EHDI/AZEIP/ASDB:

COLLABORATING WITH EARLY INTERVENTION SERVICE COORDINATORS TO SUPPORT THE EHDI 1-3-6

June 19, 2018
11:00AM – 4:00PM

Black Canyon Conference Center
9440 North 25th Avenue, Phoenix, AZ 85021

ARIZONA DEPARTMENT
OF HEALTH SERVICES

Funding for this training is provided by CDC EHDI Data Integration Cooperative Agreement 17NUR3DD000076

TODAY’S TRAINING GOALS

Participants attending today’s training will learn and understand more about:

- The Early Hearing Detection and Intervention (EHDI) goals of 1-3-6
- Language acquisition and language opportunities
- Cultural sensitivity; using appropriate terminology
- The role of ASDB on IFSP teams
- How and when to properly complete Referral and IFSP date form
- How, when and where to report hearing screening results
- Identify hearing related resources for families
- The basics of hearing and the ear
- How to identify late onset and progressive hearing loss
- How to obtain OAE screening training
- Tips for successful transition to preschool

June 19, 2018 – Training Agenda

10:00AM-11:00AM: Registration/exhibitors

11:00AM-11:10AM: Welcome and introductions

11:10AM-11:30AM: What is newborn hearing screening and the Early Hearing Detection and Intervention (EHDI) 1-3-6

11:30AM-12:00PM: Cultural Sensitivity, Language acquisition and language opportunities

12:00PM-12:30PM: Break for lunch/visit exhibitors

12:30PM-1:15PM: ASDB services
  - The role of the Teacher of the D/hh
  - The D/hh Teacher and participation with Teams at IFSP's
  - The Deaf Mentor Program and Listening and Spoken Language Support
  - Services for Children with Unilateral Hearing Loss

1:15PM-1:45PM: Forms
  - Filling out the hearing screening tracking form and documenting hearing on IFSP
  - Filling out the IFSP and Referral date form GCI-1109

1:45PM-2:00PM: Resources for SC's and families
  - Raising Special Kids
  - Az Hands & Voices, Guide By Your Side (H&V, GBYS)
  - Ear Foundation of Az/Hear for Kids (EFAz)
  - Arizona Commission for the Deaf and Hard of Hearing (ACDHH)
  - Office for Children with Special Health Care Needs (OCSHCN)
  - Office of Newborn Screening (ONBS)
  - MSR West

2:00PM-2:15PM: Break/Visit Exhibitors

2:15PM-3:00PM: Audiology 101
  - Basics of hearing and the ear
  - Screening vs diagnostic testing
  - ENT vs Audiologist
  - Chronic Otitis Media and its impact on hearing and language
  - Permanent hearing loss
  - Technology—HA, BAHA, CI, Etc.
  - Risk factors
  - Late onset and progressive hearing loss

3:00PM-3:30PM: OAE hearing screening
  - How to get Training
  - Reporting requirements

3:30PM-3:55PM: Transition to Preschool
  - Exploring all of the options available

3:55PM-4:00PM: Closing/Questions?

June 19, 2018 – Session Descriptions

11:10AM-11:30AM:	**What is newborn hearing screening and the EHDI 1-3-6** Fran Altmaier and Lylis Olsen will introduce service coordinators to the Early Hearing Detection and Intervention "EHDI" 1-3-6 model and provide an overview of the Arizona Newborn Hearing Screening program. They will present information about and acknowledge the funding from CDC data integration grant that was used to fund today's event.
11:30AM-12:00PM:	**Cultural Sensitivity, Language acquisition and language opportunities** Sherri Collins from the Arizona Commission for the Deaf and Hard of Hearing will provide service coordinators with a foundation for ensuring cultural sensitivity when working with and talking about people who are Deaf or Hard of Hearing. The concepts of language acquisition and language opportunities will be explored and participants will learn about the value of early language development.
12:30PM-1:15PM:	**ASDB services** Melissa Hoel and Susan Price will teach services coordinators about the role of the Teacher of the d/hh. They will share ASDB's philosophy about communication opportunities and the way they assist families in the decision-making process. They will discuss the importance of the teacher's active participation with early intervention teams and their value in attending IFSP meetings. Participants will learn about the Deaf Mentor program that is offered to families as well as listening and spoken language support. Finally, they will review ASDB's role in providing services to children with a unilateral hearing loss. Service coordinators will leave this session feeling confident in knowing when and how to access ASDB services for their families.
1:15PM-1:45PM:	**Forms** Annie Converse and Fran Altmaier will review with service coordinators how to document hearing related needs on a child's IFSP. The "hearing screening tracking form" will be reviewed as to how to properly complete the form. In addition the new "Referral and IFSP date form" (GCI-1109) will be reviewed and instructions provided on when and how to complete it.
1:45PM-2:00PM:	**Resources for SC's and families** Sondi Aponte will introduce the exhibitors and the resources available from their agencies.
2:15PM-3:00PM:	**Audiology 101** Pediatric Audiologist, Lisa Akey will explain the basics of the anatomy of the inner ear and hearing. She will review with service coordinators the difference between a screening test and a diagnostic evaluation and the value in knowing which is needed, when. Dr. Akey will explain the difference between what an ENT does and what an Audiologist does. She will review chronic Otitis Media (ear infections) and its impact on hearing and language. Dr. Akey will also share a brief description of available technologies such as hearing aids, BAHA's and Cochlear Implants. Finally, she will describe for service coordinators common risk factors and what to look for with late onset and progressive hearing loss in infants and toddlers.
3:00PM-3:30PM:	**OAE hearing screening** Sonia Samaniego will review with service coordinators how to get OAE training. She will review reporting requirements and how to properly fill out the reporting forms.
3:30PM-3:55PM:	**Transition to Preschool** Laura Hocknull, Karie Taylor and Jenee Sisnroy will discuss considerations when planning transition to preschool. They will review community options as well as suggestions for who needs to be included in the planning and in the IEP team.

Presenter Biographies

(in alphabetical order by last name)

Lisa Akey, AuD

Dr. Akey is a Pediatric Audiologist at Maricopa Integrated Health System in Phoenix, AZ. She received her Bachelor of Science Degree in Speech Pathology and Audiology from the University of Nevada and her Doctoral Degree in Audiology from A.T. Still University in Mesa, AZ. She subsequently completed her residency at Resurrection Medical Center in Chicago, IL where she developed a screening protocol utilizing Auditory Brainstem Response and collected normative data for high risk infants. In addition to her work at MIHS, Dr. Akey is an Adjunct Professor and Clinical Preceptor for her alma mater, A.T. Still University. She works closely with Doctor of Audiology students in both the clinic and classroom to help further develop their skills. Dr. Akey enjoys giving back to the school that taught her so much. Dr. Akey is a fellow of the American Academy of Audiology and received her CCC-A from the American Speech and Hearing Association. She specializes in pediatric audiology and newborn hearing screening and diagnostics. Dr. Akey strongly believes in a patient centered approach to healthcare and is willing to adapt testing to fit the needs of her patients. In her free time, Dr. Akey enjoys spending time with her husband and three dogs - Zephyr, Bailey, and Lucy.

Fran Altmaier, BSW

Fran is the Case Management Coordinator for the Arizona Department of Health Services, Office of Newborn Screening follow up program. She is responsible for the oversight of follow up for newborns and infants with abnormal newborn screening results (both bloodspot and hearing). The focus of newborn screening is timely identification and enrollment in intervention services for children who screen positive. Fran has been with the newborn screening program for 6 years. Prior to joining the newborn screening program, Fran spent 18 years in early intervention with the Division of Developmental Disabilities as both a service coordinator and supervisor. This dual perspective of the EI system and the EHDI system is what has driven the goals for this training. She is the Project Director on the Cooperative Agreement from the CDC related to data integration within the EHDI system. This cooperative agreement has provided the funding for this training opportunity.

Sondi Aponte

As the Education and Outreach Manager in the Office of Newborn Screening, Sondi has the responsibility of ensuring Arizonans understand the importance of newborn screening, including the laws that govern hospital, provider, and laboratory responsibilities. She teaches best practice related to Bloodspot, Hearing and Critical Congenital Heart Defect Screening. Sondi also oversees outreach campaigns and social media, provides training, and coordinates partnership and project development activities for the department. As a passionate teacher with 20 years' experience, Sondi transferred to the public health sector about 11 years ago to work in The Department of Health Services. She is an active member of AzEHDI and serves as a project manager in the CDC Data integration grant, the funder for this event.

Sherri L. Collins, M.Ed.

A nationally recognized advocate for the Deaf and the Hard of Hearing, Sherri Collins became the Executive Director of the Arizona Commission for the Deaf and the Hard of Hearing (ACDHH), a position she has held since May 1998, where she acts as the Commission's chief executive officer by advocating, strengthening and implementing state policies affecting deaf and hard of hearing individuals, and their relationship to the public, industry, health care and educational opportunities. Ms. Collins has held positions as administrator at the North Carolina Division of Services for the Deaf and the Hard of Hearing and assistant director of the Gallaudet University Regional Center at Flagler College in St. Augustine, Fla. Collins has a Bachelor of Science degree in Child Development from Gallaudet University, Washington, DC. and a Master's in Education in Adult Education/Organizational Development from North Carolina State University. She served on the boards of National Association of State Agencies of the Deaf and Hard of Hearing, President, Phoenix College, Interpreter Preparation Program Advisory board, Chair; Arizona State Schools for the Deaf and the Blind, Board President and Secretary, Arizona Statewide Independent Living Council, the Arizona Center for Disability Law, Secretary and on National Association for the Deaf Board as Region IV Board Representative.

Annie Converse

Annie graduated from Arizona State University with a Bachelor of Science in Psychology. Annie has worked for DES under DDD for over 10 years in various roles including Service Coordinator, Early Intervention Unit Supervisor, and AzEIP Data Manager. Prior to arriving at DES, Annie worked as a children's case manager in behavioral health. Annie is a certified Master Coach and has demonstrated fidelity to coaching practices within early intervention. Her daughter received early intervention services until she was 3 years old. She is now 10 years old and thriving in elementary school. Early Intervention is Annie's passion and has been a rewarding experience.

