Effectiveness of Ohio's Early Intervention on Language Outcomes

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Presentation Outline

- Overview of State of Ohio EHDI Program
- UNHS
- Regional Infant Hearing Program (RIHP)
- Results from language outcomes study

Infant Hearing Program at The Ohio Department of Health

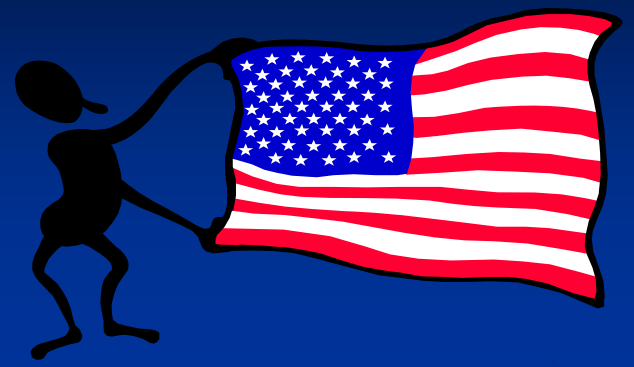
- 4 Audiology Consultants & Supervisor
  - All birthing hospitals→*UNHS*
  - 10 RIHP's→*Intervention*

- Stakeholders:
  - UNHS Advisory Council since 90's
  - Partnerships with Audiologists
  - Medical Home Initiative

Pre-UNHS Ohio

- Infant Hearing Screening and Assessment Program (IHSAP)
- 1988-2004
- High Risk Questionnaire
- Hearing Assessment (screening)
- 1998 Study: IHSAP Missing 2/3 of kids!

Ohio's Legislation



- House Bill 150 , July 1, 2004
- Rules: Ohio Administrative Code, Chapter 3701-40
- www.odh.state.oh.us

  under Rules & Regulations, Final Rules: Chapter 3701-40

Review of Legislative Mandates

- All babies receive screening, unless objection
- Parents must be given the results and the ODH required brochure
- Follow up information on providers is necessary for any non-passing babies
- ODH Form (4632) completed and sent to ODH (14 days), other distribution
- PCP provided with results

Annually in Ohio:

- Approximately 150,000 births
- Approximately 6,000 non-pass UNHS
- Approximately 450 expected to be born with some degree of hearing loss
- 136,156 UNHS Reports submitted for 2005

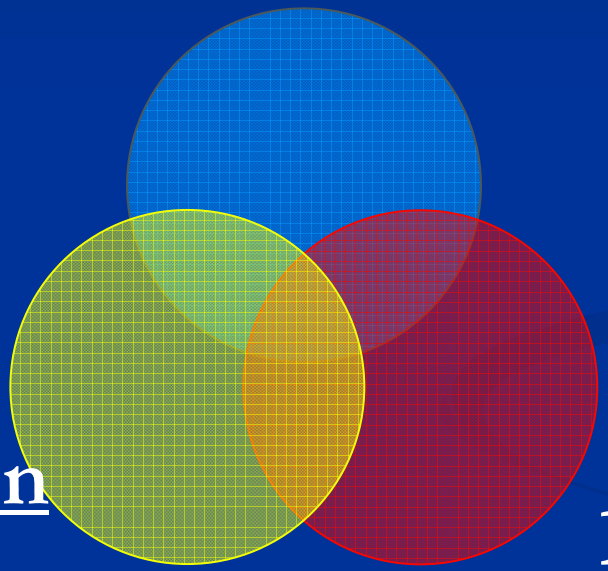
Follow Up after UNHS

- Screening was the E-A-S-Y part.

- What Happens Next?

Intervention Component

Screening



Intervention

HMG & RIHP

Diagnosis

Components of the Infant Hearing Program

- ☑ Universal Newborn Hearing Screening (UNHS)
- ☑ 10 Regional Infant Hearing Programs (RIHPs)

  Audiologists provide Technical assistance to hospitals and RIHP's, monitor compliance, etc.

Regional Infant Hearing Program

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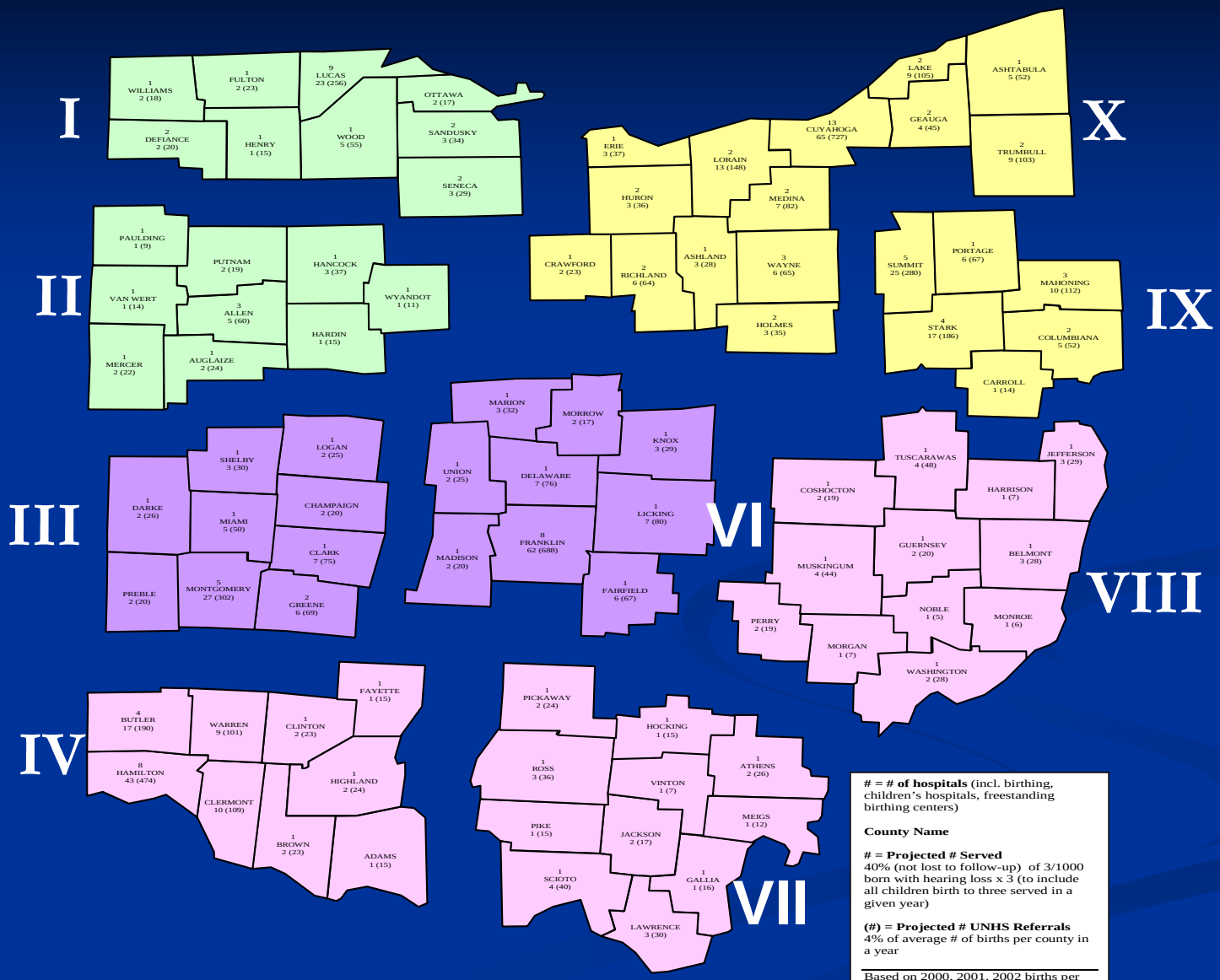


