Reducing Disparities and Improving Outcomes in Preschool Hearing Screening

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EHDI 2018
Quartz A/B
3:35-4:05 PM
Monday, March 19, 2018

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We have no disclosures

Preschool Hearing Screening Goals

- To learn evidence-based best practices in community-based preschool hearing screening
- To recognize disparities and challenges in community-based preschool hearing screening programs
- To learn strategies for improved outcomes and follow up in community-based preschool hearing screening programs.

Newborn Hearing Screening Missed

Who is missed by newborn hearing screening?

- Children with congenital hearing loss lost to follow up after UNHS
- 1:300-500 children with postnatal onset permanent hearing loss (CMV, enlarged vestibular aqueduct)

Postnatal Hearing Screening

What is our safety net?

- Hearing screens with pediatrician (4-yo well-child check)
- School hearing screening (starts in kindergarten, only mandated for public school)
- Caregiver concern
- JCIH risk factors

Postnatal Hearing Screening

What is our safety net?

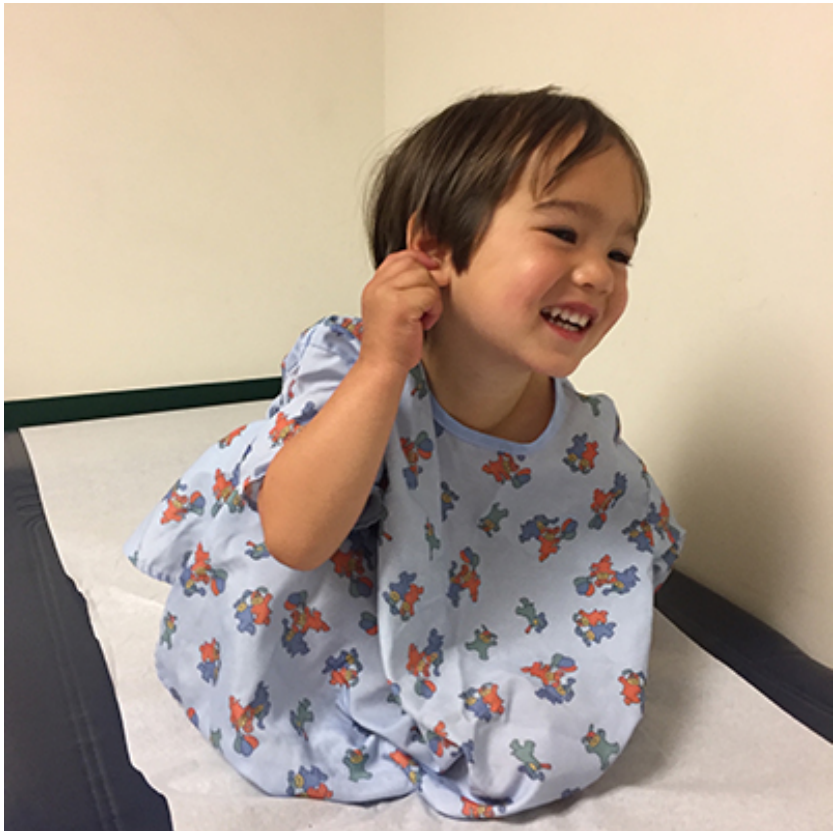
- Hearing screens with pediatrician (4-yo well-child check)
- School hearing screening (starts in kindergarten, only mandated for public school)
- Caregiver concern
- JCIH risk factors
- Preschool hearing screening

Preschool Hearing Screening

There is no standard for preschool hearing screening

Head Start/Early Head Start

Hearing screening documented within 45 days of enrollment



Preschool Hearing Screening

There is no standard for preschool hearing screening

Head Start/Early Head Start

Hearing screening documented within 45 days of enrollment

SF DPH Preschool Hearing Screening

Universal hearing screening for all students

SFDPH

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Preschool Hearing Screening

1. Description of the SF DPH Early Children Audiometric Screening (ECAS) Program
   - Program Development
   - Screening Protocol
   - Referral/Follow-up Protocol

2. Outcomes from the ECAS
   - Disparities in outcomes
   - Effect of implementation of second-tier, same-visit OAE screening

Preschool Hearing Screening

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SF DPH Office of Childhood Hearing (OCH)

- What is it?
  - Two audiometric screening programs
    - School Based Audiometric Screening (SAS)
    - ECAS (Early Childhood Audiometric Screening)
  - Supports Child Health and Disability Prevention Program (CHDP)

ECAS Development

- Why screen at the preschool age?
  - Early identification and intervention
  - School readiness
  - Low income, at risk population with unreliable access to health screenings
  - Improve parent knowledge

Early Childhood Audiometric Screening ECAS

- What is it?
  - Hearing screening program for children ages 3 and older
- Who do we serve?
  - Childcare Centers & Family Childcare Homes within the Department of Public Health Child Care Health Program (CCHP)
  - At risk, low-income population
- What type of screening is done?
  - Pure tone, “Play Audiometry”
  - Otoacoustic Emissions (OAE) *secondary screening

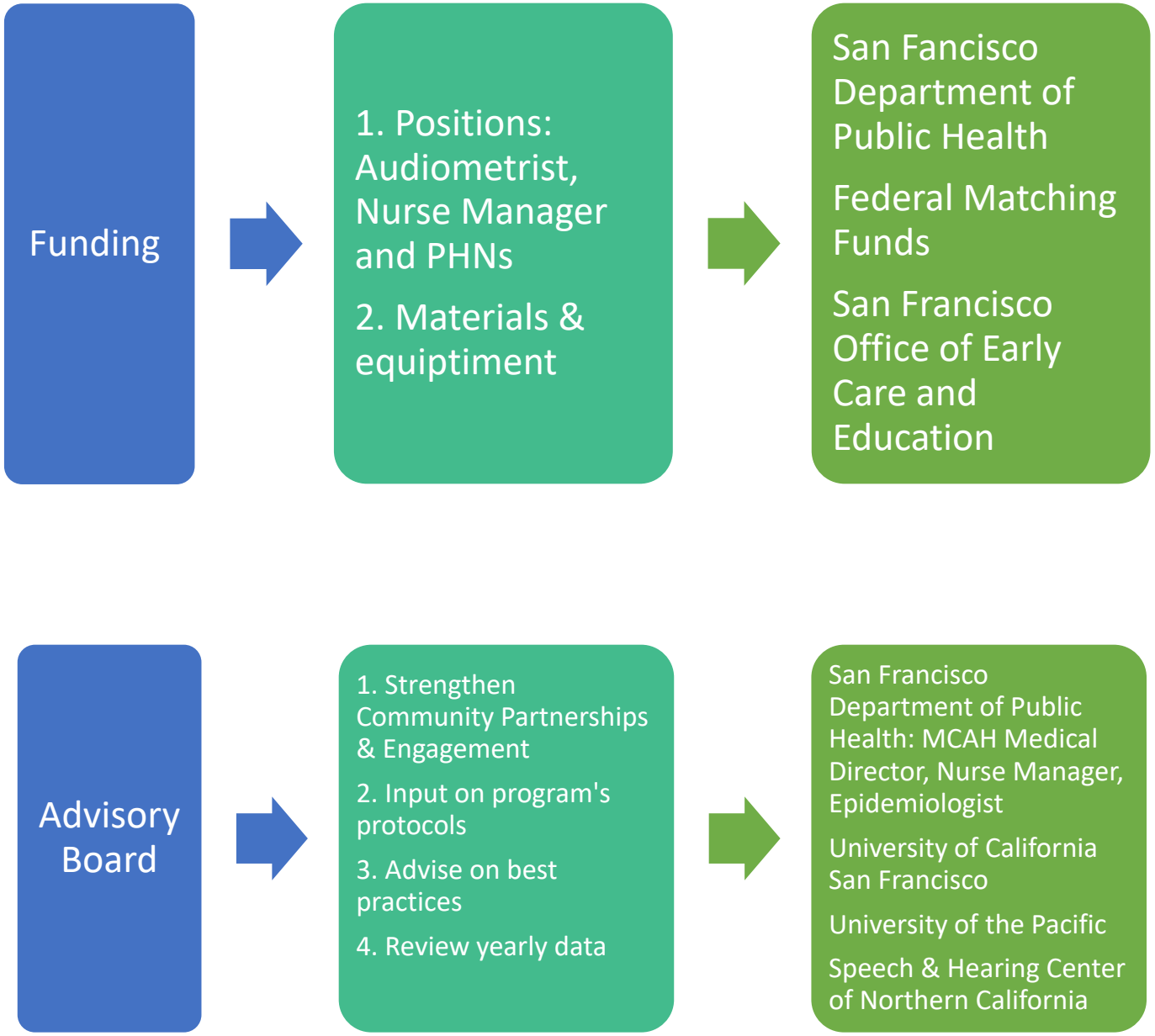
ECAS Development

- Community Partners
  - University of California San Francisco
  - University of the Pacific
  - Hearing and Speech Center of Northern California
- Best practices for screening protocols of preschool children, ages 3 and older
- Best practices for follow-up care
- Establishing positive relationships with Childcare Centers

ECAS Partners

Important Community Partner Roles within San Francisco Department of Public Health's Early Childhood Audiometric Screening Program

1. Funding
2. Advisory Board
3. Administration / Logistics
4. Screening
5. Case Management
6. Data


Funding
1. Positions: Audiometrist, Nurse Manager and PHNs
2. Materials & equiptiment
San Fancisco Department of Public Health
Federal Matching Funds
San Francisco Office of Early Care and Education
Advisory Board
1. Strengthen Community Partnerships & Engagement
2. Input on program's protocols
3. Advise on best practices
4. Review yearly data
San Francisco Department of Public Health: MCAH Medical Director, Nurse Manager, Epidemiologist
University of California San Francisco
University of the Pacific
Speech & Hearing Center of Northern California

