

USING LENA TO SUPPORT PARENT-CHILD INTERACTIONS WITH SPANISH-SPEAKING FAMILIES

Christine Yoshinaga-Itano, PhD

Dinah Beams, MA

Christine Yoshinaga-Iano, PH.D.

Professor

University of Colorado Boulder

Department of Speech, Language, & Hearing Sciences

Marion Downs Hearing Center

Dinah Beams, M.A.

Program Coordinator

Colorado Home Intervention Program

Colorado School for the Deaf and the Blind


Special thanks to


- Families and Early Intervention Providers with the Colorado Home Intervention Program
- Miranda Aragon, Undergraduate Research Opportunity Program CU-Boulder
- Infoture
- LENA Foundation




- Data collected by the LENA Foundation and CHIP
- Use non-invasive technology to compare the language environment of TD and D/HH children in both English and Spanish-speaking homes

Automatic Language Assessment in Three Easy Steps

- 

1 Turn on the DLP and place it in the pocket of the child's LENA clothing at the beginning of the recording session.
- 

2 At the end of the recording session, plug the LENA DLP into your computer. The software automatically uploads and processes the audio file.
- 

3 The sophisticated language environment analysis software processes the audio file and generates the LENA Reports, automatic assessments of expressive language development, and other analyses.

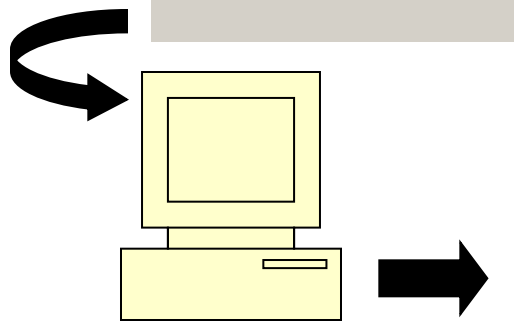
INSTRUMENTATION AND HEARING NORMS

Data Collection and Processing

- Digital recorder children wear
- Records continuously for 16 hours
- Audio transferred to computer
- Speech recognition software processes file, automatically analyzing audio stream



LENA System Algorithm



Key Child

Adult Male

Adult Female

Other Child

Overlap

Noise

TV/Media

Core Measures

1. Adult Word Count

- Adult words spoken near child

Adult Male

+

Adult Female

2. Child Vocalizations

- Frequency of child vocalizations

Key Child

3. Conversational Turns

- Adult child interactions

Key Child

+

Adult

4. TV/electronic media

- Amount of TV exposure

TV/Media

LENA Norms: Totals per Day

<u>Percentile</u>	<u>Adult Words</u>	<u>Child Vocs*</u>	<u>Turns*</u>
99 th	29,428	4,406	1,163
90 th	20,824	3,184	816
80 th	17,645	2,728	688
70 th	15,516	2,422	603
60 th	13,805	2,174	535
50 th	12,297	1,955	474
40 th	10,875	1,747	418
30 th	9,451	1,538	361
20 th	7,911	1,310	300
10 th	6,003	1,024	225

*Values represent percentiles for 24 month-olds

What predicts language development of children who are D/HH (0- 7 years)

- Unchangeable characteristics:
 - Cognitive status
 - Degree of Hearing Loss
 - Age of identification of HL
 - Maternal Level of Education
- Maternal Level of Education is overlapping with the amount of language access provided by the parent

Children who are deaf or hard of hearing

TEST-RETEST

RELIABILITY

Reliability Pilot Study

3 recordings in one week

Recordings were reliable for Adult Word Count, Conversational Turns and Child Vocalizations.

Recording 1 and Recording 2 were reliable with Pearson Product Moment Correlations between .78 and .95 $p < .05$, $p < .01$

Reliability for recording 2 and 3 dropped to $r = .70$ predominantly because parents began conducting their own experiments with different environments.