 # = # of hospitals (incl. birthing, children's hospitals, freestanding birthing centers)

County Name

 # = Projected # Served
40% (not lost to follow-up) of 3/1000 born with hearing loss x 3 (to include all children birth to three served in a given year)

(#) = Projected # UNHS Referrals
4% of average # of births per county in a year

Based on 2000, 2001, 2002 births per county

- The RIHP's are funded by the Ohio Department of Health (ODH) Bureau of Early Intervention Services, through a federal grant from the US Department of Education, Individuals with Disabilities Education Act (IDEA).

The RIHP

- Provides services at no cost to the families
- Assures that all families enrolled in the program receive Part C core services
- Coordinates tracking and follow-along for newborns identified through Ohio's newborn hearing screening program

What?

- The purpose:

  1) To provide follow along and tracking of infants who do not pass their newborn hearing screening.

  2) To provide family centered habilitative services for infants and toddlers age birth to three with hearing loss or deafness.

Components

- Home-based family support
- Unbiased parent education on communication choices
- Assistance with follow up audiological appointments, and connections to community resources
- Guidance in communication and language development
- Opportunities to interact with the deaf community
- Parent to parent support
- Planning for transition to preschool

Who?

- Staff of the Regional Infant Hearing Programs:

1. Project Director
2. Parent Advisors
3. Data support staff
4. Deaf Mentors-optional
5. Consultative: Audiologist, SLP

Curriculum

- The Parent Advisors are SKI*HI trained. SKI*HI (Utah State University Logan, Utah.)

- SKI*HI : specialized curriculum offering nonbiased information on communication choices, ongoing home and family centered support for infants and children with deafness or hearing loss.

How?

- The family is contacted within two working days of receiving an electronic referral.
- The infant is part of Tracking and surveillance
- Home visits begin once diagnosis of HL
- The RIHP's work in partnership with Help Me Grow (HMG) to provide necessary support and intervention.
- Transition to preschool at age 3

Our Goal…

To ensure that all newborns have the opportunity to communicate from birth, the EHDI program is a part of a national effort to promote:

- ☑ The early detection of hearing loss.
- ☑ The tracking of infants/children who are deaf or hard of hearing.
- ☑ The initiation of effective intervention systems.

Objectives of Current Study

Ohio has fairly robust EI system; we wanted evaluate our system's effectiveness regarding language outcomes

The objectives of the current study were:

1) To determine the impact of early intervention on language over time for children with permanent hearing loss;

2) To evaluate the association between language and:

- Age of identification
- Age of EI entry
- Degree of hearing loss

Methods

- Children with permanent HL
- Enrolled in RIHP EI program 2004-07
- SKI*HI Language Development Scale
  - Every 6 months
  - Language quotient (LQ) was created by dividing the actual score (unit completed) with the unit that signifies the appropriate language skills for the child's current age
  - Within "normal limits" considered at LQ > 80

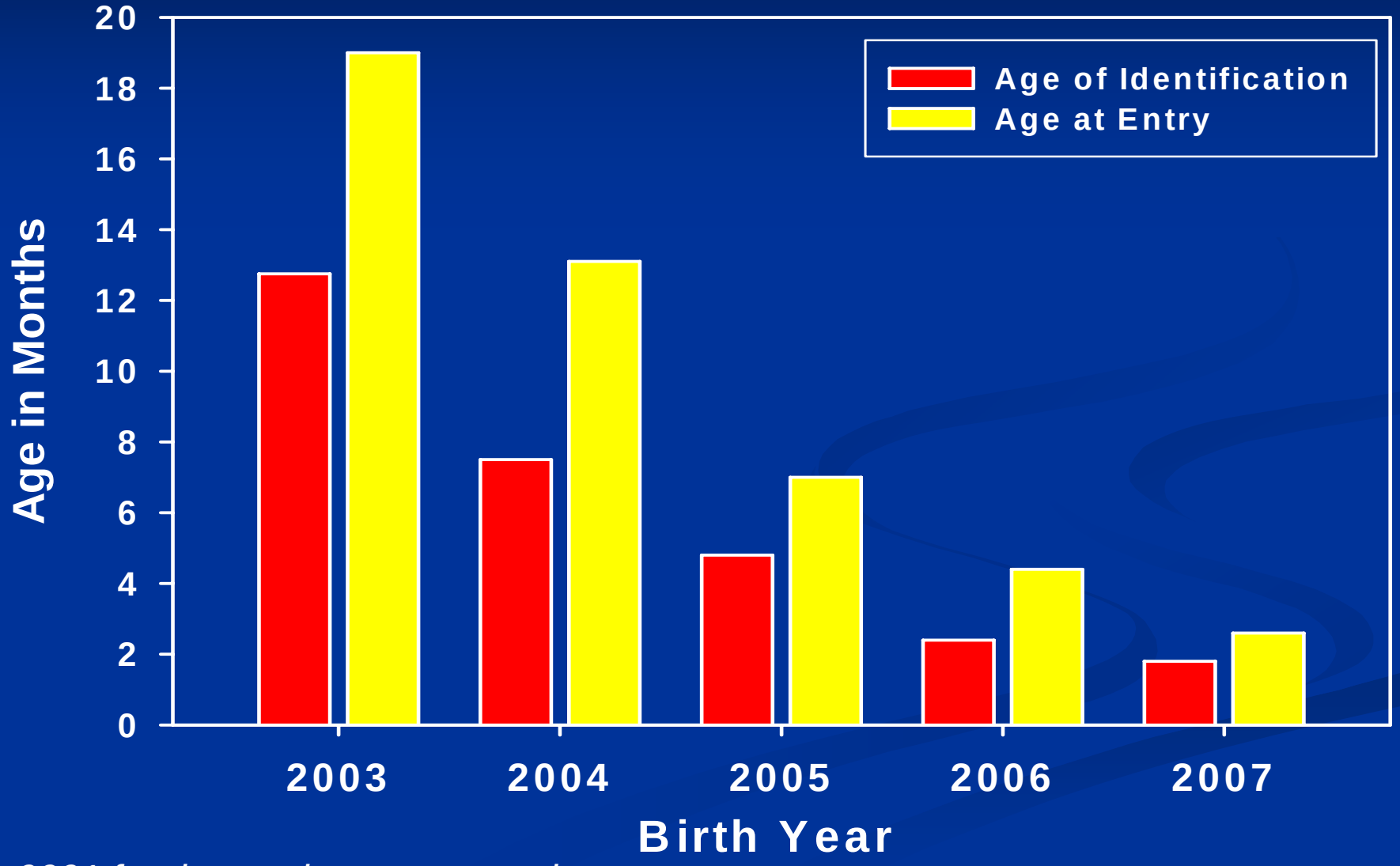
Statistical Analysis

- Evaluated age of EI entry and age of identification regarding baseline language skills with ANOVA
- Investigated the relationship between age of entry (<6 mo vs. ≥ 6 mo) and mean baseline language skills after adjusting for age of identification and severity
- Repeated measures regression models to investigate language development over time for each level of HL severity