Administration / Logistics

<u>Pre Screen:</u>

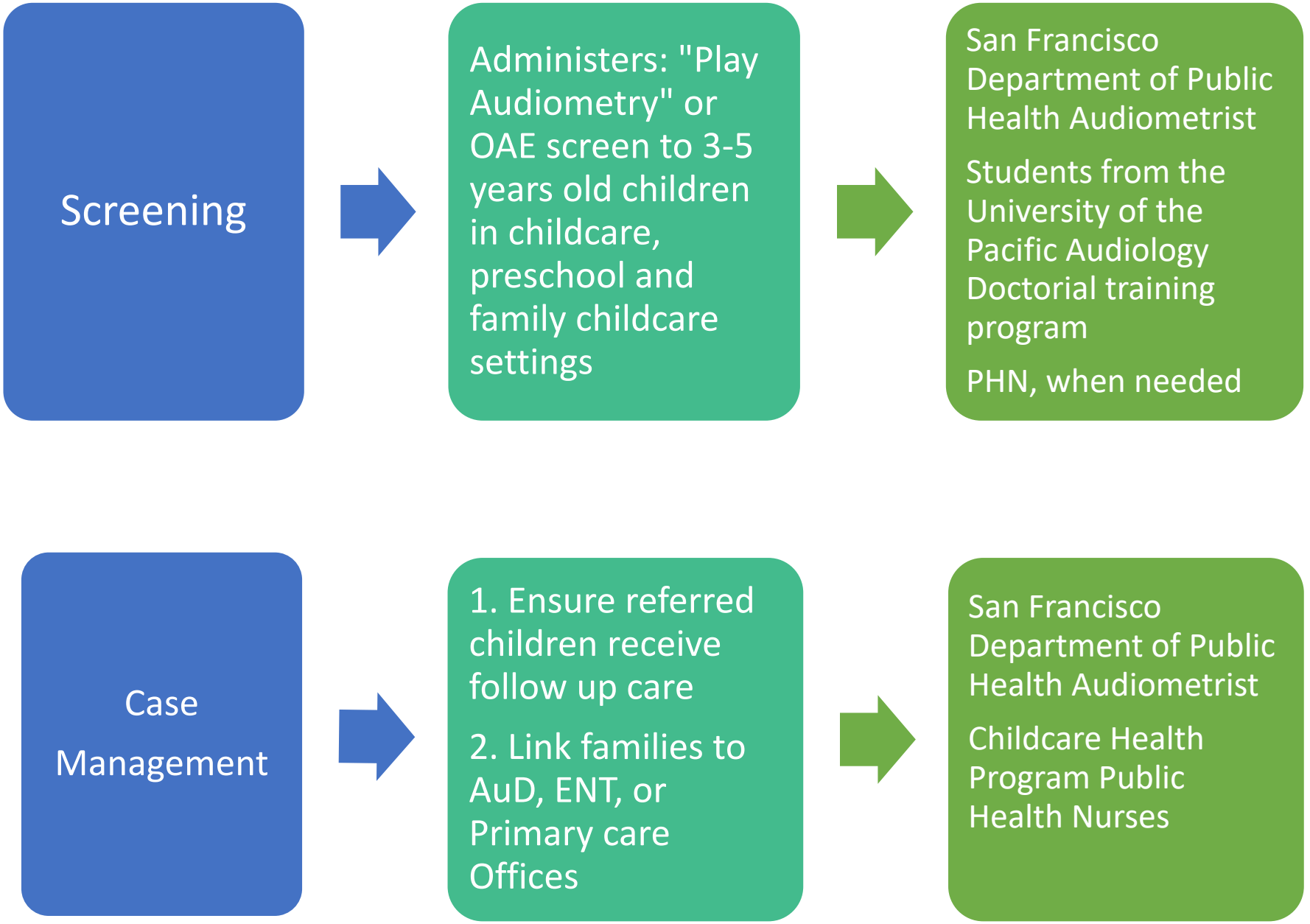
1. Establish trusting relationships with sites
2. Schedule School sites and graduate school students
3. Distribute rosters & flyers

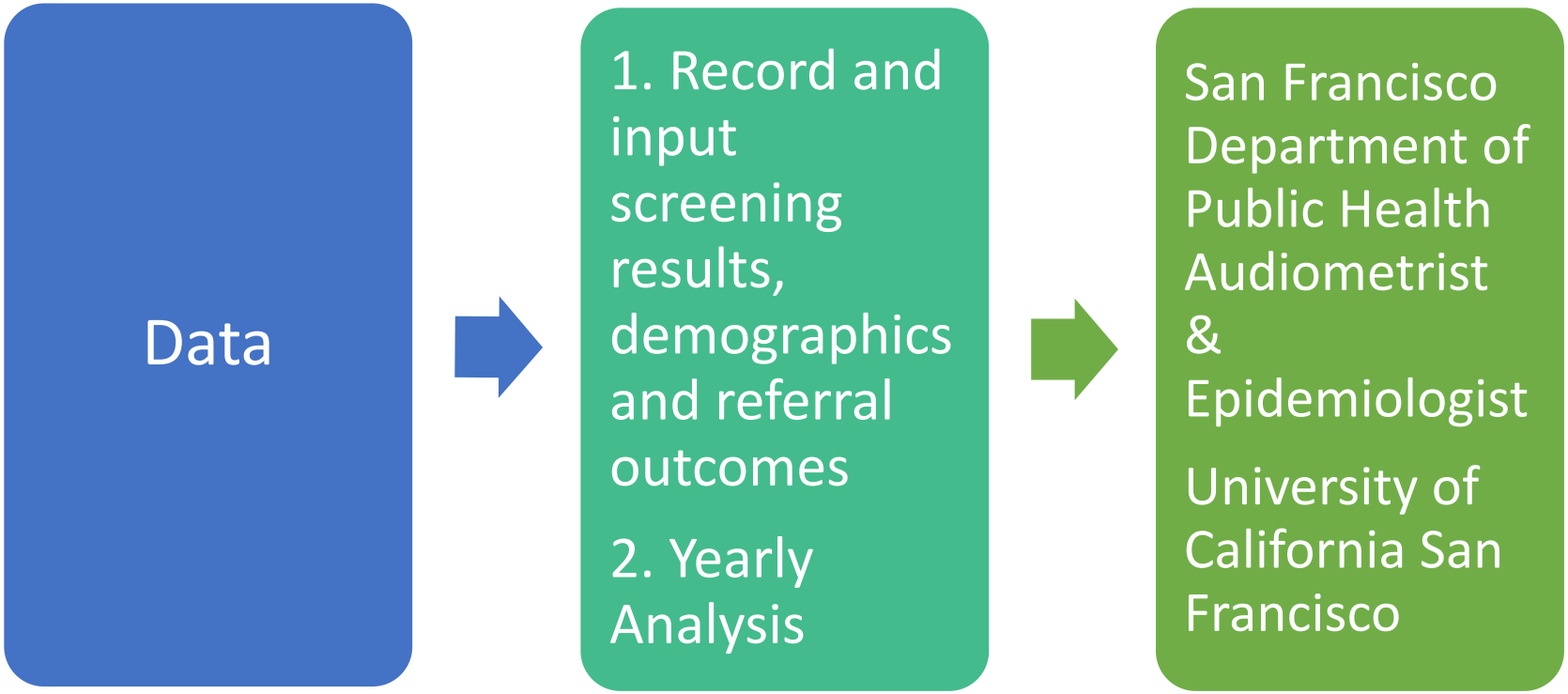
<u>Post Screen:</u>

1. Result letters to parents
2. Follow up on children who did not pass
3. Parent & Teacher education
4. Annual Report

San Francisco Department of Public Health Audiometrist

Childcare Health Program Public Health Nurses


Screening
Administers: "Play Audiometry" or OAE screen to 3-5 years old children in childcare, preschool and family childcare settings
San Francisco Department of Public Health Audiometrist
Students from the University of the Pacific Audiology Doctorial training program
PHN, when needed
Case Management
1. Ensure referred children receive follow up care
2. Link families to AuD, ENT, or Primary care Offices
San Francisco Department of Public Health Audiometrist
Childcare Health Program Public Health Nurses


Data
1. Record and input screening results, demographics and referral outcomes
2. Yearly Analysis
San Francisco Department of Public Health Audiometrist & Epidemiologist
University of California San Francisco

ECAS Development of Screening Protocols

- Use of “Play Audiometry” with pure tone screening
  - Game play
    - Hearing the sound, place block into the box
  - Screen both ears at 25dB level
    - Frequencies of 1000, 2000, 3000 and 4000
  - Motivation (stickers)

1. The American Speech-Language-Hearing Association(ASHA) (1985,May) Guidelines for Identification Audiometry, recommends “screening levels of 20dB (re ANSI-1969) al all frequencies tested.” See F,2. “Choice of a Testing Room” for environmental criteria.

ECAS Development of Screening Protocols

- “Play Audiometry” struggles for the child
  - English is child’s second language
  - Short attention span
  - Lack of motivation
  - Shy or scarred
  - Hyper-active
  - Can not follow two-step directions
  - Undefined special needs

