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# The Colorado Home Intervention Program: Outcome Data

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# A Role for Assessment

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- For individual children
  - For families
  - For program evaluation
  - For the EHDI initiative

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# Making an Investment in Assessment - For each Child

- Conduct individualized, objective evaluation of each child in order to identify baserate skills, support development of the IFSP, establish intervention goals, plan specific intervention strategies
  - Justify, with objective data, changes to a child's program (frequency of visits, communication approach, need for sign language instruction, need to change amplification)
  - The One-for-One Rule: Determine individual rate of progress (commensurate with cognitive age for children with cognitive delays)
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# Making an Investment in Assessment - For the Family

- Conduct assessment about the family, their needs & their skills
    - When delivering a family-focused intervention program, the parents are the client
    - Parents (and caregivers) are the change agents for the children – they spend the most time with their children.
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# Making an Investment in Assessment - For the Early Intervention Program

- Obtain aggregate outcome data
  - Identify priorities and plan for changes to the program
    - Staff
    - Additional services
    - Funding priorities
  - Provide forum for communication among professionals to enhance the state EHDI system
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# Making an Investment in Assessment - For the National EHDI Initiative

- Proven efficacy of early identification & intervention (Yoshinaga-Itano et al, 1998; Moeller, 2000)
  - Acquire longitudinal outcome data – birth-3; during the preschool years; and for school-age children
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# Gathering Information

- Direct assessment
    - Clinician-administered tests
    - Videotape analyses
    - Interview
  - Observation
    - Professional-parent
    - Play-based assessment
  - Parent report
    - Parent-administered protocols
    - Parent survey
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# Statewide Implementation of Colorado's FAMILY Assessment

- Started in 1986; published 1994, 2003
  - Offered to *all* families in *all* programs in Colorado
  - Supported with state funds, federal funds
  - Training provided
    - Statewide and regional workshops
    - Mentors
    - Practice
  - Continuum of assessment includes preschool and school-age children
  - Norms for deaf and hard of hearing
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PROTOCOL	Parent, Therapist, &/or Facilitator	Coder
Communication Intention Inventory		x
Communication Strategy Inventory		x
MacArthur Communicative Development Inventory	x	
Speech Production Analysis		x
Speech Intelligibility Checklist	x	x
Play Assessment Questionnaire	x	
Kent Inventory of Developmental Skills	x	
Minnesota Child Development Inventory	x	
Non-Verbal Communication Inventory		x
Communication Modality Analysis		x
Analysis of Spontaneous Language		x
Functional Auditory Performance Indicators	x	
Family Needs Survey	x	
Observation of Visual Problems	x	
Sign Vocabulary Checklist for Parents	x	

# Assessment Domains

- For the child
    - Play/cognitive development
    - Developmental profile (motor, personal-social, self help)
    - Communication (pre-verbal)
    - Language (semantics, syntax, morphology, pragmatics)
    - Use of amplification & functional auditory skills
    - Speech development
    - Sign language acquisition
  - For the family
    - Family needs
    - Environment
  - Dynamics of parent-child interaction
    - Turntaking
    - Communication modes used
    - Interactive match
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# Pre-CIPP: Preschool Edition of the Colorado Individual Performance Profile

- Development: Minnesota CDI
  - Language
    - Syntax: SALT
    - Vocabulary: MacArthur, EOWPVT
    - Pragmatics: Pragmatics Checklist
  - Functional Auditory Skills: FAPI
  - Speech
    - Phonology: LIPP
    - Intelligibility
  - Parent Training & Counseling
    - Family Participation Rating Scale
    - Parent Sign Vocabulary Checklist
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# Acknowledgements

- Participating families for their time, dedication, and continuing support
  - Early interventionists and preschool teachers
  - Research Team:
    - Christie Yoshinaga-Itano, PhD
    - Allison Sedey, PhD
    - Doctoral Students
    - Amy Dodd
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# Study #1: Trends Over Time

