



# The Prevalence of ADHD and LD in Children with Hearing Loss

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# ADHD and LD in School-Aged Children with Hearing Loss

- There are approximately 54 million school-aged children in the US
- ADHD and/or LD affect approximately 10% of these children
- An estimated 10-15% of all school-aged children have some type of hearing loss
  - Congenital
  - Progressive
  - Mild and unilateral
  - Fluctuating conductive losses due to OME
  - Noise induced
- The number of children with hearing loss who also have ADHD or LD is unknown



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# Diagnostic Criteria of ADHD

## Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)

- 6 or more symptoms of a list of inattentive behaviors
  - ◆ OR
- 6 or more symptoms of a list of hyperactivity / impulsivity behaviors
- These behaviors have been present for at least 6 months to a point that is disruptive and inappropriate for developmental level
- Hearing loss is not excluded

Several of the behaviors could easily be confused with signs of hearing loss



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# Diagnostic Criteria of Learning Disability

## Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR)

- A Learning Disorder (LD) is diagnosed when a child's achievement on individually administered standardized tests in reading, mathematics, or written expression is substantially below that expected for age, schooling, and level of intelligence
  - ***Substantially below* is usually defined as a discrepancy of more than 2 standard deviations between achievement and IQ.**
- The learning problems significantly interfere with academic achievement or activities of daily living that require the skills



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# Diagnostic Criteria of Learning Disability

## The 2004 amendments to the Individuals with Disabilities Education Act (IDEA)

- A disorder in 1 or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations
- Such term includes such conditions as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia
- Such term does not include a learning problem that is primarily the result of visual, **hearing**, or motor disabilities, or mental retardation, of emotional disturbance, or of environmental, cultural, or economic disadvantage



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# National Health and Nutrition Examination Survey (NHANES)

- Nationally representative sample
- Interviews and physical examinations – including audiological examination
- Very small sample size: approximately 5000 total sample size (adults and children) per year
- Conducted yearly since 1999
- Does not have a large enough sample size to cross hearing loss with ADHD or LD



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# National Survey of Children with Special Healthcare Needs (NS-CSHCN)

- State and local representative sample
- Telephone interviews
- Samples 750 children with special healthcare needs in 50 states and DC (38,000+)
- April 2005 – February 2007
- As a survey of children with healthcare needs, this data set does not allow for nationally representative estimates of prevalence



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# National Health Interview Survey (NHIS)

- Nationally representative sample
- In-person, household interview
- Approximately 50,000 households/ 100,000 people/ 9,000-13,000 sample children per year
- Collected annually with a major revision in 1997\
- The nature of the hearing loss and ADHD / LD questions introduce limitations to the study



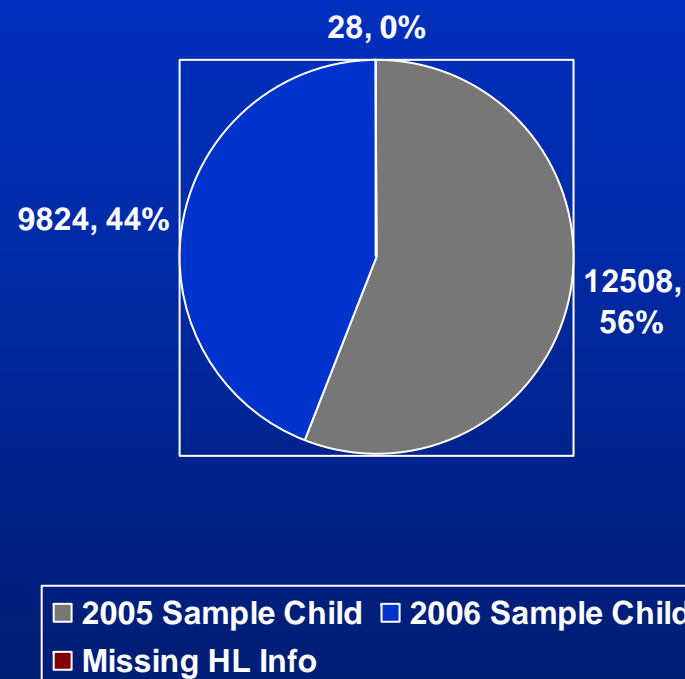
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# Methods

