

# *Fourth Latin American Pediatric Conference*

## **Considerations for Developing an Infant Hearing and Communication Development Program**

**Richard Seewald, PhD**

*National Centre for Audiology*

*The University of Western Ontario*

*London Ontario Canada*

# Dedication

## Dr. Judith Gravel



# *Fourth Latin American Pediatric Conference*

## **Considerations for Developing an Infant Hearing and Communication Development Program**

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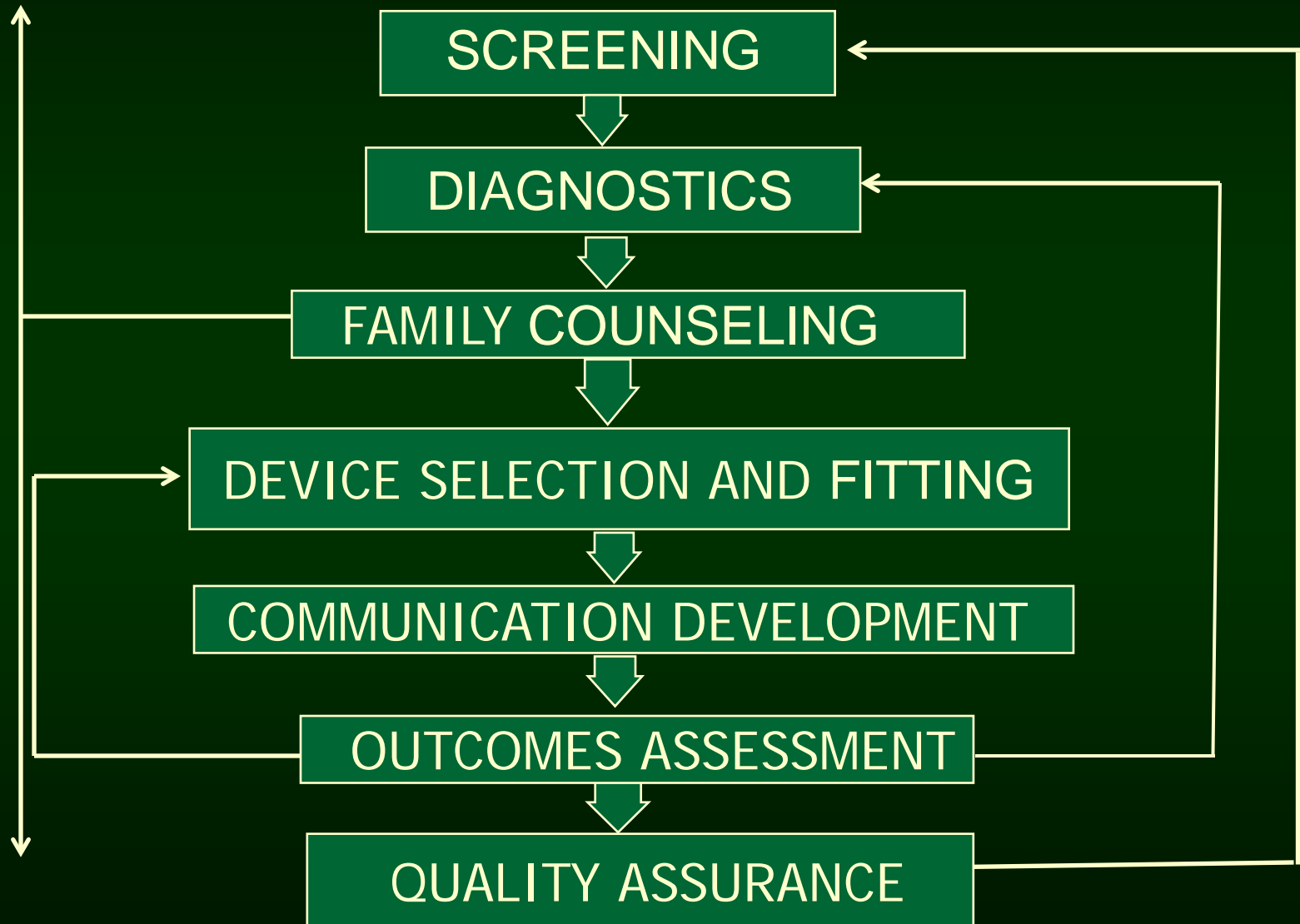
**Western**  National Centre  
for Audiology

## *With a wink of the eye. . .*

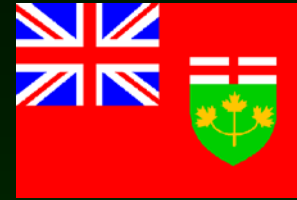
The development and implementation of a comprehensive Infant Hearing and Communication Development *Program* requires a great deal more than simply deciding which neonatal hearing screening system to purchase!



# *Major Components of an Infant Hearing and Communication Development Program*



# *Overall Context for the Program*



1. The program must be developed, organized, implemented, and monitored centrally.

For example, in Ontario Canada the Infant Hearing Program is funded and was developed, administered and closely monitored by the Ministry of Children and Youth Services.

In other words, we are fully accountable to the Ministry for all aspects of the program.

## *Overall Context for the Program*

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2. The program development must be multidisciplinary and include, for example:

- Parents
- Hearing Health Care Industry
- Audiology
- Communication Therapies and Education
- Otolaryngology
- Epidemiology
- Health Services
- Neonatology
- Pediatrics
- Social Work

## *How we approached this in Ontario Canada*

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### **We took two years for program development and implementation –**

1. Brought in experts to help us to develop the evidence-based protocols for screening, diagnostics, hearing aid fitting, behavioral assessment, counseling etc. and for the overall program design,
2. Identified the individuals/clinics who would participate,
3. Purchased the same equipment for all participants,



## *How we approached this in Ontario Canada*

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4. We trained each individual to be involved in the program in the use of the equipment and protocols,
5. And we developed the program monitoring strategies and software systems to monitor program performance over time.