VALIDITY

Pilot study: Validity

***Relationship between MacArthur
Communicative Development
Inventory and Conversational
Turns: $r=.662, p<.05$***

***(children in pilot were ages 9 months
to 18 months)***

Pilot Study: Validity

***Relationship between Minnesota
Child Development Inventory and
LENA***

***CDI with Child Vocalizations $r=.72$,
 $p=.02$***

***CDI with Conversational Turns $r=.69$,
 $p=.03$***

***CDI and AVA Standard Score
 $r=.70$, $p=.02$***

Intervention
Preschool
At home

DIFFERENCES BY HOUR

RECORDED



Client Manager

LENA
ReportsDevelopmental
SnapshotDigital Language
Processor

Settings

Adult Words

HOURLY
March 12, 2008

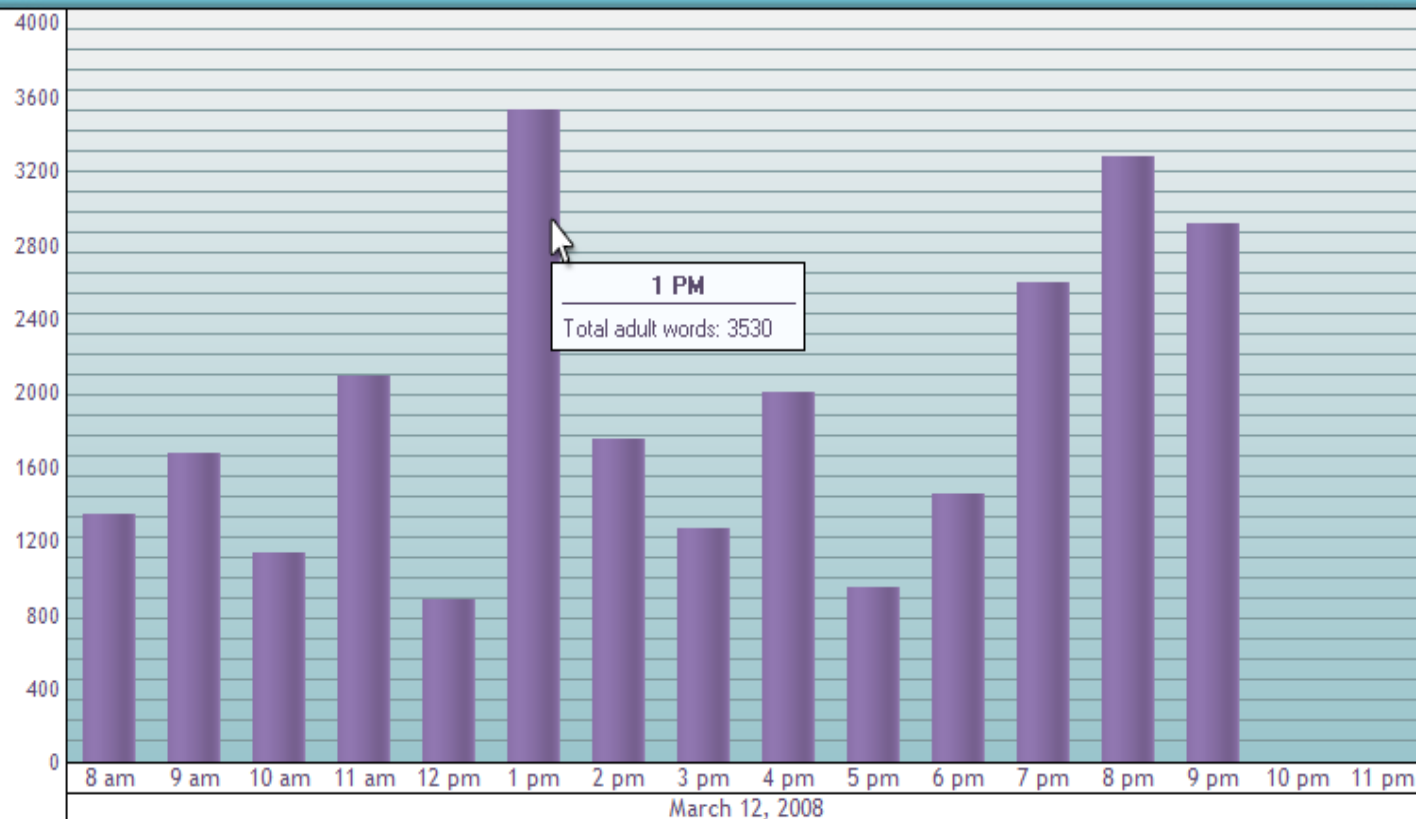
Child, _A

The Adult Words report displays number of words spoken to and in the vicinity of the child during the course of a recording.

Roll over data bars, data points, or legend icons for more detail.

Please see User Guide for additional information.