ECAS Development of Screening Protocols

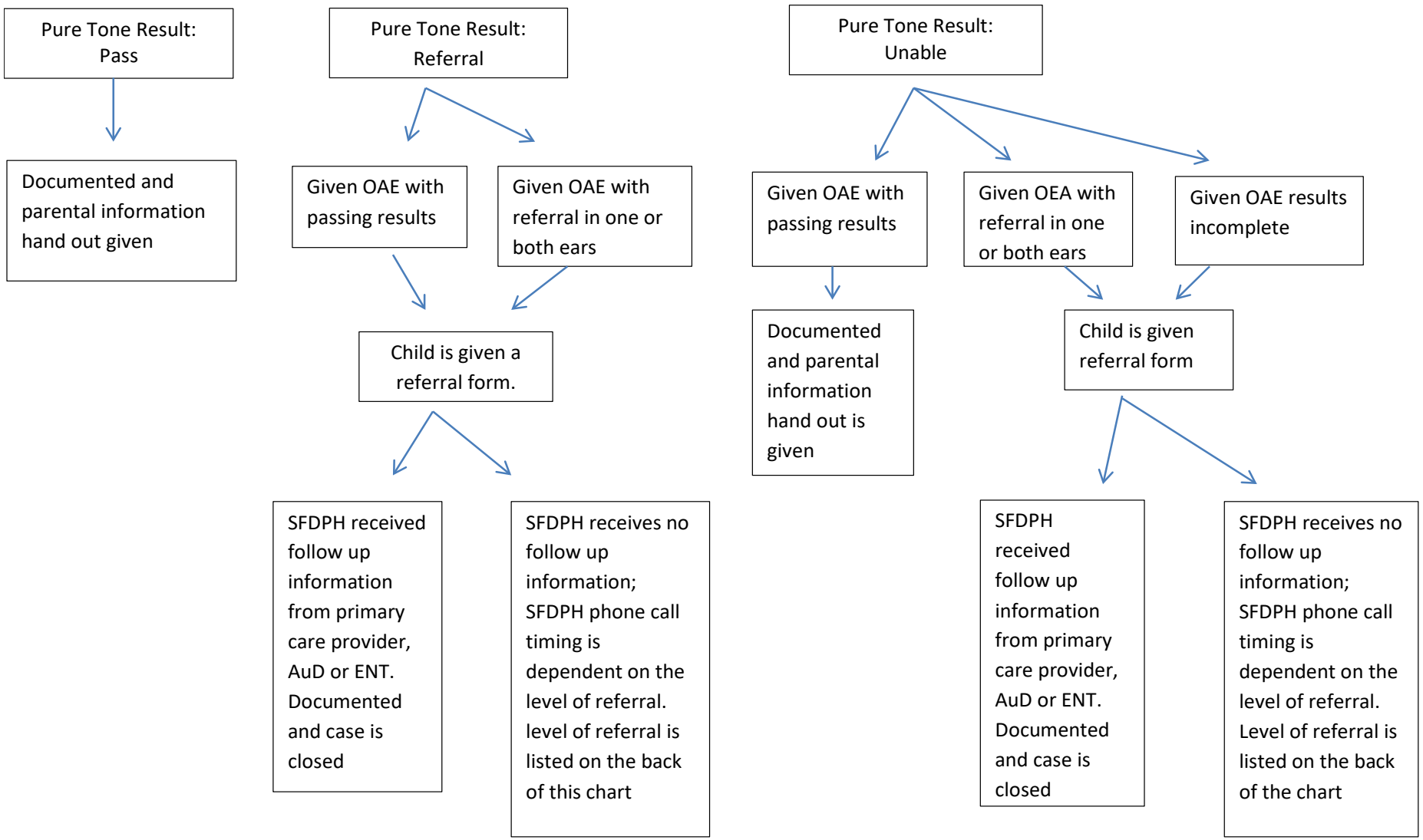
What happens when a child cannot complete “Play Audiometry”?

- Use Otoacoustic Emissions (OAE)
  - Let child touch probe
  - Let child touch buttons on OAE machine

Why use Otoacoustic Emissions (OAE)?

- Non behavioral based
- Can flag children who are at higher risk
- Easy to use
- Fast, 1-2 minutes

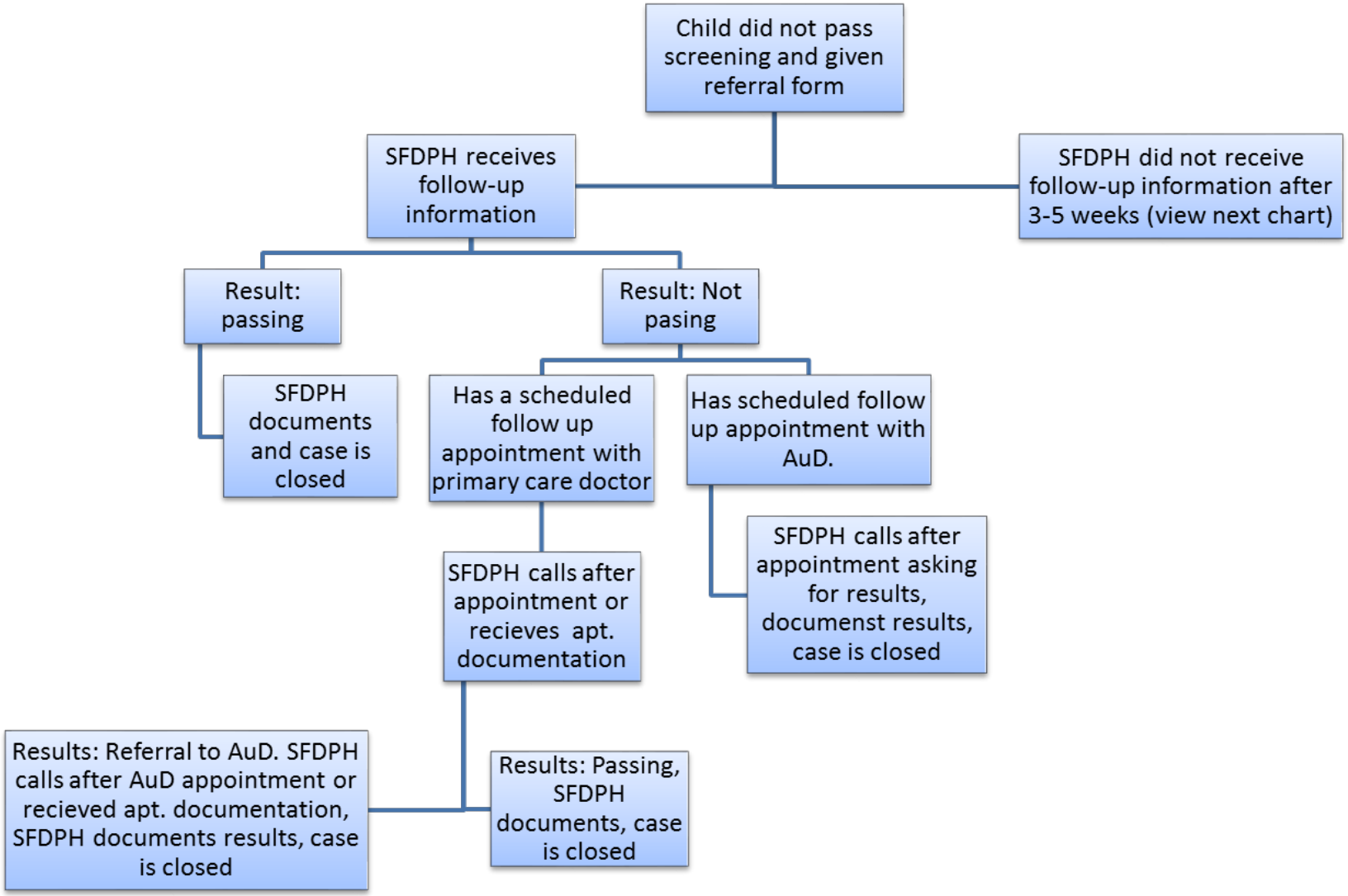
Early Childhood Audiometric Screening (ECAS) Flow Chart

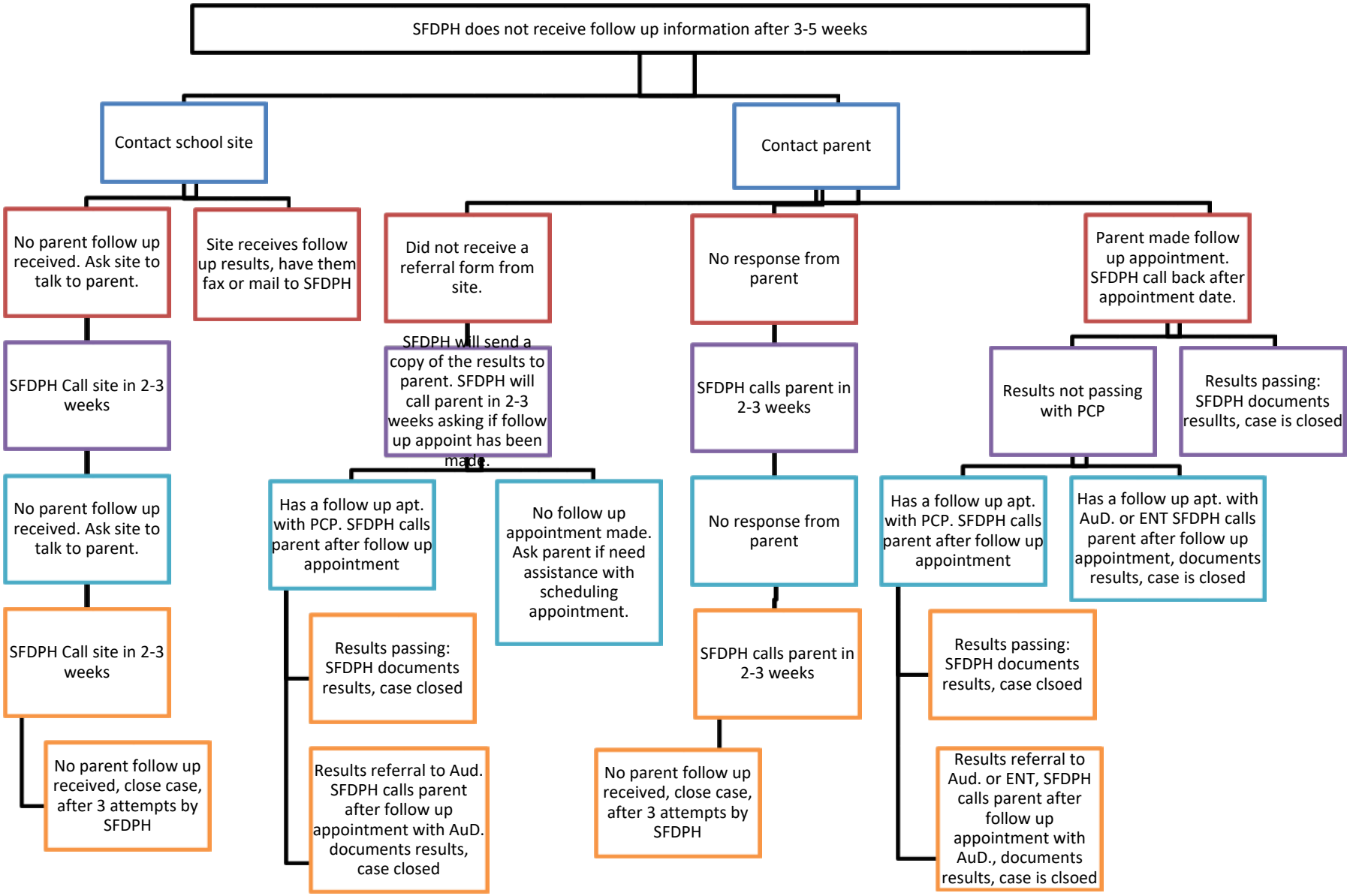


ECAS Referral Process

- Child receives referral if:
  - Does not correctly respond at 25dB in both ears at all frequencies
  - Does not complete “Play Audiometry” and refers in one or both ears with OAE screening
  - Does not complete “Play Audiometry” and OAE screening