*And only then did we begin to screen our first infants!*

## *Overall Context for the Program*

3. The effectiveness of the program must monitored over time.



# *Two Essential Components*

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- 1. The importance of using well-defined evidence-based protocols in all aspects of the program.**
- 2. The importance of detailed monitoring of all aspects of the performance of the program.**

***On the Importance of using  
Best Practice Evidence-Based  
Protocols***



## *Ideally . . .*

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*Everyone in the program is trained to use:*

- Same equipment
- Same audiologic assessment procedures
- Same device prescriptive and fitting procedures
- Same outcome assessment measures, etc.

*For Example,*

**2014**

Version 2014.01

## Protocol for the Provision of Amplification



Ontario Ministry of Children and Youth Services  
Ontario Infant Hearing Program  
November 17, 2014

***What can happen when we don't use the same evidence-based protocols?***



# *Examples from Research Studies on Hearing Aid Fitting*





# *Example 1*

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## **Hearing Instrument Fittings of Pre-School Children: Do We Meet the Prescription Goals?**

*Susan Strauss & Catherine van Dijk*  
*International Journal of Audiology*  
*2008*



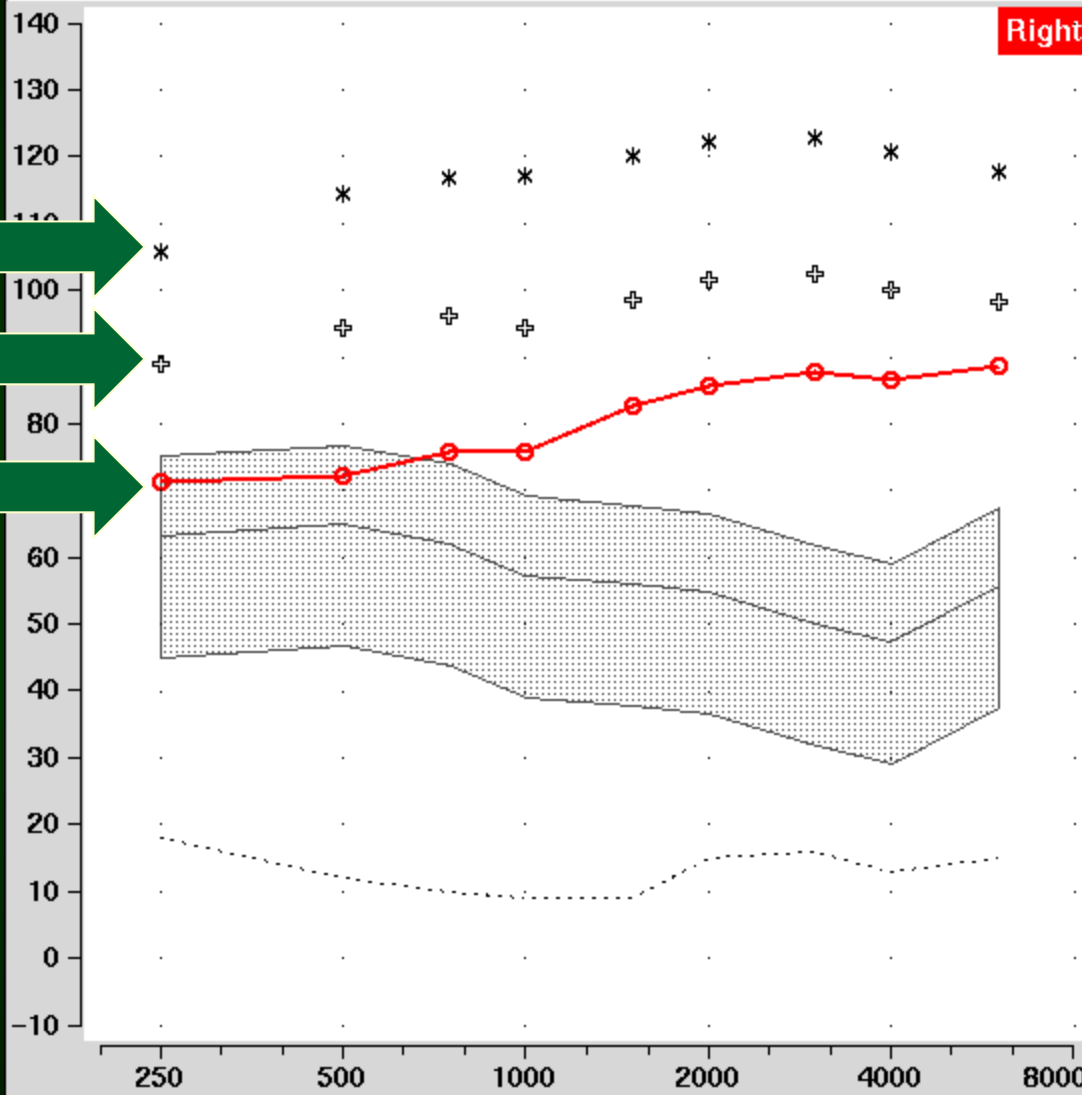
# *Method*

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- Measured the output from 20 children's hearing instruments – total of 31 ears – moderate to profound hearing loss.
- Instruments fitted by a variety of clinicians.
- Compared the measured outputs to the DSLv5 prescribed levels for each child.

