

# Cochlear implant candidacy

## Audibility and Cochlear Implant referral



Beatriz Novaes  
Phoenix 2015

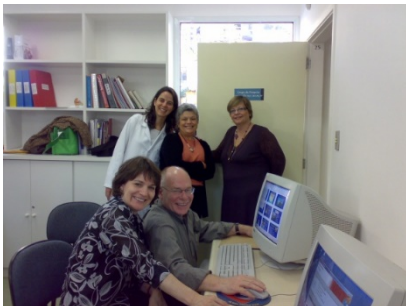


PUC-SP



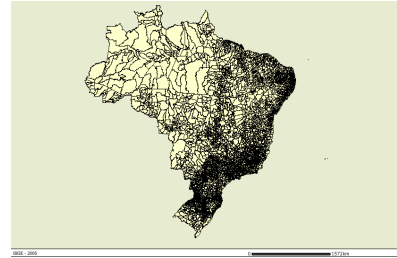
FUNDAÇÃO SÃO PAULO

**PHONAK**  
life is on

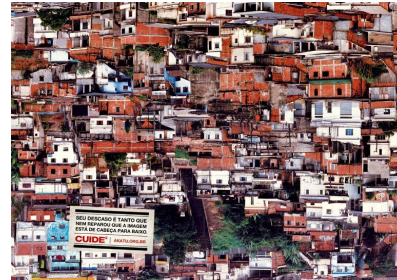


**Staff and Faculty**  
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**Mariana Fávero**  
**Vera Cury**  
**IC, Mestrandos e doutorandos**