ECAS Referral Process

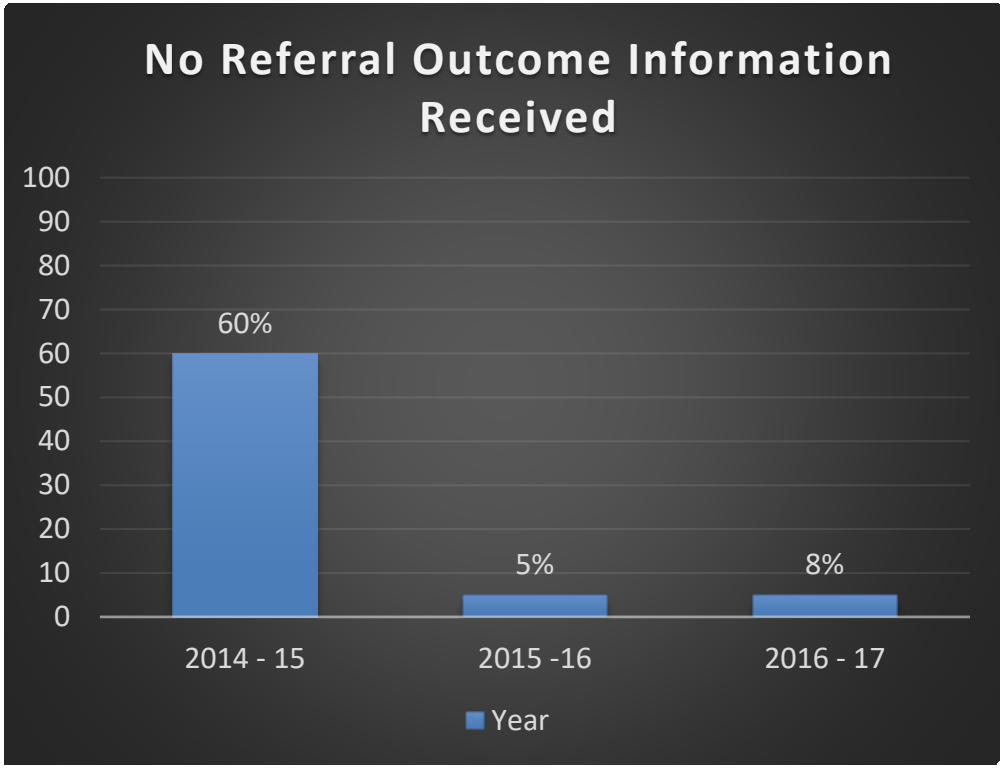



SFDPH does not receive follow up information after 3-5 weeks
Contact school site
Contact parent
No parent follow up received. Ask site to talk to parent.
Site receives follow up results, have them fax or mail to SFDPH
SFDPH Call site in 2-3 weeks
No parent follow up received. Ask site to talk to parent.
SFDPH Call site in 2-3 weeks
No parent follow up received, close case, after 3 attempts by SFDPH
Did not receive a referral form from site.
SFDPH will send a copy of the results to parent. SFDPH will call parent in 2-3 weeks asking if follow up appoint has been made.
Has a follow up apt. with PCP. SFDPH calls parent after follow up appointment
No follow up appointment made. Ask parent if need assistance with scheduling appointment.
Results passing: SFDPH documents results, case closed
Results referral to Aud. SFDPH calls parent after follow up appointment with AuD. documents results, case closed
No response from parent
SFDPH calls parent in 2-3 weeks
No response from parent
SFDPH calls parent in 2-3 weeks
No parent follow up received, close case, after 3 attempts by SFDPH
Parent made follow up appointment. SFDPH call back after appointment date.
Results not passing with PCP
Results passing: SFDPH documents resullts, case is closed
Has a follow up apt. with PCP. SFDPH calls parent after follow up appointment
Has a follow up apt. with AuD. or ENT SFDPH calls parent after follow up appointment, documents results, case is closed
Results passing: SFDPH documents results, case clsoed
Results referral to Aud. or ENT, SFDPH calls parent after follow up appointment with AuD., documents results, case is clsoed

ECAS Referral Process

- Struggles
  - Format of the referral form
  - Lack of parent response
  - Lack of parent and teacher education
  - Building relationship with Childcare Centers
  - English as second language
  - Cultural differences

ECAS Referral Process



What caused the big change?

- Revised referral forms for parent, primary care Physicians, AuD and ENTs
- Referral form available in 3 languages
- Relationships built with Childcare Sites
  - Clear on what our expectations are from each other
- Collaboration with CCHP nurses and Childcare Staff members

Referral for Hearing Screening

Name of School: _____

Name: _____ Date: _____

My child did not pass hearing screening: What to do next.

Dear Parent / Guardian,

Today your child received a hearing screening at school and did not pass. We recommend that you:

1. Make a follow up appointment with your child's doctor for a thorough hearing examination.
2. Please bring this form to the appointment for the doctor to complete the reverse side and return to Hayley Kriss by fax or mail.

If you need assistance in making a follow up appointment or need further resources for hearing, speech and language development contact Hayley Kriss by phone (415) 558-4055 or e-mail: Hayley.kriss@sfdph.org.

CERTIFIED SCHOOL AUDIOMETRIST REPORT

Results of pure tone: (√ check indicates passing)

Right Left

☐ ☐ Normal

☐ ☐ Referred

☐ ☐ Unable

Right Ear				Left Ear			
1K	2K	3K	4K	1K	2K	3K	4K

Results of Otoacoustic Emissions

Right Left

☐ ☐ Normal

☐ ☐ Referred

☐ ☐ Unable

Comments: _____

_____

_____

Signed: _____

Hayley Kriss, Certified School Audiometrist

***** FOR THE PRIMARY CARE PROVIDER TO COMPLETE AND RETURN TO THE OFFICE OF CHILDHOOD HEARING*****

Dear Primary Care Provider:

Your patient _____ is being referred to you because he/she did not pass the hearing screening at _____. Thank you for reexamining the child. To ensure follow-up care, please provide a copy of this *completed* form to:

San Francisco Department of Public Health's Audiometrist (by fax or mail).
Attn: Hayley Kriss, Certified School Audiometrist
Office of Childhood Hearing
30 Van Ness Ave, #210, SF, CA 94102
Fax: (415) 575-5702

EAR EXAMINER'S REPORT **Date of Exam: _____/_____/_____**

Pure tone examination results:

Note: √ check indicates passing, child responds at 20 dB. Following the American Academy of Pediatrics (AAP) guidelines, child must pass in ALL of the following frequencies (Hz).

Right Ear					Left Ear				
500	1K	2K	3K	4K	500	1K	2K	3K	4K

Medical service(s) performed:

☐ **Otoscopy** ☐ **Pure tone** ☐ **Tympanometry** ☐ **OAE (Otoacoustic emissions)**

Diagnosis & Treatment

Left ***Right***

☐ ☐ Cerumen removal
☐ ☐ Middle ear disorder (describe): _____
☐ ☐ Other: _____

Follow-up recommendation(s) and date by which recommendation should be completed:

☐ None
☐ Referral to California Children's Services (CCS)
☐ Repeat hearing screening (____/____/____)
☐ Refer to Audiological evaluation (____/____/____)
☐ Referral ENT (____/____/____)

Comments: _____
_____

Name of Examiner (print): _____

Signature: _____ **Date: _____**

Preschool Hearing Screening

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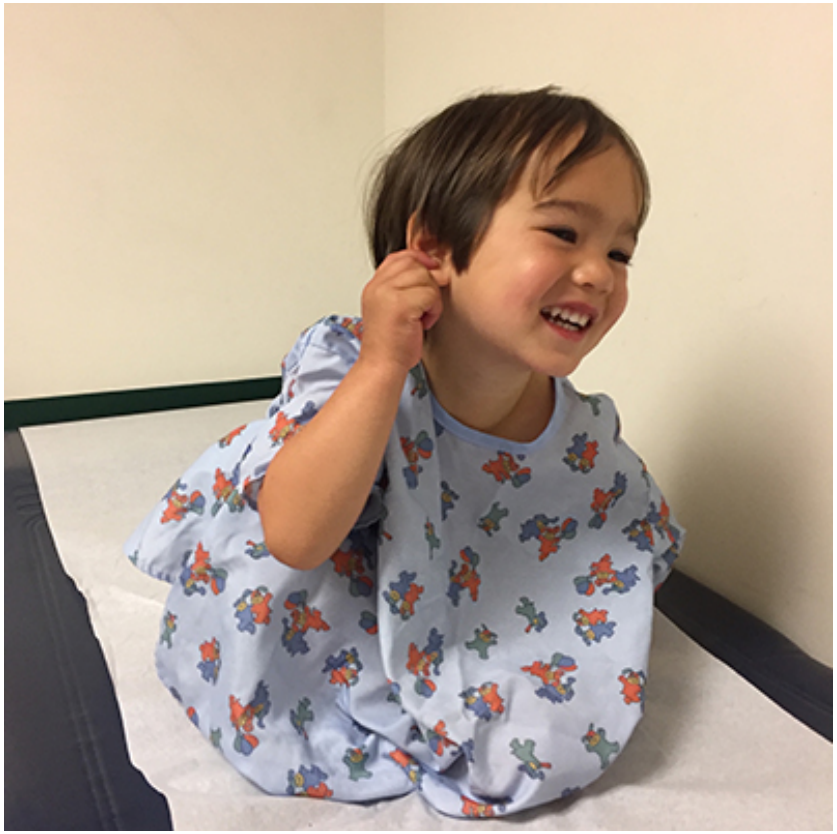
Preschool Hearing Screening Best Practices