Subjects

- 605 infants and toddlers receiving EI services between Jan 2004-July 2007
- Subjects excluded from analyses due to:
  - Complex medical conditions (35%, n=210)
  - Missing data related to:
    - Hearing loss severity (n=15), Age of entry (n=5), Not yet complete data entry (n=87)
- 288 subjects included in analyses
  - 235 (82%) bilateral hearing loss
  - 53 (18%) unilateral hearing loss

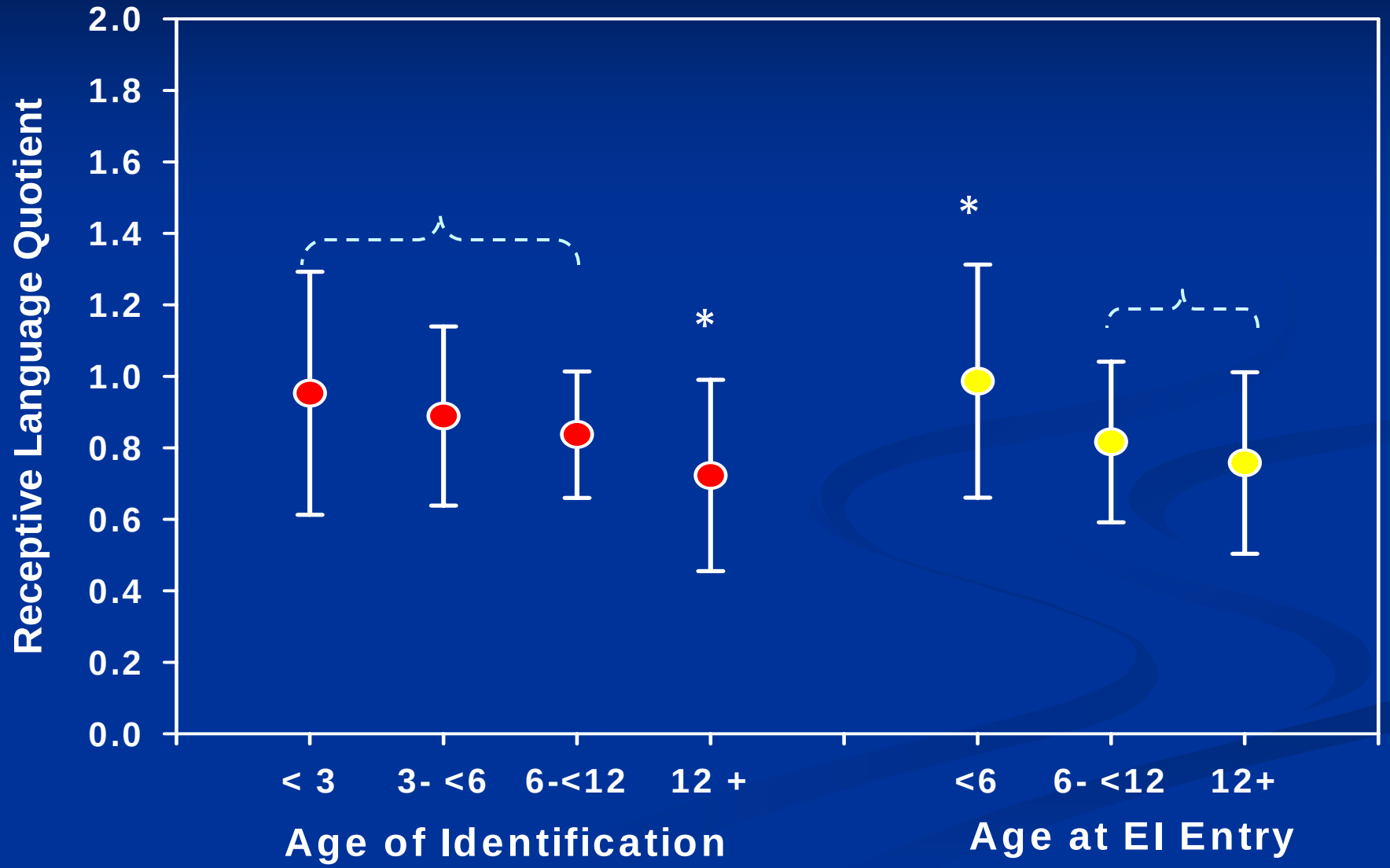
Age of Identification over Time For Children in EI



P<.0001 for decreasing ages over time

CHARACTERISTICS	Bilateral N=235 (82%)	Unilateral N=53
Age ID in months	4.0 (0-33.8)	2.7 (0-22.5)
Post UNHS implementation	*2.8 (.16-25.4)*	*2.7 (0.4-15.5)*
Age Entry in months	7.1 (0-34)	4.6 (1.3-23.4)
Post UNHS implementation	*5 (0-25.5)*	*4.5 (1.4-22.1)*
Severity of Bilateral HL		
Severe to Profound	38%	---
Mod to Moderately Severe	36.5%	---
Mild	25.5%	---
Amplified	89%	23%
Cochlear Implant	16%	----
Age at amplification	7.0 (1.2-36)	14.1 (2.8-31.9)
Primary Comm Oral	58%	85%
ASL/bilingual-bicultural	1%	----
TC	37%	15%
Other/undecided	4%	-----