Laura Hocknull, MSEd

Laura Hocknull has a MS in Deaf Education and a BS in Elementary Ed with early childhood endorsement. Laura has worked in the field of early intervention for 20 years, both as a service coordinator and hearing specialist. Additionally, Laura worked as an itinerant, middle, and high school teacher of the Deaf/hard of hearing for 8 years.

Melissa Hoel

Melissa is a teacher of the Deaf and Hard of Hearing. She has worked with the Early Childhood and Family Education Programs with ASDB since moving to Arizona in 1992, first as a part time Parent Advisor and now as a Hearing Specialist and Supervisor for the Southern part of the state. Melissa has her BA in Elementary Education and Deaf Education. Her MS is in Early Childhood Special Education. Her experience teaching in the public school setting and with the Cooperatives as an Itinerant teacher give her a unique perspective in the transition process and working with districts.

Lylis E. Olsen, MS, MPH, CCC

Lylis is a pediatric audiologist with a background in public health. She has been the Arizona Early Hearing Detection and Intervention Coordinator for more than 20 years during which time the state has gone from screening 7% of the newborns to more than 98% of all newborns by one month of age. Lylis also manages the HEAR for kids program for the EAR Foundation of Arizona (EFAz) and consults with EFAz Newborn Hearing Screening Follow up and the EFAz BASICS programs.

Susan Price, M.Ed.

Susan is a teacher of the Deaf/Hard of Hearing at the Arizona State Schools for the Deaf and the Blind. She currently provides services in Region 8--Teams 2 & 3, Region 9--Teams 1 & 3 and Region 15-- (both Cochise and Graham/Greenlee) as the Hearing Specialist. Susan has been with ASDB for 22 years and has been in the field of Deaf Education for 36 years. Prior to Arizona, she worked in Maryland, Connecticut and Pennsylvania.

Sonia Samaniego

Sonia Samaniego serves as the Education and Advocacy Program Manager for the Office of Children with Special Healthcare Needs. She is an Executive Committee Member for the Interagency Coordinating Council (ICC) for Infants and Toddlers as well as a member of the National Center for Hearing Assessment and Management (NCHAM) Advisory Committee. Mrs. Samaniego is bilingual and has over 15 years of experience working with community partners, families, stakeholders and providers for families of children with special healthcare needs. Sonia's experience includes serving culturally diverse and underserved populations. Sonia has served as a Bilingual Parent/Family advocate for families of children with Sensory needs along with Early Childhood Screening and Sensory Training within the community. Sonia has family members with special healthcare needs that include Deafness, Blindness, and other health conditions that have stemmed her passion of advocating and supporting families and individuals with Special Healthcare needs. Mrs. Samaniego continues to serve and develop awareness for the Newborn Hearing Screening and Sensory Programs within the State of Arizona.

Jenee Sisnroy

Jenee is currently the Part C Coordinator for the Arizona Early Intervention Program (AzEIP) facilitating the implementation of Arizona's Individuals with Disabilities Education Act (IDEA) Part C Program. She has worked within AzEIP for nearly 10 years serving in multiple roles working directly to support families eligible for AzEIP and as the lead for implementing AzEIP on a state level. Jenee has extensive experience in working with young children and their families and currently facilitates AzEIP agency level supports through coaching, policy implementation and facilitation across state systems.

Karie Taylor, M. ED Early Childhood Special Education

Karie has been involved in the field of early childhood for many years. She has worked in child care, Head Start, preschool special education, and early intervention. Karie worked for the Department of Economic Security for years as a Continuous Quality Improvement Coordinator and then as the Assistant Director of the Arizona Early Intervention Program. Karie retired from State service in November of 2017. More recently, she has joined the Sunrise Therapy Services, Arizona Early Intervention Program as their Program Manager.

ARIZONA DEPARTMENT OF ECONOMIC SECURITY
Arizona Early Intervention Program (AzEIP)

CONSENT TO SHARE EARLY INTERVENTION REFERRAL AND INITIAL IFSP DATE

I,______________________________, give my informed consent for the Arizona Early Intervention Program, including AzEIP team-based service provider, Division of Developmental Disabilities (DDD) Service Coordinator, and/or Arizona School for the Deaf and Blind (ASDB) team member, to release and share information (in writing and/or conversation) regarding:

____ *Child's full name*

_______________________ *Date of birth*

To the person/agency:

Arizona Department of Health Services-Office of Newborn Screening
Email to: hearing@azdhs.gov or **Fax to:** (602) 364-1495

Sharing AzEIP Referral Date: _________________

Sharing Initial Individualized Family Service Plan (IFSP) Date: ___________________

For the purpose of: As part of newborn screening, the Arizona Department of Health Services receives hearing screening information for all children in Arizona. This information is used to identify newborns or infants who are referred to the Arizona Early Intervention Program who are as deaf or hard of hearing and have an initial IFSP. This helps ensure infants and their families receive the necessary resources and supports.

Annually, the information on the number of children with different levels of hearing, including those who were referred to AzEIP and had an IFSP, is reported to the Center for Disease Control. Only aggregate numbers are shared; personally identifiable information is never released as part of this report.

I have read and understand the conditions of this release. I understand that I have agreed to disclose the information only to the person/program listed above, and that the person/program may not disclose personally identifiable information to anyone else without my prior written consent. This is a one-time consent to share this information and is valid for 6 months.

____ *Print or type Full Name of Parent(s)/ Responsible Party*

_________________ *Relationship to Child*

____ *Signature of Parent(s)/Responsible Party*

_________________ *Date*

This form is only to be used to send Early Intervention referral and enrollment information to the Arizona Department of Health Services, Office of Newborn Screening.

ADHS
PREPAREDNESS

A message from the Office of Newborn Screening

What is EHDI PALS (Early Hearing Detection & Intervention Pediatric Audiology Links to Services)?

An easy-to-use online directory matching hearing services to children's needs. For hearing tests and other hearing related services, go to: http://www.ehdipals.org

What information does EHDI PALS provide?

This site has information about hearing (audiology) services for children of all ages. The services and staff listed have the right equipment and skills to serve children.

How can I access it?

EHDI PALS is easy to use. Click "Find a Facility" to answer a few questions that take you to the services and staff closest to you.

What are some of the resources the website provides?

Click on "Parent Resources" to find questions to ask about your child's appointment. It also tells you about hearing programs in Arizona.

Click on "Other Helpful Websites" for national and state parent support groups and other resources related to childhood hearing loss and testing.

Each year in the United States, more than 12,000 babies are born deaf or hard of hearing; most have two hearing parents. Hearing loss can affect a child's ability to develop communication, language, and social skills. The earlier children with hearing loss start getting services, the more likely they will reach their full potential*.

*Adapted from the Centers for Disease Control and Prevention website – www.cdc.gov

ADHS
PREPAREDNESS

A message from the Office of Newborn Screening

Pérdida de la Audición: Directorio por Internet para Padres de Familia y Proveedores

¿Qué es EHDI PALS (*Early Hearing Detection & Intervention Pediatric Audiology Links to Services)*?

Son las siglas de un directorio por Internet fácil de usar para combinar los servicios de la audición con las necesidades de los niños. Para las pruebas de la audición y otros servicios auditorios afines, vaya a la página de Internet http://www.ehdipals.org

¿Qué información proporciona EHDI PALS?

Esta página de Internet cuenta con información sobre servicios de audición (audiología) para niños de todas las edades. Los servicios y el personal que se enumeran en la misma cuentan con el equipo y las destrezas indicadas para servir a los niños.

¿Cómo puedo obtener acceso?

EHDI PALS puede usarse con facilidad. Haga clic en el enlace “Find a Facility” para responder a ciertas preguntas que le guiarán al personal y a los servicios que más cercanos le queden.

¿Con qué recursos cuenta esta página de Internet?

Haga clic en el enlace "Parent Resources" para enterarse de las preguntas que debe hacer acerca de la cita médica de su niño o niña. También le informa acerca de varios programas de la audición disponibles en Arizona.

Haga clic en el enlace "Other Helpful Websites" para enterarse de grupos nacionales y estatales de apoyo a los padres de familia y otros recursos afines a la pérdida y las pruebas de la audición paras niños.

En los Estados Unidos, cada año nacen más de 12,000 bebés sordos o con dificultades para oír; la mayoría tienen dos padres que pueden oír bien. La pérdida de la audición puede afectar la capacidad de los niños para desarrollar destrezas de comunicación, del idioma y de tratos sociales. Mientras más pronto los niños con pérdida de la audición comiencen a recibir servicios, más probable será que alcancen su potencial pleno.*

*Adaptado de la página de Internet de los Centros de Control y Prevención de Enfermedades – www.cdc.gov

THE EAR FOUNDATION®
OF ARIZONA

HEAR for Kids

Vouchers

- Eligibility
    - Do not have to be a legal resident but must live in Arizona
    - Families who are enrolled in AHCCCS, KidsCare do not qualify
    - Families eligible but still working on enrollment in AHCCCS or KidsCare may qualify
    - Insured families may qualify if their insurance does not cover hearing
    - Exceptions can be made for unusual circumstances
- Download application in English or Spanish at www.earfoundationaz.com
- Fill out the application and either fax to 602-296-0425 or scan and email to hearforkids@earfoundatonaz.com or mail to EFAz 326 East Coronado Suite 203 Phoenix Az 85004
- A voucher will be sent by fax or secure email
- Find a local audiologist at www.EHDI-PALS.org
- Make an appointment with an audiologist (tell them you have a HEAR for Kids voucher)
- Most audiologists participate and accept the voucher as payment in full
- Vouchers cover one visit if additional visits are needed contact HEAR for Kids program manager

Sample Eligiblity Criteria

Income

Total Household income for the past 12 months: $_________________________

Include: Wages/salary, Pension, Social Security, Child Support and any other income.