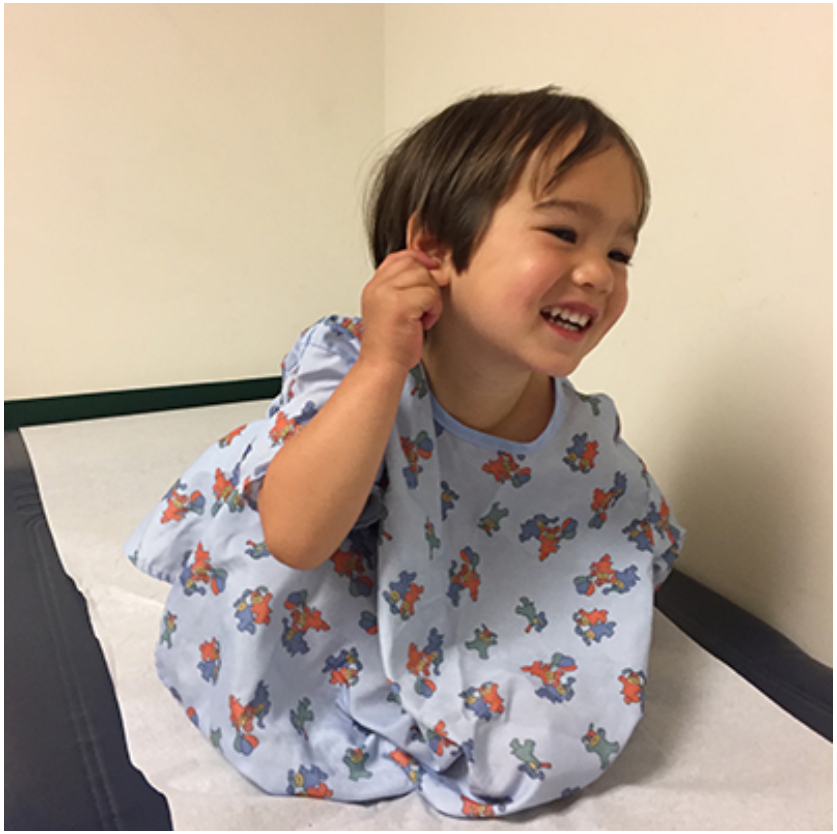
Best practices for preschool hearing screening (3-5 yo)

- American Academy of Audiology guidelines (2011)[1]
  - Conditioned Play Audiometry
  - Objective testing for age <3 or concern for delay
- Children as old as 5 may not be cooperative with CPA[2]
- OAE screening (ECHO initiative)
- Objective testing (OAE) has lower sensitivity and specificity
- 2-tiered screens?

1. Bright K, Eichwald J, Tanner G. American Academy of Audiology Childhood Hearing Screening Guidelines. September 2011. http://www.cdc.gov/ncbddd/hearingloss/documents/aaa_childhood-hearing-guidelines_2011.pdf Downloaded April 17, 2016

2. Sideris I, Glattke TJ. A comparison of two methods of hearing screening in the preschool population. *J Commun Disord*. 2006 Nov-Dec;39(6):391-401.

Preschool Hearing Screening Study Design



2-year ecological study design

3257 children screened

Year 1 – Pure-tone play audiometry alone

Year 2 – additional 2nd-tier OAE screening

Outcome measures:

- Ability to be tested (ATT)
- Pass/Not Pass (Refer + Unable to test (UTT)
- Age
- Teacher concern (speech/language/behavior)
- Home language
- Follow-up (obtained?, diagnosis)

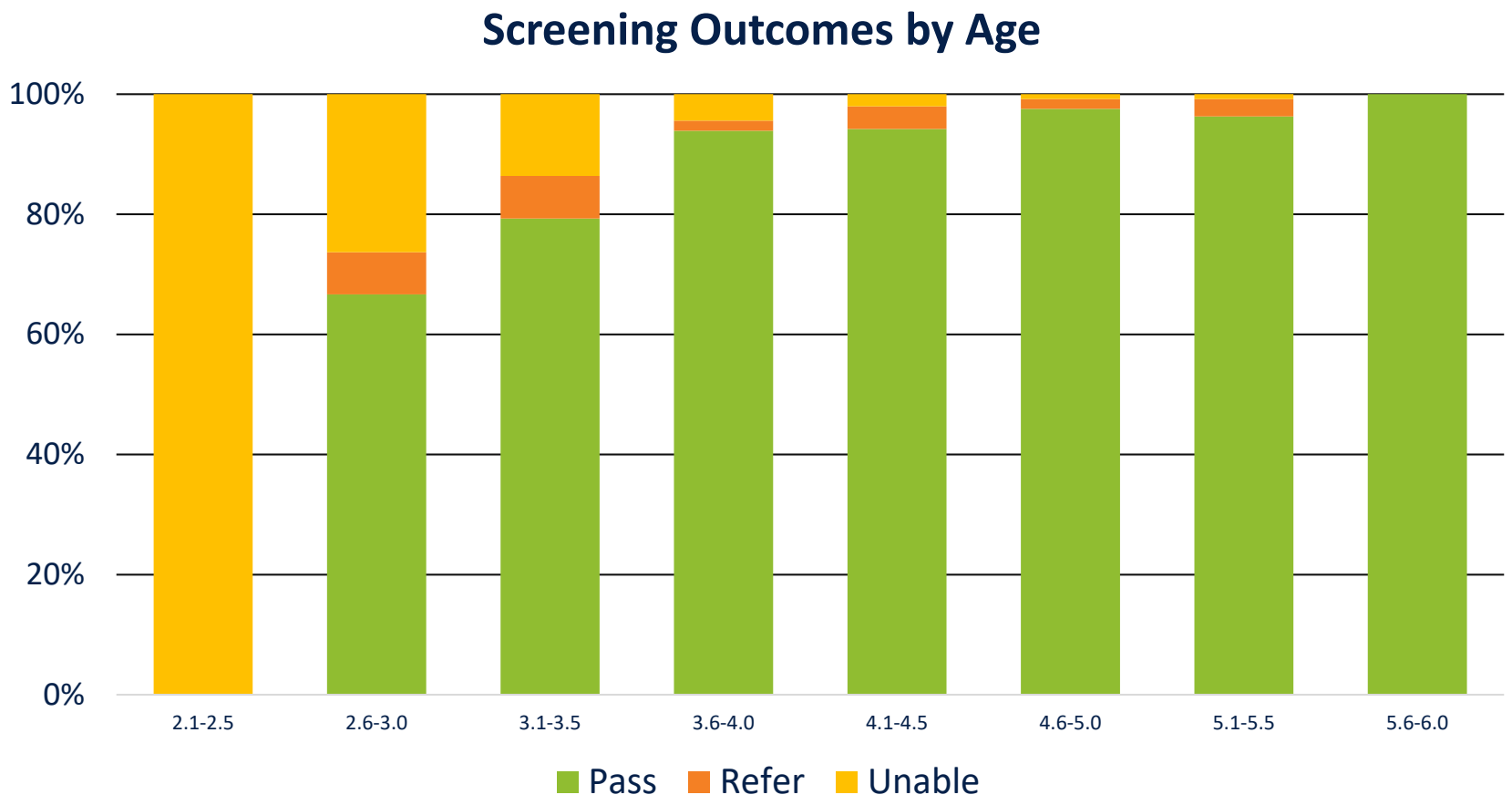
Year 1 Screening and Clinical Outcomes

	Year 1
Pass	1323 (92.1%)
Refer	45 (3.1%)
UTT	68 (4.7%)
ATT	1368 (95.3%)
NP	113 (7.9%)

Recommended for further evaluation

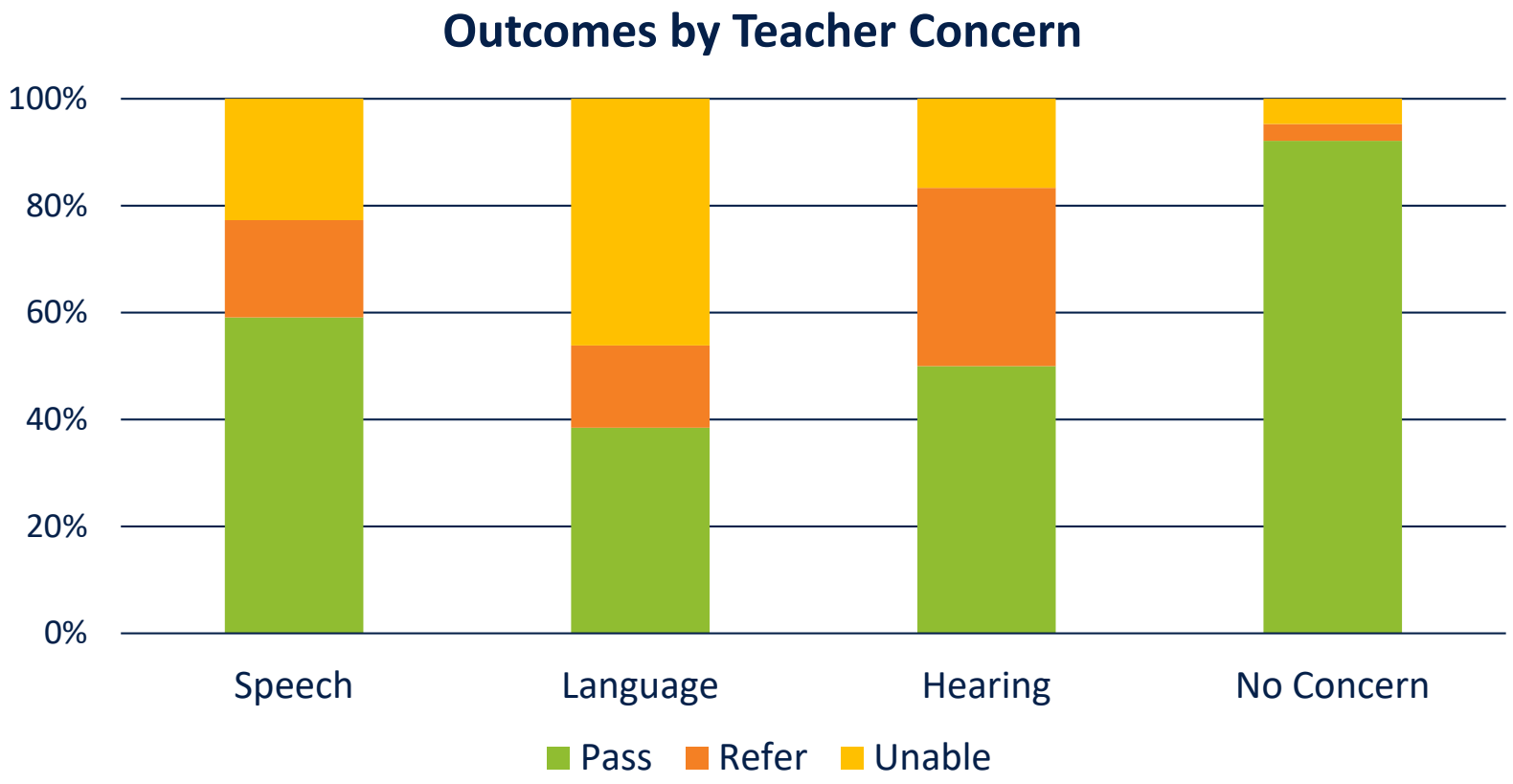
	Year 1
Passed Rescreen	20
Conductive Loss	10
Ear Wax	1
Otitis Media	7
Required Tubes	1
Other Conductive	1
Sensorineural loss	1
Unable to test	10
No follow-up	12
Pending	4
No information	56
Total	113