[View Adult Word Normative table and Average Daily Pattern of Talk table here.](#)



Total Hourly Adult Words



Client Manager



LENA Reports



Developmental Snapshot



Digital Language Processor



Settings

Adult Words



HOURLY
September 17, 2009

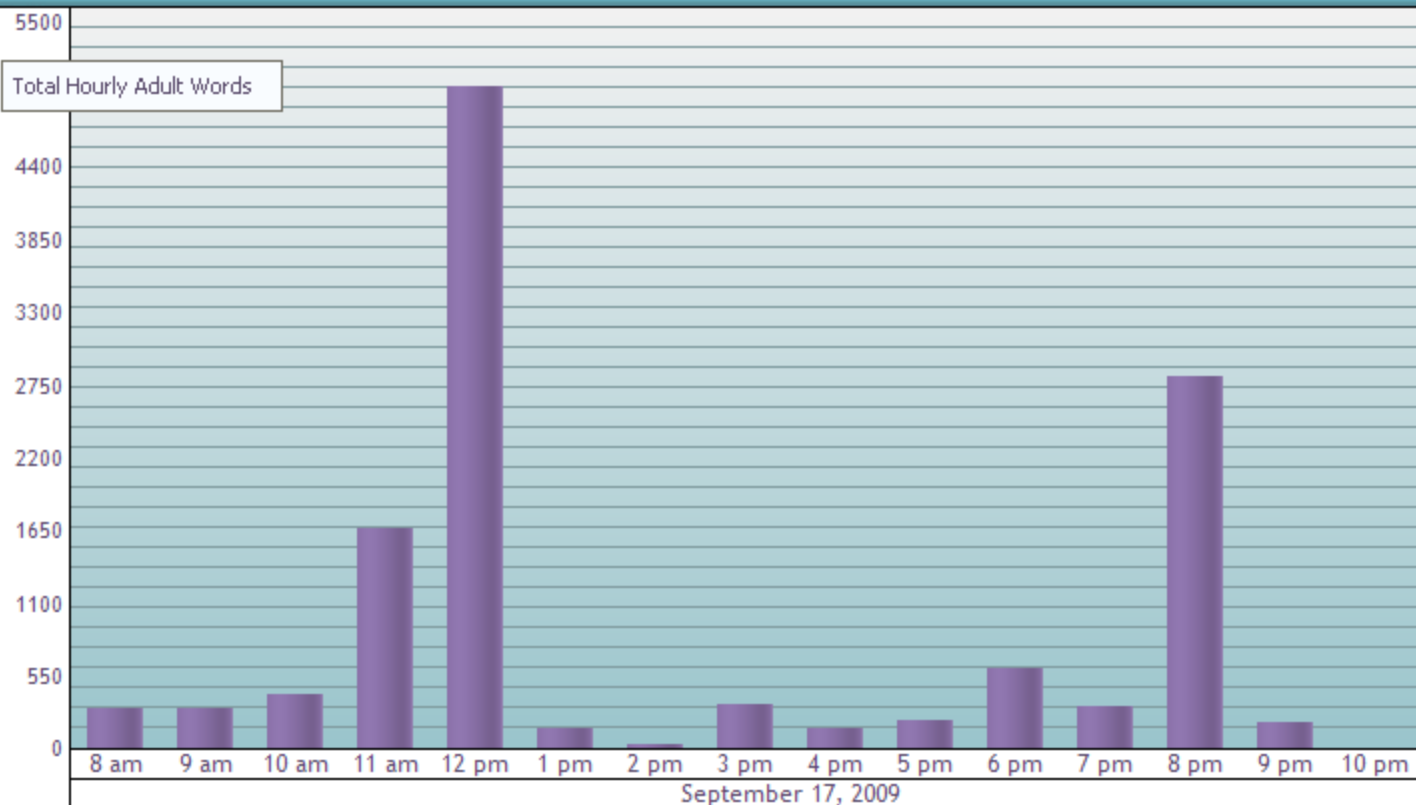
(C007) - xxxxxx, xx

The Adult Words report displays number of words spoken to and in the vicinity of the child during the course of a recording.

Roll over data bars, data points, or legend icons for more detail.

Please see User Guide for additional information.