Language Skills at Baseline by Age



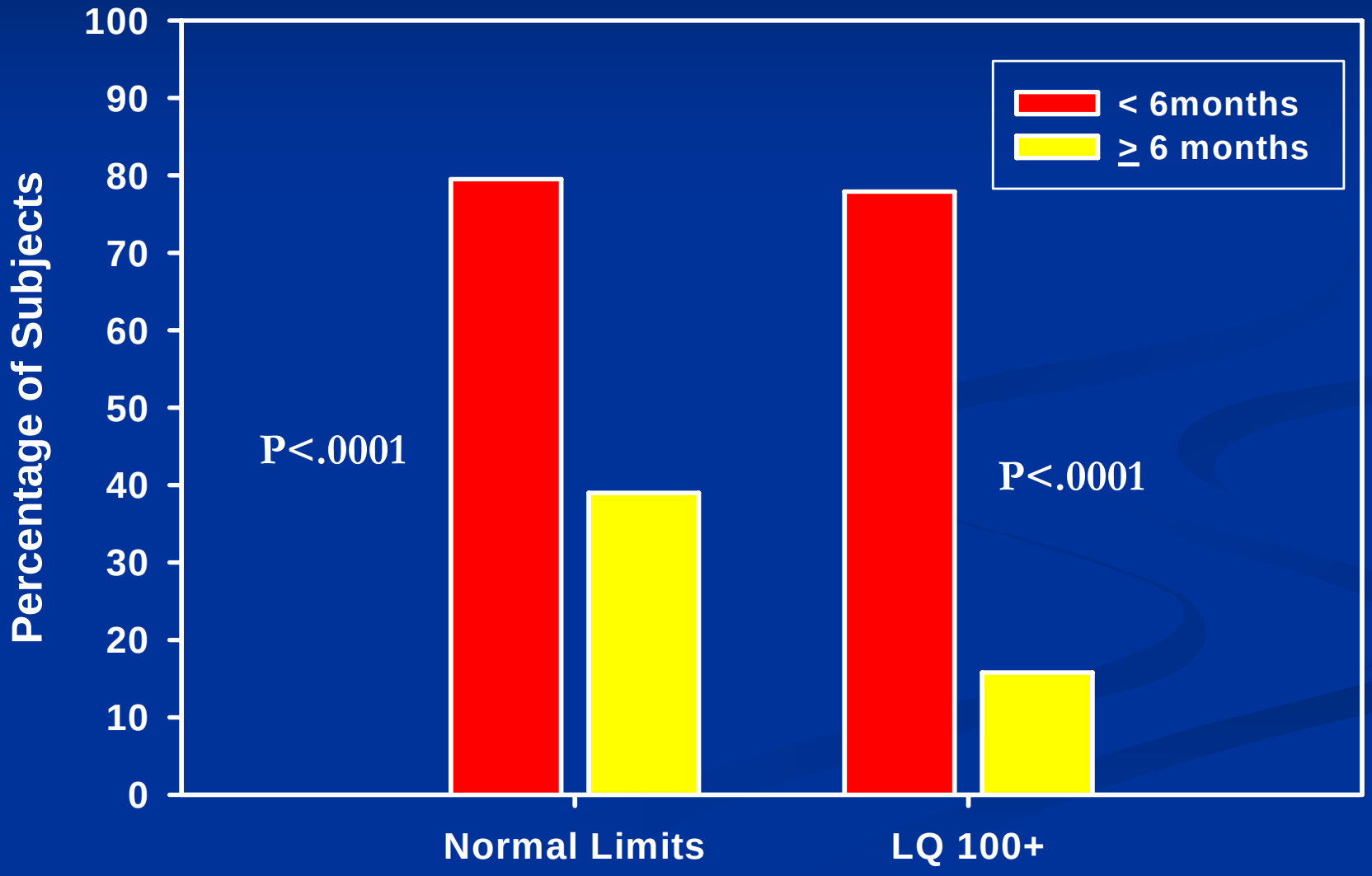
*P<0.05 multiple comparisons

Mean (SD) Baseline Language Skills

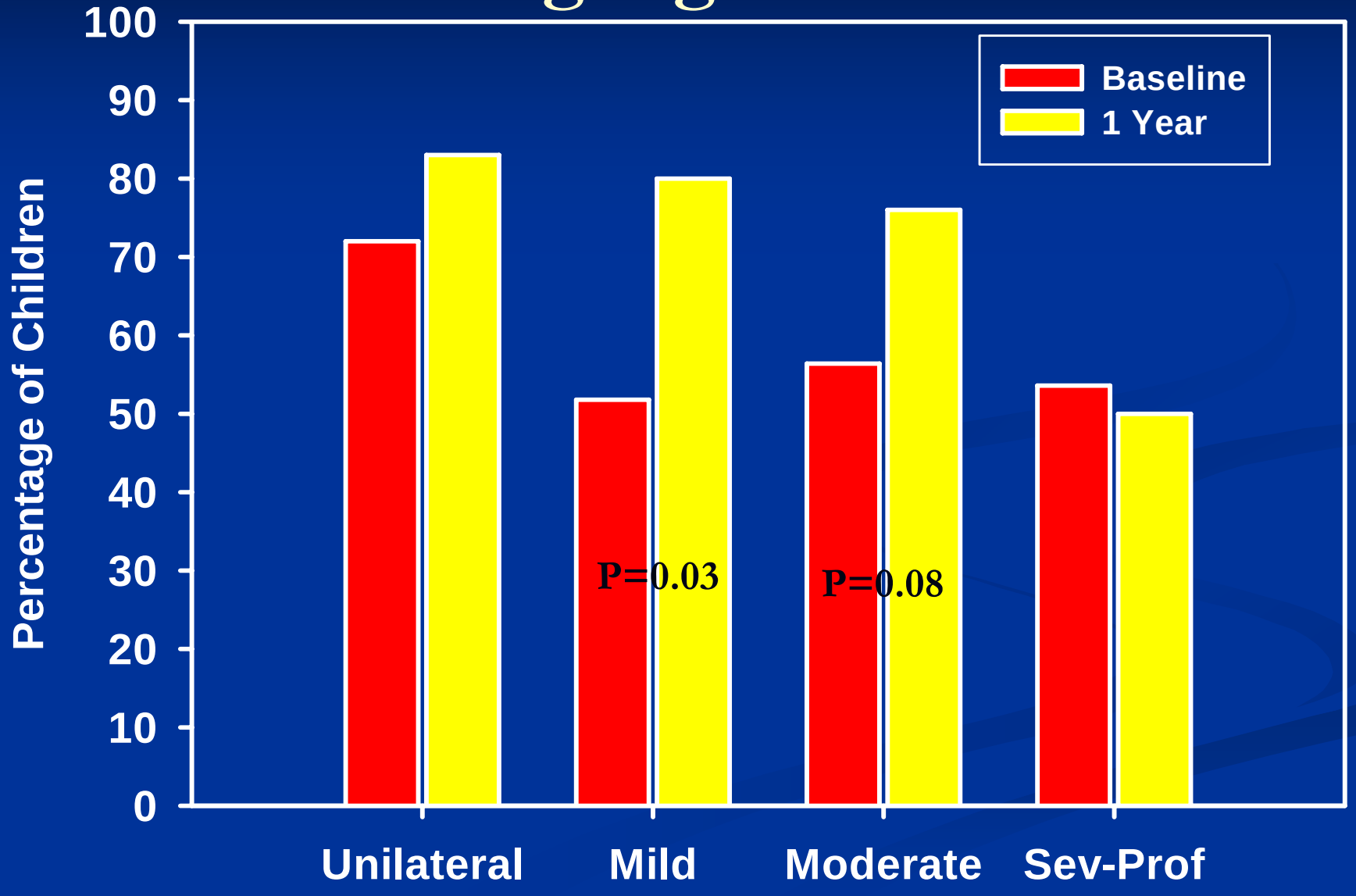
Language*	< 6 mos N=122	≥6 mos N=146	Effect for age at entry
Expressive	100.3 (36)	72.3 (35)	<.0001
Receptive	96.2 (32)	78.9 (32)	<.0001
By Severity, Expressive language quotients			
Mild	94.0 (29)	70.3 (28)	0.006
Moderate	102.7 (39)	74.7 (38)	0.006
Severe	114.5 (34)	64.9 (32)	0.0001
Profound	93.6 (32)	65.9 (33)	0.02
Unilateral	105 (25)	84.6 (56)	0.07