Screening Outcomes Age



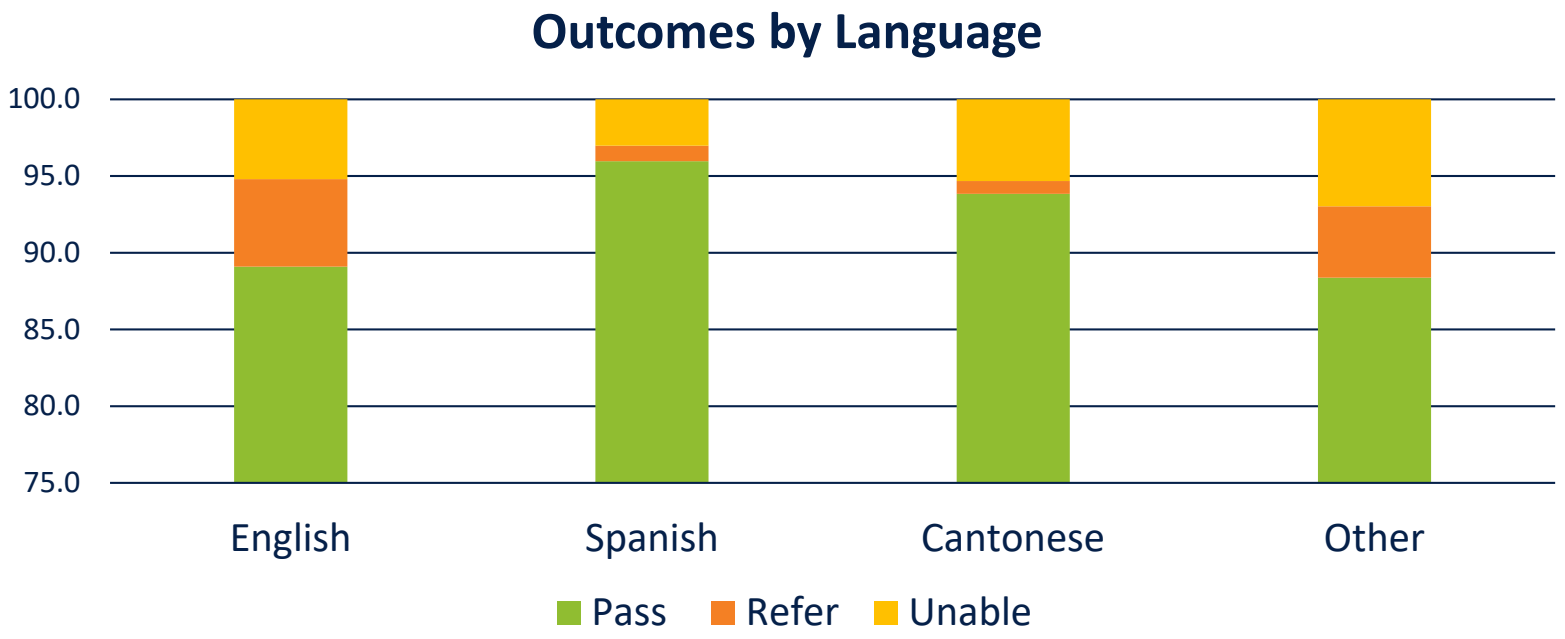
- Children aged ≤3 (n=63) significantly less likely to be able to test
  - OR 0.071 [0.039-0.129], P<0.001

Screening Outcomes Teacher Concern



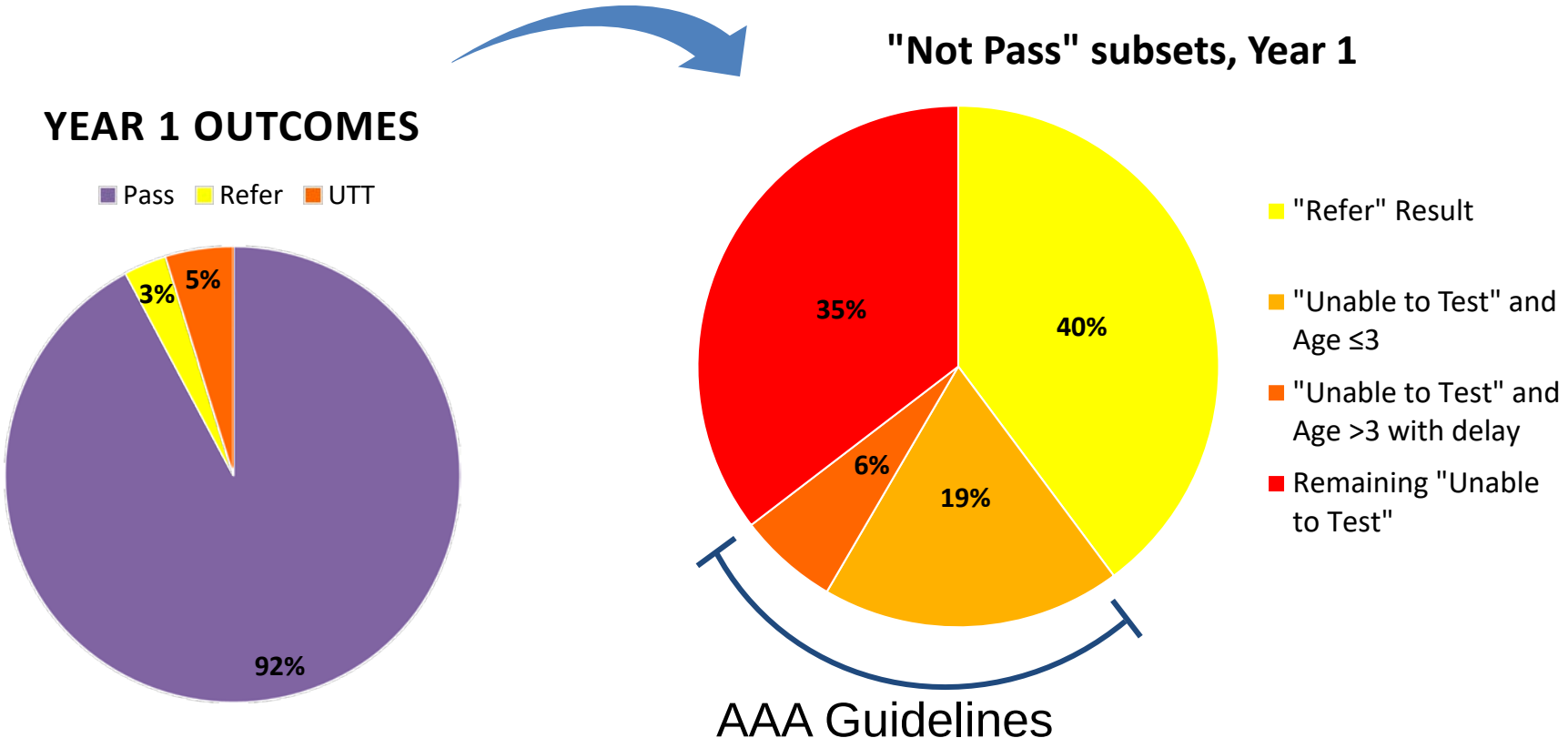
- Children with teacher concerns more likely to not pass hearing screening (OR 0.15 [0.07-0.31], $p < 0.0001$
- Children with possible speech or language delay poorly served by standard screening, but very important to screen