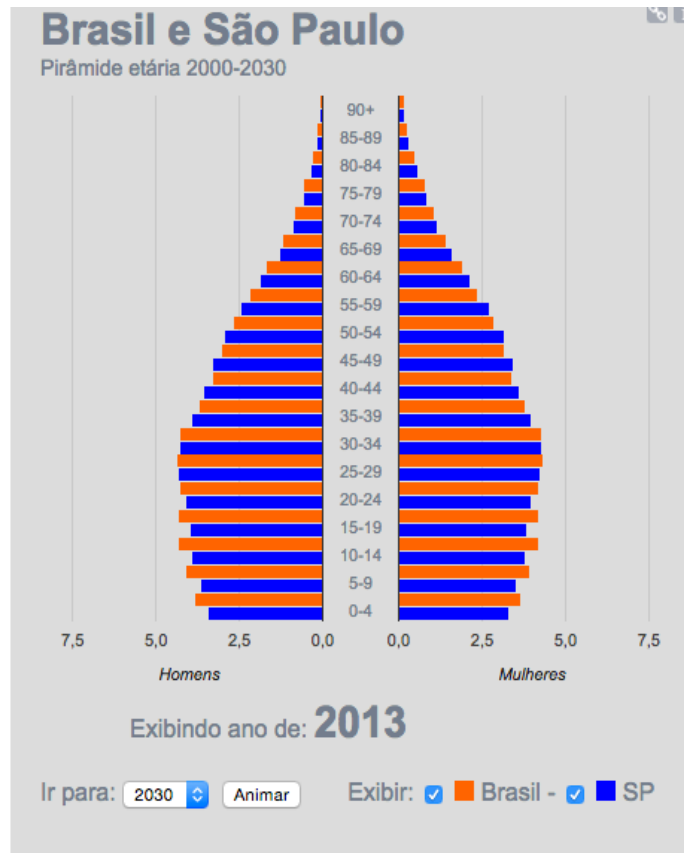




**5570 cities**  
**80% have less than 20.000 inhabitants**

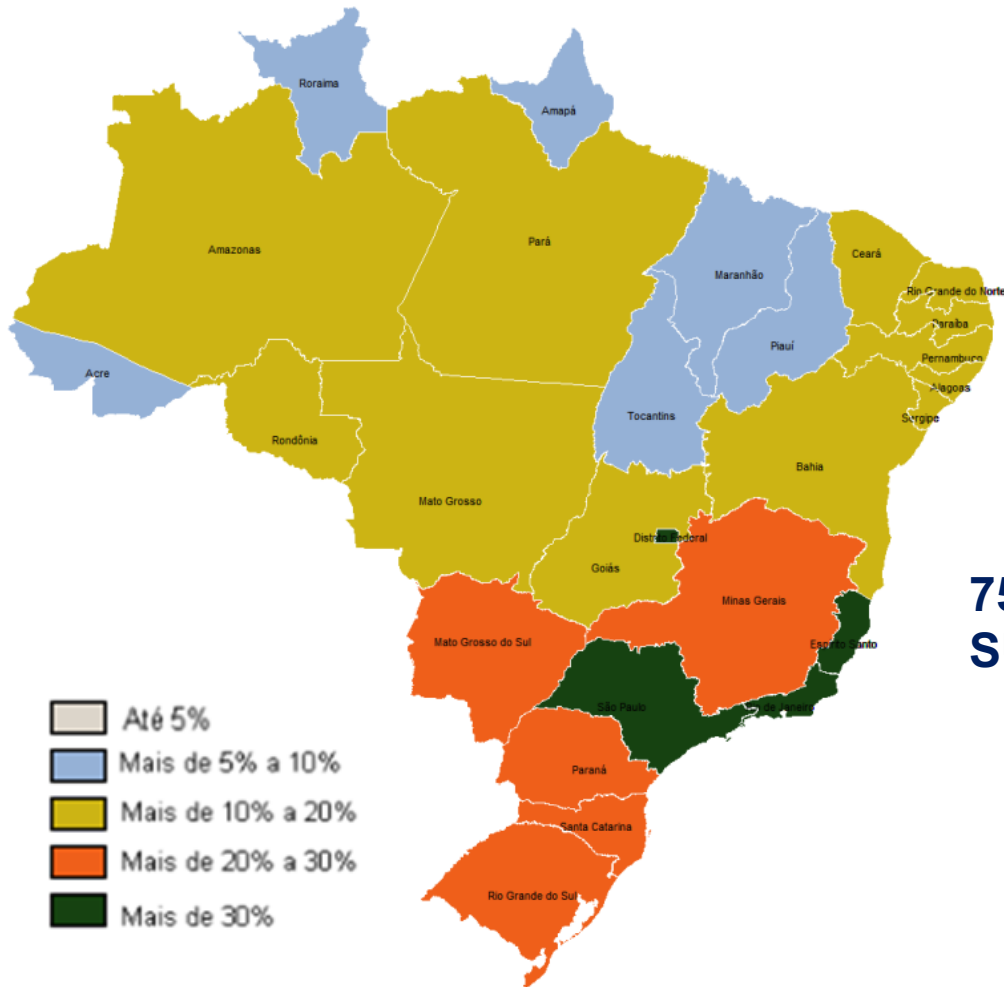


## Context



## Context

# % of Private Health Care Plans per state (Brazil - June/2015)



**75 to 80% of the population depends on SUS (Public Health System)**

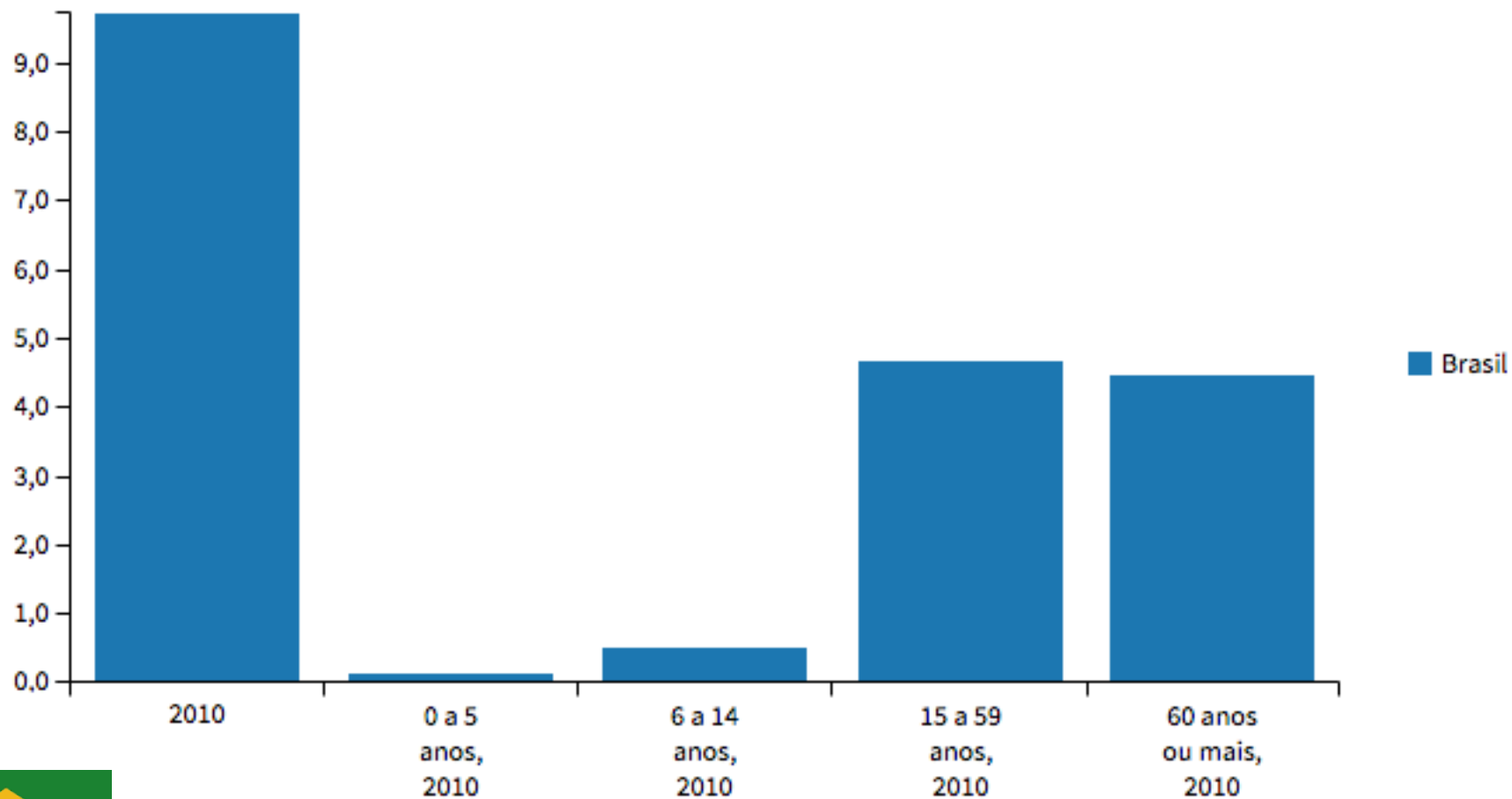


## Context

Tabela - Deficiência auditiva (pessoas)

Divisões Territoriais ▲	2010 ◆	0 a 5 anos, 2010 ◆	6 a 14 anos, 2010 ◆	15 a 59 anos, 2010 ◆	60 anos ou mais, 2010 ◆
Brasil	9.717.318	114.554	501.647	4.654.875	4.446.242

Fonte: IBGE, Censo Demográfico 2010



Context



# TIMELINE

## PUBLIC POLICIES IN BRASIL

17.09.1993



Portaria nº 126  
SAS/MS:  
implante coclear.

20.10.1999



Portaria nº 1278  
GM/MS: Alta Complexidade  
Hospitalar: IC.

14.11.2000



Portaria nº 432  
Alta Complexidade Ambulatorial:  
Concessão de aparelhos de  
amplificação sonora individuais (AASI).

07.10.2004



Portaria SAS/MS nº 587:  
Redes Estaduais de Atenção  
à Saúde Auditiva - AASIs.

28.09.2004



Portaria GM/MS  
n.º 2.073: Política Nacional  
de Atenção à Saúde Auditiva

08.10.2004



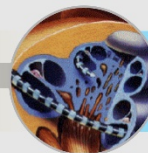
Portaria SAS/MS nº 589:  
Procedimentos de atenção  
à saúde auditiva no SIA/SUS.

02.08.2010



Lei nº 12.303:  
Emissões Otoacústicas  
Evocadas em hospitais e  
maternidades.

03.12.2012



Portaria nº 126  
SAS/MS:  
implante coclear.