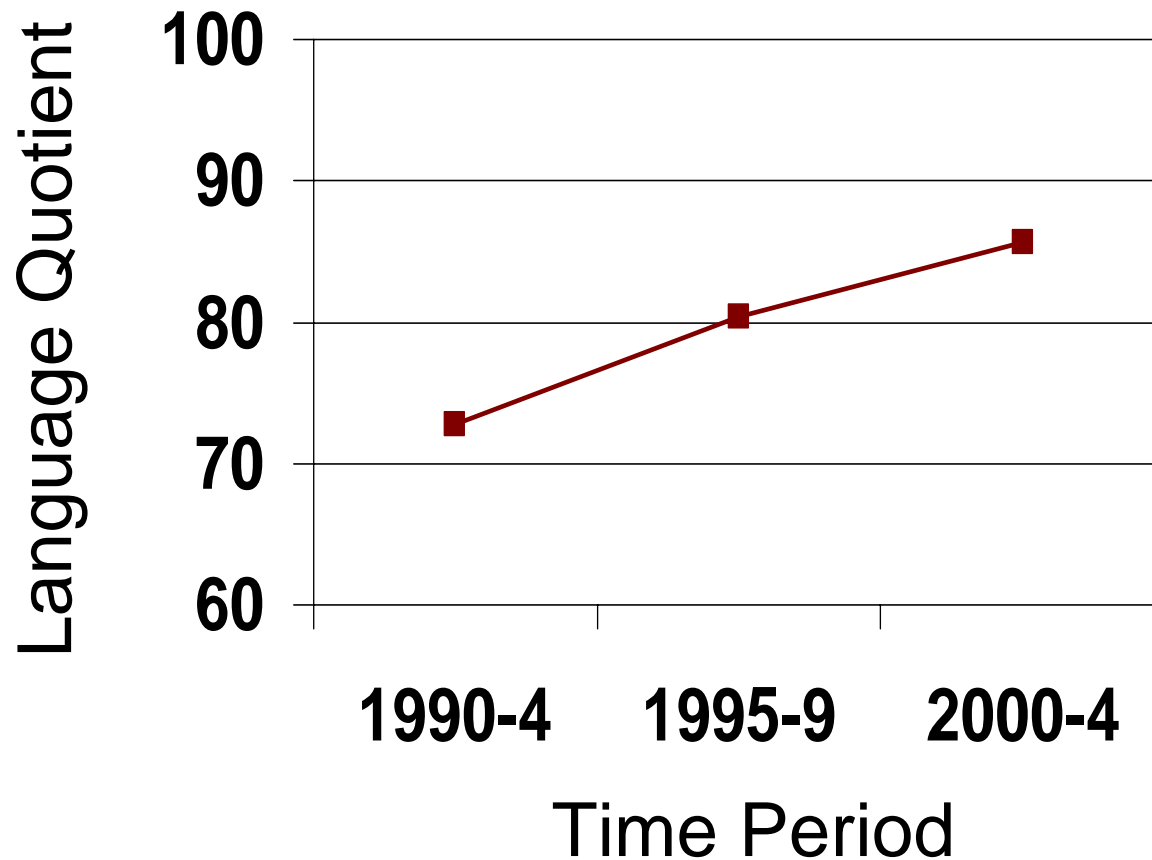
- Normative data was gathered on a large sample of deaf/hard-of-hearing children
    - Chronological Age
      - 1 month - 6 years; 6 months
    - Degree of Hearing Loss
      - Mild to profound
    - State of Residence
      - 97% from Colorado
      - 3% from New Mexico and Wyoming
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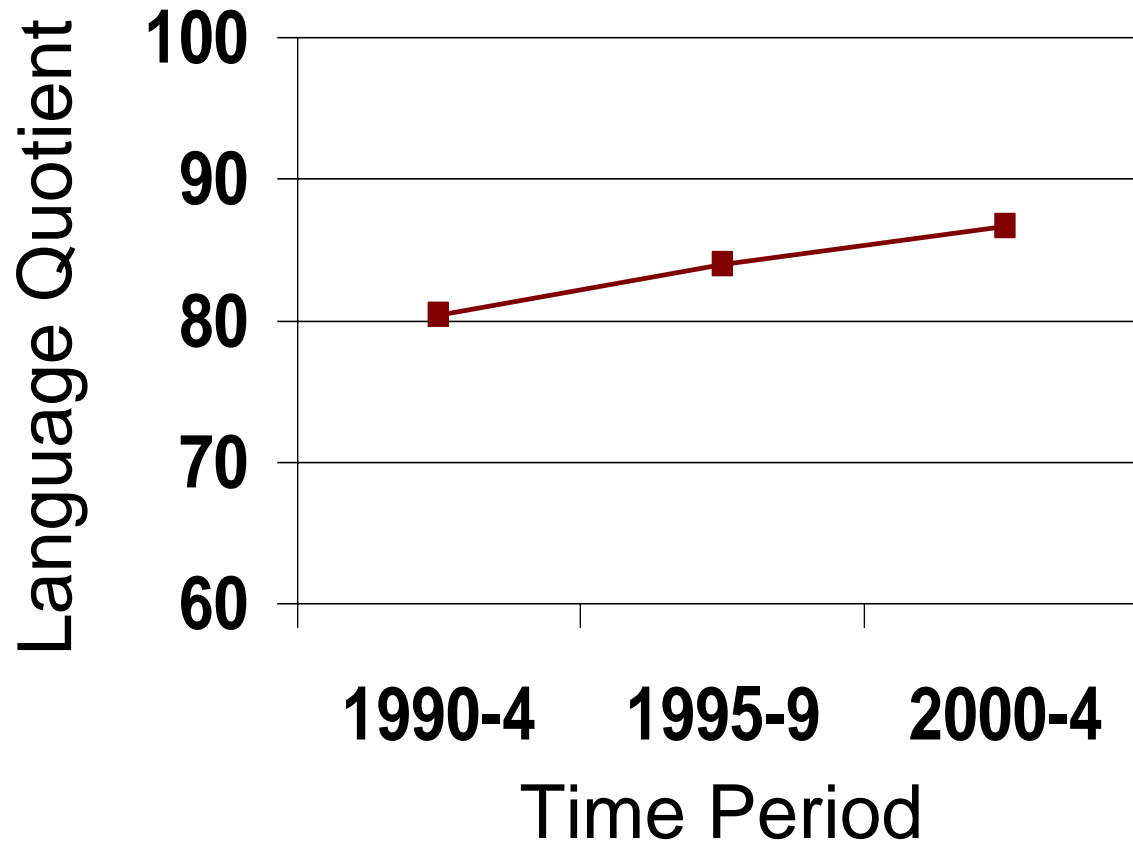
# Past to Present: Sample Characteristics

- N = 961 Minnesota assessments
  - Administered between 1990 and 2004
  - Cognitive Quotient  $\geq 80$ 
    - Based on Minnesota CDI
    - Average of Self-Help and Situation Comprehension Subtests
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# Median Expressive Language Quotients Over Time