[View Adult Word Normative table and Average Daily Pattern of Talk table here.](#)



Total Hourly Adult Words



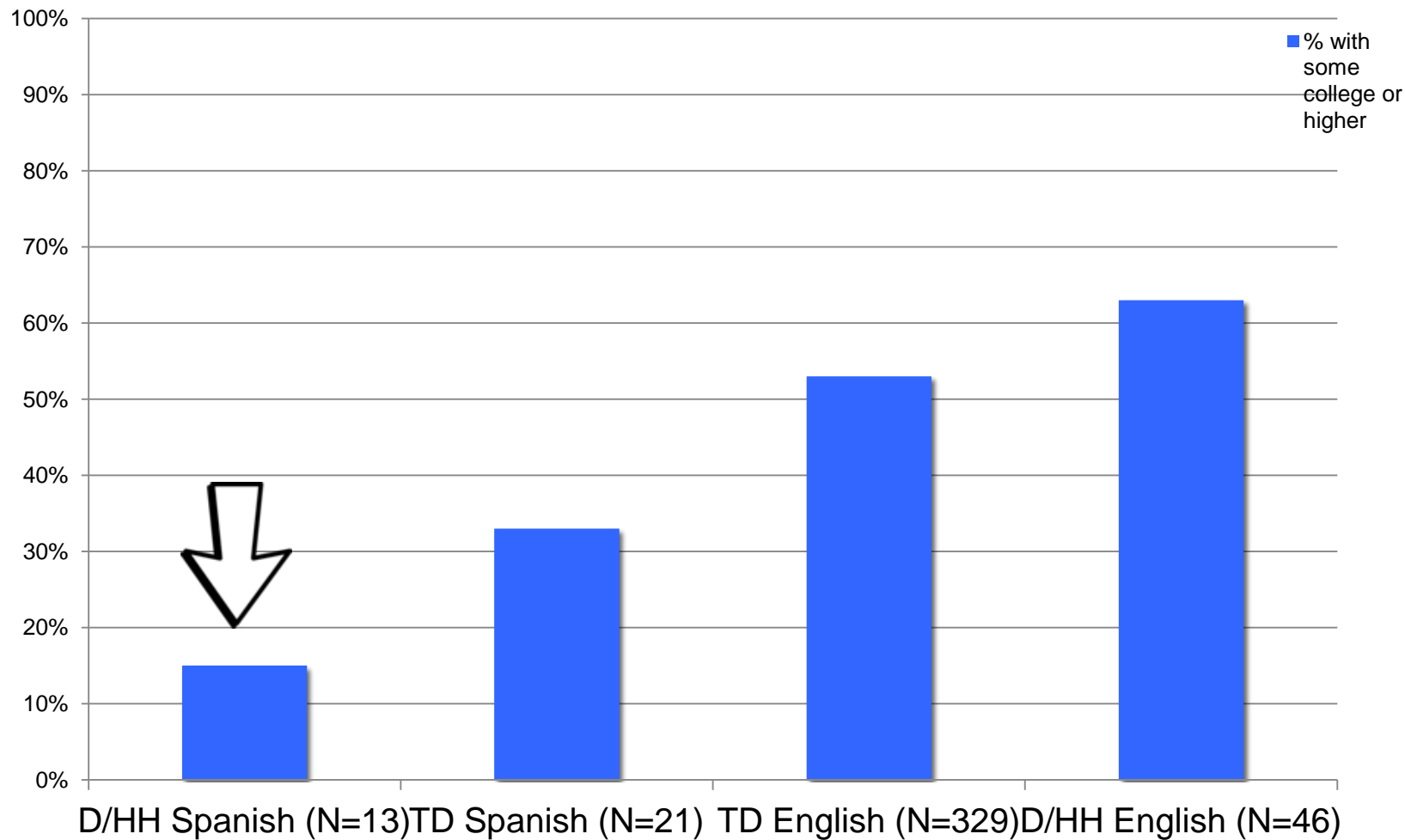
COMPARISON OF D/HH IN ENGLISH-SPEAKING HOMES AND D/HH IN SPANISH- SPEAKING HOMES

Miranda Aragon, B.A.