25.06.2013



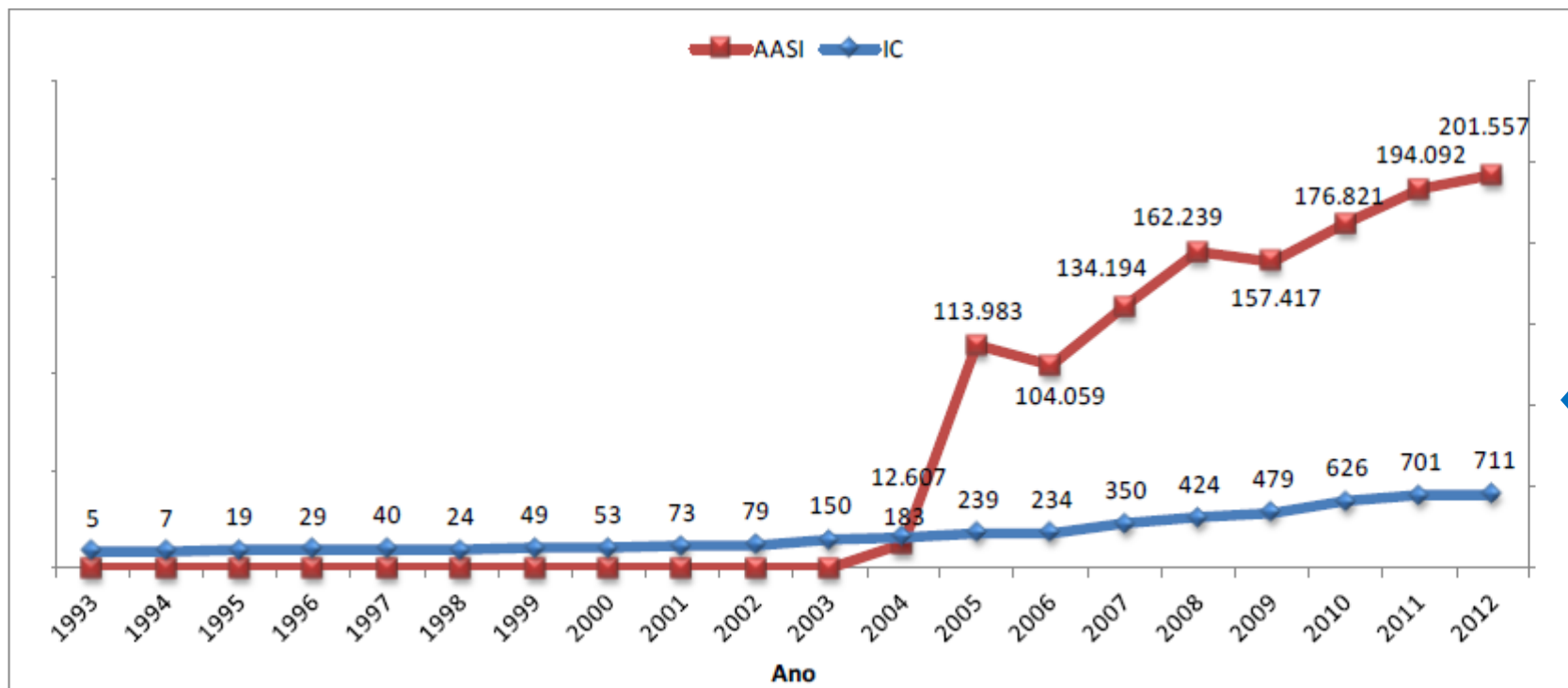
Portaria Nº 1.274:  
Sistema FM - SUS.

18.12.2014



Portaria Nº 2.776:  
Implante coclear  
bilateral e próteses  
auditivas ancoradas no osso.

# Hearing Aids and Cochlear Implants Public System (SUS) - 1993 to 2012



Fonte: Ministério da Saúde - Cadastro Nacional dos Estabelecimentos de Saúde do Brasil - CNES