Expenses

Number of family members living in the household:______________

Total Allowed Deductions for the past 12 months: $________________________

Include: Total medical/dental not paid for by health insurance or third party, Annual rent or mortgage payment, Annual payments for primary vehicle, Dependent Care. For dependant care, use the following calculations:

Number of children in childcare ____ x $200 x number of months ____=____

Number of incapacitated adults receiving care ____x$100 x number of months ____=____

Determine eligibility by subtracting the amount in the Expenses section from the amount in the Income section and reviewing the following chart (based on 150% of federal poverty, current as of 5/18)

Number in Family	*Annual Income*	*Number in Family*	*Annual Income*	*Number in Family*	*Annual Income*
1	*$18,210*	3	*$31,170*	5	*$44,130*
2	*$24,690*	4	*$37,650*	6	*$60,610*

Contact hearforkids@earfoundationaz.com 602-753-5273(phone) 602-296-0425 (fax)

Applications can be found at www.earfoundationaz.com

EHDI Program Update
CDC's Progress in Detecting Infant Hearing Loss

CDC's Early Hearing Detection and Intervention (EHDI) has made clear progress in supporting the early identification of deaf and hard of hearing (DHH) infants.

The earlier children with hearing loss are identified and start getting intervention, the more likely they will reach their full potential.

Hearing Professionals use These Important 1-3-6 Benchmarks

1 **Before one month of age:** ***Hearing Screening***

3 **Before three months of age:** ***Hearing evaluation***

6 **Before six months of age:** ***Early Intervention***

Hearing screening is the first hearing service to determine if a baby has hearing loss.

Hearing evaluation is a comprehensive test to determine the severity of hearing loss.

Identifying hearing loss early is important

- Hearing loss is one of the most common birth defects.
- Each year 12,000 infants are born deaf or hard of hearing (DHH).
- When left undetected, a hearing loss can delay a child's speech and language development, as well as his or her thinking, learning, and social skills.
- Newborn hearing screening and intervention programs can save nearly $200 million in additional education costs annually[1].

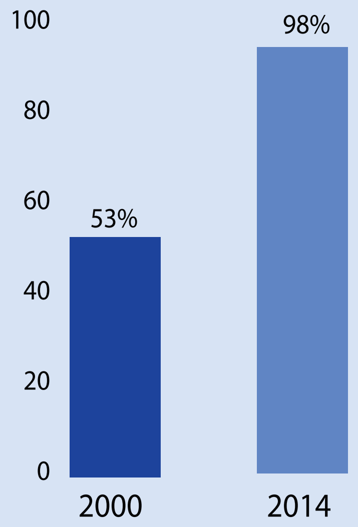
How CDC is helping to make progress

- CDC is responsible for collecting and analyzing EHDI data from across the United States.
- The CDC EHDI program provides technical assistance to all states and territories to help support the early identification of DHH infants.
- CDC funds the development and use of systems and data tools that help states and territories ensure DHH children receive essential services:
  - Hearing screening
  - Hearing evaluation
  - Early intervention
- Nearly all newborns are screened for hearing loss, usually before leaving the hospital.

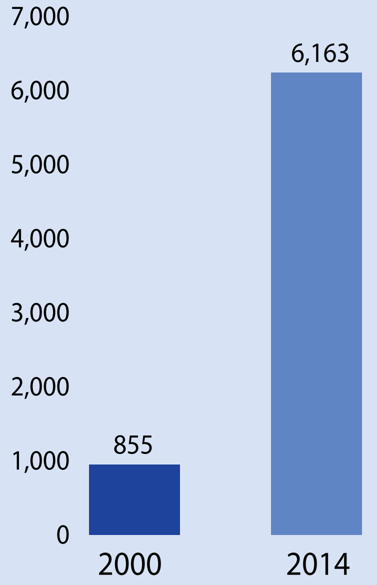
National Center on Birth Defects and Developmental Disabilities
Division of Human Development and Disability

CS280652

Percent of infants screened for hearing loss has nearly doubled[2]



Number of infants identified early as DHH has increased



CDC's data shows clear progress in identifying infants

- The percentage of infants who received needed follow-up to determine if they were DHH increased from only 36% in 2005 to 66% in 2014.
- Better systems and tools are helping states and territories ensure more DHH infants receive the follow-up testing they need to be identified early.

CDC supports states and strengthens partnerships

- CDC coordinates with partners and leverages advances in health information technology. This work supports states and territories in the collection, use, and dissemination of standardized data.
- CDC funds 45 states and territories to develop and improve data information systems, which help make sure all infants receive recommended services.

Next steps for CDC EHDI

- Expand the capacity of states and territories to collect and use complete and accurate data.
- Update and promote the use of national standards on information exchange and electronic quality measures.
- Support research to study the impact and effectiveness of infants' hearing screening and follow-up activities.

Continued efforts are needed to:

- Ensure all DHH infants are diagnosed early by documenting that they have received critical screening, testing, and early intervention services.
- Generate timely data analyses to assess and support ongoing progress.
- Strengthen information exchange between health information systems.
- Provide technical assistance to states and territories to support the enhancement and use of their data systems.

For more information

visit: www.cdc.gov/ncbddd/hearingloss

email: ehdi@cdc.gov

call: 800-CDC-INFO

Follow us on Twitter: @CDC_NCBDDD

Find detailed data maps at

www.cdc.gov/ncbddd/hearingloss/dash-intro.html

References:

[1] Gross, SD. Education cost savings from early detection of hearing loss: New findings. Volta Voices 2007; 14(6):38-40

[2] Data obtained from **CDC Hearing Screening and Follow-up Survey** at www.cdc.gov/ncbddd/hearingloss/ehdi-data.html2 Data obtained from CDC **Hearing Screening and Follow-up Survey** at www.cdc.gov/ncbddd/hearingloss/ehdi-data.html

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Early Hearing Detection and Vocabulary of Children With Hearing Loss

Christine Yoshinaga-Itano, Allison L. Sedey, Mallene Wiggin and Winnie Chung
Pediatrics 2017;140;
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American Academy of Pediatrics
DEDICATED TO THE HEALTH OF ALL CHILDREN™

Early Hearing Detection and Vocabulary of Children With Hearing Loss

Christine Yoshinaga-Itano, PhD,[a] Allison L. Sedey, PhD,[a,b] Mallene Wiggin, PhD,[a] Winnie Chung, AuD[c]

abstract

BACKGROUND AND OBJECTIVES: To date, no studies have examined vocabulary outcomes of children meeting all 3 components of the Early Hearing Detection and Intervention (EHDI) guidelines (hearing screening by 1 month, diagnosis of hearing loss by 3 months, and intervention by 6 months of age). The primary purpose of the current study was to examine the impact of the current EHDI 1-3-6 policy on vocabulary outcomes across a wide geographic area. A secondary goal was to confirm the impact of other demographic variables previously reported to be related to language outcomes.

METHODS: This was a cross-sectional study of 448 children with bilateral hearing loss between 8 and 39 months of age (mean = 25.3 months, SD = 7.5 months). The children lived in 12 different states and were participating in the National Early Childhood Assessment Project.

RESULTS: The combination of 6 factors in a regression analysis accounted for 41% of the variance in vocabulary outcomes. Vocabulary quotients were significantly higher for children who met the EHDI guidelines, were younger, had no additional disabilities, had mild to moderate hearing loss, had parents who were deaf or hard of hearing, and had mothers with higher levels of education.

CONCLUSIONS: Vocabulary learning may be enhanced with system improvements that increase the number of children meeting the current early identification and intervention guidelines. In addition, intervention efforts need to focus on preventing widening delays with chronological age, assisting mothers with lower levels of education, and incorporating adults who are deaf/hard-of-hearing in the intervention process.

FREE

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Dr Yoshinaga-Itano conceptualized and designed the study and drafted components of the initial and final manuscript; Dr Sedey participated in the conceptualization and design of the study, oversaw the collection of the data, conducted the statistical analysis, and had a major role in the written manuscript as submitted; Dr Wiggin participated in the review of the literature, assisted in data collection, drafted sections of the initial manuscript, and participated in editing of the final manuscript as submitted; Dr Chung conducted the initial literature review, supplied critical background material for the study, and critically reviewed the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

The views in this article are those of the authors and do not necessarily represent the official views of the Disability Research and Dissemination Center or the Centers for Disease Control and Prevention.

DOI: https://doi.org/10.1542/peds.2016-2964

WHAT'S KNOWN ON THIS SUBJECT: Previous research has supported the beneficial effects, within a restricted geographic area, of a single component of the Early Hearing Detection and Intervention system (ie, hearing screening, early identification, or early intervention).

WHAT THIS STUDY ADDS: This multistate study demonstrates the significant, positive impact on vocabulary outcomes of meeting all 3 criteria of the Early Hearing Detection and Intervention guidelines (screening by 1 month, identification by 3 months, and early intervention by 6 months of age).

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Significant delays in language acquisition are consistently reported for children who are deaf or hard of hearing.[1–3] Universal newborn hearing screening (UNHS) and programs based on the Early Hearing Detection and Intervention (EHDI) guidelines were established in the United States to expedite diagnosis and treatment of hearing loss with the hope of mitigating these delays. The Joint Committee on Infant Hearing has recommended universal hearing screening by 1 month of age, diagnosis of hearing loss by 3 months of age, and enrollment in early intervention by 6 months of age.[4] These recommendations are commonly referred to as the EHDI 1-3-6 guidelines.