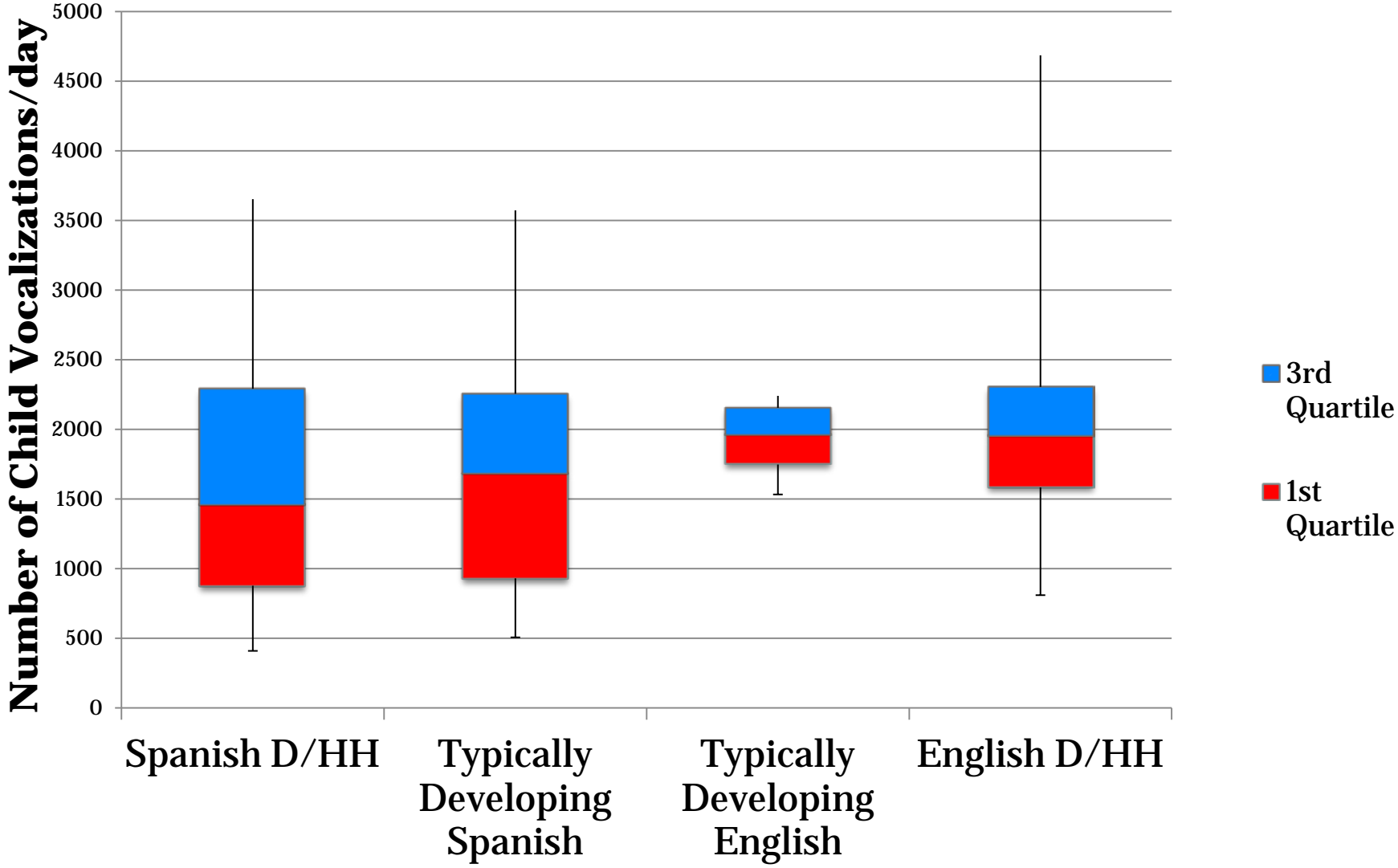
Christine Yoshinaga-Itano, Ph.D.