August, 2014 to August, 2015

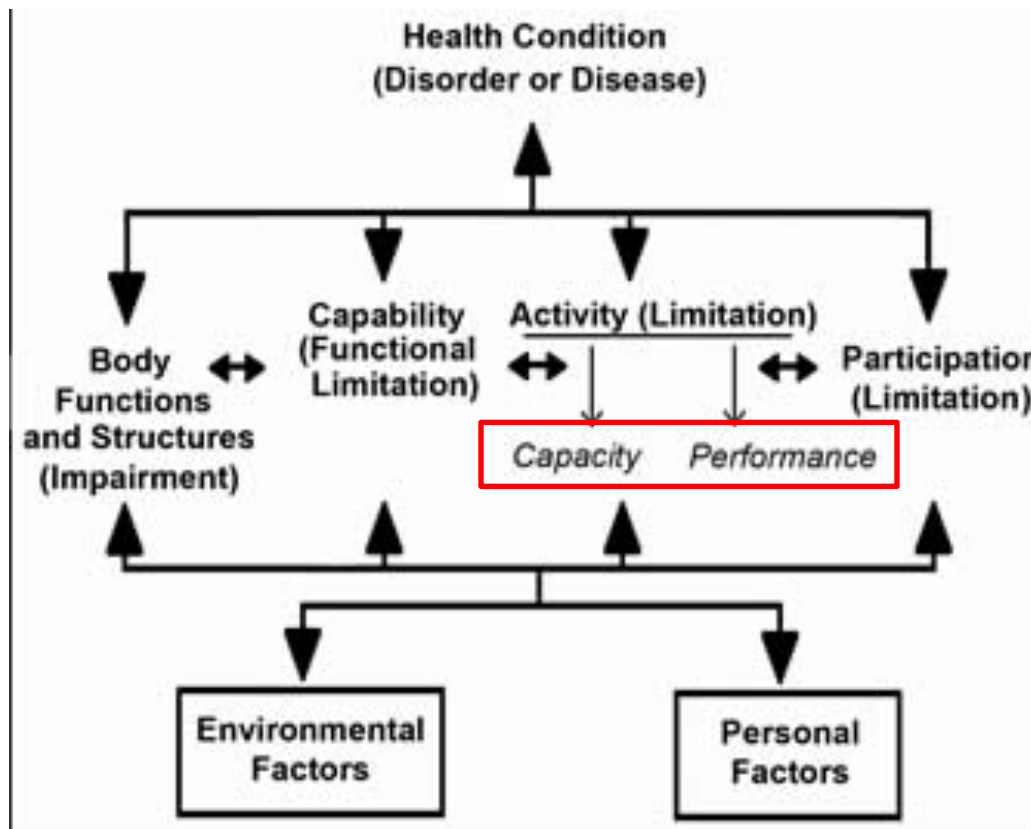
1508 CI



Context



# Candidacy for Cochlear Implants is Audiological and Funtional issue – Contributing for ICF



# Someone's Hearing

## ICF

International  
Classification of  
Functioning,  
Disability and Health

Longitudinal data

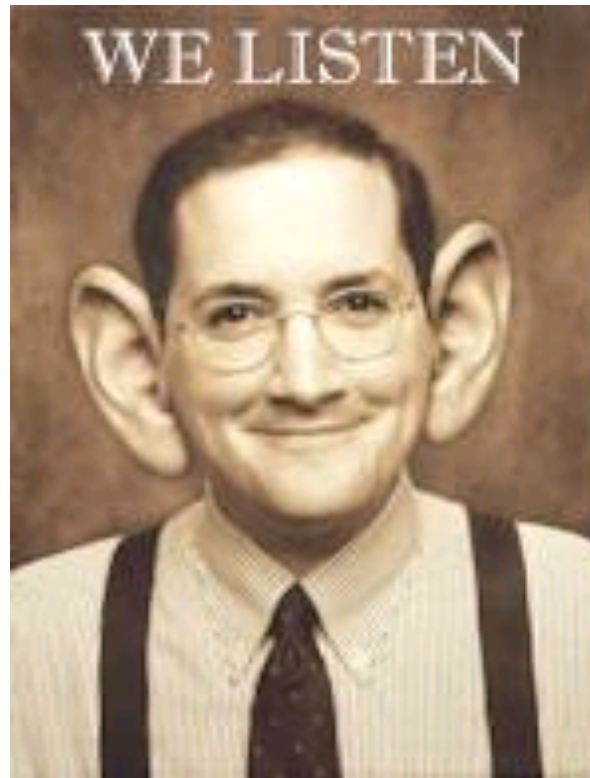


Transversal data

## ICD

International  
Classification of  
Diseases

# Hearing

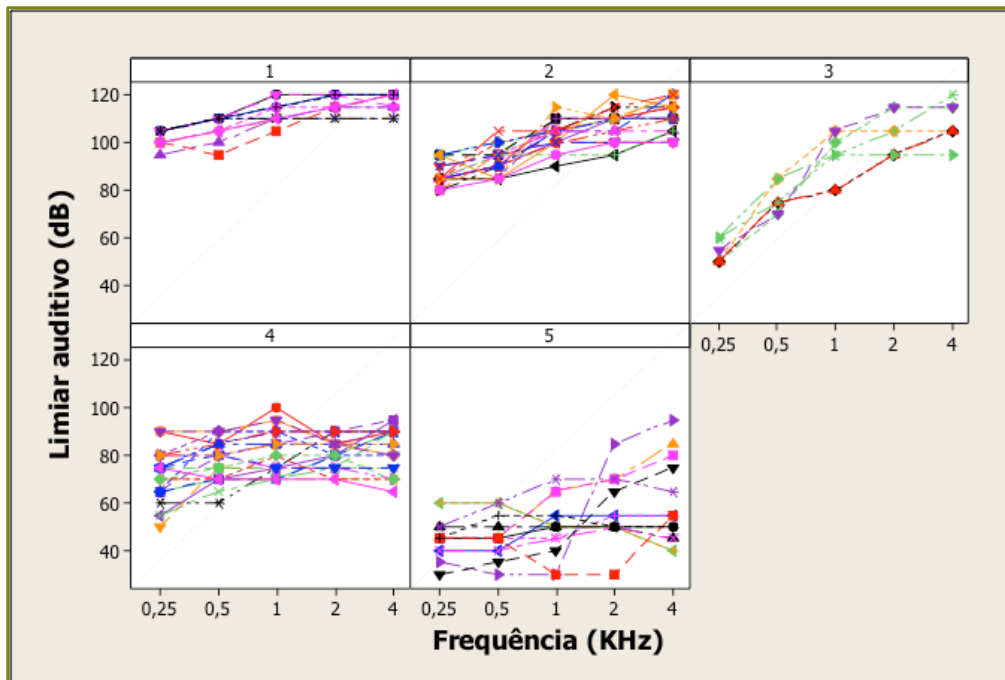


# Candidacy for Cochlear Implants is Audiological and Functional issues – Contributing for ICF

- Audiological Criteria is a starting point, but to establish priorities within a limited budget, there are other needs involving longitudinal data and a multidisciplinary approach, considering audiological background is very heterogeneous within the country.
- The **International Classification of Functioning, Disability and Health**, known more commonly as **ICF**, is a classification of health and health-related domains. As the functioning and disability of an individual occurs in a context, ICF also includes a list of environmental factors.
- **ICF Core Sets** facilitate the description of functioning in clinical practice by providing lists of categories that are relevant for specific health conditions and health care contexts to allow a user-friendly description of functioning and disability, and to support the applicability of ICF in practice

# Hearing Loss Classification based on dynamic relation among: degree, configuration and amplified SII 65, using DSLm[i/o]v.5

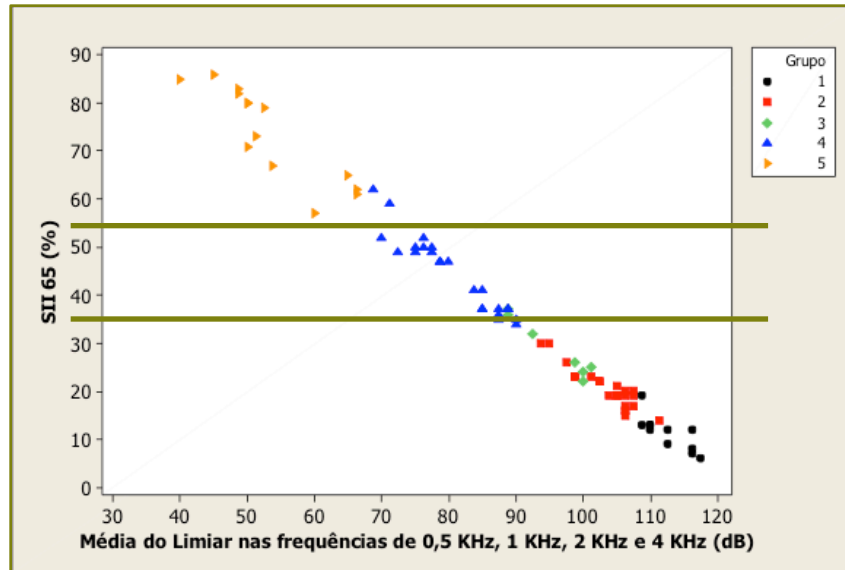
- ✓ **Algorithm determination for groups, sensible to threshold and configuration**



- Cluster analysis (Johnson e Wichern, 1992): groups internally homogeneous for thresholds and heterogeneous among them.
- 5 Groups: Gr1, Gr2, Gr3, Gr4 e Gr5
  - Gr1, Gr2 e Gr3 – predominantly profound losses
  - Gr4 and Gr5 – moderate and severe

78 ears – Children 4 to 80 mo

# Proposed SII 65 value intervals ( $Int_{SII}$ ) for predicting functional audibility for speech sounds



1st interval –  $SII < 35\%$  (Gr1, Gr2 e Gr3)

- The other intervals were obtained considering the relationship between sensibility and specificity – ROC Curve (Park et al., 2004) – establishing the values for boundaries.
- Estimated SII 65 can anticipate auditory behavior when rehabilitation does not occur within the same service.
- It can be a starting point for clinical decisions.