Recent epidemiologic cohort studies conducted in England and Australia have reported better language outcomes for children born in areas of the country or during years in which UNHS had been implemented compared with cohorts of children born before UNHS,[5,6] with long-term benefits in reading ability also reported.[7] Comparing a group screened at birth with those who received a behavioral screen at 9 months of age, researchers in the Netherlands reported better scores on a quality-of-life measure for the UNHS group but no significant group differences in language outcomes.[8] This may be because the UNHS group received amplification at the relatively late mean age of 15.7 months. In the United States, researchers have reported more favorable language outcomes for children whose hearing loss was identified earlier,[9] who received hearing aids earlier,[3] or who began intervention services at an earlier age.[10,11] Collectively, the majority of previous research has supported the beneficial effects of early identification and intervention. However, many of these studies were conducted within a restricted geographic area and/or included an age of confirmation of hearing loss within the "early" group that was relatively late by today's standards, and in all studies, grouping was based on only a single component of the EHDI program (screening, identification, or intervention).

TABLE 1 Number of Participants From Each NECAP State

State of Residence	No. of Participants
Arizona	78
California	37
Florida	8
Idaho	88
Indiana	41
Maine	14
North Dakota	8
Oregon	1
Texas	66
Utah	55
Wisconsin	32
Wyoming	20

To date, no studies have reported vocabulary or other language outcomes of children meeting all 3 components of the EHDI guidelines. The primary purpose of this study was to examine the impact of the current EHDI 1-3-6 guidelines on vocabulary outcomes across a wide geographic area. A secondary goal was to confirm the impact of other demographic variables (chronological age, additional disabilities, degree of hearing loss, presence of an adult who is deaf or hard of hearing in the home, and mother's level of education) previously reported to be related to language outcomes.

METHODS

Participants

This was a cross-sectional study of 448 children with bilateral, prelingual hearing loss between 8 and 39 months of age (mean = 25.3 months, SD = 7.5 months). All of the children were participating in the National Early Childhood Assessment Project (NECAP). This project, supported by the Centers for Disease Control and Prevention, is a multistate effort to examine developmental outcomes of young children with hearing loss. Participants lived in 12 different states (see Table 1).

Participants included children with (18%) and without (82%) additional disabilities judged by their parents and/or early interventionists to interfere with speech and/or language development. Cognitive impairment was reported in 58% of those who had additional disabilities (see Table 2). The primary written language used in the home was English (88%) or Spanish (12%). The communication modes used with the children and additional demographic characteristics are summarized in Table 3.

Information regarding hearing loss (onset, degree, and amplification) is presented in Table 4. Preliminary analyses found that independent variable effects were significantly different for children with auditory neuropathy spectrum disorder (ANSD) compared with those without ANSD. The small number of children with ANSD (n = 26) prevented adequately exploring or controlling for these differences, so these children were not included in this study.

The participants' hearing loss was confirmed through diagnostic audiologic testing at a mean age of 4.1 months. All children were enrolled in an early intervention program (mean age of enrollment = 7.0 months). Slightly over half of the participants (58%) met the

1-3-6 guidelines. Of the 258 children who met the 1-3-6 guidelines, 58% also met a stricter 1-2-3 criteria (screening by 1 month of age, identification by 2 months of age, and intervention by 3 months of age).

All of the children participating in the NECAP who met the participant criteria are included in the study. Although it is unknown to what extent the eligible population of each participating intervention program were invited and agreed to participate in the NECAP, the demographics of this sample are consistent with the Gallaudet Research Institute national survey of 37 828 students who are deaf or hard of hearing in terms of sex, ethnicity, primary language at home, degree of hearing loss, type of amplification, and communication mode used by the family.[12] Compared with the Gallaudet results, this sample included a smaller percentage of children who were African American (5% vs 16%), a higher percentage of children who had a parent who was deaf and/or hard of hearing (17% vs 9%), and a smaller percentage of children with additional disabilities (18% vs 39%). This is not surprising because, initially, only children without additional disabilities were included in the current study. Additionally, the Gallaudet national survey included students through 12th grade, allowing more time for additional special needs to be identified.

This project was approved by the Institutional Review Board at the University of Colorado Boulder. All families provided written informed consent.

TABLE 2 Additional Disabilities and Percentage of Occurrence (Based on the 81 Children Who Were Reported to Have One or More Additional Disabilities Thought to Impact Speech and/or Language Development)

Disability	Percentage of Participants
Cognitive	58
Motor	44
Vision	40
Brain damage	12
Cleft lip and/or palate	12
Seizures	12
Cerebral palsy	11
Sensorimotor integration	9
Balance	7
Emotional and/or behavioral	6
Autism spectrum disorder	4
Other	23

Percentages total to more than 100% because some participants had more than 1 additional disability.

TABLE 3 Participant and Family Characteristics

Characteristic	Percentage of Participants
Sex	
Male	53
Female	47
Ethnicity	
Non-Hispanic	68
Hispanic	32
Race	
White	87
African American	5
Asian	3
Native American	2
Other	3
Communication mode used with the child	
Primarily spoken language	74
Spoken language only	30
Spoken language with occasional use of sign language	44
Sign language and spoken language	22
Sign language only	4
Hearing status of the parent	
Both parents hearing	83
One or both parents deaf and/or hard of hearing[a]	17
Mother's highest educational degree	
Less than bachelor's degree	71
Less than high school	13
High school	38
Vocational	8
Associate's	12
Bachelor's degree or higher	29
Bachelor's	22
Graduate	7

[a] Of the parents who were deaf or hard of hearing, approximately half used sign language when communicating with their child.

Procedures

The participants' expressive vocabulary was measured by using the MacArthur-Bates Communicative Development Inventories.[13] This norm-referenced assessment has been extensively validated with typically developing children[14,15] as well as those with a variety of different disabilities,[16,17] including hearing loss.[18,19] Families in which the language of the home was Spanish completed the Spanish version of this instrument.[20] Expressive vocabulary ability was selected as the dependent variable because vocabulary size and rate of word learning are important predictors of later language and academic skills.[21,22]

TABLE 4 Characteristics of the Participants' Hearing Loss

Characteristic	Percentage of Participants
Age of onset of hearing loss	
Congenital	90
Late onset (before 2 y of age)	6
Unknown	4
Degree of hearing loss	
Mild to moderate	57
Mild (26–40 dB HL)	35
Moderate (41–55 dB HL)	22
Moderately severe to profound	43
Moderately severe (56–70 dB HL)	15
Severe (71–90 dB HL)	8
Profound (>90 dB HL)	20
Type of amplification	
None	11
Hearing aids	68
Cochlear implant	13
Bone conduction hearing aid	5
Hearing aid and cochlear implant	3

The degree of hearing loss was determined by using the better-ear pure tone average, that is, the average of hearing thresholds at 500, 1000, and 2000 Hz. HL, hearing level.

TABLE 5 Description of the Coding of the Independent Variables Included in the Regression Model

Independent Variable	Coding of Variable
Chronological age	Treated as a continuous variable in 1 mo increments
Disability status	0 = no additional disabilities 1 = additional disabilities
Adherence to the 1-3-6 EHDI guidelines	0 = does not meet 1 = meets
Adult who is deaf or hard of hearing in the home	0 = not present 1 = present
Maternal level of education	0 = less than a bachelor's degree 1 = bachelor's degree and higher
Degree of hearing loss	0 = mild to moderate 1 = moderately severe to profound

In keeping with the administration instructions in the test manual for populations with language delays, the level of the inventory administered (Words and Gestures versus Words and Sentences) was determined on the basis of the interventionists' and/or caregivers' estimate of the child's vocabulary size rather than chronological age.[13] For the participants in all but 1 state, the appropriate MacArthur-Bates inventory was given to the family by their early interventionist. In the remaining state, the inventory was mailed to the family's home. The MacArthur-Bates Communicative Development Inventories list a variety of early-developing words arranged in different semantic categories. The child's primary caregiver was instructed to mark all of the words that his or her child produced spontaneously in spoken and/or sign language. The form was then reviewed by the child's early interventionist for completeness and accuracy and sent to the NECAP staff for scoring.

Scoring of all assessments was completed by 1 person and checked by a second person. Disagreements in scoring were corrected by consensus. Total raw scores were calculated by counting the number of words a child produced regardless of modality (spoken or signed). Raw scores were converted to vocabulary age scores by using the procedure described in the test manual. To examine each participant's expressive vocabulary age score relative to his or her chronological age, vocabulary quotients (VQs) were calculated by dividing the child's vocabulary age by his or her chronological age and multiplying by 100. A VQ of 100 indicated that a child's vocabulary age was commensurate with his or her chronological age.

All families and/or their interventionist completed a demographic form, which included information such as the caregivers' level of education. Audiologic records were used to determine the degree of hearing loss. For data analysis, the participants' demographic characteristics were categorized as detailed in Table 5.

RESULTS

The mean VQ for the 448 children was 74.4 (SD = 20.3). When considering the 367 children with no additional disabilities, the mean VQ was 77.6 (SD = 19.7). For the 81 participants with additional disabilities, the mean was 59.8 (SD = 15.6).

To explore the relationships between vocabulary ability and the demographic variables, Pearson product-moment correlations were computed. As detailed in Table 6, there was no significant relationship between VQ and sex or between VQ and language of the home (Spanish versus English). Significant correlations were obtained between VQs and the remaining demographic variables.

Multiple linear regression analysis was used to identify predictors of variance in the participants' VQs. Sex and language of the home were initially included in the model to confirm that they were not significantly related to VQs when controlling for other demographic factors. These variables remained nonsignificant and were removed from the final model. The primary

TABLE 6 Correlations Between VQ and Demographic Variables

	1	2	3	4	5	6	7	8	9
1. VQ	—	—	—	—	—	—	—	—	—
2. Chronological age	−0.50 **	—	—	—	—	—	—	—	—
3. Disability status	−0.34 **	0.05	—	—	—	—	—	—	—
4. Meets EHDI	0.27 **	−0.17 **	−0.10 *	—	—	—	—	—	—
5. Adult who is deaf or hard of hearing	0.21 **	−0.11 *	−0.15 **	0.09	—	—	—	—	—
6. Level of education[a]	0.14 **	0.01	−0.02	0.08	0.02	—	—	—	—
7. Degree of hearing loss[b]	−0.11 *	0.03	−0.02	0.04	0.06	0.05	—	—	—
8. Sex	0.02	−0.02	−0.05	−0.02	−0.09	0.003	−0.07	—	—
9. Language of home[c]	0.01	0.07	−0.02	0.17 **	0.13 **	0.17 **	0.01	−0.04	—

[a] Level of education: below bachelor's degree versus bachelor's degree or higher.