# Median Receptive Language Quotients Over Time



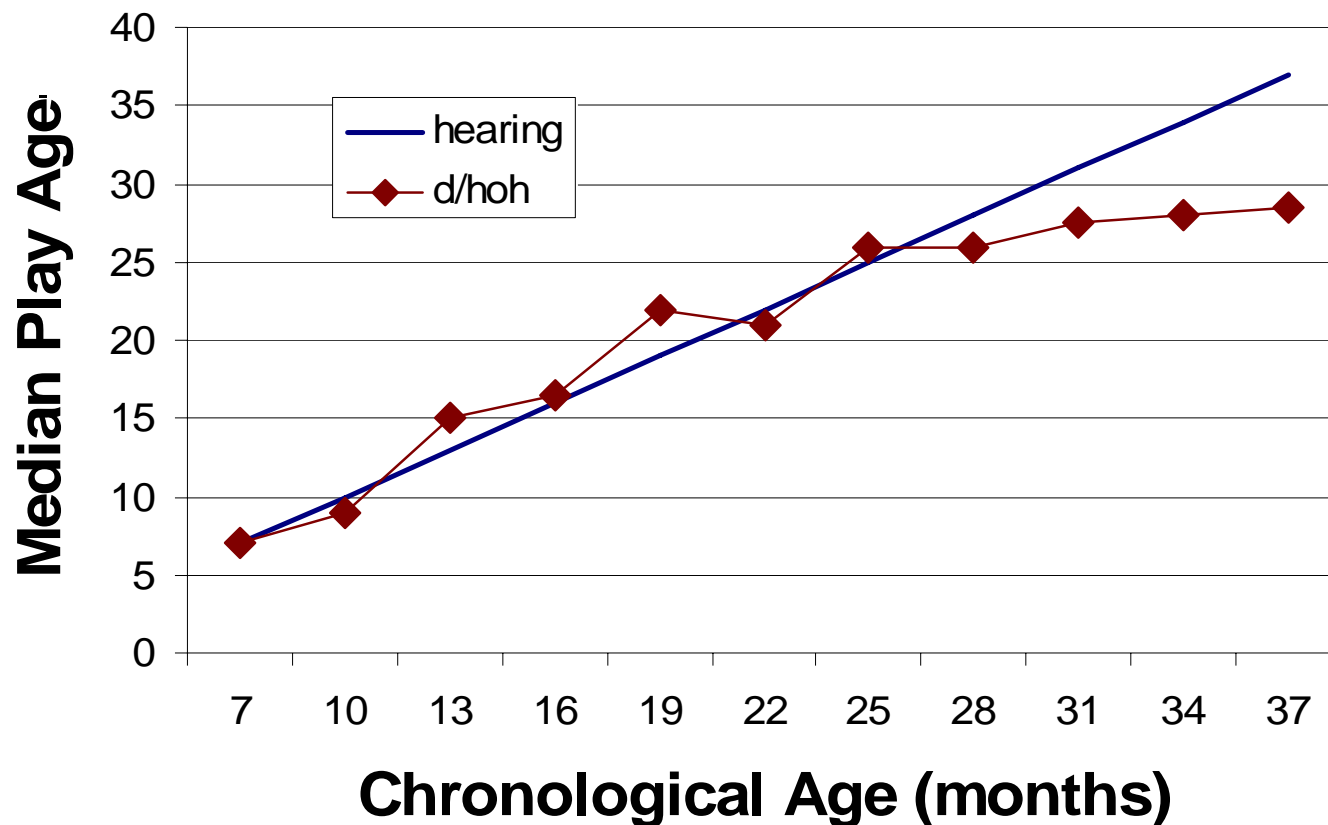
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# Potential Reasons for Improvement Over Time

- Increase in percentage of children identified and receiving intervention early
  - Improvements in technology
    - Digital hearing aids
    - Cochlear implants
  - Ongoing systematic training and increasing expertise of interventionists
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# Play Assessment with Increasing Age

Children with Cognitive Quotients  $\geq 80$



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# Potential Reasons for Delay with Increasing Age

- Several of the more advanced items involve language
    - “child tells you play plans before carrying them out”
    - “child gives roles or tasks to other players”
  - Some play behaviors may involve internal language mediation
  - Adults may model and encourage play relative to child’s language age
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# Language: A Critical Analysis of Strengths and Challenges

- Overall language quotients are WNL
  - Clinicians observe some challenges; unsure which specific skills are problematic
  - Undertake a critical analysis of specific language items
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# Study #2: Language of D/HH Children – What's Missing?

## ■ Participants

- 352 deaf and hard-of-hearing children
  - Children assessed on 1 to 9 occasions
  
  - Total number of assessments = 725
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# Participant Characteristics

- Chronological Age
    - 6 months - 6 years; 3 months
    - Mean = 34 months
  - Cognitive Ability
    - Estimated to be within the normal range
    - Based on subscales of the Minnesota
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# Participant Characteristics

- Hearing Loss
    - Bilateral
    - Mild to profound
  - Parents
    - Normal hearing
    - Use English as their primary language
  - Communication Approach
    - Full range of different approaches
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# Procedures

- FAMILY Assessment
    - Birth to 3
    - Facilitated by the CHIP provider
  - Pre-CIPP
    - 3 to 6
    - Facilitated by the preschool teacher
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# Minnesota CDI

- Minnesota Child Development Inventory
    - 8 subscales
    - Items re-worded to accept sign or spoken language
    - Selected items examined from 2 subscales
      - Expressive Language
      - Comprehension/Conceptual (Receptive Language)
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# Determining Language Quotient

- Language Age/Chronological Age x 100
    - If  $LQ = 100$ , Language Age = CA
    - If  $LQ < 100$ , Language Age < CA
    - If  $LQ > 100$ , Language Age > CA
  
  - LQs of 80+ are within the normal range compared to hearing children
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# Results: Language Quotients

- Expressive Language
    - To avoid ceiling effects that would underestimate the group's ability, children >54 months were not included
    - Number of assessments = 601
    - Range of LQ= 27 to 175
    - Median = 81
    - LQ >80 = 53%
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# Results: Language Quotients