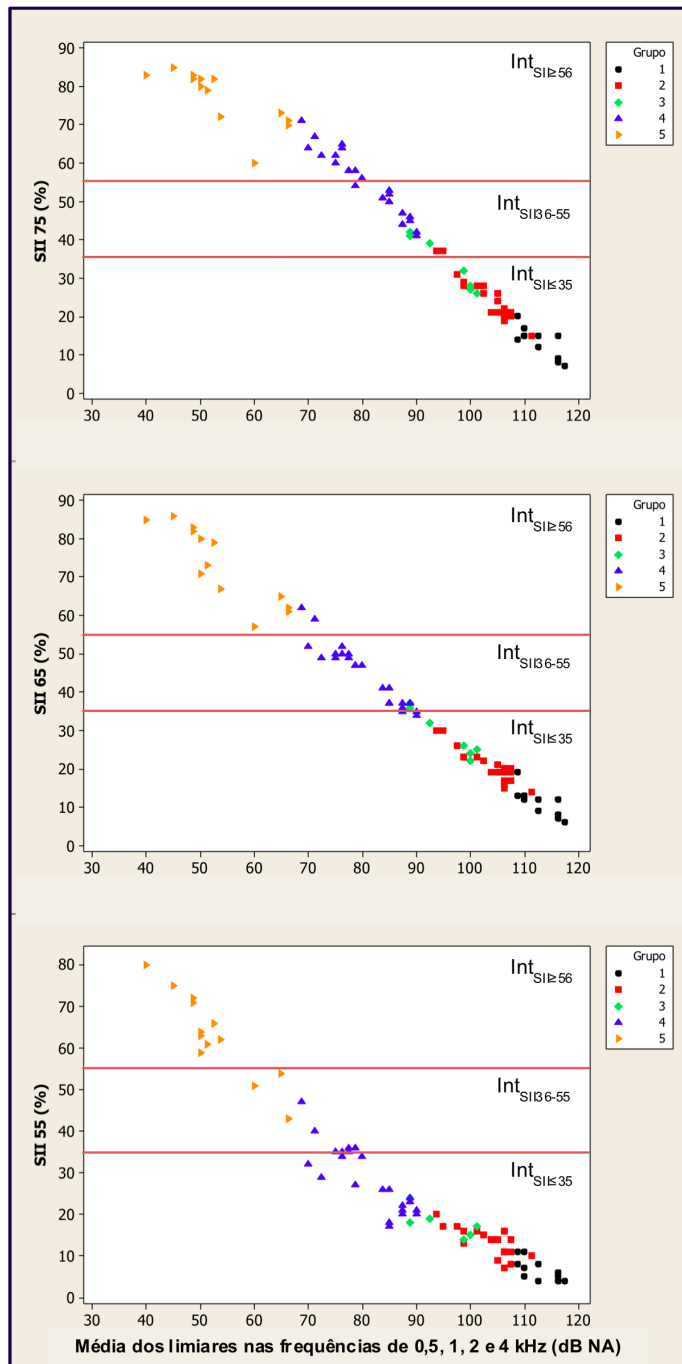
$Int_{SII \leq 35}$	Gr1, Gr2 e Gr3	pouca audibilidade indicação IC
$Int_{SII 36-55}$	Gr4	variabilidade de valores SII
$Int_{SII \geq 56}$	Gr5	cuidados adequação alvo-saída

# SII – Speech Inteligibility Index - Effects of distance

## Possible contribution for ICF Core set

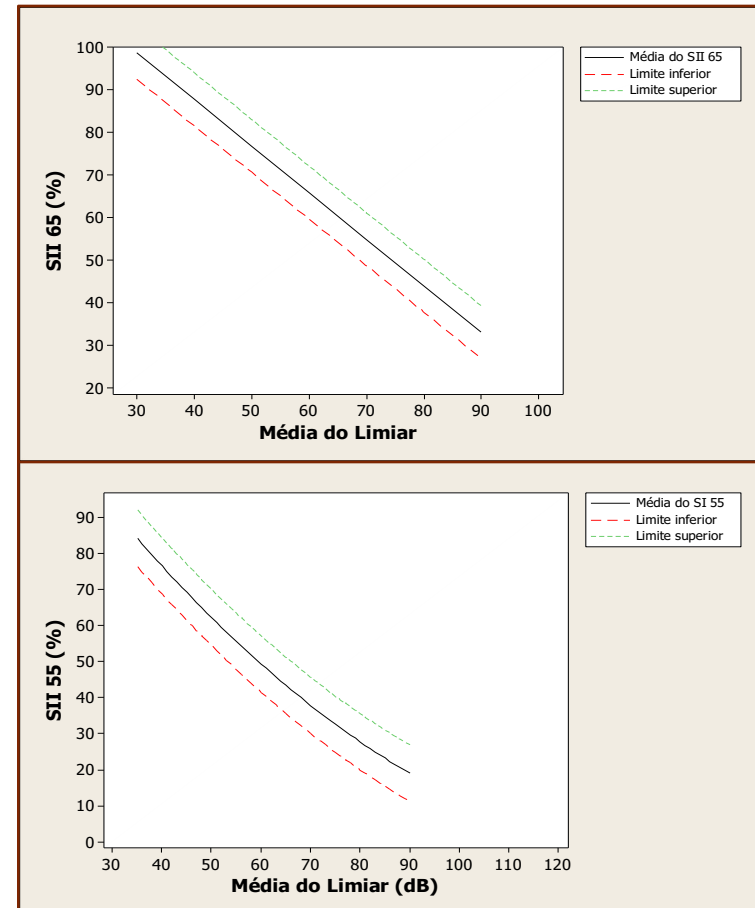
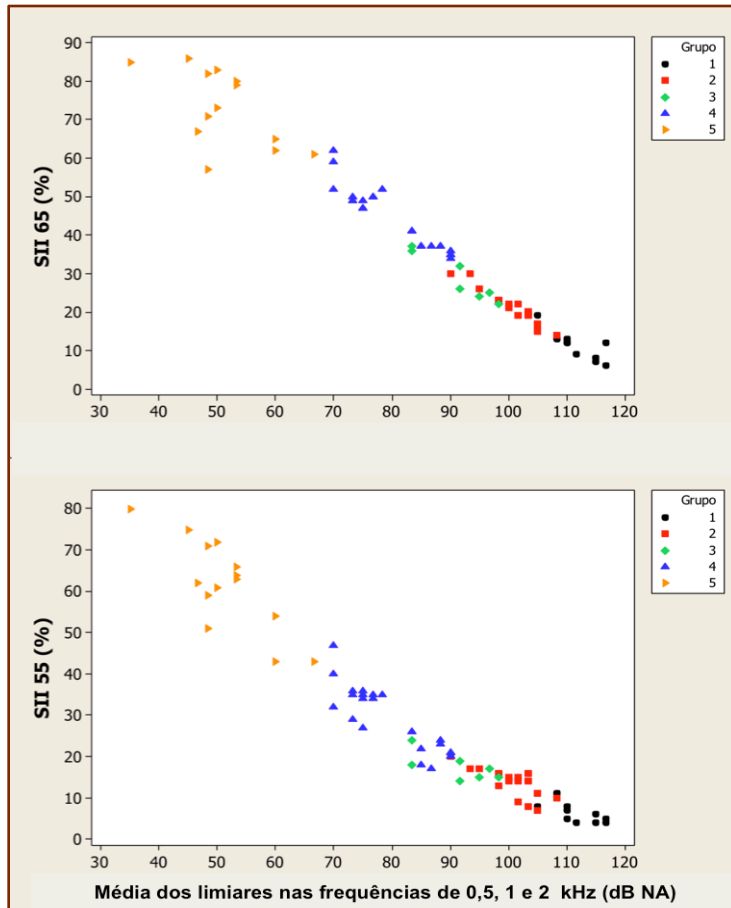
### SII 75, SII 65 e SII 55 values and relationship with proposed SII 65 intervals ( $Int_{SII}$ )