- NHIS 2005-2006 Sample
  - 22,360 Sample Children Total
    - ◆ 28 children were missing information on hearing question
  - Final n for analysis: 22,332 sample children
- Ages covered by condition questions
  - ADHD: 2-17 years
  - LD: 3-17 years
  - Hearing: 0-17 years

Proportion of Sample by NHIS Survey Year



## Slide 9

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s2

When we cross ADHD and hearing, we only use those 2-17 (limited by ADHD). When we cross LD and hearing we are limited to those 3-17 (limited by LD). The ear infections question is asked in two separate questions to be able to estimate rates for those 0-2 and 3-17. That's just the way the ear infection question is asked.

sfv1, 2/20/2008

# NHIS Questions

- Which statement best describes [child's] hearing without a hearing aid?
  - good, a little trouble, a lot of trouble, deaf\*
- Has a doctor or health professional ever told you [child] has Attention Deficit Hyperactivity Disorder (ADHD) or Attention Deficit Disorder (ADD)?
  - yes, no, refused, don't know
- Has a representative from a school or a health professional ever told you [child] had a learning disability?
  - Yes, no, refused, don't know

**Lot of trouble and deaf are combined for all statistical comparisons**



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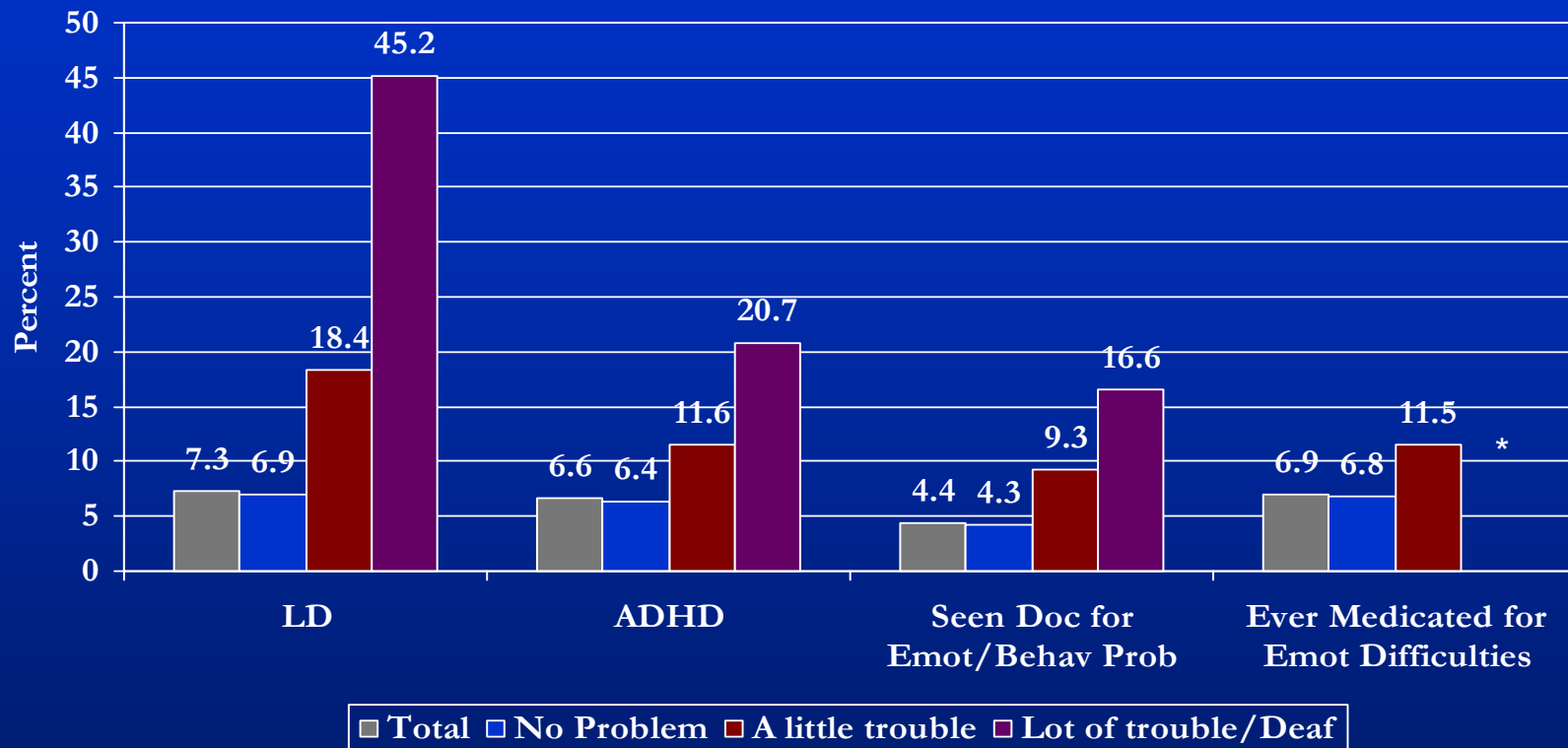
# Results: Prevalence of Conditions (Parent-Report)