- Comprehension/Conceptual
    - To avoid ceiling effects that would underestimate ability, children >70 months were not included
    - Number of assessments = 700
    - Range of LQ= 29 to 175
    - Median = 82
    - LQ >80 = 54%
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# Determining Item Age Level

- Find the first age at which two-thirds of the children achieve a given item
  - Same procedure followed in the test's normative sample
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# Linguistic Categories

- ❑ Non-verbal communication
  - ❑ Early verbal communication
  - ❑ Pre-literacy
  - ❑ Knowledge of colors and numbers
  - ❑ Rote language
  - ❑ Early world knowledge
  - ❑ Conceptual vocabulary
  - ❑ Cognitive-linguistic skills
  - ❑ Grammar
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# Results: Proportion of Delay

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•Non-Verbal	1.14
•Pre-Literacy	1.05
•Colors/Numbers	.97
•Rote Language	.96
•Early Communication	.87
•Concept Vocabulary	.79
•Early World Knowledge	.76
•Cognitive-Linguistic	.71
•Grammar	.66

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# Results: Categories at or near age level

- Non-verbal communication
    - “Points”
    - “Waves bye-bye”
    - “Shakes head no”
    - “Plays peek-a-boo”
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# Results: Categories at or near age level

- Pre-literacy skills
    - “Recites/fingerspells the alphabet in order”
    - “Recognizes/names 5 capital letters”
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# Results: Categories at or near age level

- Knowledge of colors and numbers
    - “Identifies one color correctly”
    - “Names primary colors”
    - “Counts 3 or more objects”
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# Results: Categories at or near age level

- Rote language
    - “Says/signs please”
    - “Says/signs thank you”
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# Results: Categories with mild delay

- Early communication
    - “Refuses by saying ‘no’”
    - “Says/signs 5 words”
    - “Asks for ‘more’”
    - “Points to familiar objects when asked”
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# Results: Categories with mild delay

- Conceptual vocabulary
    - “Points to/names the bigger of 2 objects”
    - “Expresses feelings in words”
    - “Knows the meaning of same/different”
    - “Knows the meaning of first/last/middle”
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# Results: Categories with moderate delay

- Early world knowledge
    - “Refers to other kids as boy/girl correctly”
    - “Provides address when asked”
    - “Knows names of playmates”
    - “Says/signs name when asked”
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# Results: Categories with moderate delay

- Cognitive-linguistic skills
    - “Names at least one opposite”
    - “Asks the meaning of words”
    - “Tells jokes or riddles”
    - “Tells what he/she dreams about”
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# Results: Category with severe delay

## ■ Grammar

- “Uses plural pronouns correctly”
  - “Asks questions with ‘when’”
  - “Makes conditional statements”
  - “Puts 2 or more words together to make a sentence”
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# Summary: Strengths

- Non-verbal communication
  - Pre-literacy skills
  - Colors and numbers
  - Early language skills
  - Some concept vocabulary
  - Quantity of utterances
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# Summary: Moderate Limitations

- Early world knowledge
  - Cognitive linguistic skills
  - Use of negation
  - Some concept vocabulary
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# Summary: Significant Limitations

- Utterance length
  - Diversity of vocabulary
  - Grammar
  - Use of conjunctions
  - Use of modal auxiliary verbs
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# Program Adaptations

- **Rationale:** Language demands from 21 months on are increasingly grammar dependent, complex and/or abstract
    - “uses plural pronouns”
    - “makes conditional (if...then...) statements”
    - “asks questions beginning with ‘how’”
    - “recalls past events”
  - **Program adaptation:** Increase frequency of home visits starting at 21 months. Parent-centered therapy extended >36 months
  - Encourage parents to have high expectations for their child. Communicate according to the child’s chronological (or cognitive age) rather than limiting exposure to the child’s language age
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## Study #3: Interaction of Cochlear Implant Use and Communication Approach in Young Children

- Investigate the communication approach used with children before and after implantation
  - Questions from different implant centers on the efficacy of specific communication approaches
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# Demographic Information

- 54 deaf children who received cochlear implants
    - All resided in Colorado
    - English is the primary spoken language of the home
    - Hearing parents
    - Implanted by 5 years of age
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# Demographic Information

- Age of Identification
    - Range = Birth - 39 months
    - Mean = 9 months
    - By 6 months of age = 49%
  - Age at implantation
    - Range = 13 months - 5 years; 1 month
    - Mean = 31 months
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# Communication Approach of Primary Caregiver

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Sim Communication (SC)	44%
Oral/auditory verbal	15%
Primarily oral with some sign	10%
Oral → some sign	10%
SC → some sign	13%
SC → oral → some sign	8%

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# Total Communication Participants

- Selected children who signed in > 50% of utterances at pre-implant tape
  - No additional disabilities that interfere with language development
  - N = 29
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# Vocabulary Outcomes (MacArthur CDI)