[b] Degree of hearing loss: mild to moderate versus moderately severe to profound.

[c] Language of the home: English versus Spanish.

* $P < .05$, 2-tailed.

** $P < .01$, 2-tailed.

independent variable was whether the child met all 3 components of the EHDI 1-3-6 guidelines. Five additional independent variables were entered into the regression equation to explore and control for other factors known from previous research to be related to vocabulary outcomes. The overall model was significant ($F_{6,441}$ = 51.0, $P < .0005$) and explained 41% of the variance in the children's expressive vocabulary abilities (see Table 7). All 6 predictor variables made a significant, independent contribution to the model.

On the basis of the results of the regression, and as shown in Fig 1, mean VQs were shown to decrease as chronological age increased. Although absolute vocabulary size increased with participant age, the gap between chronological and vocabulary age was greater for older children, resulting in lower VQs.

Higher VQs were predicted by the absence of additional disabilities, higher maternal level of education, lesser degrees of hearing loss, and the presence of a parent who was deaf and/or hard of hearing in the home. Even when controlling for these factors, meeting EHDI 1-3-6 guidelines was a significant predictor of vocabulary outcomes. The standardized β weight of .16 indicates that meeting EHDI guidelines had a meaningful impact on vocabulary outcomes in addition to being statistically significant. In comparing the children who met the EHDI guidelines to those who did not, there was a 12-point difference in mean VQ. Mean VQ comparisons across all of the independent predictors are presented in Fig 2.

To determine if the impact of meeting EHDI guidelines had a differential effect across various demographic subgroups, 5 interaction terms (meets EHDI × each of the remaining 5 independent variables) were created and evaluated within separate regression models that retained all 6 of the main effect variables. In all cases, the main

TABLE 7 Multiple Regression Predicting MacArthur Expressive VQ

Participant Characteristics	Standardized Coefficient	Unstandardized Coefficient	*t* test Value	*P*
Chronological age	−0.44	−1.19	−11.80	<.0005
Disability status	−0.29	−14.97	−7.65	<.0005
Meets EHDI guidelines	0.16	6.42	4.19	<.0005
Mother's level of education	0.12	5.50	3.37	.001
Degree of loss	−0.12	−4.79	−3.19	.002
Adult who is deaf/hard of hearing	0.11	5.74	2.86	.004

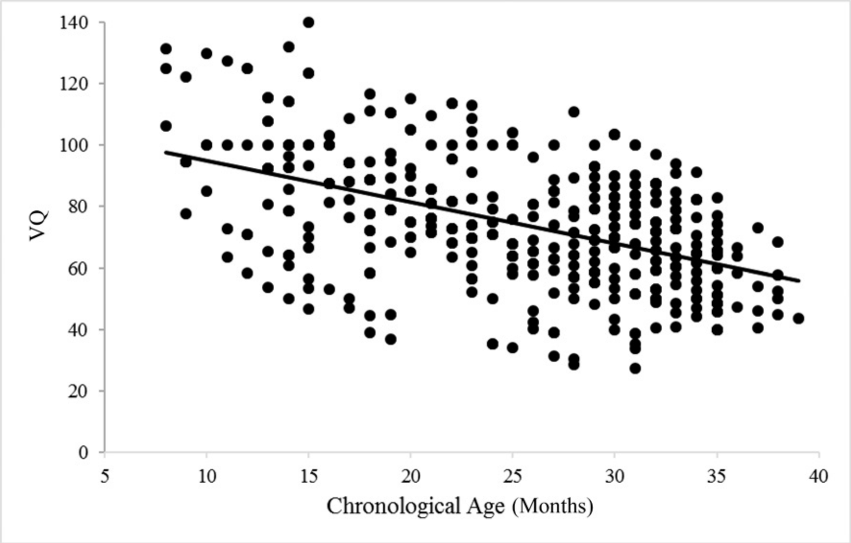

FIGURE 1
VQs for participants as a function of chronological age.

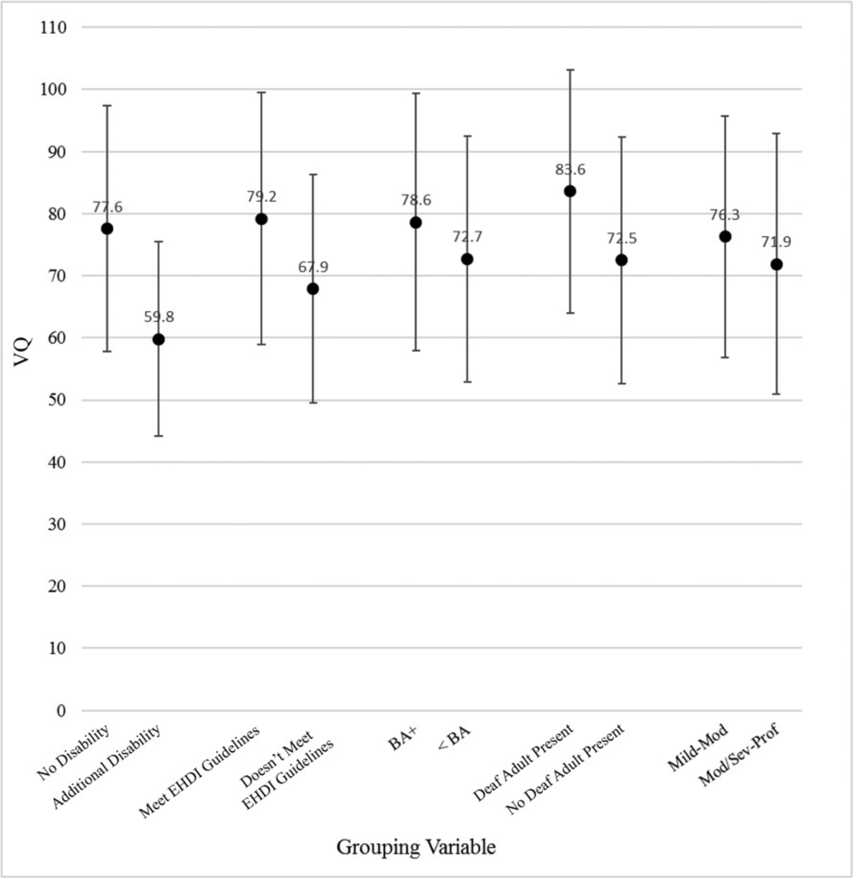

FIGURE 2

Mean VQs and SD bars of subgroups on the basis of significant independent variables from the regression analysis (all participants included). BA +, Bachelor's degree or higher; Mild-Mod, mild to moderate hearing loss; Mod/Sev-Prof, moderately severe to profound hearing loss; < BA, less than a Bachelor's degree.

effects remained significant, and the interaction term was not significant ($P > .05$). Thus, it appears that the benefits of meeting EHDI guidelines in terms of vocabulary outcomes are consistent across children with a wide range of demographic characteristics. Although there was no significant interaction between EHDI and disability status, to examine vocabulary performance in children with hearing loss without additional disabilities, mean comparisons across the different independent variables are presented for this no-additional-disabilities subgroup in Fig 3.

To examine possible differences among children who did not meet the EHDI guidelines, participants were divided into 4 groups: (1) meets both the identification and intervention criteria, (2) meets identification by 3 months but not intervention by 6 months, (3) meets intervention by 6 months but not identification by 3 months, and (4) does not meet either criteria. A one-way analysis of variance was conducted with VQ as the dependent variable and EHDI category as the independent and/or grouping variable. The main effect was significant ($F_{3,437} = 11.26$, $P < .0005$). The results of Scheffe post hoc tests revealed the group that met all EHDI criteria performed significantly better than the other 3 groups ($P < .05$ across all comparisons). There was no significant difference in any of the post hoc pairwise comparisons among the remaining 3 groups ($P = .94$ to .99). See Table 8 for means and SDs of the 4 groups.

DISCUSSION

This large, multistate study is the first to explore the benefits of meeting all 3 components of the EHDI 1-3-6 guidelines on the vocabulary outcomes of children with bilateral hearing loss. Higher VQs were associated with meeting EHDI guidelines even when controlling for a variety of other factors previously reported to impact language development. The lack of significant interactions indicated that the benefits of meeting the guidelines were consistent across a variety of demographic subgroups.

Despite the benefits for children who met the EHDI guidelines, the mean VQ of children without additional disabilities who met EHDI guidelines was 82, considerably less than the expected mean of 100. Particularly concerning is that 37% of this subgroup had VQs <75 (ie, below the 10th percentile). Although this percentage is substantially better than for those who did not meet EHDI guidelines (64% without additional disabilities had VQs <75), it points to the importance of identifying additional factors that may lead to improved vocabulary outcomes.