Participants

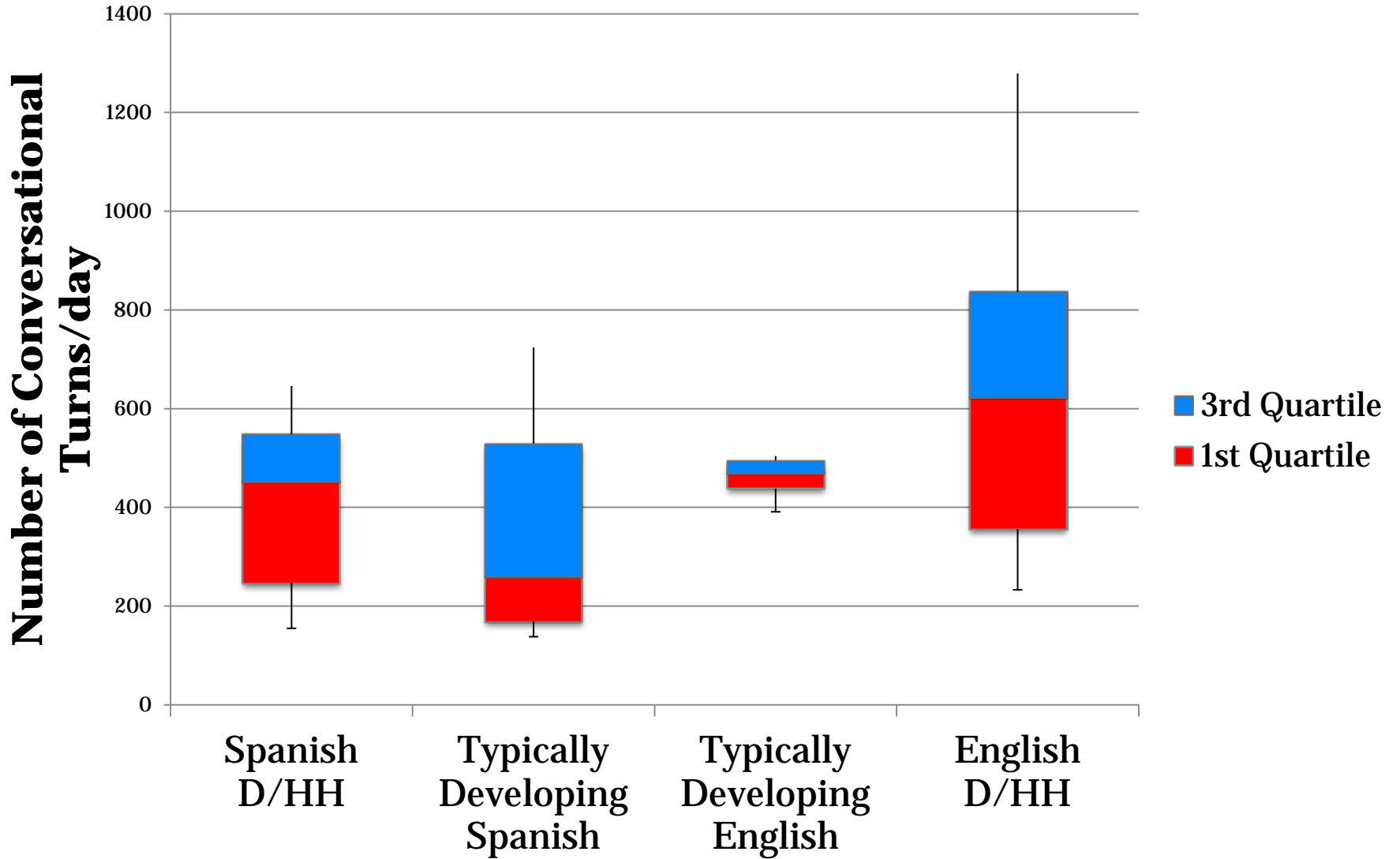
Maternal Level of Education



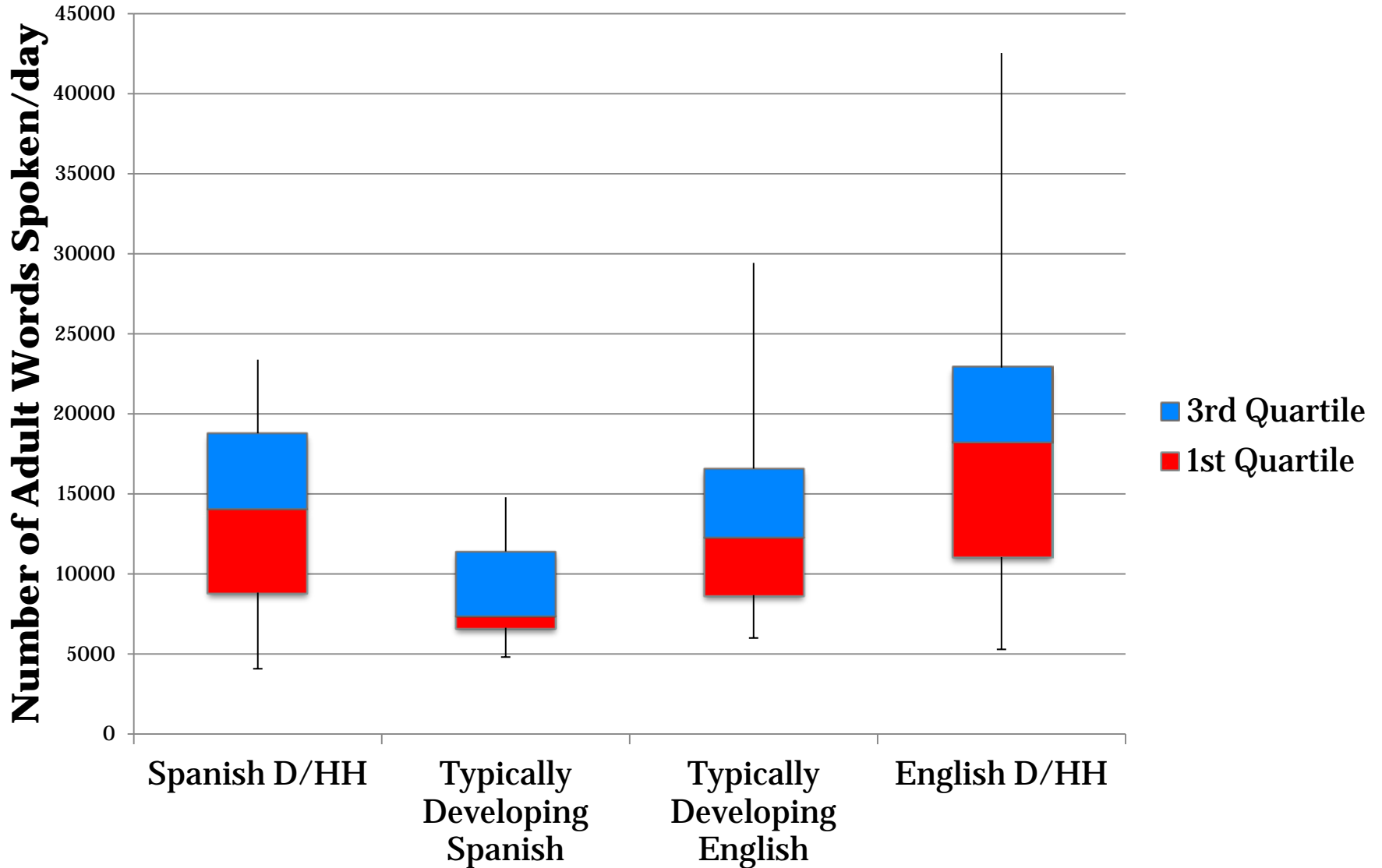
Range: Child Vocalizations



Range: Conversational Turns



Range: Adult Word Count



**Meaningful Language:
Spanish D/HH vs English D/HH
(in percent)**

	Min:	Max:	Mean:	Standard Deviation
Spanish D/HH	7%	25%	17%	5
English D/HH	5%	33%	20%	6

**TV:
Spanish D/HH vs English D/HH
(in percent)**

	Min:	Max:	Mean:	Standard Deviation
Spanish D/HH	2%	33%	14%	10
English D/HH	2%	28%	8%	6

**Distant Language:
Spanish D/HH vs English D/HH
(in percent)**

	Min:	Max:	Mean:	Standard Deviation
Spanish D/HH	10%	51%	30%	13
English D/HH	10%	39%	21%	7

**Noise:
Spanish D/HH vs English D/HH
(in percent)**

	Min:	Max:	Mean:	Standard Deviation
Spanish D/HH	1%	20%	4%	6
English D/HH	1%	11%	3%	3

**Silence:
Spanish D/HH vs English D/HH
(in percent)**

	Min:	Max:	Mean:	Standard Deviation
Spanish D/HH	13%	59%	34%	14
English D/HH	20%	66%	47%	10

Averages in Typical Development LENA Control

- N= 3384
- Meaningful Language 19%
- Distant Language 40%
- TV/Media 10%
- Noise 3%
- Silence 28%

Infoture Research Findings

- Parents talk more to daughters than sons
- Parents talk more to firstborns than to children born after
- Most parent talk occurs in the late afternoons and evenings
- Children of talkative parents are also talkative
- Parents overestimate the amount of talk they have with their children

Intervention Uses and Implications: Increased Adult Word Count

- LENA recording on a 13 month old with moderately-severe bilateral hearing loss
 - Adult Word Count 6066 3rd%ile
 - Conversational Turns 185 16th%ile
- LENA recording after 8 months of intervention
 - Adult Word Count 21,048 97th%ile
 - Conversational Turns 1136 98th%ile