- MacArthur Communicative Development Inventories
    - Checklist of early vocabulary
    - Parent indicates words child can produce in:
      - Spoken language only
      - Sign language only
      - Both sign and spoken language
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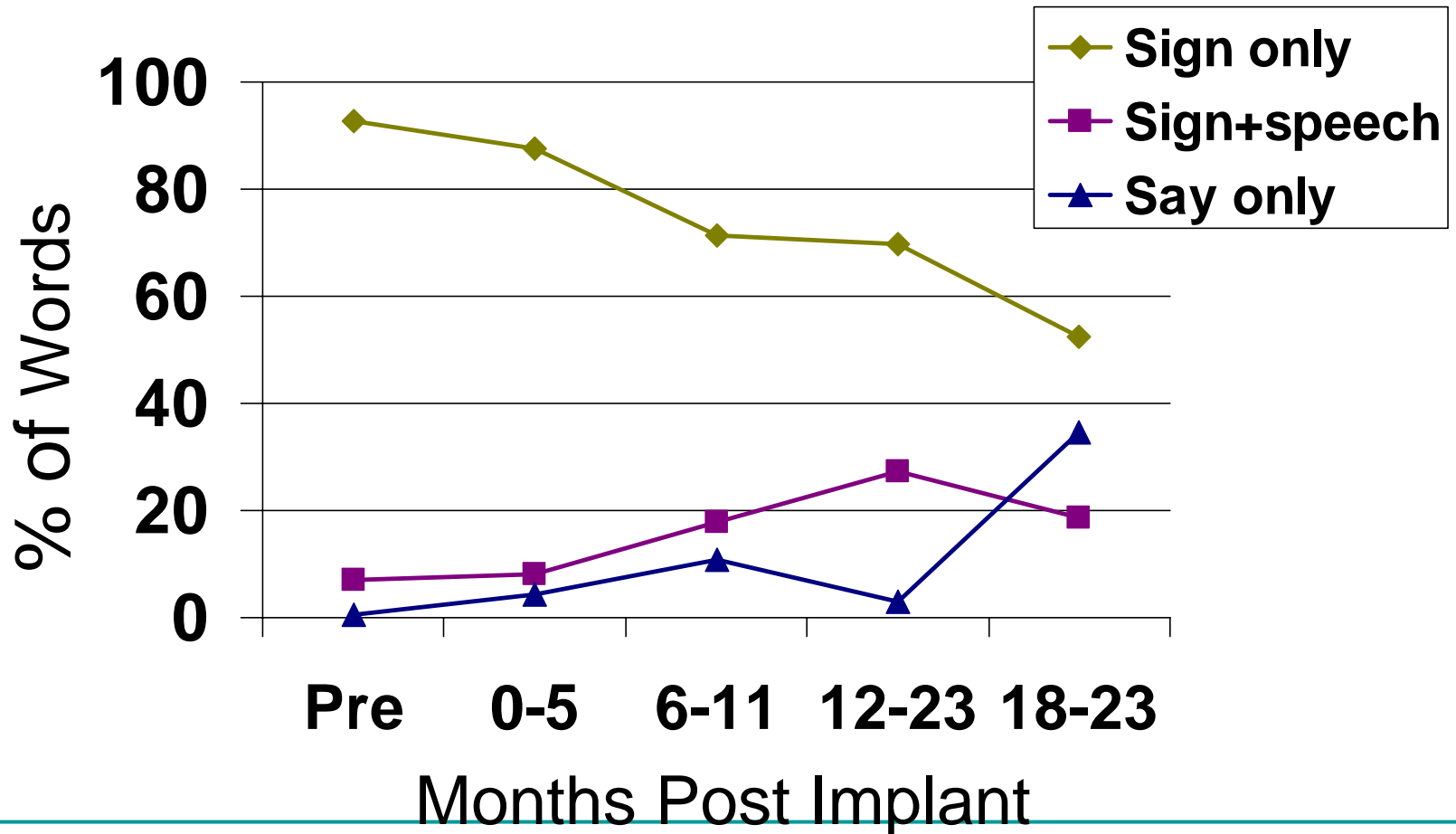
# Number of Participants by Months Post CI (MacArthur)

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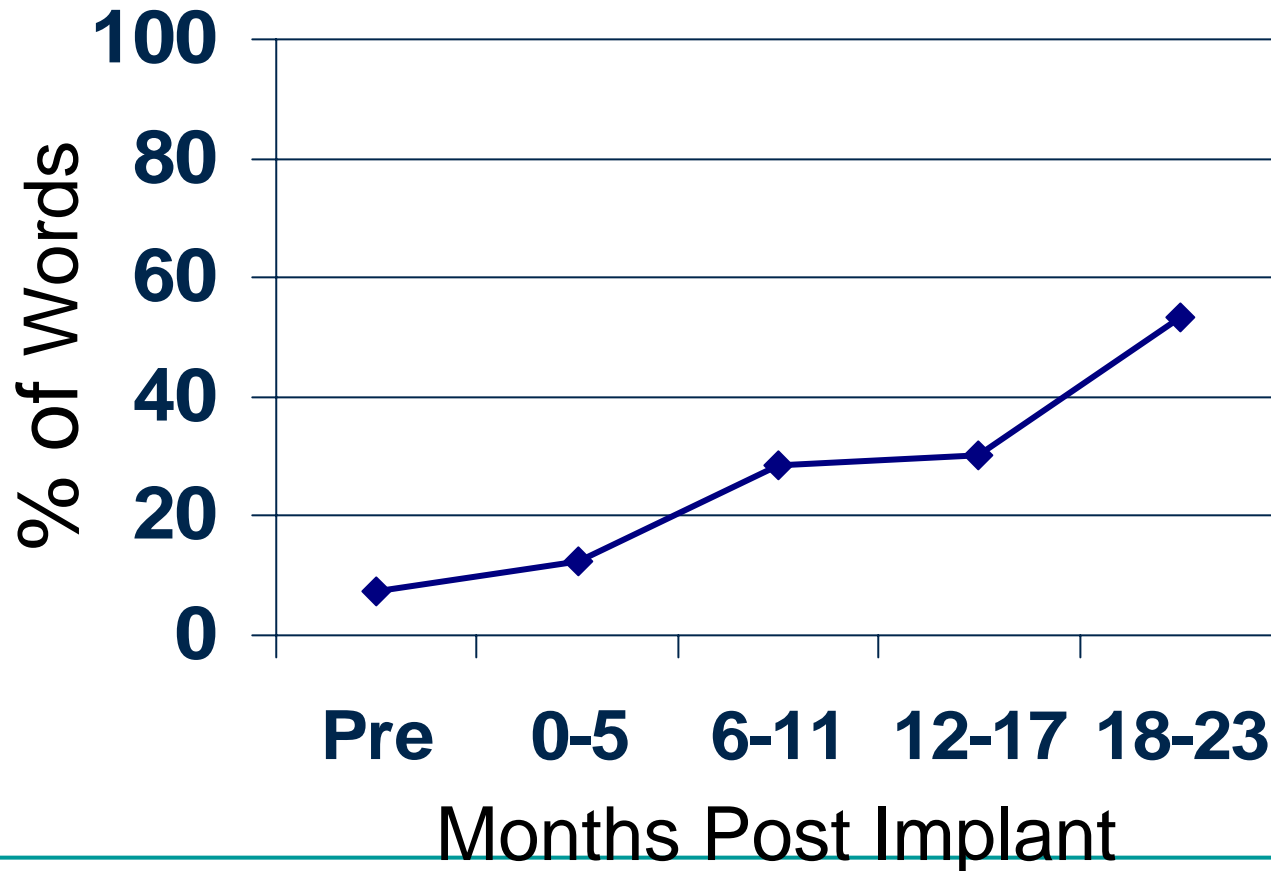
Pre	21
0 to 5 months	21
6 to 11 months	14
12 to 17 months	7
18 to 23 months	3