The percentage of children in the "meets EHDI" group who fell below the 10th percentile is similar to that reported by Vohr et al,[10] who also used the MacArthur-Bates Communicative Development Inventory (43% of their early-identified 18- to 24-month-olds fell below the 10th percentile). Several studies have used the Child Development Inventory to measure the language skills of children with hearing loss.[8,9,23] Direct comparisons with these studies cannot be drawn given that the Child Development Inventory yields substantially higher scores in children who are deaf or hard of hearing than the MacArthur-Bates

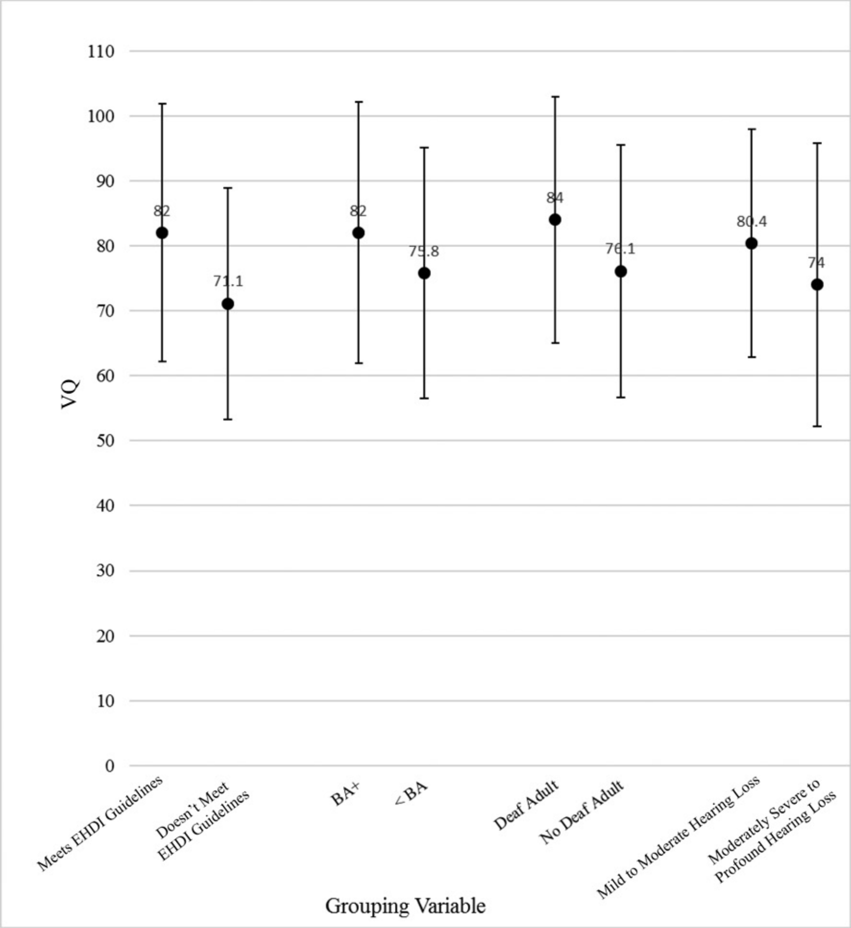

FIGURE 3

Mean VQs and SD bars of subgroups on the basis of significant independent variables from the regression analysis (only children without additional disabilities included). BA +, Bachelor's degree or higher; Mild-Mod, mild to moderate hearing loss; Mod/Sev-Prof, moderately severe to profound hearing loss; < BA, less than a Bachelor's degree.

TABLE 8 Mean VQs and SDs for 4 EHDI Groups

EHDI Group	Mean	SD
Identified by 3 mo; intervention by 6 mo	79.2	20.3
Identified by 3 mo; intervention after 6 mo	66.7	16.7
Identified after 3 mo; intervention by 6 mo	68.7	20.3
Identified after 3 mo; intervention after 6 mo	68.9	18.8

Communicative Development Inventory (on average by 11 quotient points).[24]

The variables in this study associated with higher VQs are consistent with previous reports that found better vocabulary and other language outcomes to be related to the absence of additional disabilities,[25] lesser degrees of hearing loss,[3,10,26] the presence of a parent who is deaf or hard of hearing,[26,27] and higher maternal education.[28] The association of lower VQs with increasing chronological age complements previous findings that, even when early-identified, children with hearing loss fail to match the vocabulary acquisition trajectory of children who are hearing.[10,29,30] This suggests that many children with hearing loss fail to keep pace with the exponentially increasing vocabulary growth demonstrated by hearing children as they move beyond 18 months of age (ie, from producing an average of 9 new words per month to 40 words per month).[13]

Comparing children without additional disabilities who were younger than and older than 24 months of age revealed a 19-point difference in their mean VQs (younger group = 88.9; older group = 69.9). This significant drop is important to consider when describing the vocabulary abilities of children between birth and 3 years of age. Specifically, mean scores may be misleading because they are likely to underrepresent the abilities of younger children and overrepresent the abilities of older children. The low mean VQ of older children is concerning. This mean is well below the 10th percentile, indicating a significant risk for continued, substantial language delays. Awareness of the magnitude of typical growth is critical when setting early intervention goals for young children with hearing loss, and studies exploring strategies to increase the effectiveness of early intervention are needed.

One such strategy that warrants further investigation is how to most effectively include adults who are deaf or hard of hearing in the intervention process. This strategy is supported by the finding that better vocabulary outcomes were apparent in children for whom one or both parents were deaf or hard of hearing. Although this finding may be due in part to a quicker emotional adjustment to having a child with hearing loss and, for those parents who used sign language, to a fluent command of the language, it is also likely that these parents (who included both those who did and did not use sign language) have firsthand knowledge of effective communication strategies that can maximize vocabulary acquisition.

Examining the contribution of parental communication mode to expressive vocabulary acquisition is an additional area that warrants future exploration. Given that families may change their communication approach over time and, if they choose to use sign language, are likely to vary in the extent and fluency with which sign language is used over time, this question is best explored in future research through a longitudinal design.

A limitation of this study is that only a single aspect of language was examined: expressive vocabulary. Future studies should consider additional components of language, including comprehension, syntax, and pragmatics. A second limitation is that disability status was determined by parent and/or interventionist report. It is likely that some children in the "no disability" group actually had an additional disability that was not yet apparent to their parent and/or interventionist. A further limitation is the potential for selection bias. Because of the nature of the data collection process, it was not possible to compare children and/or families who chose to participate in the study with those who declined. However, given the close correspondence between the characteristics of the present sample and the results of the Gallaudet Research Institute survey,[12] this sample appears to be representative of the population of children living in the United States who are deaf or hard of hearing.

CONCLUSIONS

The results of this study underscore the importance of current efforts to decrease the age at which children are identified with hearing loss and enrolled in early intervention. Given that, across the participating states, only one-half to two-thirds of children met the EHDI 1-3-6 guidelines, much work still needs to be done to ensure that all children are screened by 1 month of age, diagnosed with hearing loss by 3 months of age, and enrolled in intervention by 6 months of age. This requires a team approach that includes newborn screening personnel, audiologists, early interventionists, and state-based EHDI surveillance programs that monitor and facilitate timely transition from screening to diagnosis to intervention. Pediatricians and other pediatric medical professionals are critical members of this team. Parents look to their child's primary care providers for advice, and these professionals have the ability to motivate families whose children have not passed a hearing screen to seek timely assessment of their child's hearing and prompt enrollment in intervention when hearing loss is confirmed.

The independent variables in the current study explained only 41% of the variance in vocabulary outcomes. Given that a substantial proportion of the children performed below the average range, understanding additional factors that influence vocabulary development is critical. Future studies should examine variables such as family involvement, parent–child interaction, compliance with amplification use, intensity of intervention services, and characteristics of early intervention providers and programs. In addition, examining factors that influence vocabulary acquisition rates within a longitudinal design may provide additional information that can support improved outcomes for children who are deaf or hard of hearing.

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ABBREVIATIONS

ANSD: auditory neuropathy spectrum disorder
EHDI: Early Hearing Detection and Intervention
NECAP: National Early Childhood Assessment Project
UNHS: universal newborn hearing screening
VQ: vocabulary quotient

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Early Hearing Detection and Vocabulary of Children With Hearing Loss

Christine Yoshinaga-Itano, Allison L. Sedey, Mallene Wiggin and Winnie Chung

Pediatrics 2017;140;
DOI: 10.1542/peds.2016-2964 originally published online July 8, 2017;