# Speechmap/DSL - Single view

audioScan



Right

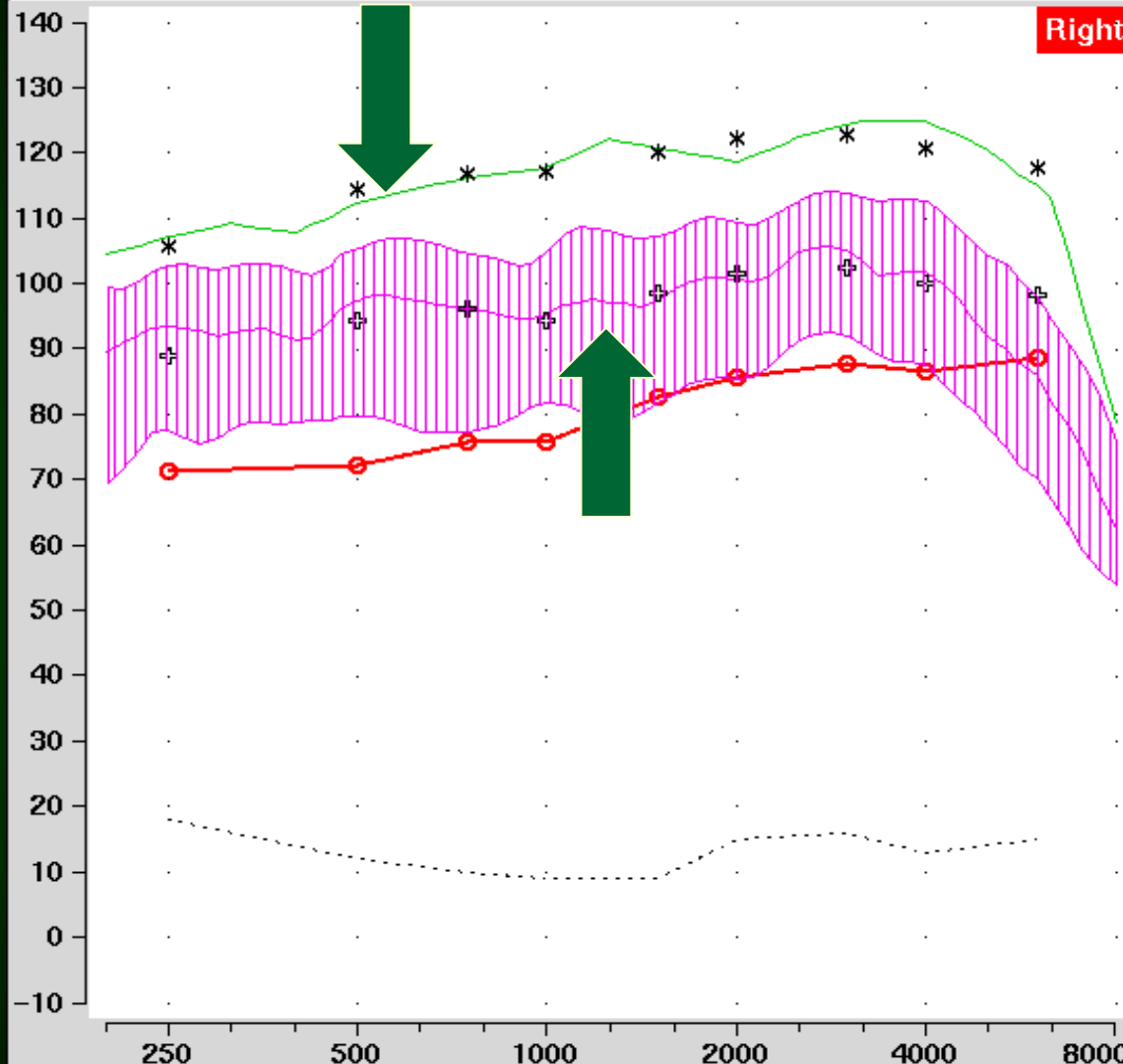
- Instrument: BTE
- Mode: S-REM
- Presentation: Single view
- Format: Graph
- Scale (dB): SPL

- Audiometry:
- Age: <7 months
- Transducer: Insert+Foam
- UCL: Average
- RECD: Average

REAR	Stimulus	Level	SII
<input type="radio"/> 1	MPO	90	N/A
<input type="radio"/> 2	Speech-shape	Avg (70)	67
<input type="radio"/> 3	Speech-shape	Soft (55)	45
<input type="radio"/> 4	Speech-shape	Loud (75)	62
Unaided			<input type="radio"/> 5
Curve			Hide / Show <input type="radio"/>

Connect coupler and instrument to coupler microphone. Select one of REAR 1 through REAR 4.