**Controlling for age of identification and severity; region not significant*
***Controlling for age of identification*

Children within Normal Expressive Language Limits



Children within Normal Expressive Language Limits



Statistical Models

- Thus far, only looked at baseline language skills
- Evaluate the change in language skills (language development) over time spent in EI
  - Controlled for potential confounders that may influence outcome
- Created multiple regression models for each level of hearing loss
- Investigated the possible interaction between age of entry and duration in EI

Mild and Moderate HL

Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mo)	0.001	0.68		
Receptive				
Duration in EI (mo)	0.003	0.16		

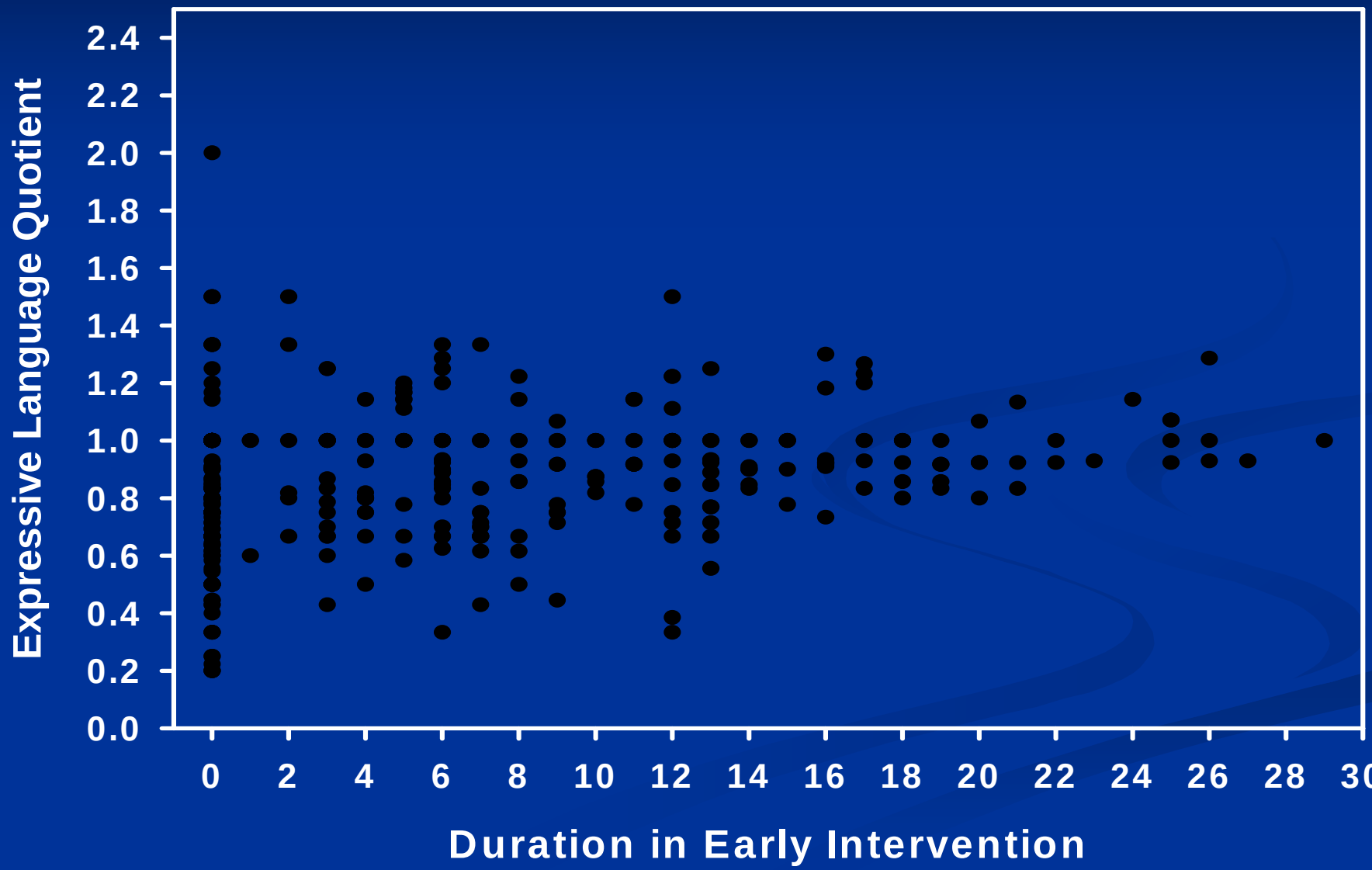
Controlling for Age of ID (NS); Region of Ohio not significant in the models

Mild and Moderate HL

Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mo)	0.001	0.68	**0.011**	**<.0001**
Receptive				
Duration in EI (mo)	0.003	0.16	**0.007**	**<.0001**