- Prevalence of ADHD
  - 6.6%
- Prevalence of LD
  - 7.4%
- Prevalence of Probable Hearing Loss
  - No trouble: 96.9%
  - A little trouble: 2.7%
  - A lot of trouble: .19%
  - Deaf: .06%



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# Prevalence Estimates (per 100 youth) of Conditions by Hearing Group

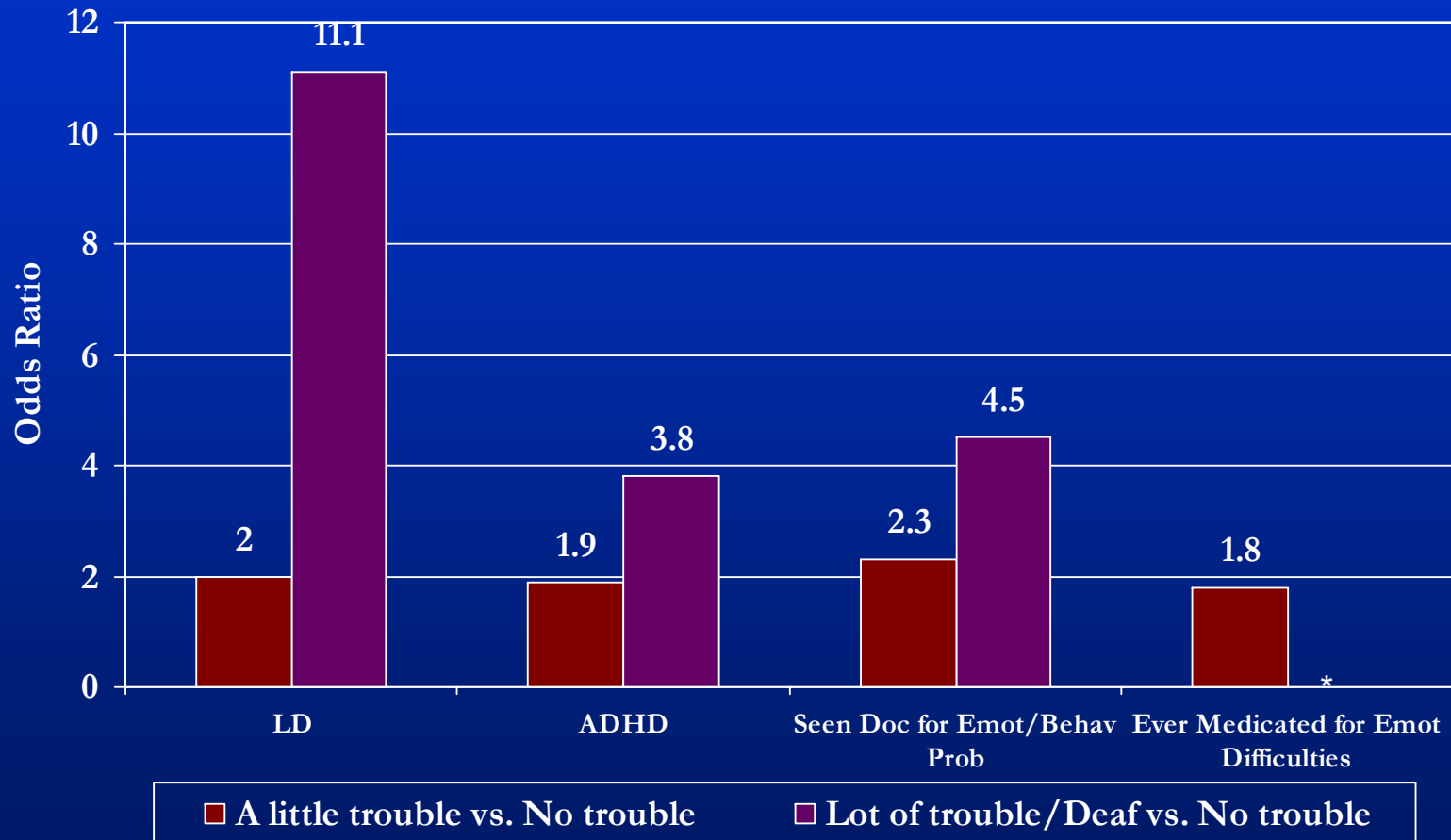


\* = Sample size prohibited statistical estimation



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## Odds of Having a Parent-Endorsed Condition Among Those with Probable Hearing Loss (referent = no trouble hearing)



\* = Sample size prohibited statistical estimation



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# Limitations

- Percentage of hearing loss is less than expected according to other studies – bias toward more severe losses
- Characteristics of the questions
  - Parent report
  - Does not ask about a *diagnosis* of hearing loss
- There is a possibility for misdiagnosis by the evaluator or misunderstanding by the parent
- The sequence of diagnoses is unclear
- No information on the criteria used for diagnosing ADHD or LD



# Diagnosis of ADHD

- A comprehensive diagnostic evaluation
  - Complete history and physical examination
  - Observation at home and school
  - Assessment tools – assessment from both parent and teacher
    - ◆ The Child Behavioral Checklist (CBCL)
    - ◆ Conners' Rating Scales Revised (CRS – R)
    - ◆ Vanderbilt ADHD Diagnostic Rating Scales
    - ◆ Behavioral Assessment System for Children (BASC 2)
  - Hearing screening/ assessment

**Symptoms of hearing loss can be very similar to symptoms of hearing loss**



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# Diagnosis of Learning Disabilities

