

OBJECTIVE

To provide information regarding the importance of implementing a hearing and speech screening protocol in preschool, a description of current protocols and guidelines, and outcomes from a population based preschool screening program at the Marion Downs Center in Denver.

BACKGROUND

In 1993, the National Institutes of Health (NIH) Consensus Development Program recommended that all newborns receive a hearing screening before leaving the hospital. The current Joint Committee on Infant Hearing (JCIH, 2019) recommends that infants with hearing loss be identified by 3 months of age and receive intervention by 6 months of age. Late-onset hearing loss (LOHL) in children can result from lost to follow-up from newborn hearing screening (CDC, 2023), from limitations of equipment or methods being used that may miss the presence of a hearing loss (American Speech-Language-Hearing Association (ASHA)), or from progressive or acquired loss after the newborn period. Approximately 2-3 times as many elementary school children are identified with hearing loss than are identified through newborn hearing screening (CDC, 2023). Progressive or acquired hearing loss can be associated with several conditions including congenital Cytomegalovirus (CMV), inner ear structural differences, genetics, and head trauma.

A hearing loss that has not been identified or monitored can have significant impacts on a child's ability to properly acquire speech and language and perform academically. According to ASHA (2023), out of the 50 states, 37 require school hearing screenings, 5 suggest screenings, and 8 do not require screenings. At this time, there is limited information about individual state requirements for screenings.

MDC is a non-profit health clinic that provides audiology, speech, and language services in both a clinic and community setting. The clinic offers hearing services using best practices, as well as educates patients, families, and the surrounding community on the impacts of untreated hearing loss. The MDC's KidScreen program provides screenings for hearing, speech, vision, and development in school settings, primarily through Head Start and Early Head Start programs which provide services to families that are below the federal poverty line and receive public assistance. Age specific protocols are implemented and results are used to make referrals for further evaluation if needed.

SCREENINGS & INCIDENCE

Head Start: According to Head Start policy 1302.33, with parental consent, Head Start programs must provide a developmental, behavioral, motor, language, social, cognitive and emotional screening within the first 45 days of a child's enrollment. If a program is 90 days or less, a screening must be completed within the first 30 days of enrollment.

Educational Audiology Association (EAA): States that hearing screenings are used routinely to identify any child that may need diagnostic hearing testing. Routine screenings are recommended for children who do not have typical development. Any severity of hearing loss can negatively impact access to speech/language specifically relating to education and instruction.

Incidence of Hearing Loss: According to ASHA, statistics from 2019 indicated that 1.7 per 1000 newborns were identified with a permanent hearing loss from their newborn hearing screening. ASHA also reports that this rate increases to 23 per 1000 children with a permanent hearing loss (unilateral and bilateral) by adolescence.



CONSIDERATIONS FOR PRESCHOOL PROTOCOLS

Protocol I	Protocol II	Protocol III
<ul style="list-style-type: none"> - Otoacoustic Emissions (OAE): appropriate for ages 0 to 4year11months; determines inner ear function; automated screening device which does not require in-depth interpretation by examiner. - Pure Tones: appropriate for ages 5 years and older; frequency specific information, requires the ability to condition to a specific task. - Tympanometry: applicable for any age, useful for early childhood; screens outer and middle ear status; to be used after referring on OAEs. 	<ul style="list-style-type: none"> - 3 years: - OAEs are completed using an automated screening protocol - Tympanometry is to be completed after referring on OAEs - 4 years: - Pure Tones are completed at 1000Hz, 2000Hz and 4000Hz at 20dBHL - Tympanometry is to be completed after referring on Pure Tones at any frequency - If conditioning to Pure Tones cannot be completed the protocol for 3 year olds will be used. 	<ul style="list-style-type: none"> - Pure Tones: - Pure Tone are used starting at 3 years of age - Test at 1000Hz, 2000Hz, and 4000Hz at 20dBHL - Present tone minimum of 1 time and maximum of 4 times - Tympanometry: To be used in conjunction with pure tones on preschool age children - OAEs: Only to be used for children who pure tones are not developmentally appropriate
Colorado Department of Education (CDE)	Marion Downs Center (MDC)	American Academy of Audiology (AAA)

PURE TONES

3 year old vs. 4 year old:

A retrospective study from 2022, using MDC KidScreen data, looked at the results of pure tone screenings in 3 and 4 year-olds, which is shown in Table 1. Pure tone testing requires the child to demonstrate a behavioral response consistently when a stimulus is presented.

The results indicated that approximately 70% of 3 year-olds were unable to condition to pure tones; whereas, only 36% of 4 year-olds were unable to condition to the task. This result indicates that pure tone screenings, may not be age appropriate for children under the age of 4 years.