- Intensity and distance
- Subject group shift -  $Int_{SII}$
- Gr4 –  $Int_{SII36-55}$  more sensitive to distance factor
- Clinical Implications



## Reference curves for SII 55 e SII 65

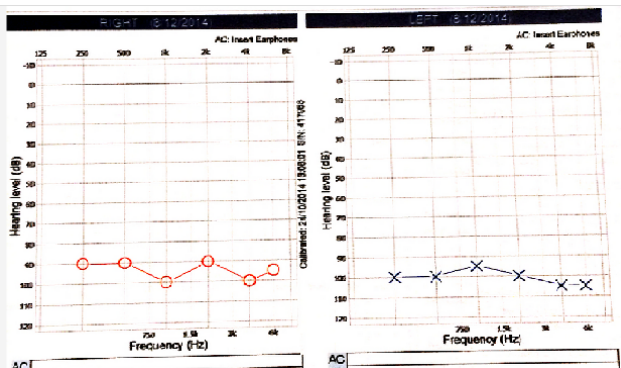
- Reference curves – average for frequencies 500, 1000 e 2000Hz – adjusted regression models (Harris e Boyd, 1995)



Orelha	Transdutor	500 Hz	2000 Hz	4000 Hz	olique	NP desc
Direita	Via aérea	100	100	100 (-)	90 (-)	(-)
	Via óssea				50 (-)	
Esquerda	Via aérea	100	90	90	NP	
	Via óssea					

Failed NHS  
 39 weeks; 3,475kg; 48cm  
**Diag:** 4 months  
**Etiology:** unknow  
**H Aids and Intervention:**  
 4 months