Intervention Implications and Uses:

FM

- Family living in the mountains – hiking
- Family living in the mountains – excessive noise from river
- Preschool and daycare

Intervention Implications and Uses: Differential Diagnosis

- Child 30 months of age with profound bilateral loss
- Identified through NBHS, Progressive loss, CI at 27 months
- Good Auditory Performer

LENA

- LENA Adult Word Count 60th%ile
- Red Flags:
 - Conversational Turns: 26th%ile
 - Child vocalizations 7th%ile
 - Automatic Vocalization Age
 - Standard Score 78.8

Intervention Implications and Uses: Distant vs. Meaningful Speech

- Infant of Mother who cleans hotels
- Busy households with multiple speakers
- Childcare facilities

LENA CAN BE USED TO DEMONSTRATE CHANGE OVER TIME

INCREASE IN AMOUNT OF PARENT WORDS

INCREASE IN CONVERSATIONAL TURN-TAKING

INCREASE IN SPEECH DEVELOPMENT- AVA

INCREASE IN CHILD VOCALIZATIONS

CHANGE IN HOME ENVIRONMENT:

~~TIME IN SILENCE~~

TIME IN NOISE

TIME WITH TV

TIME WITH MEANINGFUL LANGUAGE

Intervention Uses and Implications: Increased Adult Word Count

- LENA recording on a 13 month old with moderately-severe bilateral hearing loss
 - Adult Word Count 6066 3rd%ile
 - Conversational Turns 185 16th%ile
- LENA recording after 8 months of intervention
 - Adult Word Count 21,048 97th%ile
 - Conversational Turns 1136 98th%ile

LENA CAN BE USED FOR DIFFERENTIAL DIAGNOSIS

DOES THE DEAF/HH CHILD LACK AWARENESS TO
SPEECH

IS THE DEAF/HH CHILD NOT ABLE TO DISCRIMINATE
NOT ABLE TO COMPREHEND
NOT BE ABLE TO PRODUCE THE SPEECH
MOTOR COORDINATION

IS THE FREQUENCY OF PARENT WORDS NOT
SUFFICIENT

IS THE CONVERSATIONAL TURN-TAKING TOO LOW

IS THE FREQUENCY OF THE VOCALIZATIONS TOO
INFREQUENT

IS THE QUALITY OF THE SPEECH APPROXIMATING
INTELLIGIBLE SPOKEN ENGLISH

Case 1

Spanish-speaking

Early ID – 8 weeks

Enlarged Vestibular Aqueduct EVA

***Significant Motor Delays 1st year OT
PT***

Progressive HL – 18 mo. +

Differential Diagnosis

Case 1

Good auditory performer

***CA Developmental Evaluations = 22,
27 & 30 mo.***

CI 27 months

Cognitive Quotient: Normal

***Cortical Auditory Evoked Potential
(CAEP) P1 – delayed pre CI - not
present post-CI***

***Case 1: Language – progressively poorer
(parent report) – EOWPVT - picture ID
good – not consistent with parent report***

CA 22

MINN ELQ 91

MINN RLQ 82

CA 27

MINN ELQ 82

MINN RLQ 72

CA 32

MINN ELQ 66

EOWPVT 84

MINN RLQ 64

Case 1: Auditory Skills

***Visual Reinforcement Infant Speech
Discrimination: Excellent (vowels,
place, voicing)***

***Cincinnati Auditory Skills Checklist:
41/70 3 mo. Post CI
good***

Case 1: LENA

Adult Words: 60%ile

RED FLAG:

Conversational Turns: 26%ile

*******Child Vocalizations: 7%ile***

Automatic Vocalization Age:

Standard Score 78.8

Apraxia

Case 1

- Pre-Implant
- VEMP (Vestibular Evoked Myogenic Potentials) – measures organ of balance (saccul)- Normal Pre and Post
 - OT concerns – delayed motor development
- LittleEars did not indicate implantation
- VRISD – could discriminate Ling phonemes pre-linguistically
- P1=Delayed

Post Implant

- Support for good auditory performance
 - VRISD
 - ASC
 - LENA
- **Benefit** of differential diagnosis: Rule out maternal input & auditory abilities for poor performance; able to diagnose Apraxia earlier and initiated appropriate motor planning therapy
-

Show video clip

Christie.yoshi@Colorado.EDU

dbeams@cldb.org