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# Results: Use of sign & spoken vocabulary (MacArthur)



# Results: Use of spoken vocabulary (MacArthur)



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# Vocabulary Outcomes (Language Sampling)

- Spontaneous Language Sample
    - 25 minutes of interaction
    - Child interacted with parent or teacher
    - Free play/conversation
    - Transcribed and analyzed by SALT
    - Spoken and sign language transcribed
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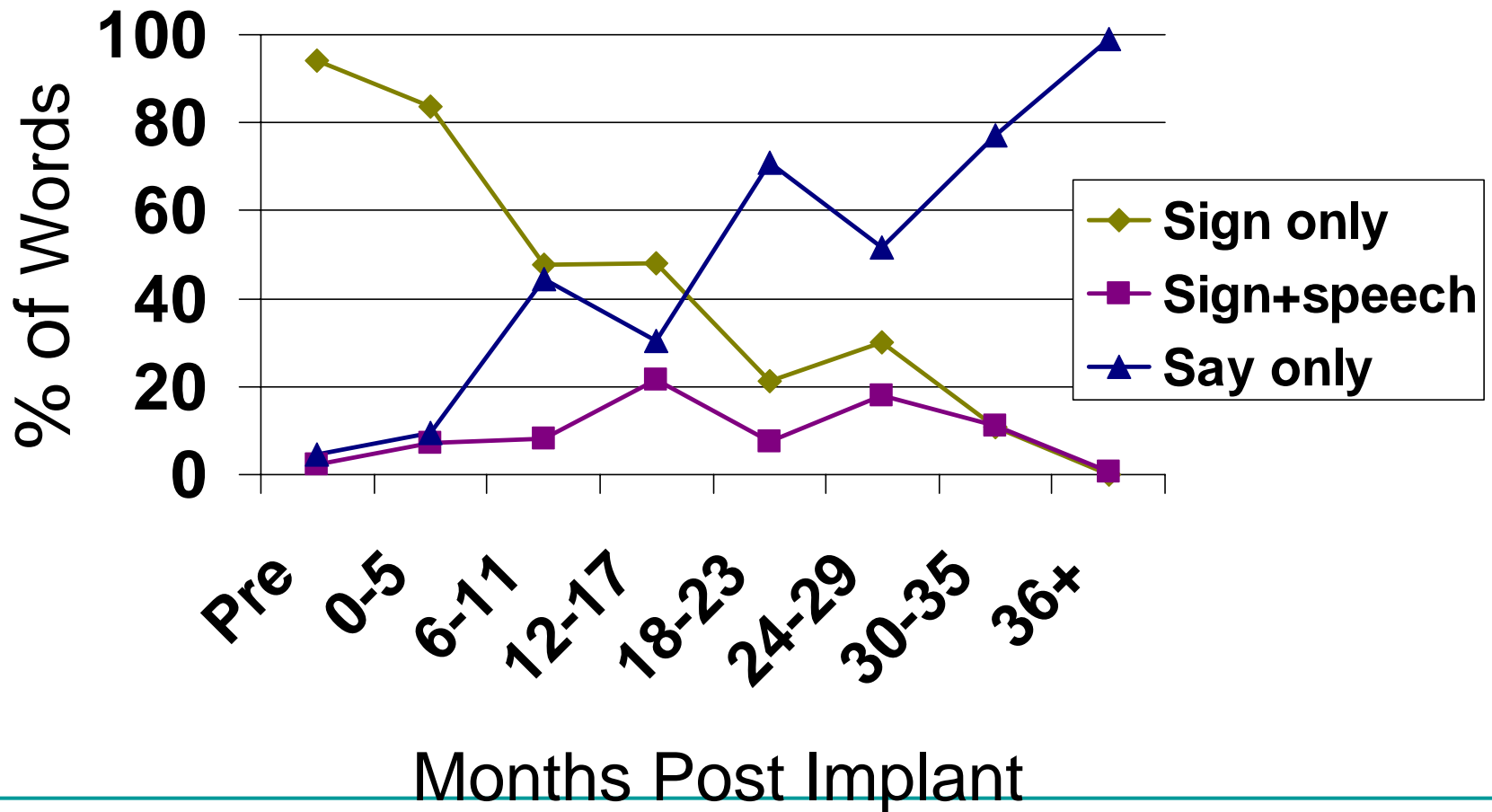
# Number of Participants by Months Post CI (Lang Sample)