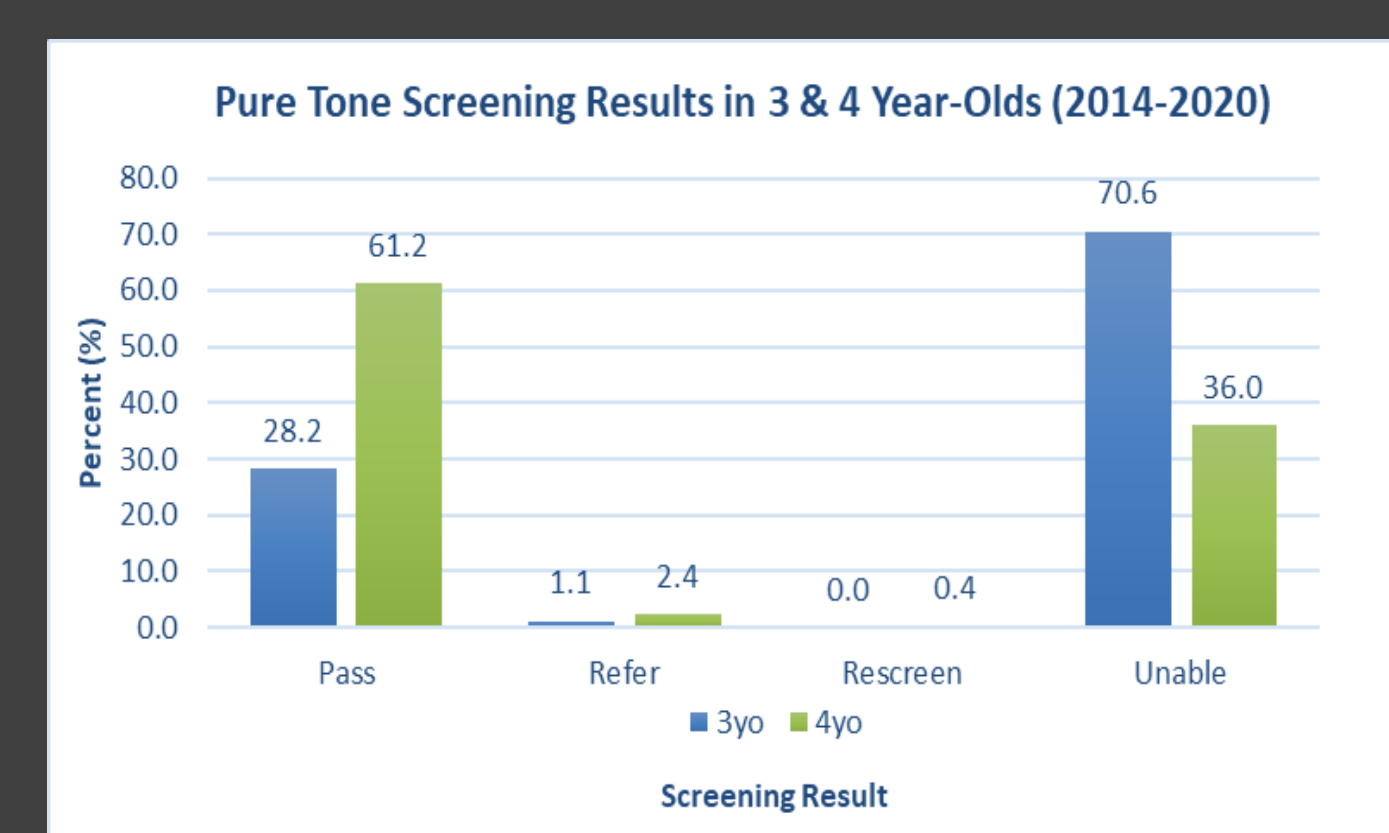


Table 1. depicts the results of a retrospective study on pure tone screening results from the KidScreen database.