Controlling for Age of ID (NS); Region of Ohio not significant in the models

Mild and Moderate HL



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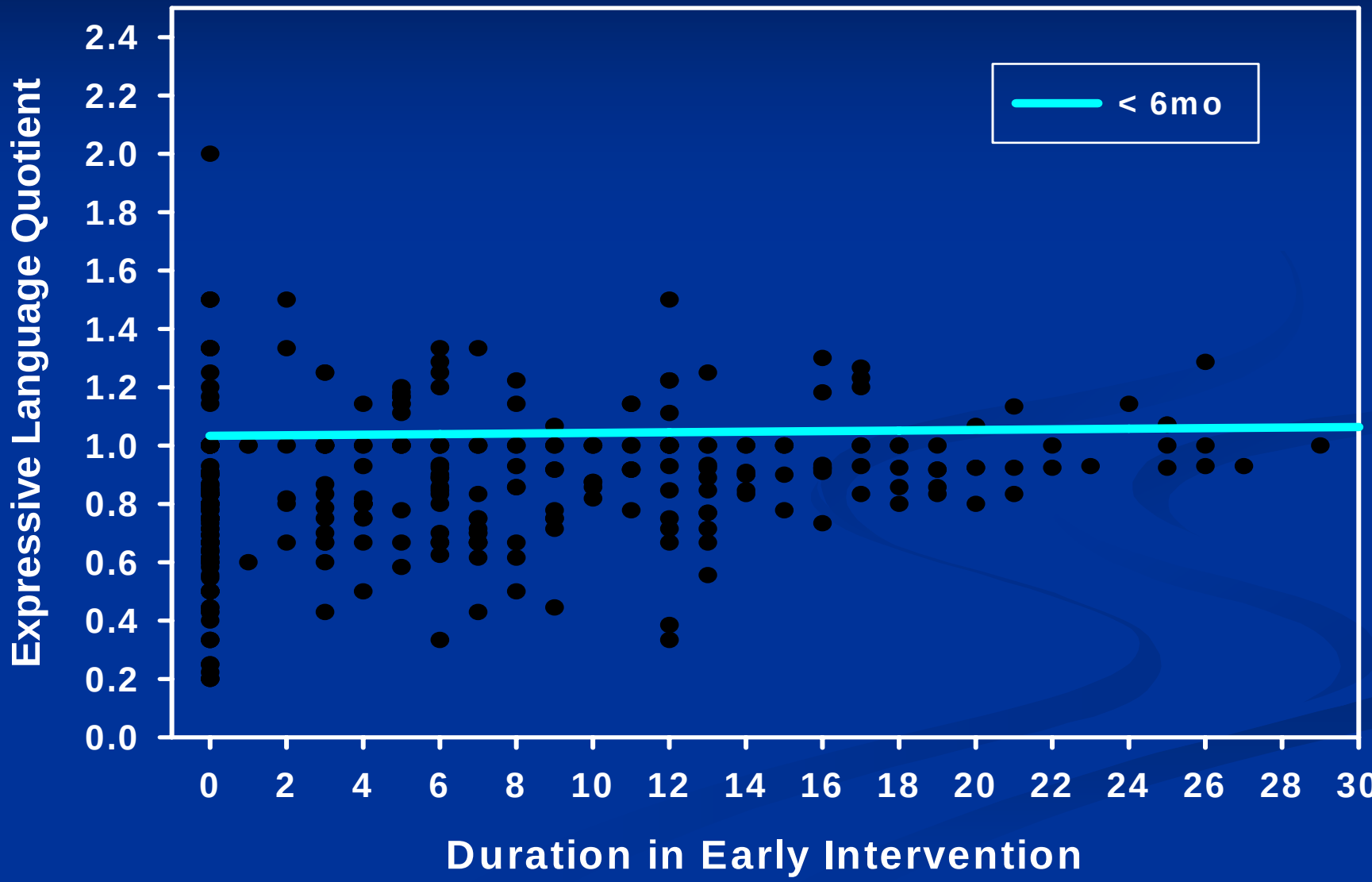

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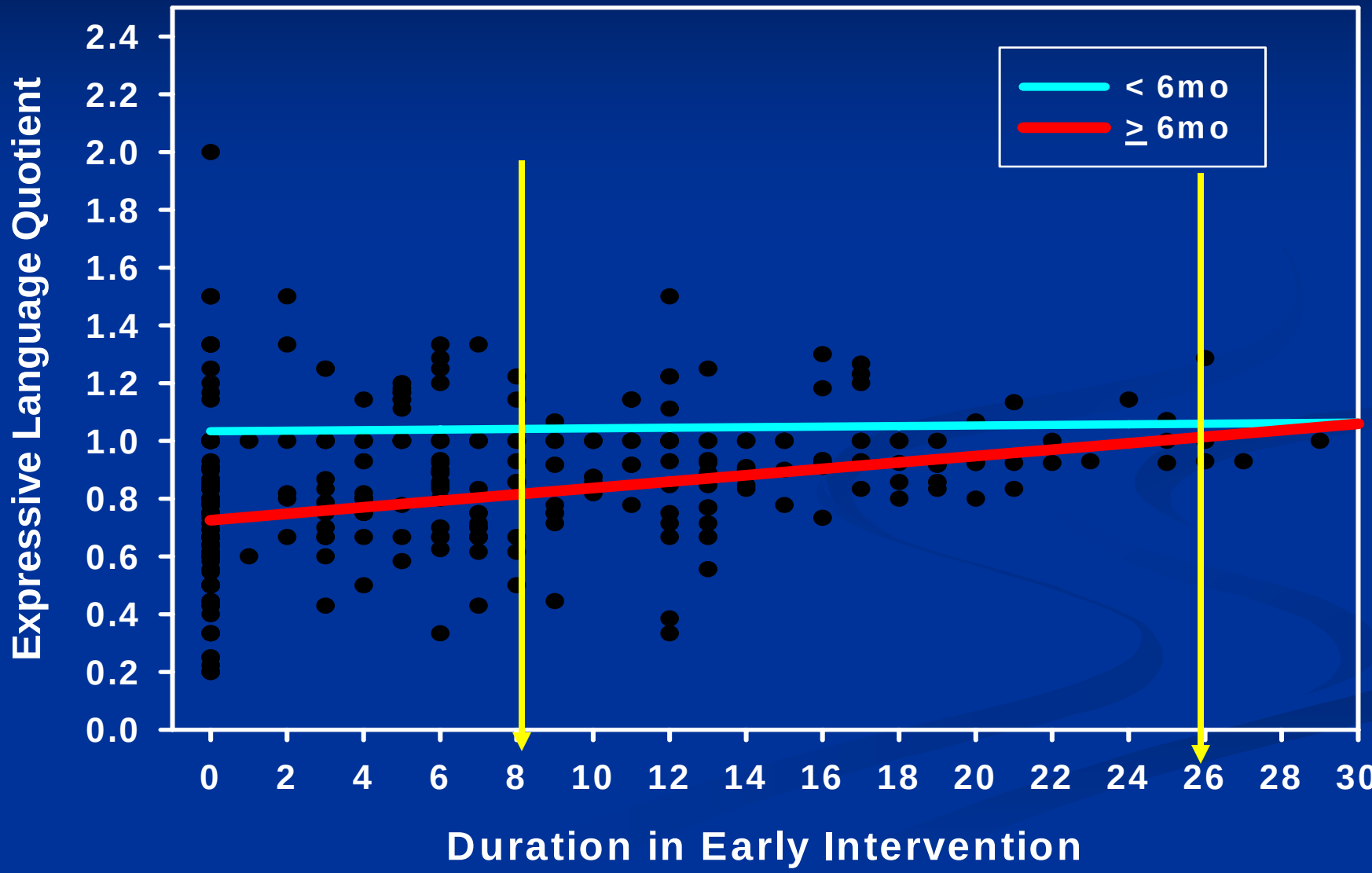
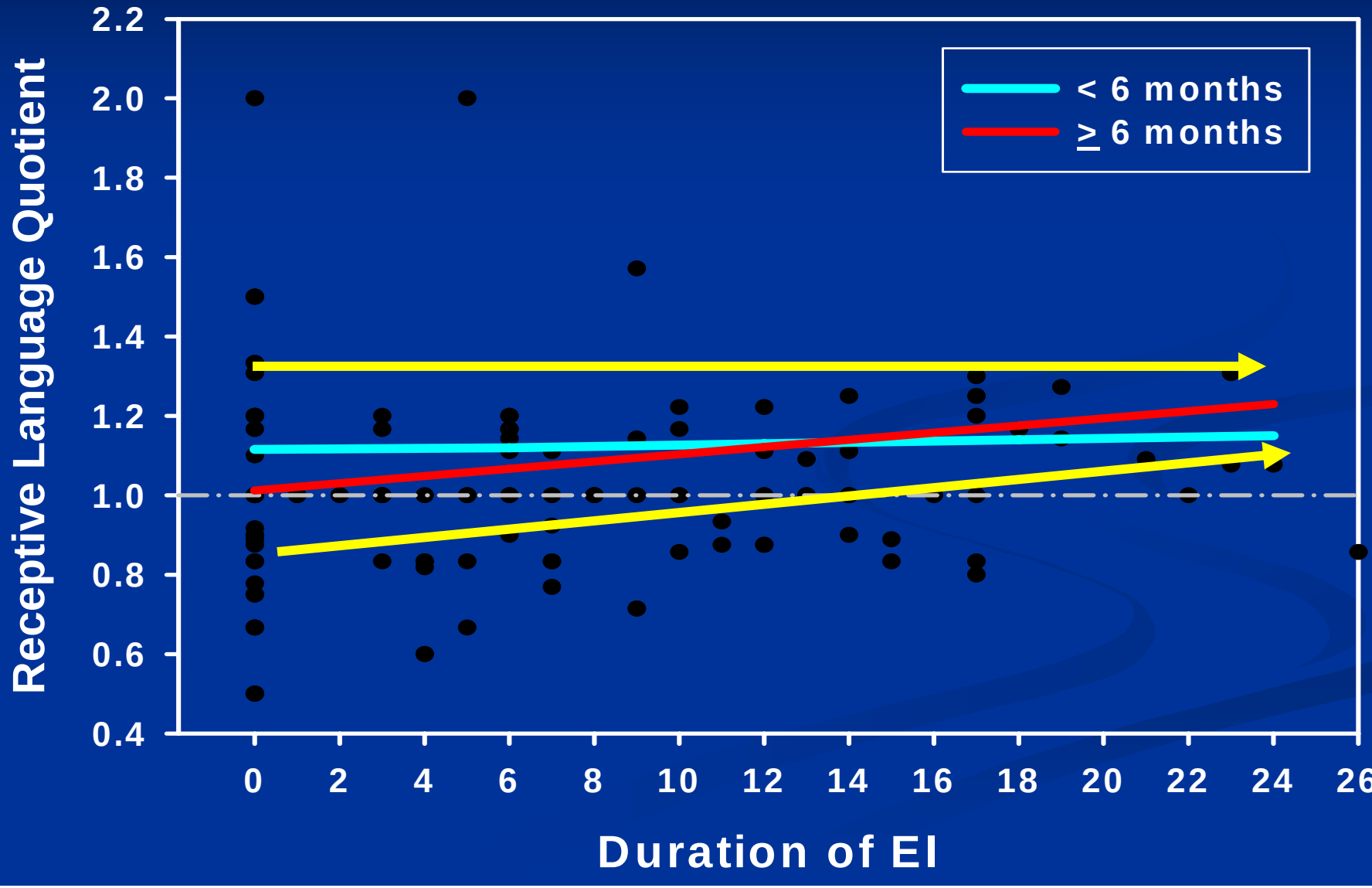