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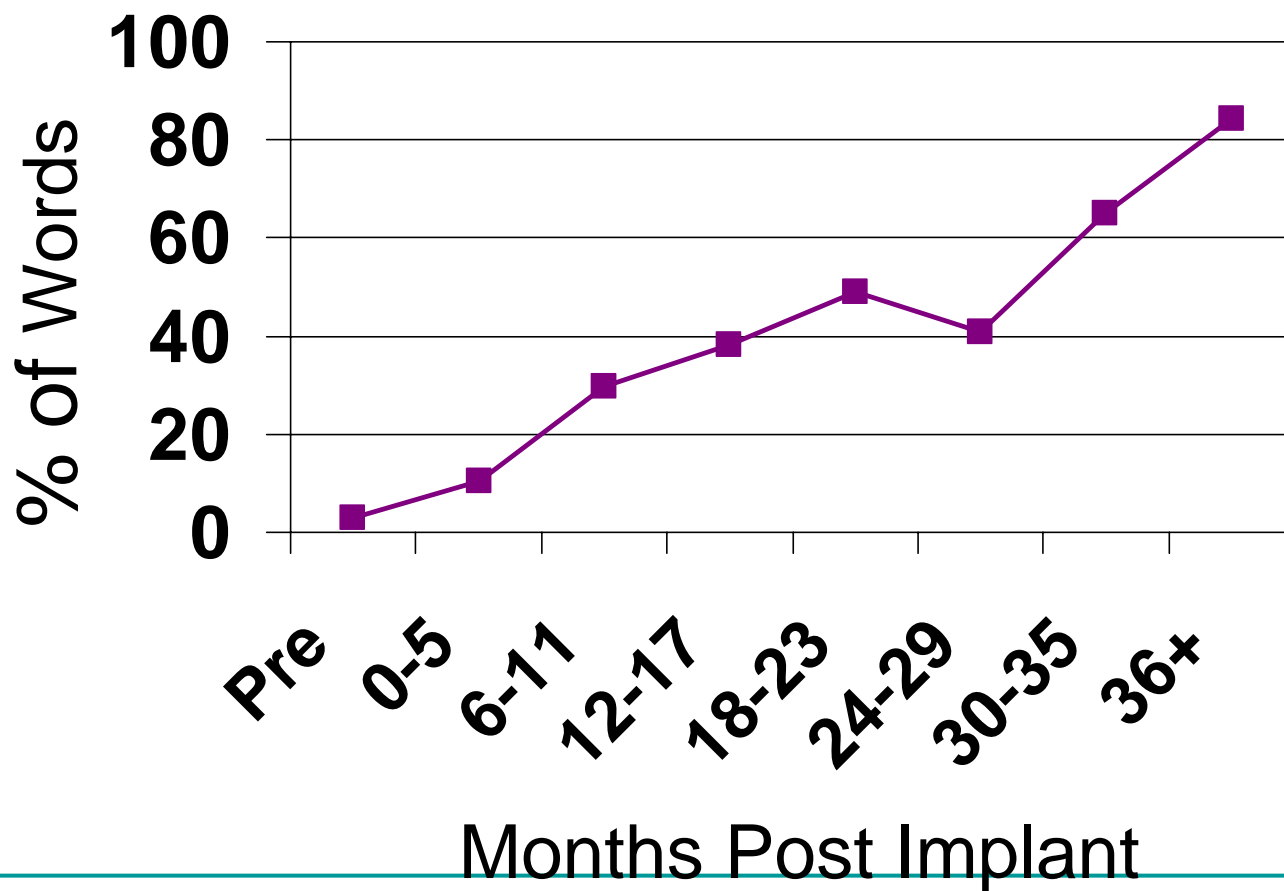
Pre	19
0 to 5 months	22
6 to 11 months	14
12 to 17 months	10
18 to 23 months	9
24 to 29 months	6
30 to 35 months	4
36+ months	3