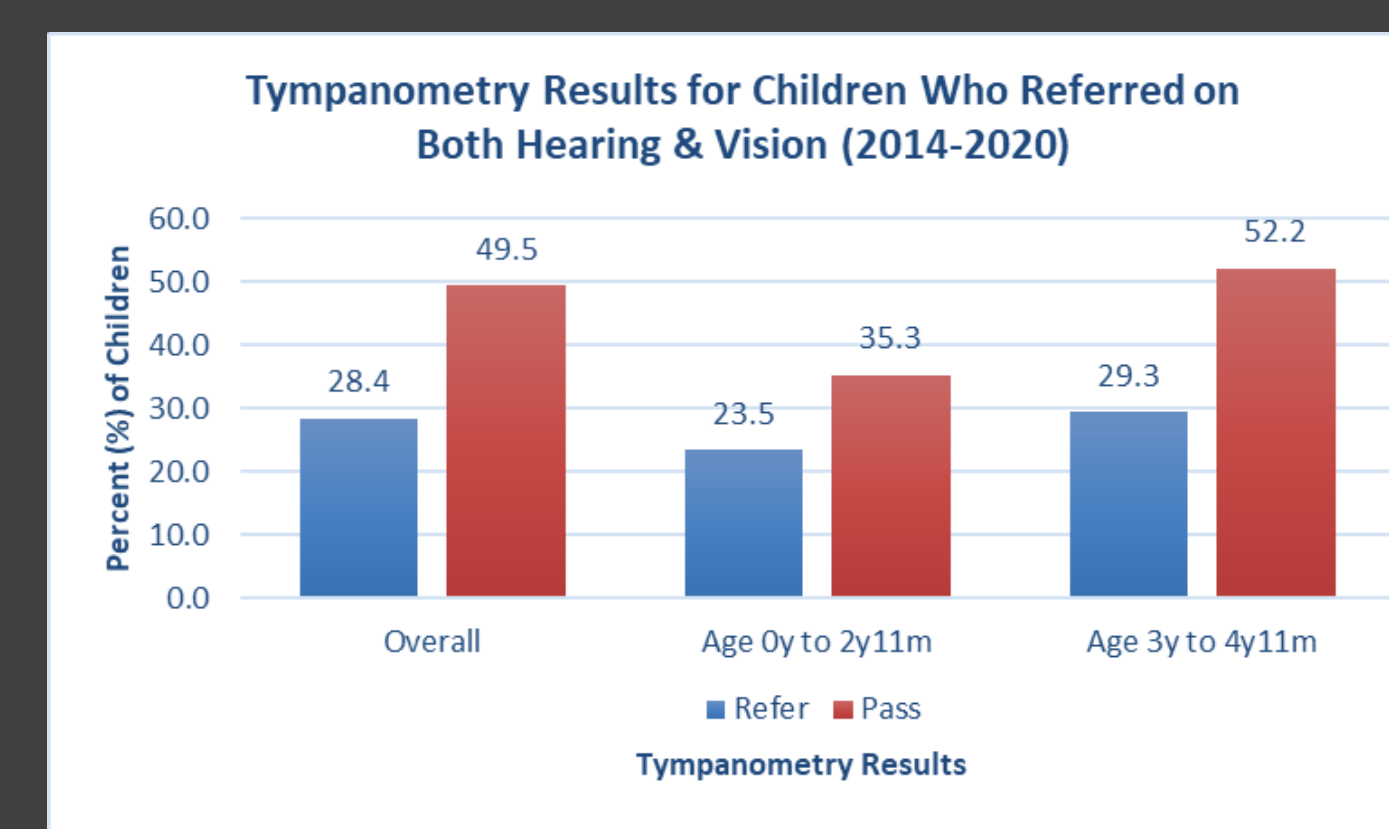


Table 2. shows the results from a retrospective review of KidScreen data following a referral on hearing screening and tympanometry results.

TYMPANOMETRY

Incidence of Abnormal Middle Ear Status:

A study from by Amir Minovi and Stefan Dazert (2014), stated that acute otitis media, a middle ear pathology, typically occurs between 3 months and 3 years of age. With approximately 80% of 3 year-olds experiencing otitis media at least once, and 40% of children having 6 bouts of otitis media within the first 7 years. Any abnormality to the middle ear cavity can result in a conductive hearing loss, which is typically temporary. ASHA states that experiencing a prolonged conductive hearing loss during development can have negative impacts on speech and language development.

Importance of Tympanometry:

The use of tympanometry can help determine the type of referral that is made following a screening. The MDC KidScreen protocol uses tympanometry to determine if an audiologic or medical referral is needed.

- Failed OAE or Pure Tone screening and **abnormal** tympanometry results requires a **medical** referral.

- Failed OAE or Pure Tone screening and **normal** tympanometry results requires and **audiologic** referral.

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SUMMARY & DISCUSSION

It is clear that routine hearing screenings are recommended by JCIH, ASHA, AAA, Head Start, EAA, and CDE for children, but implementation of preschool screenings is not mandated in most states. Maine, New York, Illinois, and Oregon all require screenings starting in preschool. Screenings should be completed or offered within the first 30 days of enrollment, for children 3 years and older. The recommended protocols for preschool age hearing screenings are inconsistent as indicated above and vary from state to state, and even program-to-program.

There is a notable increase in the incidence of hearing loss as children age when compared to newborn hearing screenings, therefore population-based hearing screenings should be completed for preschool age children. The protocol used for preschool age children should be age appropriate to be the most sensitive in identifying hearing loss. The suggested MDC protocol in Table 1 indicates that **OAEs should be used for 3 year-olds and Pure Tones should be used starting at 4 years of age**. Tympanometry is added for referrals to differentiate between a medical or audiologic referral depending on the middle ear status of a child.

In conjunction with hearing screenings, speech screenings are important to identify educationally significant speech challenges. Within the MDC KidScreen speech protocol, age-appropriate acquisition of vowels and consonants are evaluated as well as speech intelligibility and articulation. When there is a parental concern for speech and/or hearing, the child should be referred for a diagnostic evaluation completed by an audiologist or speech language pathologist.