# Speechmap/DSL – Single view



Right

audioScan

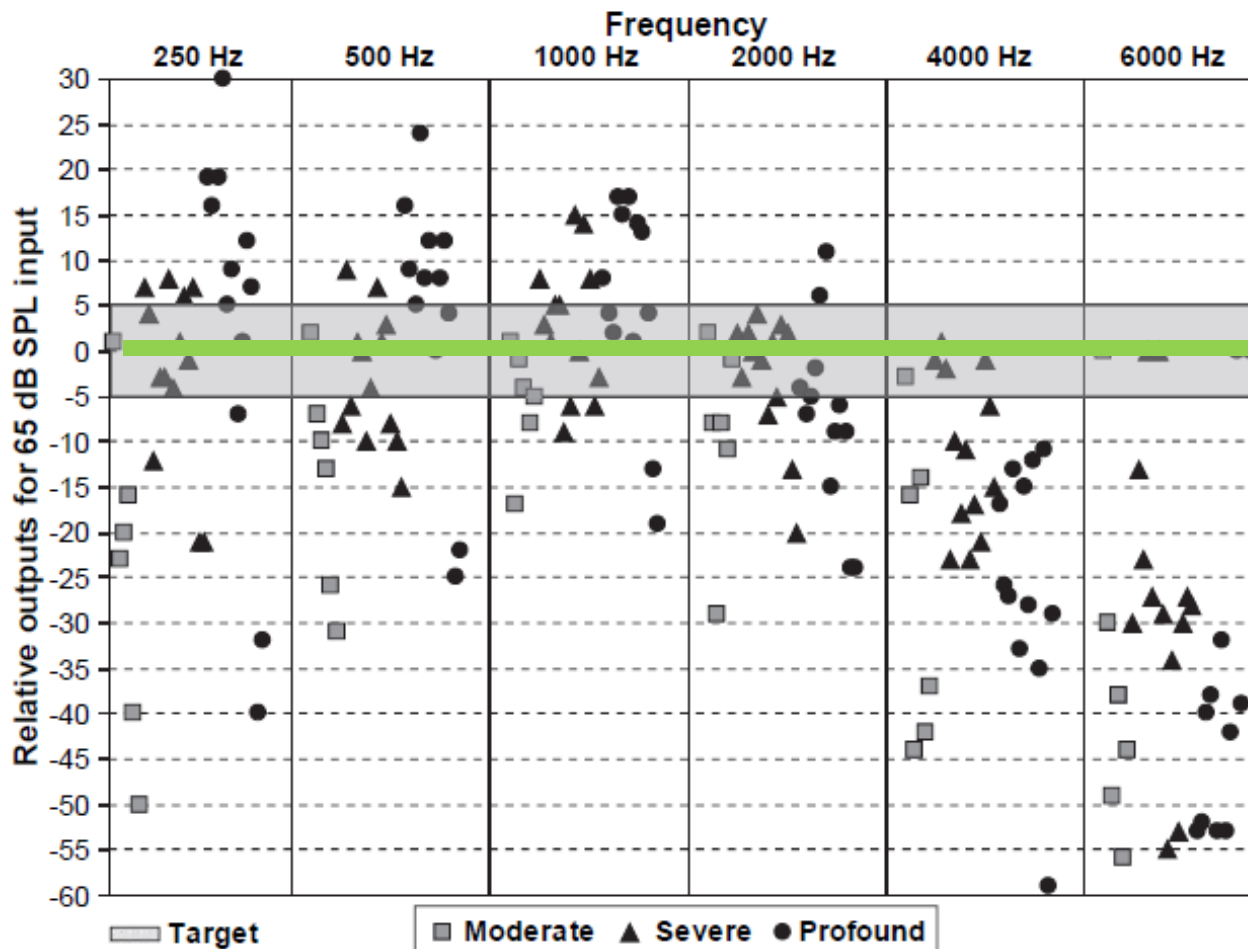
- Instrument
- Mode
- Presentation
- Format
- Scale (dB)

- Audiometry**
- Age
  - Transducer
  - UCL
  - RECD

REAR	Stimulus	Level	SII
<input type="radio"/> 1	MPO	90	N/A
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<input type="radio"/> 4	Speech-shape	Loud (75)	62
Unaided			5
Curve			Hide / Show <input type="text"/>

Connect coupler and instrument to coupler microphone. Select one of REAR 1 through REAR 4.

# Results: 65 dB SPL (average speech) input



## ***Results: 65 dB SPL (average speech) Input***

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- **Moderate Losses:** only **34%** had output values that were  $\pm 5$  dB of the prescribed values.
- **Severe Losses:** only **47%** were within  $\pm 5$  dB.
- **Profound Losses:** only **34%** were within  $\pm 5$ dB



## ***Results: 90 dB SPL Input***

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- **Moderate Losses:** only **34%** had output values that were  $\pm 5$  dB of the prescribed values.
- **Severe Losses:** only **39%** were within  $\pm 5$  dB.
- **Profound Losses:** **92%** were 5 dB or more below the DSLv5 target values for output limiting.



## ***Example 2***

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Fit-to-Targets for the DSL v5.0a Hearing Aid  
Prescription Method for Children