Screening Outcomes Language/Ethnicity



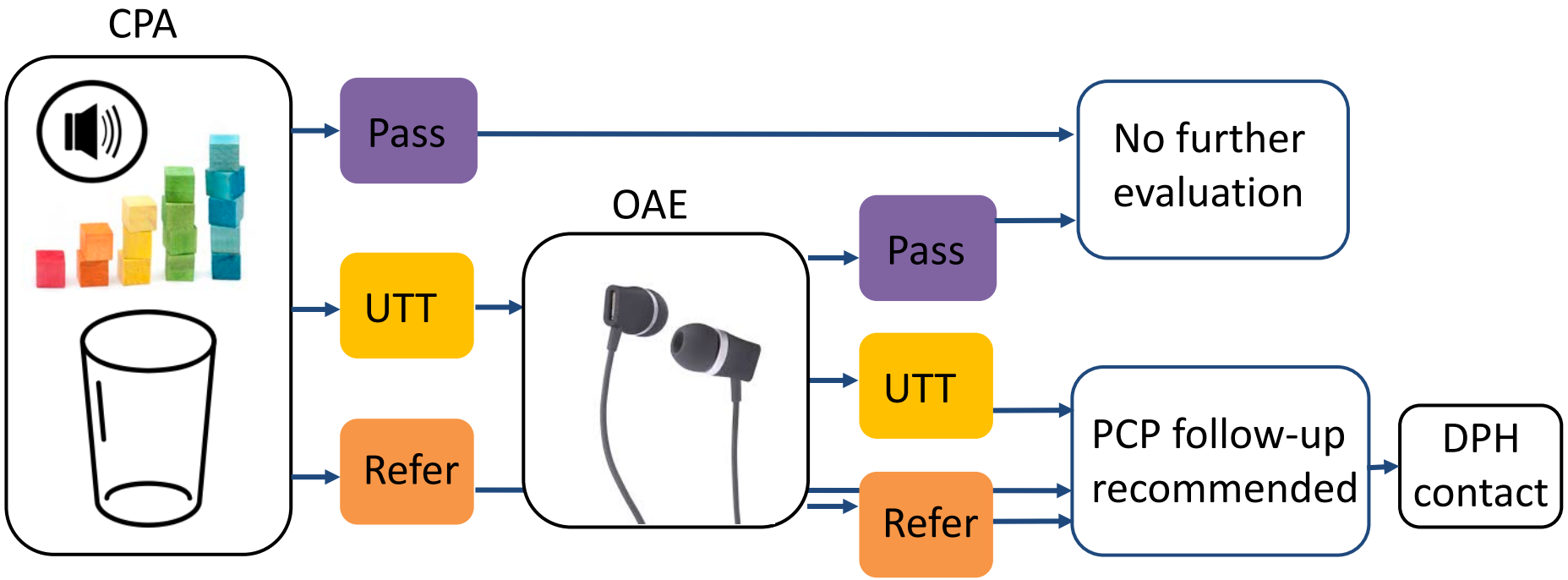
- Non-English more likely to pass (OR 2.0 [1.4-3.0]; $p < 0.005$)
- No difference among pass rates by ethnicity

Pure-tone Screening Shortfalls



- In total, almost 60% of UTT were not accounted for by AAA guidelines for for objective testing

Preschool Hearing Screening OAE



Post-OAE Comparison Demographics

		Year 1	%	Year 2	%	P-value	Type 3 P-value
Overall		1436		1821			
Sex	Male	730	**50.8%**	936	**51.4%**	**0.98**	**0.75**
	Female	706	**49.2%**	885	**48.6%**	**reference**	
Age	2.1-3.0	63	**4.4%**	108	**5.9%**	**reference**	**0.27**
	3.1-4.0	464	**32.3%**	592	**32.5%**	**0.086**	
	4.1-5.0	661	**46.0%**	816	**44.8%**	**0.051**	
	5.1-6.0	248	**17.3%**	305	**16.7%**	**0.067**	
Primary Language	English	596	**41.5%**	881	**48.4%**	**reference**	**<0.0001**
	Spanish	397	**27.6%**	406	**22.3%**	**<0.0001**	
	Cantonese	357	**24.9%**	368	**20.2%**	**<0.0001**	
	Other	86	**6.0%**	166	**9.1%**	*	
Ethnicity	Asian	566	**39.4%**	611	**33.6%**	**0.0011**	**0.0078**
	Latino	346	**24.1%**	456	**25.0%**	**0.17**	
	Caucasian	183	**12.7%**	284	**15.6%**	**reference**	
	Other	341	**23.7%**	470	**25.8%**	*	
Teacher Concern	Speech	22	**1.5%**	22	**1.2%**	**0.43**	**0.89**
	Language	13	**0.9%**	16	**0.9%**	**0.91**	
	Hearing	6	**0.4%**	8	**0.4%**	**0.96**	
	None	1395	**97.1%**	1775	**97.5%**	**reference**	

*not reported, as includes a mix of multiple categories

Post-OAE Comparison Screening Outcomes

	Year 1	Year 2	P-value
Pass	1323 (92.1%)	1728 (94.9%)	P=0.0014
Refer	45 (3.1%)	81 (4.5%)	
UTT	68 (4.7%)	12 (0.7%)	P<0.0001
Refer/Refer	n/a	56 (3.2%)	
Refer/Pass	n/a	4 (0.3%)	
Refer/UTT	n/a	0 (0%)	
UTT/Pass	n/a	84 (4.6%)	
UTT/Refer	n/a	21 (0.9%)	
UTT/UTT	n/a	12 (0.7%)	
ATT	1368 (95.3%)	1809 (99.3%)	P<0.0001
NP	113 (7.9%)	93 (5.1%)	P=0.0014

- Referral rate (Refer or UTT) was reduced
- UTT rates were reduced
- Nearly 5% of all children no longer needed referral

Post-OAE Comparison Clinical Outcomes

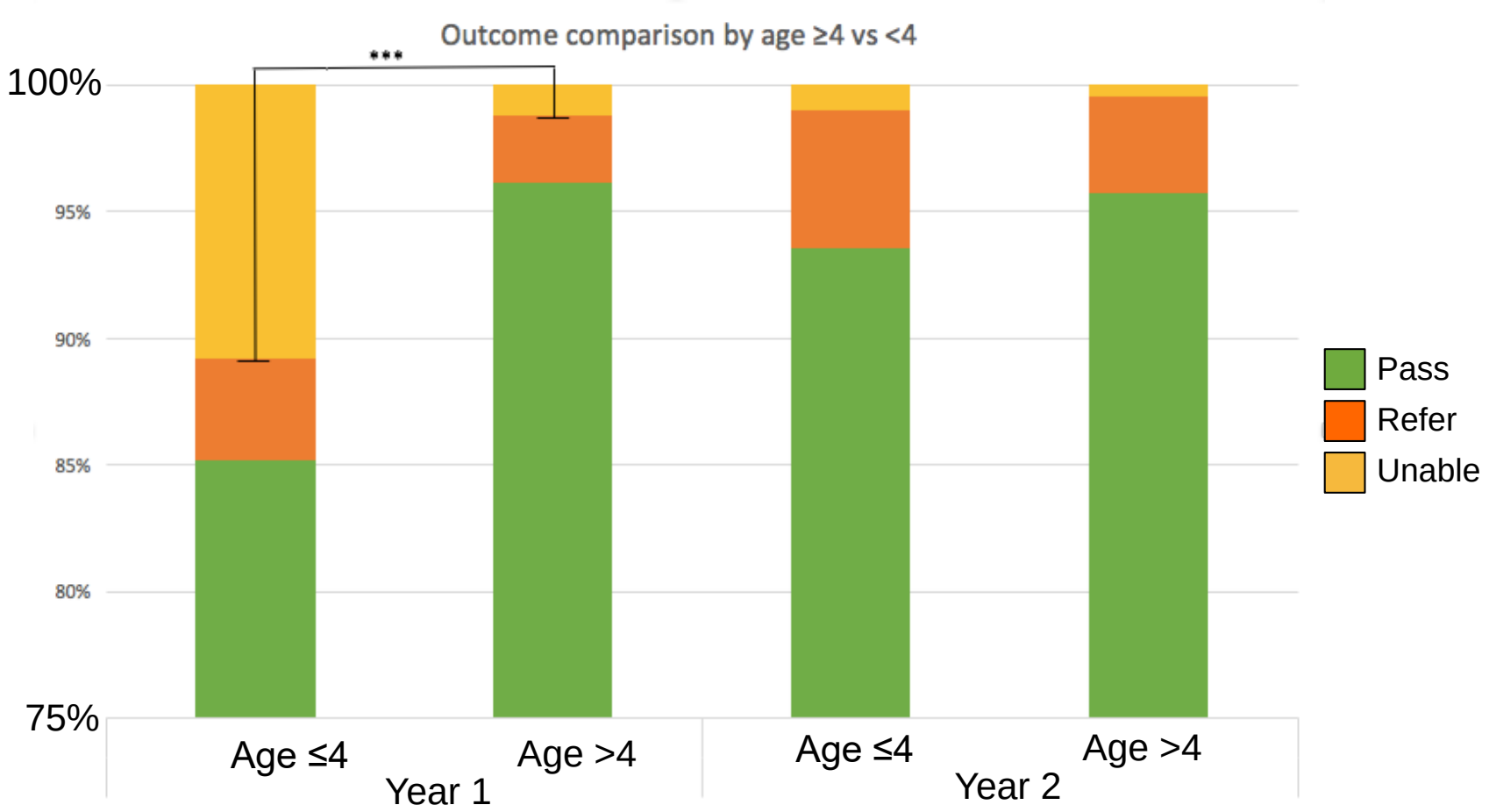
	Year 1	Year 2
Passed Rescreen	20	29
Conductive Loss	10	46
Ear Wax	1	34
Otitis Media	7	10
Required Tubes	1	2
Other Conductive	1	0
Sensorineural loss	1	3
Unable to test	10	7
No follow-up	12	1
Pending	4	3
No information	56	4
Total	113	93

Final Outcomes (%)

	Year 1	Year 2	P-value
Identified SNHL (SNHL/known follow-up)	1.75	3.37	P=0.5318
Identified CHL (CHL/known follow-up)	17.54	51.69	P<0.0001
Total pathology (Pathology/referred)	9.73	52.69	P<0.0001