- A comprehensive diagnostic evaluation
  - Complete history and physical examination
  - Nonverbal IQ tests on Standardized Instruments
    - ◆ PPS, Leiter-R, Performance section of the WISCII, non-verbal section of the K-ABC, TONI, Raven's Progressive Matrices
  - Language development
  - Achievement tests
  - Hearing screening/ assessment
  - Auditory Processing
  - Reading skills/ comprehension



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# Responsiveness To Intervention (RTI)

- **Tier 1:** High quality instructional and behavioral supports are provided for all student in general education
- **Tier 2:** Students whose performance and rate of progress lag behind those of peers in their classroom, school, or district receive more specialized prevention or remediation within general education
- **Tier 3:** Comprehensive evaluation is conducted by a multidisciplinary team to determine eligibility for special education and related services

[www.ldanatl.org/pdf/rti2005.pdf](http://www.ldanatl.org/pdf/rti2005.pdf)



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## Children with Hearing Loss - What are the Next Steps?

- Learn the signs - better define the signs of ADHD and LD seen in children with hearing loss
- Create awareness - parents, educators and health care providers need to become more vigilant in recognizing signs of ADHD and LD in children with hearing loss
- Improve diagnostic evaluations for children with hearing loss
- Promote research – both diagnosis and intervention



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