Updated Information & Services	including high resolution figures, can be found at: http://pediatrics.aappublications.org/content/140/2/e20162964
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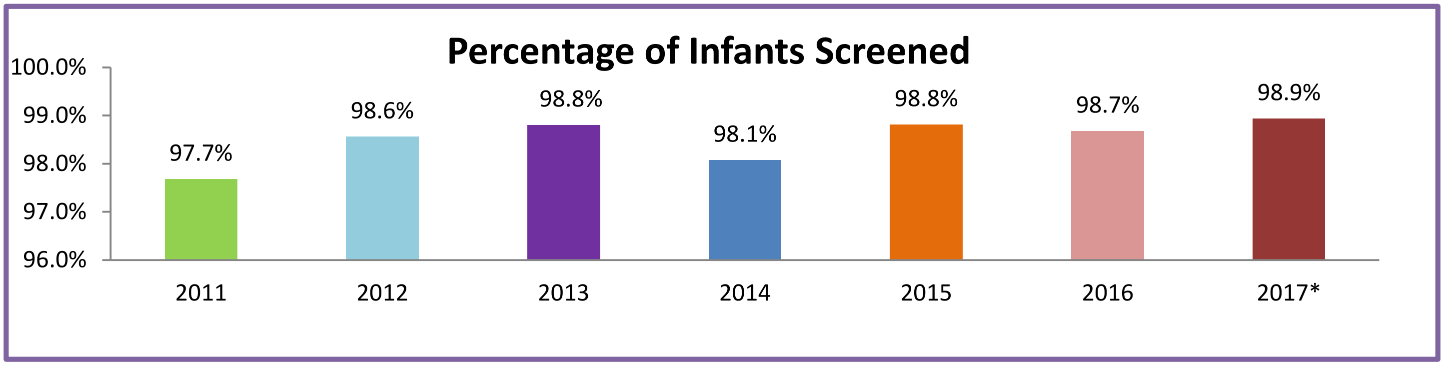
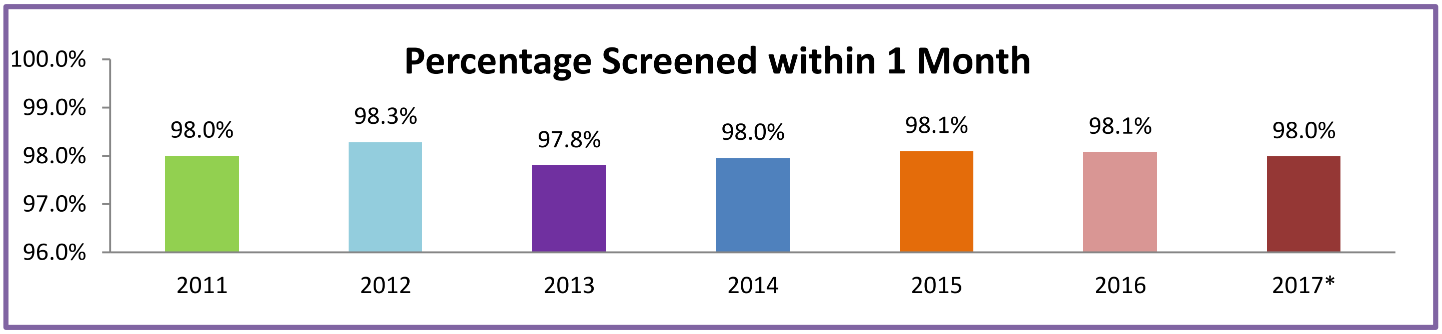
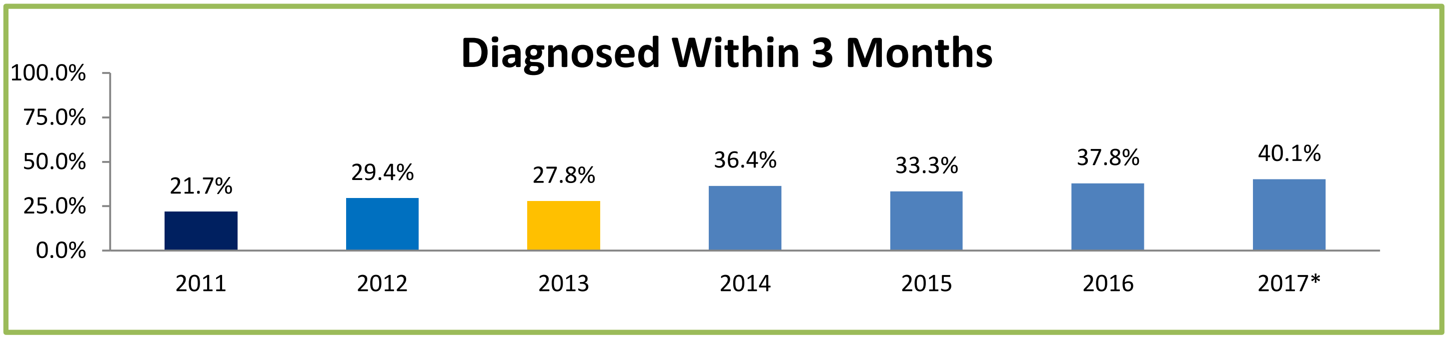
Office of Newborn Screening EHDI Outcome Data


Percentage of Infants Screened


Percentage Screened within 1 Month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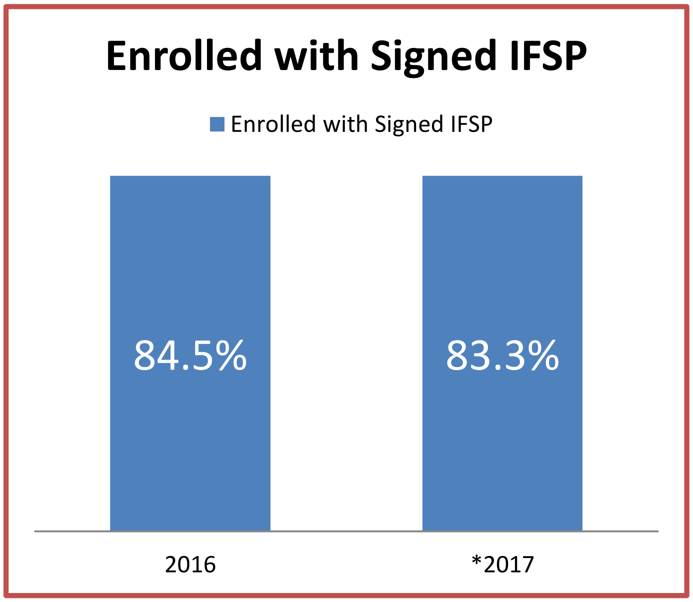
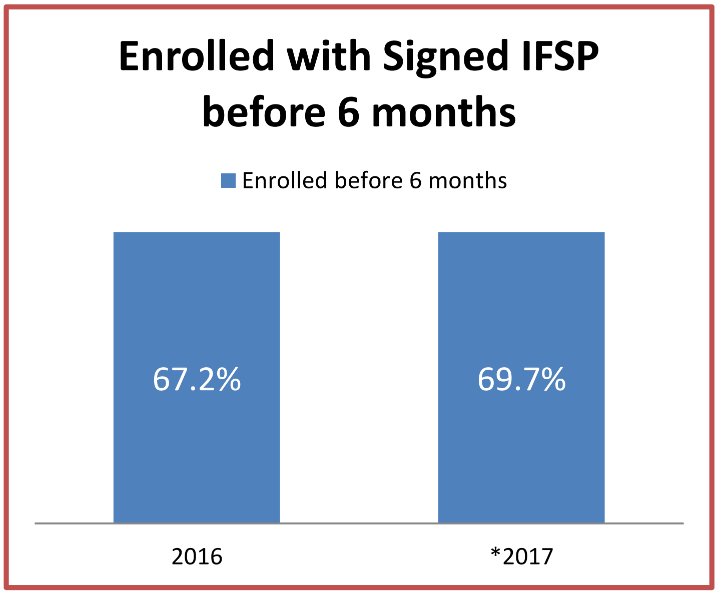

Enrolled with Signed IFSP


Enrolled with Signed IFSP before 6 months

*** Preliminary Data**

as of June, 2018

May 2018

Summary of 2016 National CDC EHDI Data

Data Source: 2016 CDC EHDI Hearing Screening & Follow-up Survey (HSFS)

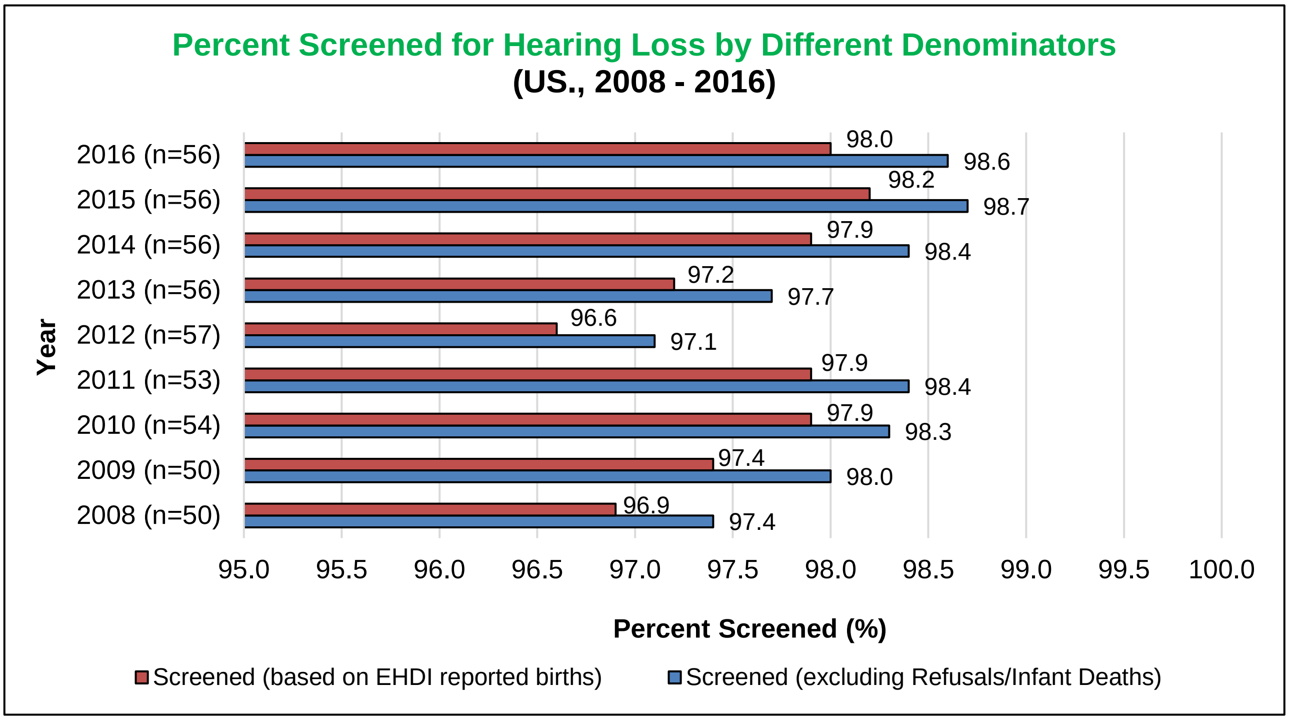
Number of Respondents: **56**[α] (*49 states, 7 territories*) AL, AK, American Samoa, AZ, AR, CA, Commonwealth of the Northern Mariana Islands, CT, DE, District of Columbia, FL, GA, Guam, HI, ID, IL, IN, IA, KS, KY, LA, ME, Marshall Islands, MD, MA, MI, Micronesia, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, Palau, PA, Puerto Rico, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI, WY