Unilateral Hearing Loss

Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mo)	-0.003	0.32	**0.01**	**0.06**
Receptive				
Duration in EI (mo)	0.002	0.68	**0.0091**	**0.02**

Region of Ohio not significant in the models; controlled for amplification, age ID

Unilateral Hearing Loss

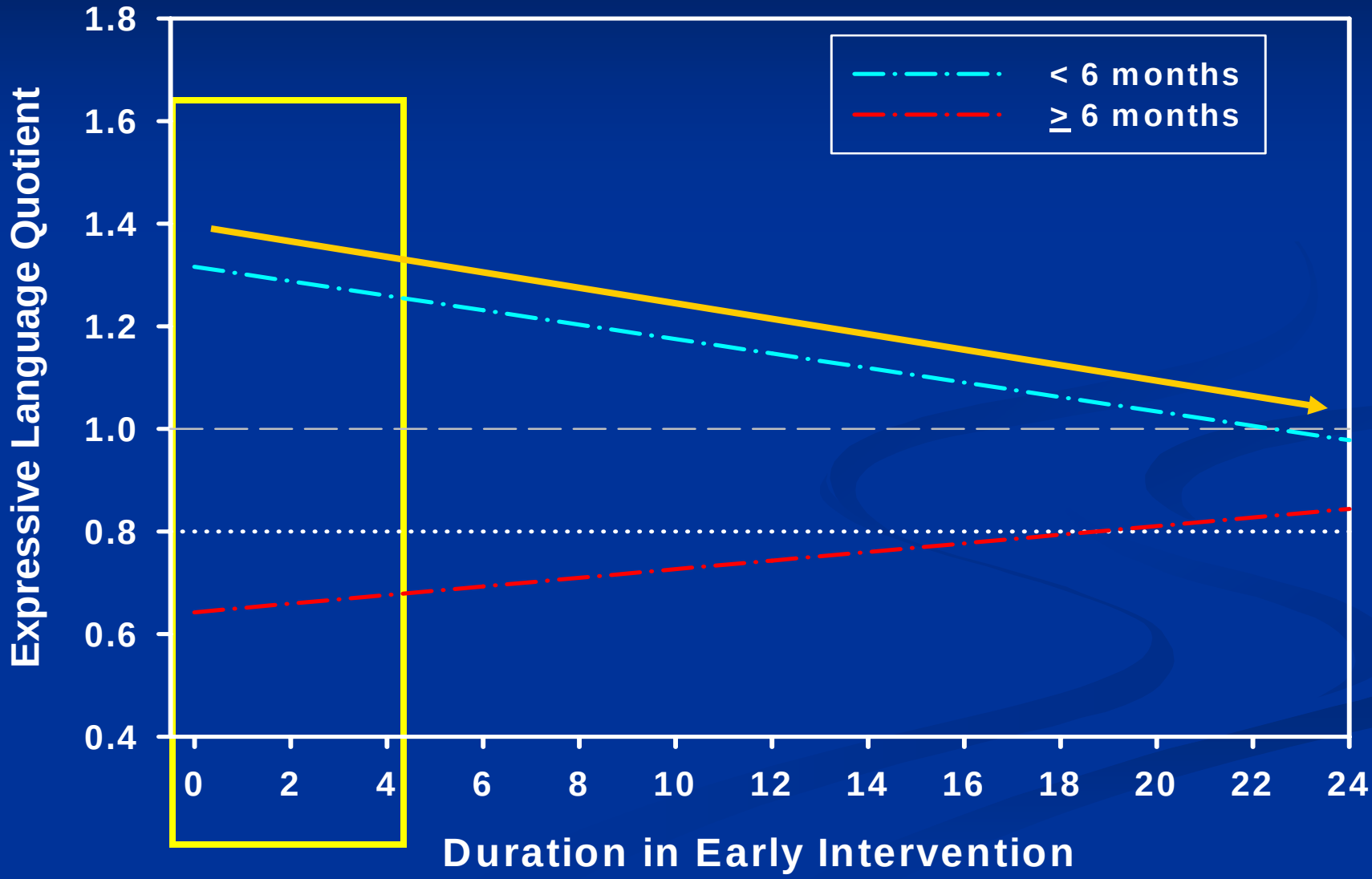


Severe to Profound HL

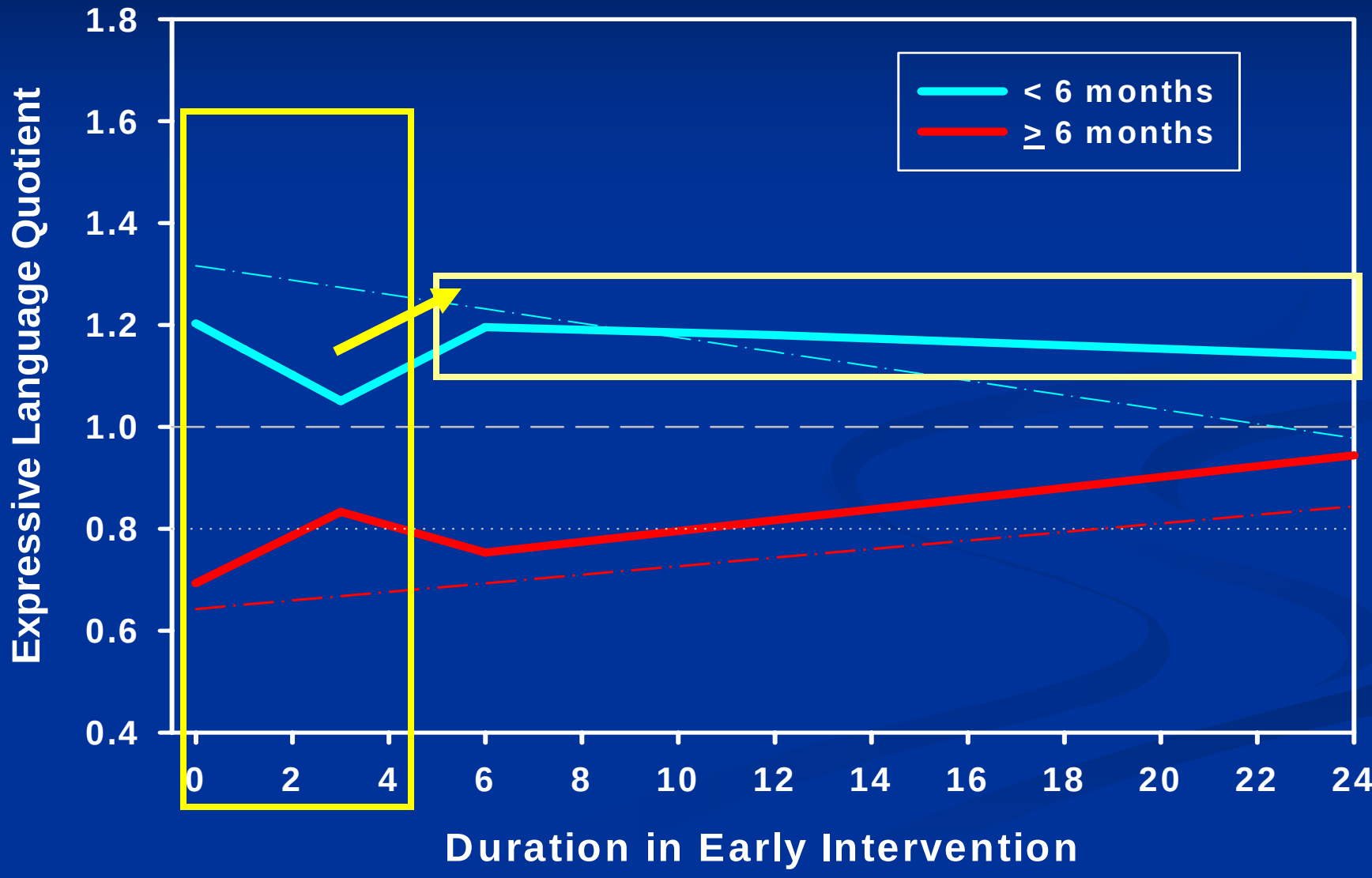
Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mos)			**0.008**	**0.10**
Age at ID	-0.033	0.008	-0.006	0.03
Receptive				
Duration in EI (mos)			**0.010**	**0.05**
Age at ID	-0.02	0.19	-0.004	0.19

Region of Ohio not significant in the models; controlled for amplification

Severe to Profound



Severe to Profound



Strengths and Challenges

- Infants included with any degree of HL
  - Includes unilateral HL
- Systematic data collection on all infants as part of Ohio's EI system
- Able to evaluate age of early enrollment and improvement in language skills over time across all degrees of hearing loss

Strengths and Challenges

- Statewide data: unable to account for certain factors that may influence outcomes (e.g. developmental disabilities)
- Missing data may bias our results
- Used a language quotient as opposed to standardized score
  - A good approximation of actual skill development

In Summary

- Majority of infants who enter EI < 6 months have normal language skills at entry

- Infants/toddlers who enter the program "late" (>6 months of age) make significant progress, "catching up" to their early entry peers.

In Summary

- Language development over time is not necessarily a linear relationship (i.e. constant increase in skills)
- Normal language development in all infants/toddlers varies over time
- Infants who enter EI very early (<3 months) do not have many language skills
  - Difficult to determine delay at that age; delay may show up later however.
  - Children may start out with high language skills early and appear to lose them as the language testing gets harder
  - Particularly evident among those with severe to profound HL

In Summary

- Infants diagnosed with permanent HL, enrolled in Ohio's EI program, all make significant progress, or maintain age-appropriate skills while in EI
- Results from this study emphasize the importance of EI services for children with HL, regardless of severity of HL or age of entry.
- Early Intervention is simply important!

Mild and Moderate HL

Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mos)	0.001	0.68	**0.011**	**<.0001**
Age at ID	-0.03	0.33	0.001	0.75
Receptive				
Duration in EI (mos)	0.003	0.16	**0.007**	**<.0001**
Age at ID	-0.03	0.17	-0.0005	0.78

Region of Ohio not significant in the models

Unilateral Hearing Loss

Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mos)	-0.003	0.32	**0.01**	**0.06**
Age at ID	-0.2	0.24	-0.005	0.51
Receptive				
Duration in EI (mos)	0.002	0.68	**0.0091**	**0.02**
Age at ID	-0.05	0.05	-0.001	0.87

Region of Ohio not significant in the models; controlled for amplification

Severe to Profound HL

Predictor	< 6 mos		≥ 6 mos	
	β	p	β	p
Expressive				
Duration in EI (mos)			**0.008**	**0.10**
Age at ID	-0.033	0.008	-0.006	0.03
Receptive				
Duration in EI (mos)			**0.010**	**0.05**
Age at ID	-0.02	0.19	-0.004	0.19

Region of Ohio not significant in the models; controlled for amplification