***Sheila Moodie and  
The Network of Pediatric Audiologists of Canada***

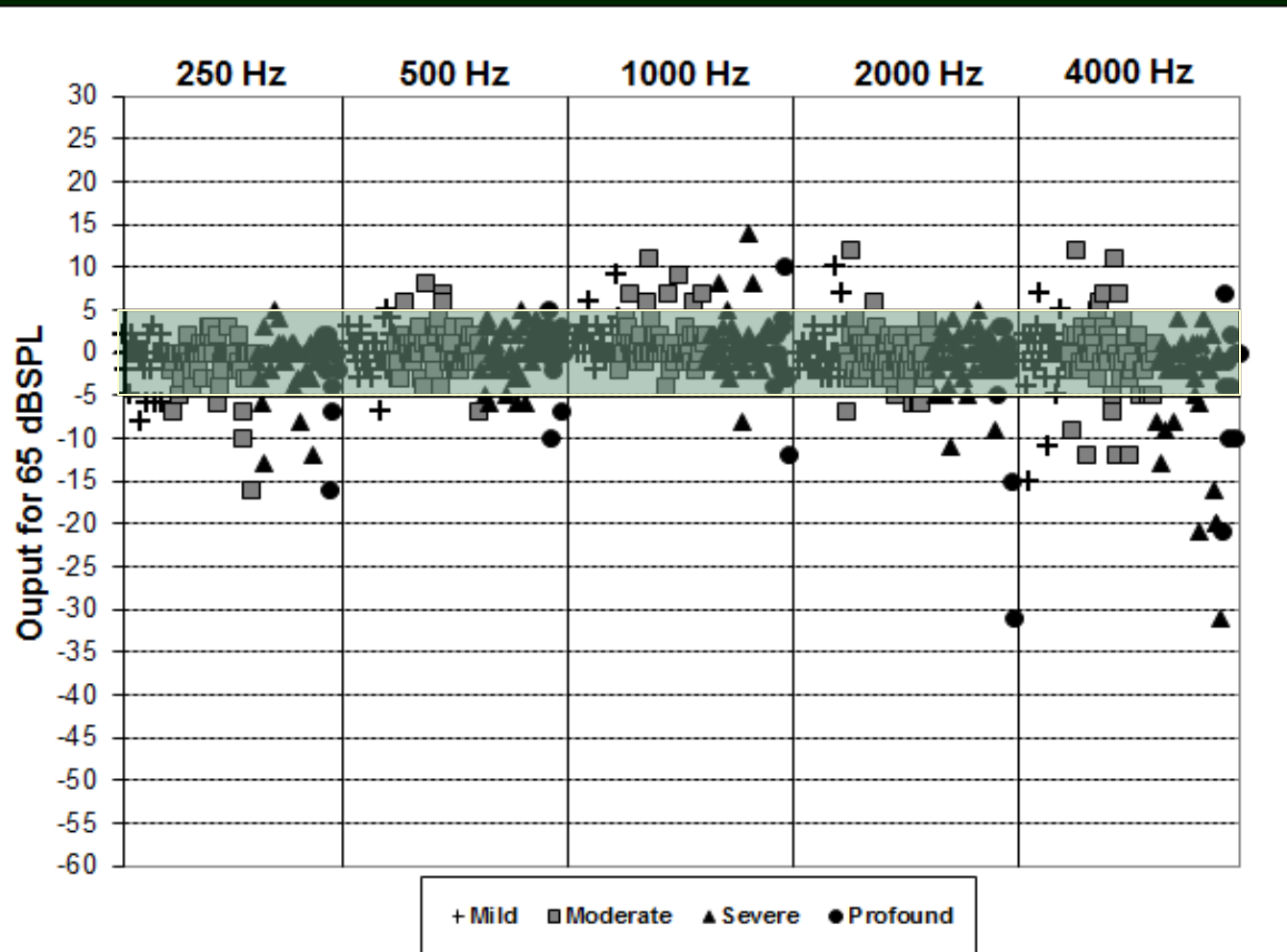


# *Method*

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- Measured the output from 109 children's hearing instruments – total of 161 ears – mild to profound hearing loss.
- Instruments were fitted in 9 clinical sites in 5 different Canadian Provinces using the DSL prescription procedure and the same verification measures.
- Compared the measured outputs to the DSLv5 prescribed levels for each child for soft, average and loud speech inputs and for the maximum hearing aid output.

# Results: 65 dB SPL speech input

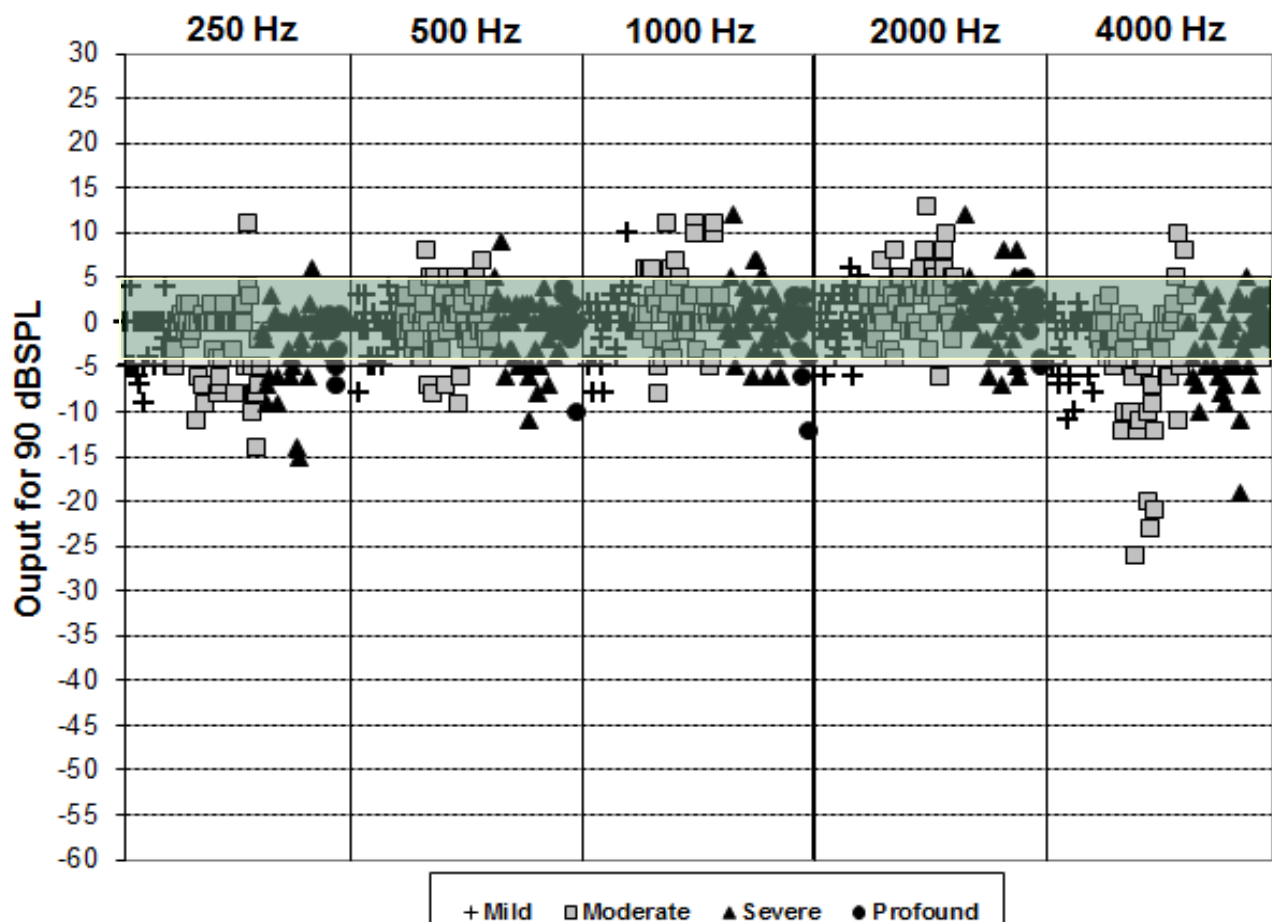


## ***Results: 65 dB SPL (average speech) Input***

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- For this sample, the average fit to prescriptive targets was  $\pm 2$  dB.
- Overall, 80% of the fittings were within  $\pm 5$  dB of the DSL prescribed target values.
- Most of the deviations from the  $\pm 5$  dB goal were observed for the lowest and highest frequencies for children with profound hearing losses.