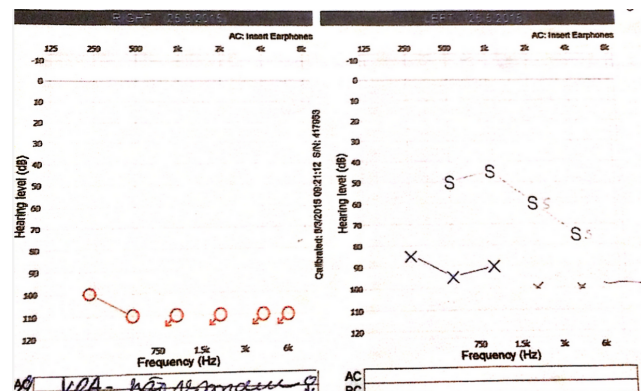
ABR- FS + AESS - 4 months



VRA - 8 months

**OD SII 65: 34**  
**OD SII 55: 21**

**OE SII 65: 23**  
**OE SII 55: 14**

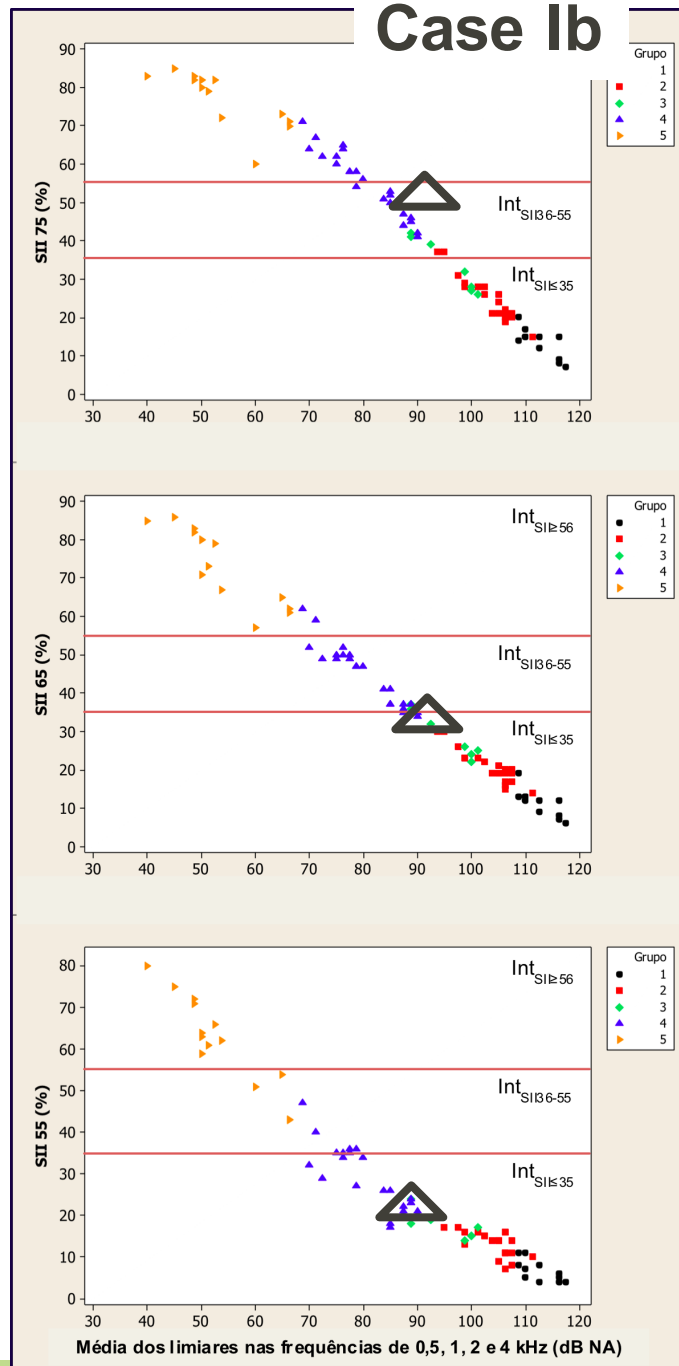


VRA - 1 year old

**OD SII 65: 6**  
**OD SII 55: 3**

**OE SII 65: 11**  
**OE SII 55: 6**

## Case Ib





# Case Ib

## Auditory, Speech and Language Development Pre-implant



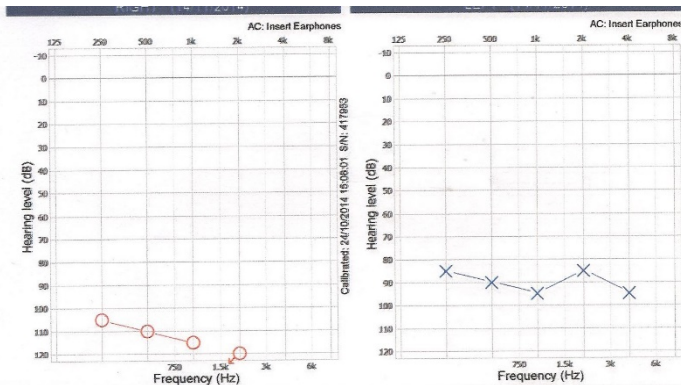
# Case Mb

O quadro abaixo indica os limiares tonais estimados (dBeHL) aplicando-se a correção para os limiares de PEATE Tone Burst (Stapells, 2010):

orelha	ASSR 500Hz	PEATE 500 Hz	ASSR 2kHz	PEATE 2kHz
OD	90dBcghL	90 dBeHL	↓ 105 dBcghL	↓ 105 dBeHL
OE	85 dBnHL	75 dBeHL	105 dBeHL	105 dBnHL

**Conclusão:** Resultados indicam integridade de via auditiva até Colículo Inferior bilateralmente com perda auditiva sensorioneural de grau profundo bilateralmente.

## ABR-FS + AESS - 2 months

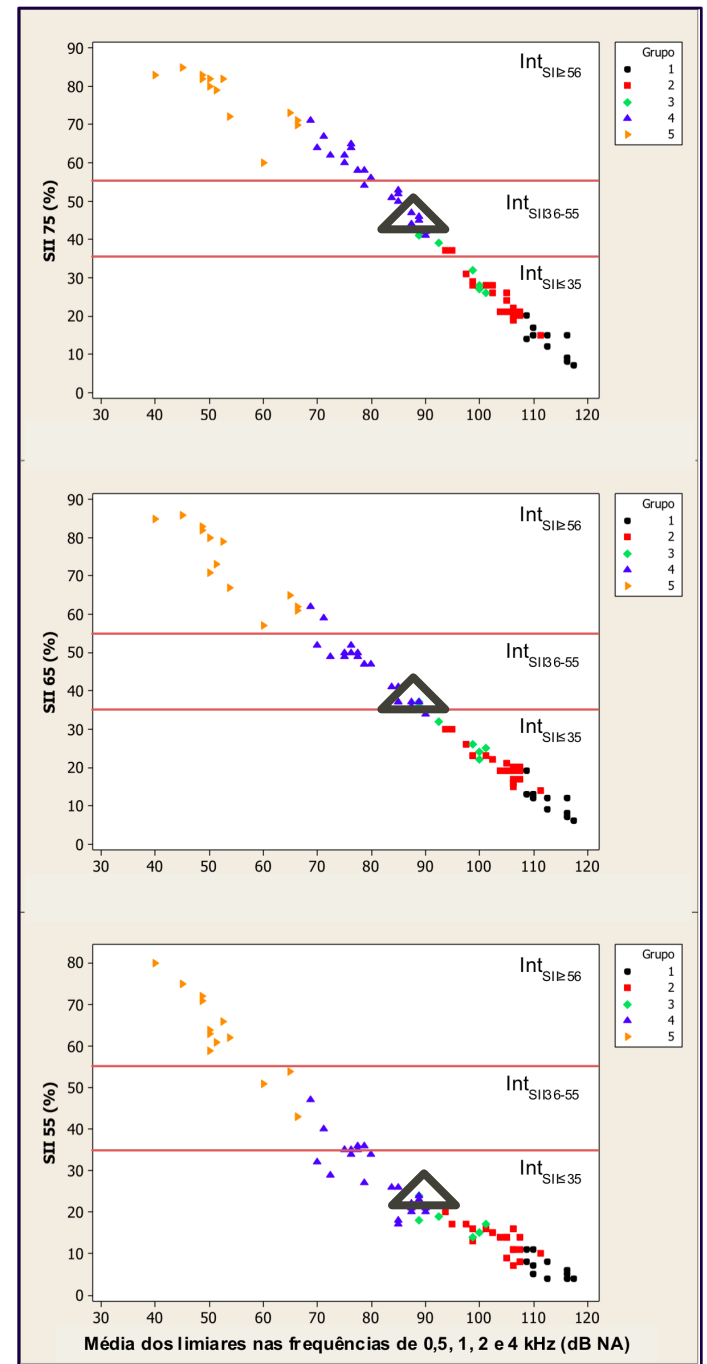


**OD SII 65: 11**  
**OD SII 55: 6**

**OE SII 65: 38**  
**OE SII 55: 24**

## VRA – 8 months e 11 months

Failed NHS  
40 weeks; 3,585kg; 50cm  
In vitro fertilization  
**Diag:** 2 months  
**Etiology:** unknown  
**H Aids and Intervention:**  
3 months