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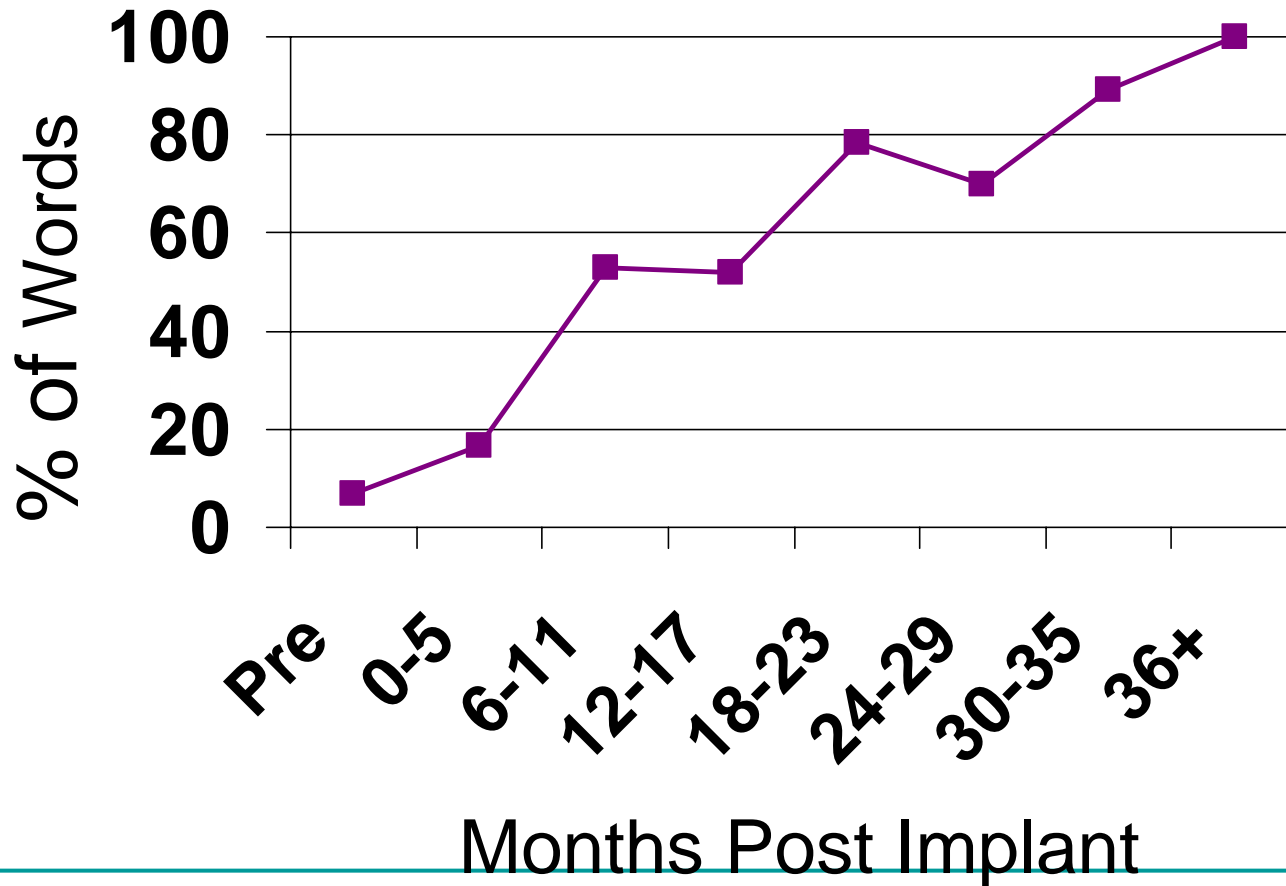
# Results: Use of sign & spoken vocabulary (Language Sample)



# Results: % of Signs Produced with Speech (Lang Sample)



# % of Words Produced in Spoken Language (with or without sign)



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# Summary

- After their child receives a cochlear implant...
    - The majority of parents do *not* radically change their communication approach
    - Most families continue to use at least some sign language
    - 44% of families continue to use sign with spoken language most of the time
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# Summary

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- On average, children who communicated primarily with sign language and no speech before receiving a cochlear implant...
    - Used spoken language (with or without signs) about 50% of the time after 6 to 12 months of implant use
    - Used spoken language (with or without signs) about 80% of the time after 18 to 24 months of implant use
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# Summary

- Although all children using simultaneous communication showed increases in the use of spoken language over time, the *rate* of this increase was quite variable
    - At 6 to 12 months post-implant, percentage of words produced in spoken language varied from 1.9% to 100%
    - At 12 to 18 months post, the range was 4.2% to 95.1%
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# The Impact of Survey Data

- Demographic data for EHDI program
    - Required by CDC
    - Demonstrates incidence/prevalence
  - Parent Survey Data
  - Interventionist Survey Data
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# Parent Surveys

- Conducted by The Colorado Home Intervention Program (CHIP) annually
  - Results confirm program priorities
  - Results are used to identify program changes
  - Results contribute to Deaf Education Reform initiative in Colorado
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# Parent Survey - 2004

- 130 surveys mailed to families
  - 49 surveys returned (36% return rate)
  - Length of time in early intervention
    - 6 months or less 23%
    - 7-12 months 23%
    - 13-24 months 39%
    - More than 2 years 15%
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# Intensity of Services

- Number of visits per month
    - Median = 4
    - Range = 1 to 6
    - 91% of families receive 2-4 visits per month
    - 63% receive 4 visits per month
  - Program Planning
    - Number of visits should reflect the parents' needs and the child's skills
    - Intensity of services is determined at the IFSP
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# Information and Resources Provided to Families...

*(Topics requested by 95% - 63% of families surveyed)*

**95%**      **communication approaches**

**88%**      **language development**

**84%**      **speech development**

**83%**      **sign language**

**81%**      **hearing aids**

**80%**      **functional auditory skills**

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# Information and Resources

72%	general development
71%	service coordination
68%	Part C
66%	parent groups
64%	financial resources
64%	appropriate play strategies & toys
63%	private therapy

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# Information & Resources – Program Planning

- Hierarchy of parents' needs supports the need for service providers to have a specialization in hearing loss
  - Some parents want information that they have not received: Training with service providers to address this, work with specialty service coordinators to assure facilitators have access to information parents request.
  - Program creates additional handouts & identifies additional resources
  - Continually translate information in to Spanish
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# Supporting Program Initiatives

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- Outcome data
  - Observations
  - Consensus

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# Program Initiatives

- Based on outcome data:
    - Sign Language Instructors (FAMILY Assessment; parent sign skills)
    - Early Literacy Initiative (CO Dept. of Education; statewide assessment)
    - Integrated Reading Project (CHIP demographics)
    - Specialty Service Coordinators (Parent survey)
  - Based on observations:
    - D/HH Connections (requests from parents)
    - Parent Manual (facilitators)
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- ❑ Peer Mentoring (Facilitator survey; implementation of best practices)
  - ❑ Oral Communication Consultant (parents & facilitators)
  - Based on consensus
    - ❑ FAMILY Assessment (Early Childhood programs, Early Intervention Task Force)
    - ❑ Serving Children with Minimal Hearing Loss (CO Infant Hearing Advisory Committee, CDC)
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For more information:

*Check the CHIP webpage at:*  
[www.csdb.org](http://www.csdb.org)

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