# Results: 90 dB SPL narrow band input



## ***Results: 90 dB SPL Input***

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- For this sample, the average fit to maximum power output targets was within  $\pm 4$  dB.
- Overall, 75% of the fittings were within  $\pm 5$  dB of the DSL prescribed target values.
- Again, most of the deviations from the  $\pm 5$  dB goal were observed for the lowest and highest frequencies for children with profound hearing losses.

# *Conclusion*

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- Overall, this study provides evidence that typical hearing aid fitting for children with mild to profound hearing losses can be achieved to within  $\pm 5$  dB of the DSL prescriptive targets in the majority of cases.

## *More importantly . . .*

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- These results demonstrate what is possible across clinicians and clinical settings when one applies an evidence-based protocol within the larger context of a carefully designed infant hearing program.



# The Importance of Detailed Monitoring of all Aspects of the Program's Performance



# Ontario Infant Hearing Program Report (February 2015)

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*With thanks to Marlene Bagatto and Susan Scollie*



# Question 1

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- What percentage of the infants were screened by one month of age?

## *KEY to Histograms:*



Hearing Loss Only 2008



Multiple Issues 2008

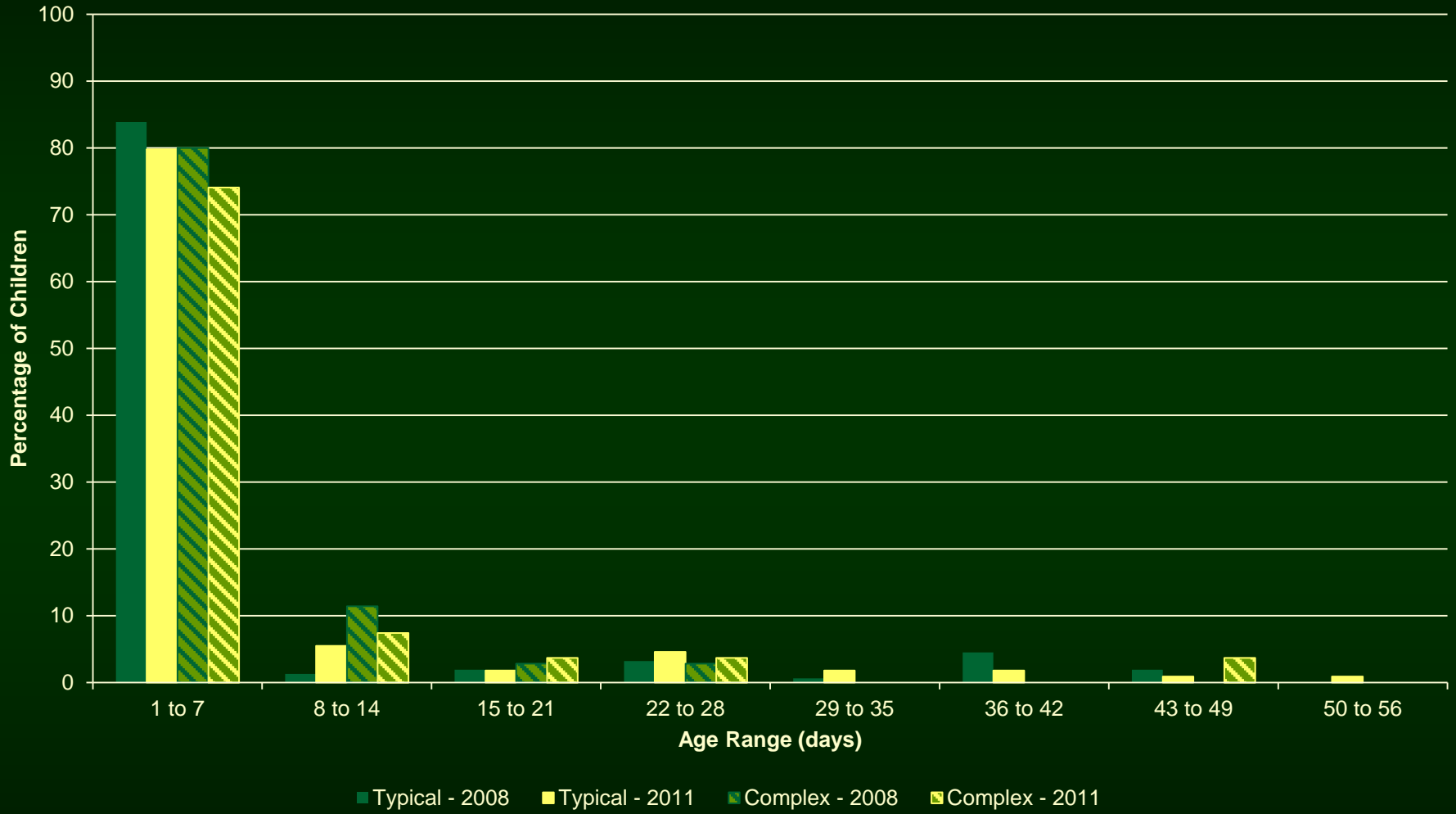


Hearing Loss Only 2011



Multiple Issues 2011

# Stage 1 Screening



# *Answer to Question 1*

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- 97% (2008) and 96% (2011) of all infants were screened by one month of age.