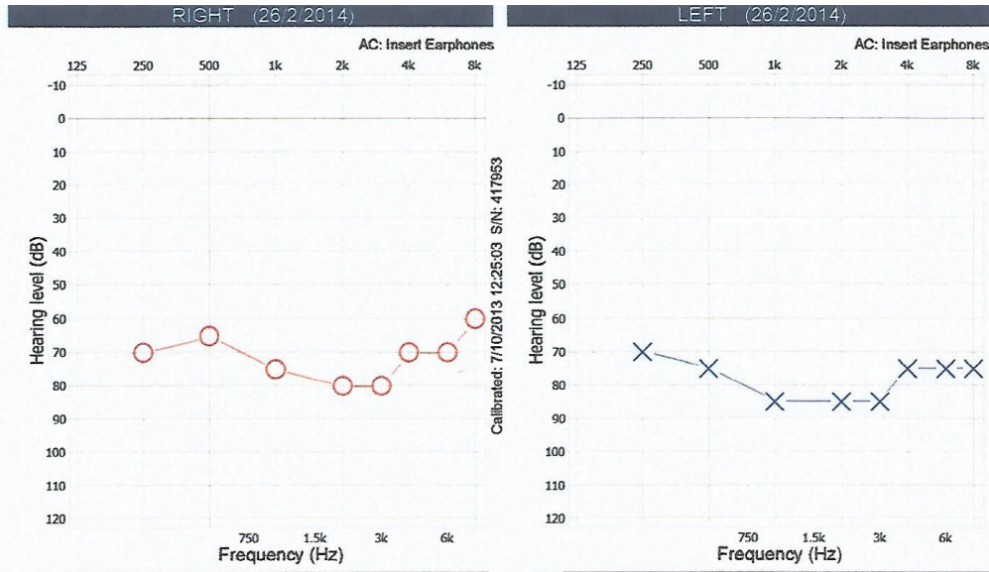


## Case Mb

# Auditory, Speech and Language Development Pre-implant



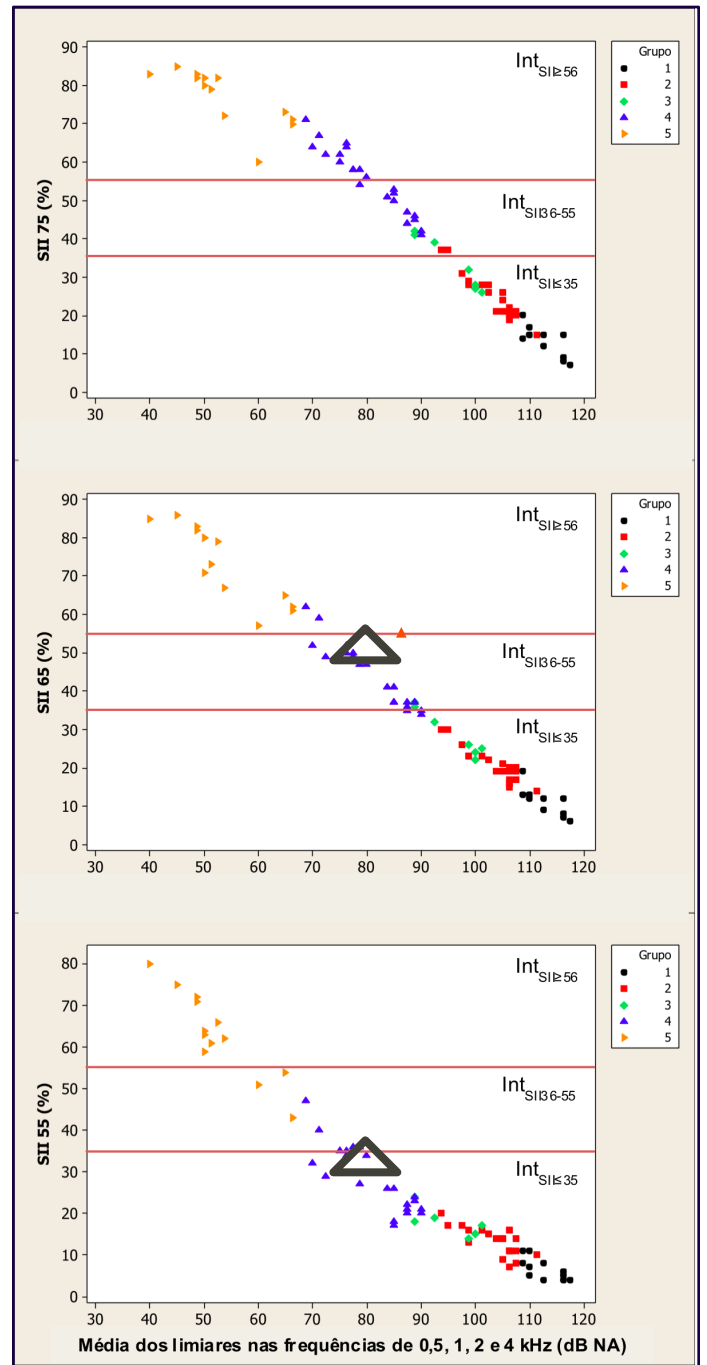
# Case Jo



9 anos

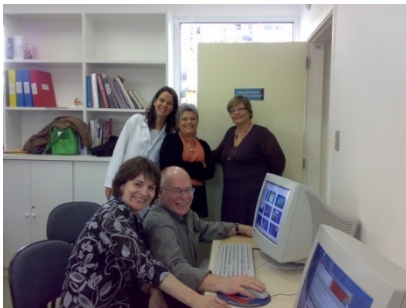
**OD SII 65: 52**  
**OD SII 55: 35**

**OE SII 65: 41**  
**OE SII 55: 26**



# Clinical Implications

- **Audibility Capacity compared to Performance:** The contribution of a parameter of audibility can be used for determination of ICF in core sets involving candidacy for cochlear implants, particularly if working with a limited budget.
- **Children:** Audibility and oral language development – predicted and observed. Consideration of cognitive, emotional and motor development, to provide parameters for local therapists, and adjust expectations.
- **Adults:** Audibility and performance in speech perception tasks. Verification, consistency of use, personal and professional demands. Context to understand specific needs and make decisions.
- Emphasis on series of therapy sessions with participation of parents, sons, daughters and spouses for expectation adjustments.



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**Vera Cury**  
**Undergraduate and Graduate**  
**Students**