2016 Documented EHDI Data Items	
Total Occurrent Births (*according to state & territorial EHDI programs*)	**3,830,526**
Documented Hearing Screening	
Percent Screened	**98.0%** (n = 3,755,784) *(Range: 82.5% - 100.0%)*
o Percent Screened (*excluding infant deaths & parental refusals*)	98.6%
o Percent Screened before 1 Month of Age	94.8% (n = 3,559,949)
Percent Not Passing final / most recent screening	1.7% (n = 65,156)
No Documented Hearing Screening	
Percent w. No Documented Screening:	**2.0%** (n = 74,742)
o Overall Percent Loss to Follow-up (LFU) / Loss to Documentation (LTD) for Screening[∞] ▪ *LFU/LTD = # Parents/Family Contacted but Unresponsive (1,489) + # Unable to Contact (1,051) + # Unknown (26,067)*	**0.7%** (n = 28,607) *(Range: 0.0 – 17.1%)*
Documented Diagnosis	
Percent Diagnosed	**62.7%** (n = 40,835) *(Range: 1.1% - 89.2%)*
o Percent with No Hearing Loss (*i.e., no diagnosed hearing loss*)	52.9% (n = 34,498)
o Percent with Hearing Loss	9.7% (n = 6,337)
o Percent Diagnosed (*normal hearing* + *hearing loss*) before 3 Months of Age	75.9% (n = 30,983)
Prevalence of Hearing Loss	**1.7 per 1,000 screened**
No Documented Diagnosis	
Percent w. No Documented Diagnosis:	**37.3%** (n = 24,322)
o In Process	2.5% (n = 1,607)
o Infant Died / Parents Declined	3.2% (n = 2,069)
o Non-Resident / Moved	2.6% (n = 1,676)
o Overall Percent Loss to Follow-up (LFU) / Loss to Documentation (LTD) for Diagnosis[∞] ▪ *LFU/LTD = # Parents/Family Contacted but Unresponsive (4,708) + # Unable to Contact (2,675) + # Unknown (9,139)*	**25.4%** (n = 16,522) *(Range: 0.0 – 98.9%)*
▪ Percent LFU / LTD for Diagnosis: Due to Unable to Contact and Unknown	**18.1%** (n = 11,814)
▪ Percent Unresponsive for Diagnosis: Due to Parents/Family Contacted but Unresponsive	**7.2%** (n = 4,708)
Other Cases of Hearing Loss	
Number of Additional Cases (*e.g., late-onset hearing loss & infants not screened at birth*)	n = 452
Number of Cases of Non-Permanent / Transient Hearing Loss	n = 1,964
Documented Referral to Early Intervention (EI)	
Percent Referred to Part C EI *(of those with hearing loss)*	87.9% (n = 5,569)
Percent Not Referred to Part C and Unknown *(of those with hearing loss)*	9.9% (n = 626)
Documented Enrollment in EI	
Percent Enrolled in EI *(Part C & Non-Part C)* o *Enrolled in EI = # in Part C EI (4,121) + # in Non-Part C EI (139)*	**67.2%** (n = 4,260) *(Range 0.0% - 100.0%)*
o Percent Enrolled in EI before 6 Months of Age *(Part C & Non-Part C)*	**67.3**% (n = 2,869)
No Documented Enrollment in EI	
Percent w. No Documented EI Services	**32.2%** (n = 2,043)
o Infant Died / Parents Declined	8.9% (n = 567)
o Non-Resident / Moved	2.0% (n = 126)
o Not Eligible for Part C Services	0.9% (n = 59)
o Overall Percent Loss to Follow-up (LFU) / Loss to Documentation (LTD) for EI[∞] ▪ *LFU/LTD = # Parents/Family Contacted but Unresponsive (134) + # Unable to Contact (280) + # Unknown (825)*	**19.6%** (n = 1,239) *(Range 0.0 – 100.0%)*
▪ Percent LFU / LTD for EI: Due to Unable to Contact and Unknown	**17.4%** (n = 1,105)
▪ Percent Unresponsive for EI: Due to Parents/Family Contacted but Unresponsive	**2.1%** (n = 134)

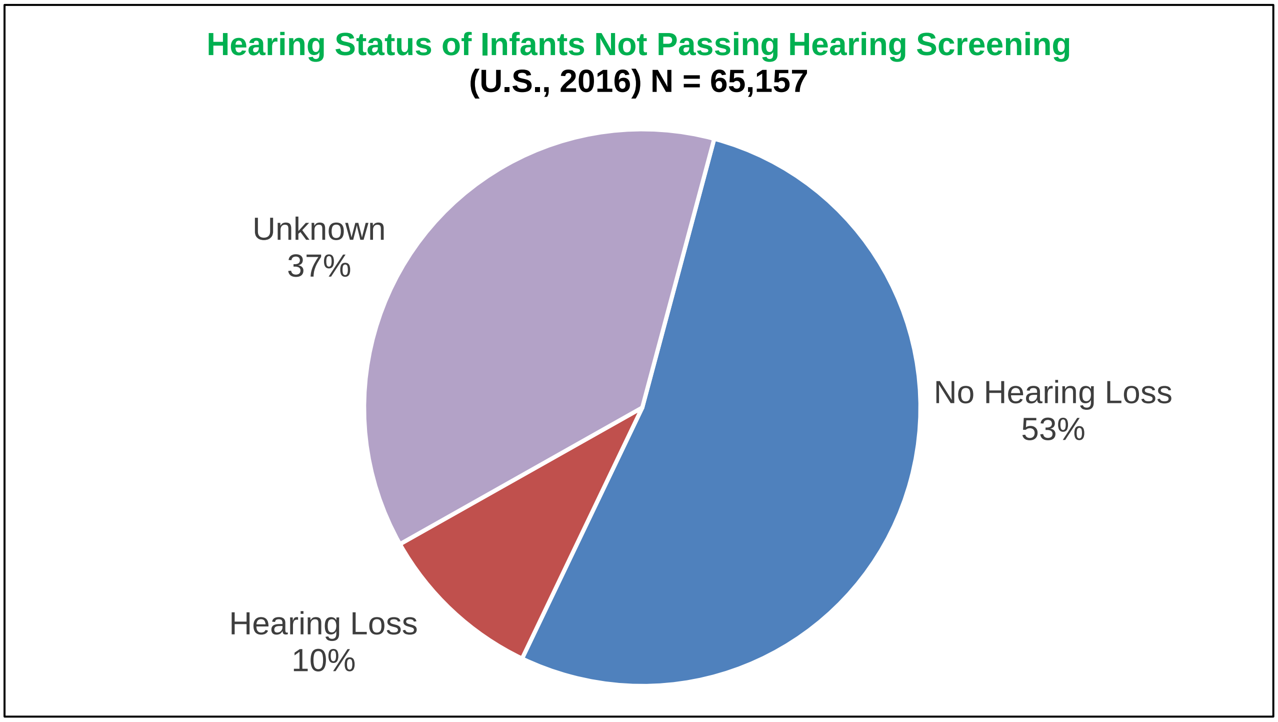
Notes: [α]All 56 states and territories responded to all parts of the survey [∞]Respondents had the option to either use the revised definition or previous version for the field "*Parents/Family Contacted but Unresponsive*." 39 jurisdictions used the revised definition for the 2016 HSFS.

For summaries by jurisdiction please visit: www.cdc.gov/ncbddd/hearingloss/ehdi-data.html

Summary of 2016 National CDC EHDI Data

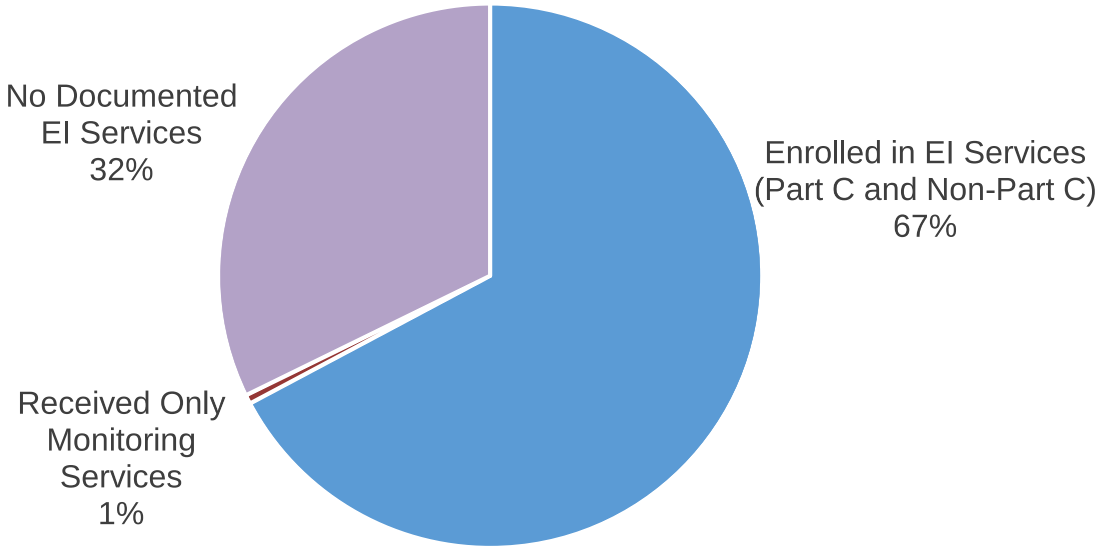


Percent Screened for Hearing Loss by Different Denominators
(US., 2008 - 2016)



Hearing Status of Infants Not Passing Hearing Screening
(U.S., 2016) N = 65,157

Summary of 2016 National CDC EHDI Data



Documented Intervention Status of Infants with Hearing Loss
(U.S., 2016) Total w. Hearing Loss = 6,337

NOTES

NOTES

Thank you to the planning committee for the time and effort needed to plan this conference!

Fran Altmaier

Sondi Aponte

Sherri Collins

Annie Converse

Kathy Levandowsky

Lylis Olsen

Sonia Samaniego

Barb Schrag

Jenee Sisnroy

Thank you to The Office for Children with Special Health Care Needs for providing funding for CART and interpreter services!

ARIZONA DEPARTMENT
OF HEALTH SERVICES