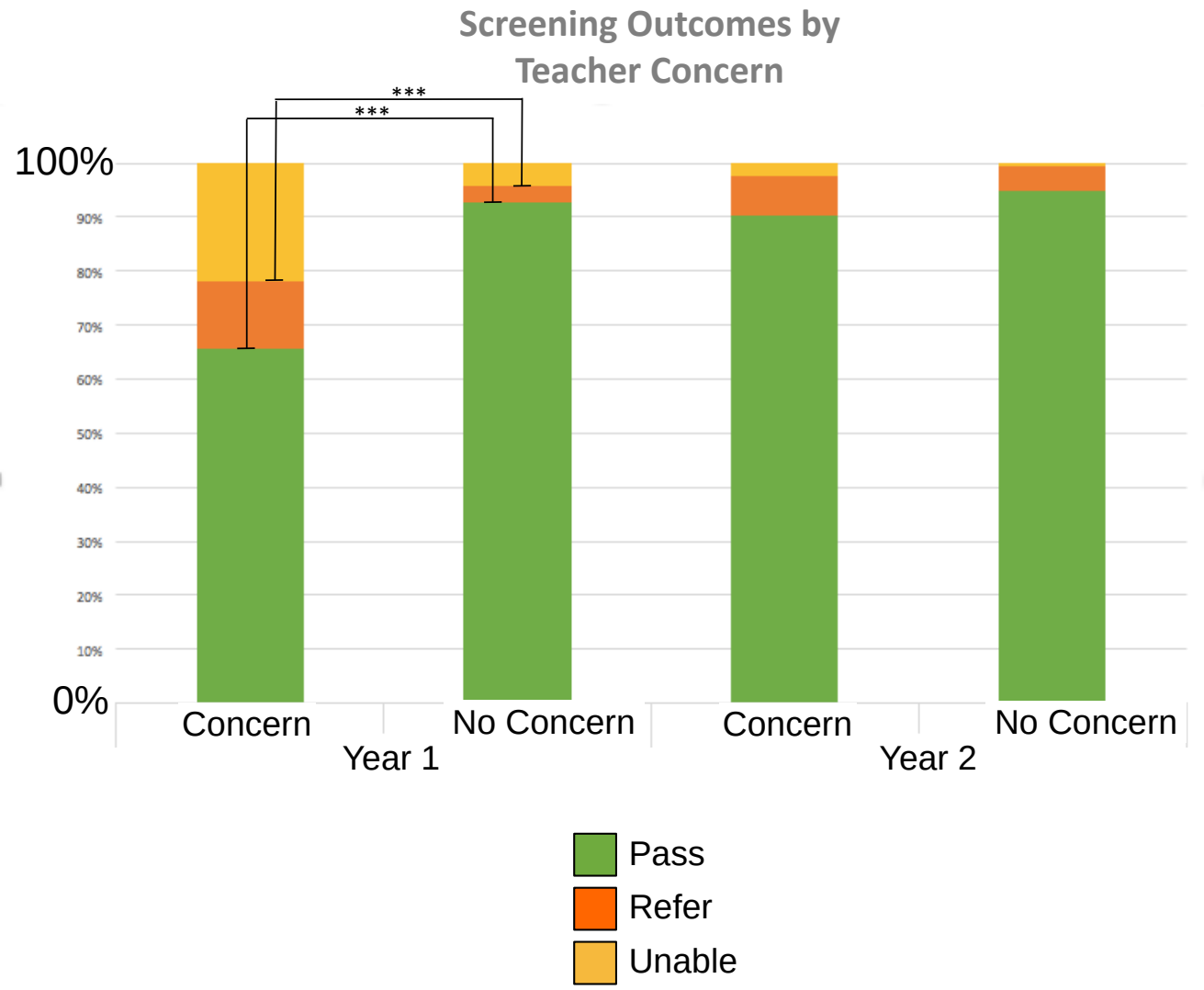
- Large increase in rate of follow-up
- No change in incidence of diagnosed permanent hearing loss
- We were not missing hearing loss
- Yield of screening for pathology increased
- More effective screen

Post-OAE Comparison Age Disparity



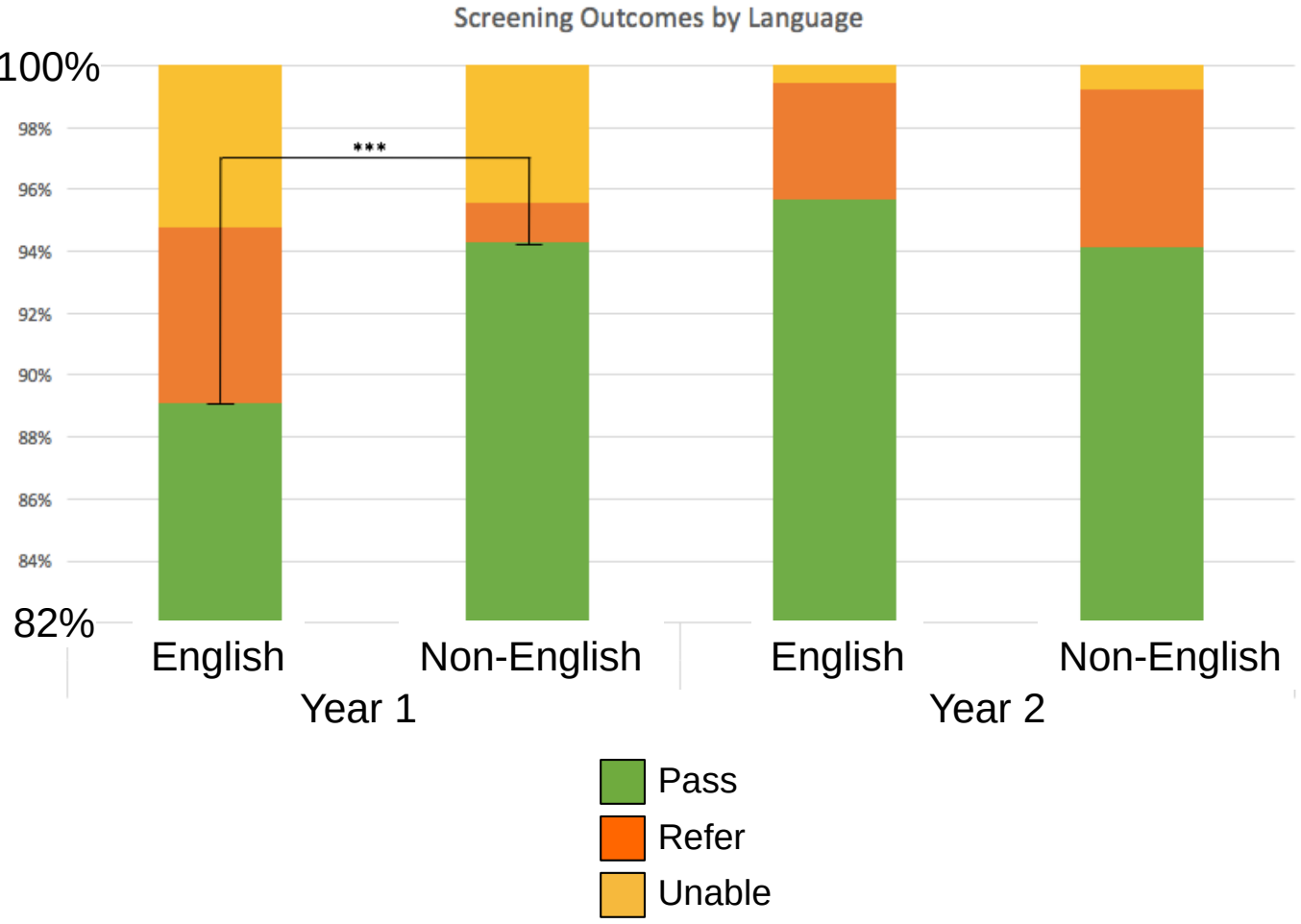
- Age >4 more likely to Pass than those age ≤4 (OR Pass 1.54 [1.01-2.3]; P=0.043)
- Equally likely to be ATT (OR ATT 2.2 [0.73-6.6]; P=0.16)

Post-OAE Comparison Concern Disparity



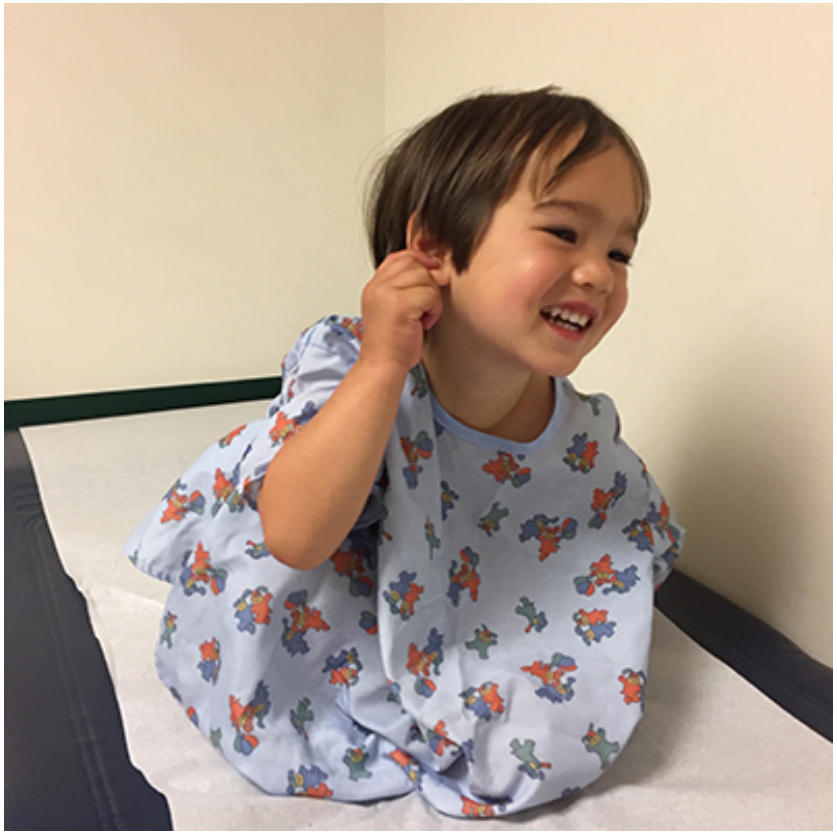
- Year 1 – Children with hearing/speech/language concerns were less likely to be able to be tested
- Year 2 – no difference in ability to test between children with and without concerns

Post-OAE Comparison Language/Ethnicity Disparity



- Language - No difference in Pass or ATT Rates
  - OR Non-English Pass 0.73 [0.48-1.11] P=0.14
  - OR Non-English ATT 0.78 [0.26-2.4] P=0.66
- Ethnicity – Latino less likely to Pass than Caucasian
- Overall difficult to make strong conclusions at this time

Preschool Hearing Screening Conclusions



- Two-tiered, single-visit preschool hearing screening
- Pure-tone play audiometry -> OAE for any who do not pass
- Significant findings:
  - Reduction in referral rate
  - Higher rates of identification/intervention
  - Improved tracking of outcomes with improved follow-up
  - Reduction of disparities due to age and teacher concern
  - Effective with a wider preschool age range
- Valuable option for hearing screening in preschool children

Questions?