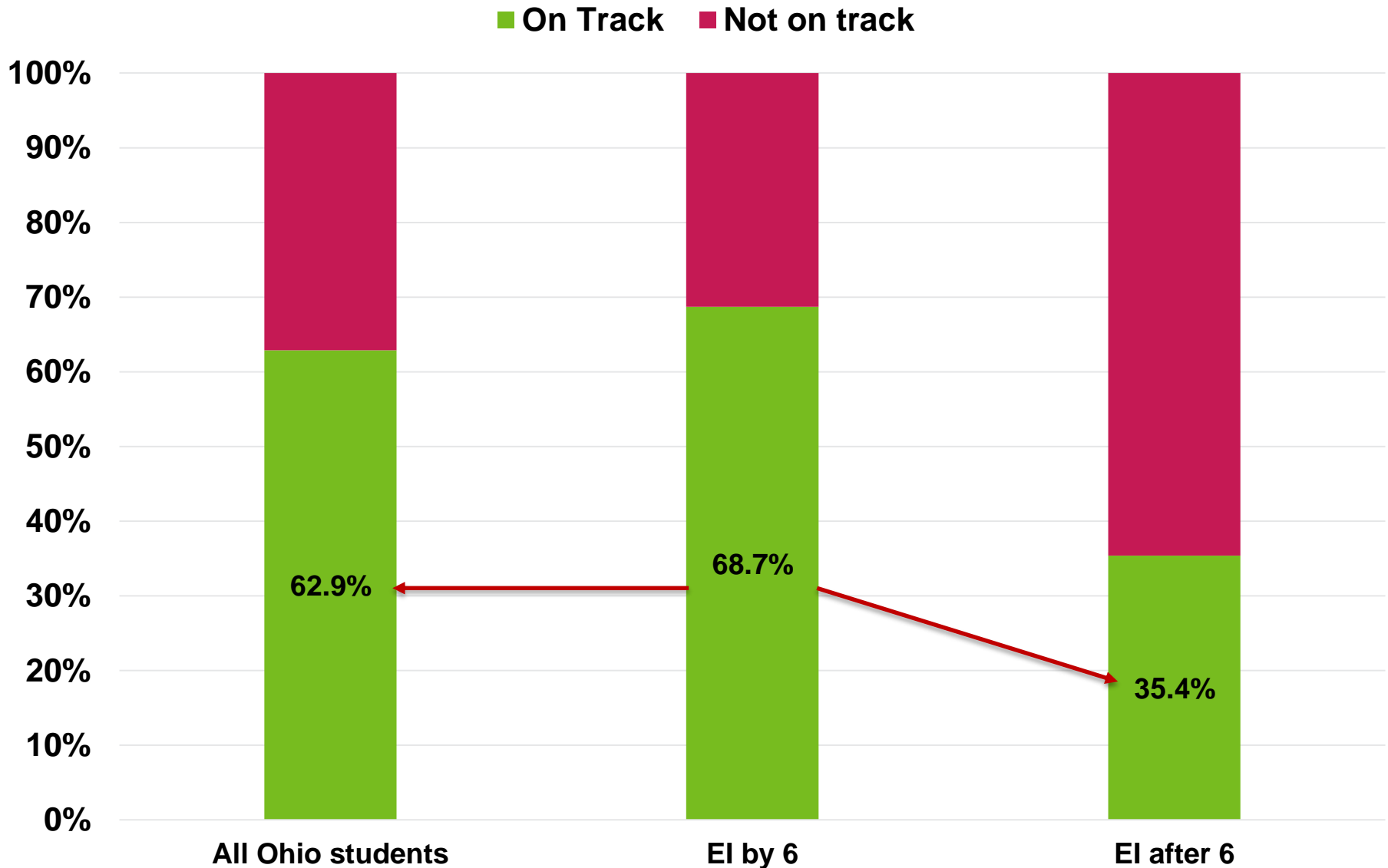
■ Demonstrating    ■ Approaching    ■ Emerging



# Kindergarten Readiness



# Language and Literacy “on track”



# Future work

- Assess different EHDI benchmark cutoffs
- Evaluating the role that intervention intensity plays in outcomes
- Evaluate longer term educational outcomes
- Understanding children who were referred but not enrolled into EI
- Understanding children in the education system who may not have accessed EI



# In Summary

- Earlier intervention (by 6 months of age) is associated with improved language in the first 36 months of life
- Also associated with higher early literacy skills in preschool
  - Evidence of sustained effect of EI and longer term impact of EHDI 1-3-6 benchmarks

*Occurred because we had 3 distinct, autonomous, motivated agencies working towards a common goal*

# In Summary

- Development of a child does not end at Part C, nor does it begin at Part B
- Study supports the importance of linking data systems
- Can also identify areas for improvement regarding transition between EI and preschool/academics

**Thank you!!**

**Questions?**