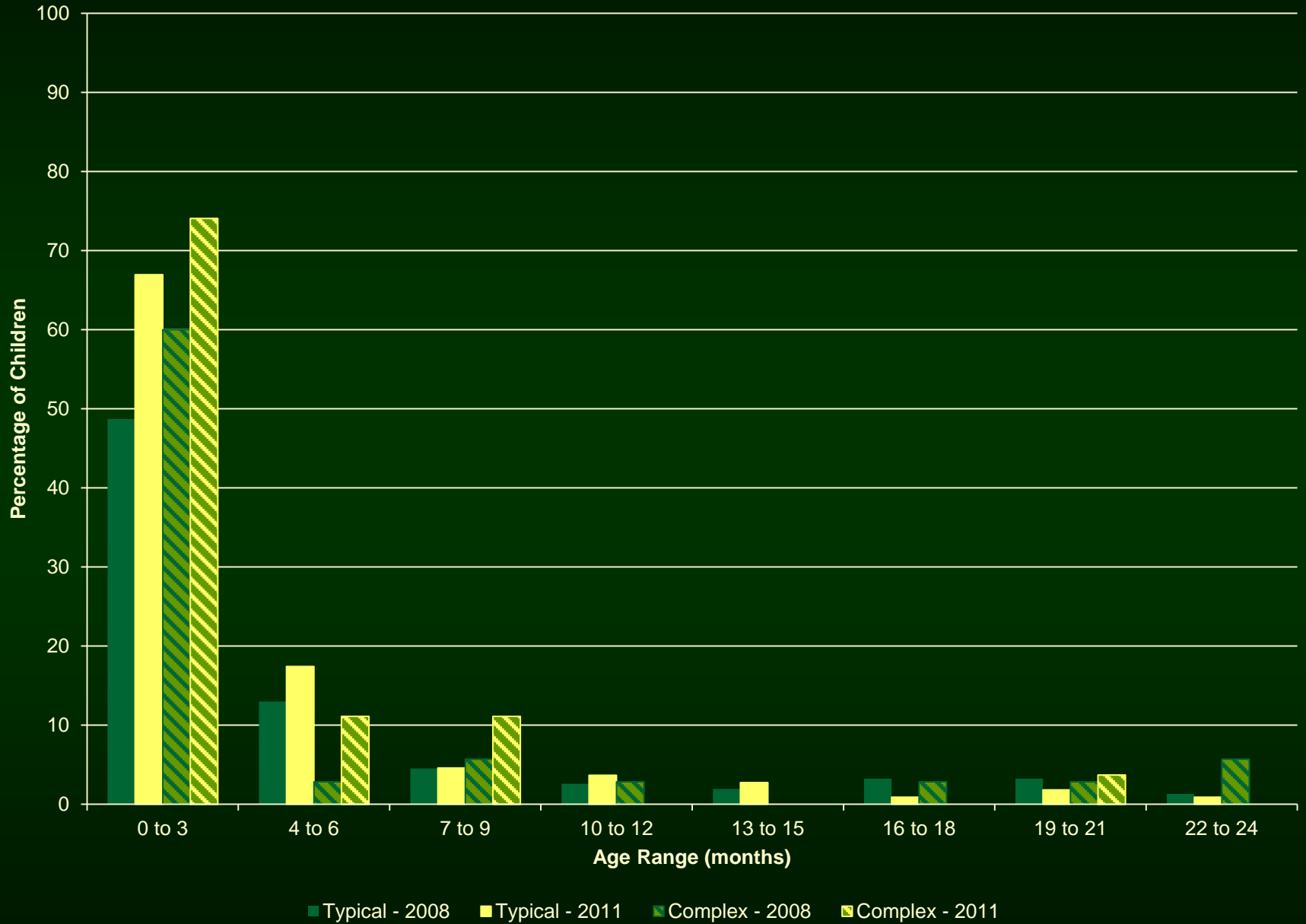
## Question 2

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- What percentage of the infants had their hearing loss identified and defined by 3 months of age?



# Initial Hearing Loss Identification



## *Answer to Question 2*

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- The majority of infants had their hearing loss identified and defined by 3 months of age.
- In some cases, children with multiple issues had their hearing losses identified earlier than children with hearing loss alone.





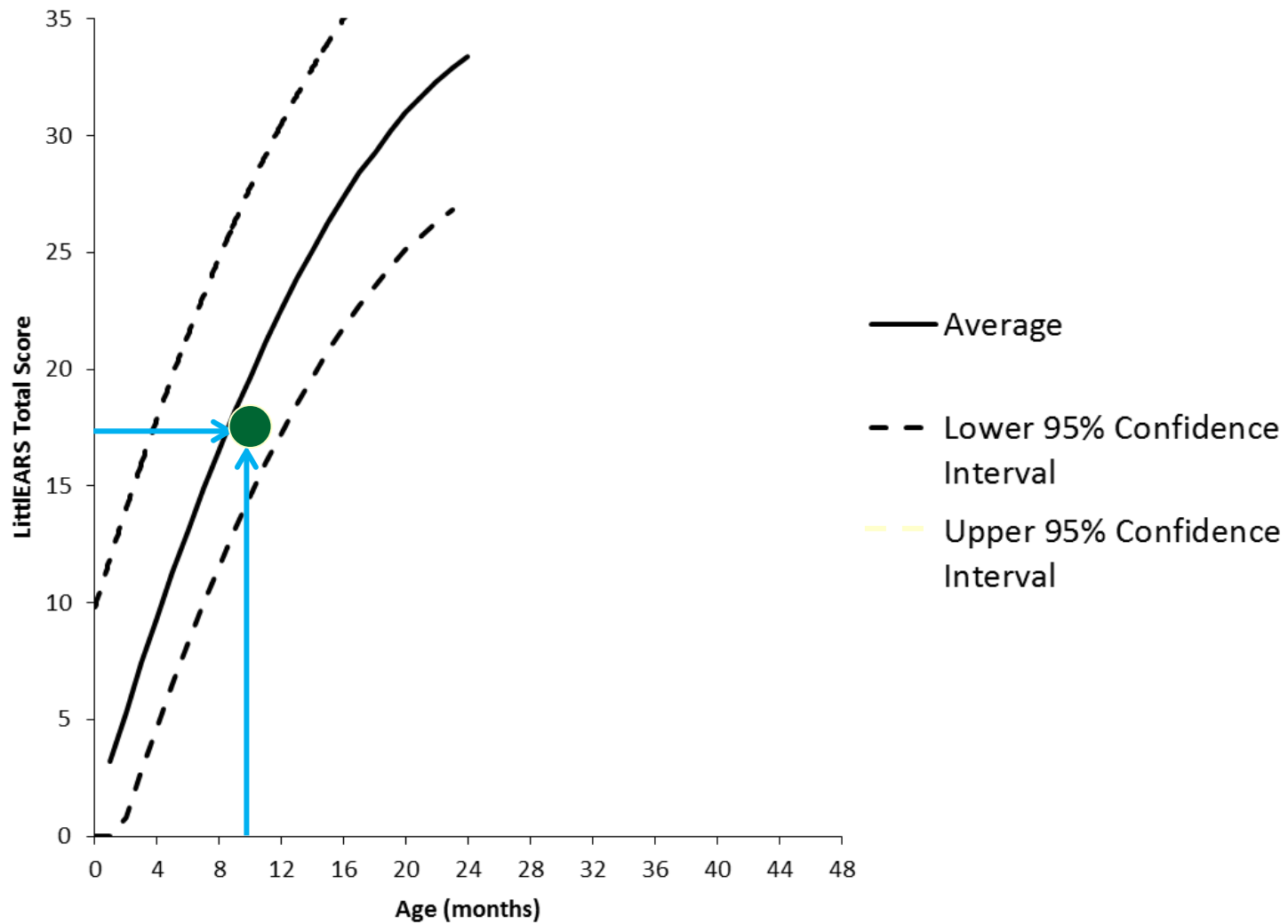
# The All Important Question 3

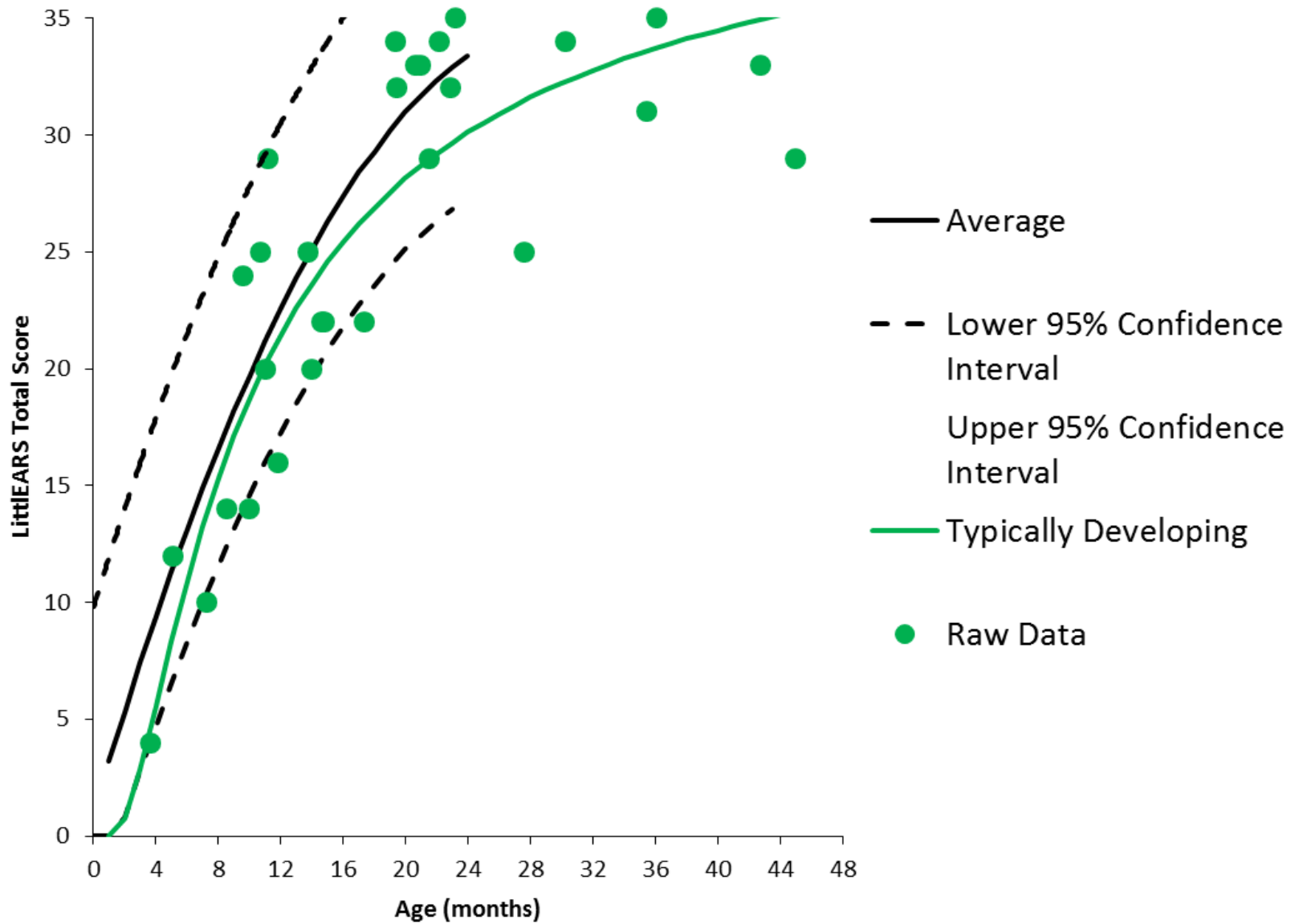
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- What are the communication development outcomes of our program looking like?



# Norms for LittleEARS performance





## *Answer to Question 3*

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- For this randomized sample of infants and young children from 4 clinics, greater than 80% of children are demonstrating auditory development within the typical range for children with normal hearing.

## *Summary suggestions,*

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- The program must be developed, organized, implemented, and monitored centrally.
- The program development must acknowledge the multidisciplinary nature of what we are attempting to accomplish.

# *Summary suggestions,*

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- Evidence-based best practice protocols must be applied within all components of the program,
- Program performance must be monitored to ensure the uniformity and overall quality of the program overtime.

## *Summary suggestions,*

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- Finally, in a family-centered Infant Hearing and Communication Program, we must always keep in mind that the child and family are at the very center of our work. Thus, it is our job to provide them with all of the support and information necessary to help them to make the important decisions they will need to make with our support throughout this important process.

