

From Screening to Language: How EHDI Timeliness Shapes Deaf Children's Outcomes: California Case Study

Introduction

- Congenital hearing loss is one of the most common developmental disabilities, affecting approximately 2 infants per 1,000 live births in the United States (Grosse et al., 2017)
- The program was established in response to high incidence rates of children with congenital hearing loss identified later in life, as late as age 4 or 5, resulting in delays in language and child development (Shulman et al., 2010)
- Delays in hearing loss diagnosis can lead to major health issues, such as delayed speech and language development, cognitive and academic delays, reduced literacy outcomes, and social and emotional challenges. (Shojaei et al., 2016; Yoshinaga-Itano et al., 1998)
- Studies show that DHH infants with lower socioeconomic status are more likely to not access early intervention services timely and poorer vocabulary production (Khetani et al., 2017; Yoshiunaga-Itano et al., 2017)
- Research shows that meeting EHDI benchmarks timely will increase DHH infants' spoken language outcomes (Grey et al., 2021)
- Promoting timely natural language acquisition is critical to ensuring DHH children's future developmental and literacy outcomes (Humphries et al., 2012; Hall et al., 2017)
- Language Equality and Acquisition for Deaf Kids is a policy framework that increases accountability for tracking DHH children's language outcomes and ensuring kindergarten readiness (LEAD-K Family Services, n.d)

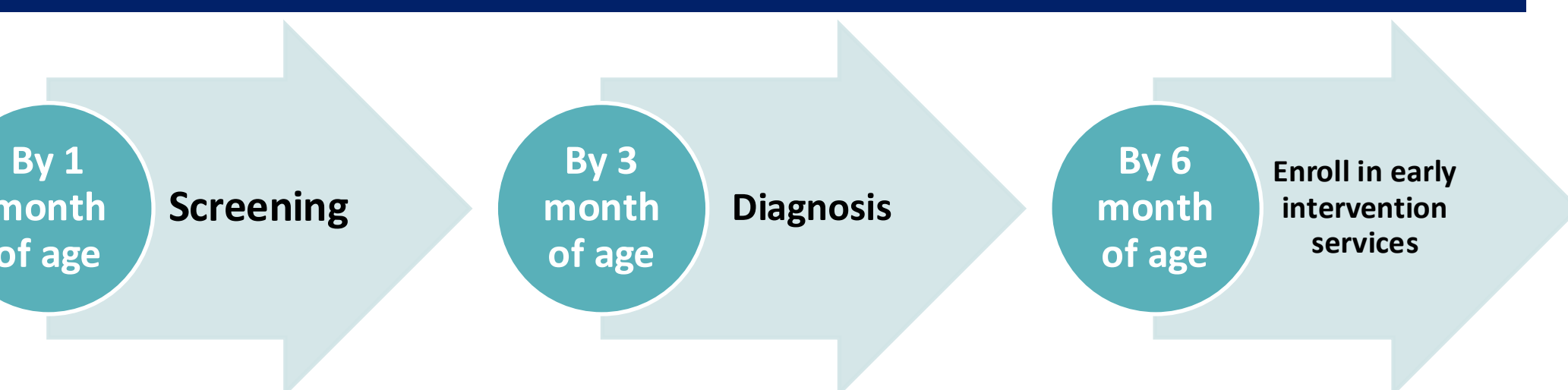
Stakeholders

- Newborns
- Parents
- EHDI professionals
- Early intervention specialists

Research Question

Does timely early-intervention enrollment before six months correspond to higher rates of DHH children meeting LEAD-K age-appropriate language expectations?

Program Design



The program is funded by the Children Act of 2000 and aims to ensure that newborns are screened and diagnosed, preventing any future delays in language outcomes.

Methodology

Procedure

- Mixed-Methods using both qualitative and quantitative analysis
- **Qualitative research:** Analysis of the overall EDHI systems using interviews and thematic analysis
 - Themes:
 - Dimension #1: Parents Perspective (Werfel et al., 2025)
 - Dimension #2: Medical providers (Cree et al., 2025)
 - Dimension #3: System Infrastructure (Alam et al., 2016; GAO, 2025)
 - LEAD-K Program Design
 - Administer language assessment to identify DHH children's language progress
 - Connect EHDI providers with Early Intervention Providers, ensuring timely intervention services access
 - 2025 Government Accountability Office Report
- **Quantitative research:**
 - California's Language Equality and Acquisition for Deaf Kids Annual Data (CDE, 2025)
 - EHDI Data Hub by WashU (EHDI Data Hub, 2026)
 - Center for Disease and Control (CDC, 2022)
 - Annual California Newborn Hearing Screening Program (DHCS, 2025)

Language Outcomes

- Data collected from all DHH infants and toddlers (0-5 years old) signed with an Individualized Family Service Plan or an Individual Education Plan
- Language outcomes were tracked adhering to the Desired Results Developmental Profile, a valid assessment tool for infants and toddlers with IFSPs and IEPs
- DRDP scores are determined based on a combination of work samples, family input, and a rating scale of developmental categories
- DRDP assessment scores were computed into the mean and standard deviation of the age expectation adhered to DRDP
- At-Age-Expectation Student Group: Percentage of DHH students who scored above 1.2 standard deviation from the mean score (CDE, 2025)

EHDI Benchmark Rates

- Data was retrieved from the WashU's EHDI Data Hub and represents the percentage of DHH infants who were screened by 1 month, received a diagnosis by 3 months, and were enrolled in early intervention services by 6 months, calculated using CDC's standardized EHDI timeliness (CDC, 2022)

Results

Quantitative Findings

- A scatterplot was produced with Rstudio
- Percentage of Children in Early Intervention: 6 Month Benchmark Rate: Total DHH Infants Enrolled by 6 months/ Total DHH Infants Diagnosed
- This positive association suggests that increasing timely early intervention enrollment rates may improve statewide language outcomes for DHH children
- Results show the critical need of consistent timely early intervention enrollment rate to ensure language outcomes for DHH children
- California has steady rates of executing timely early intervention services and exceeding the national benchmarks for EDHI systems

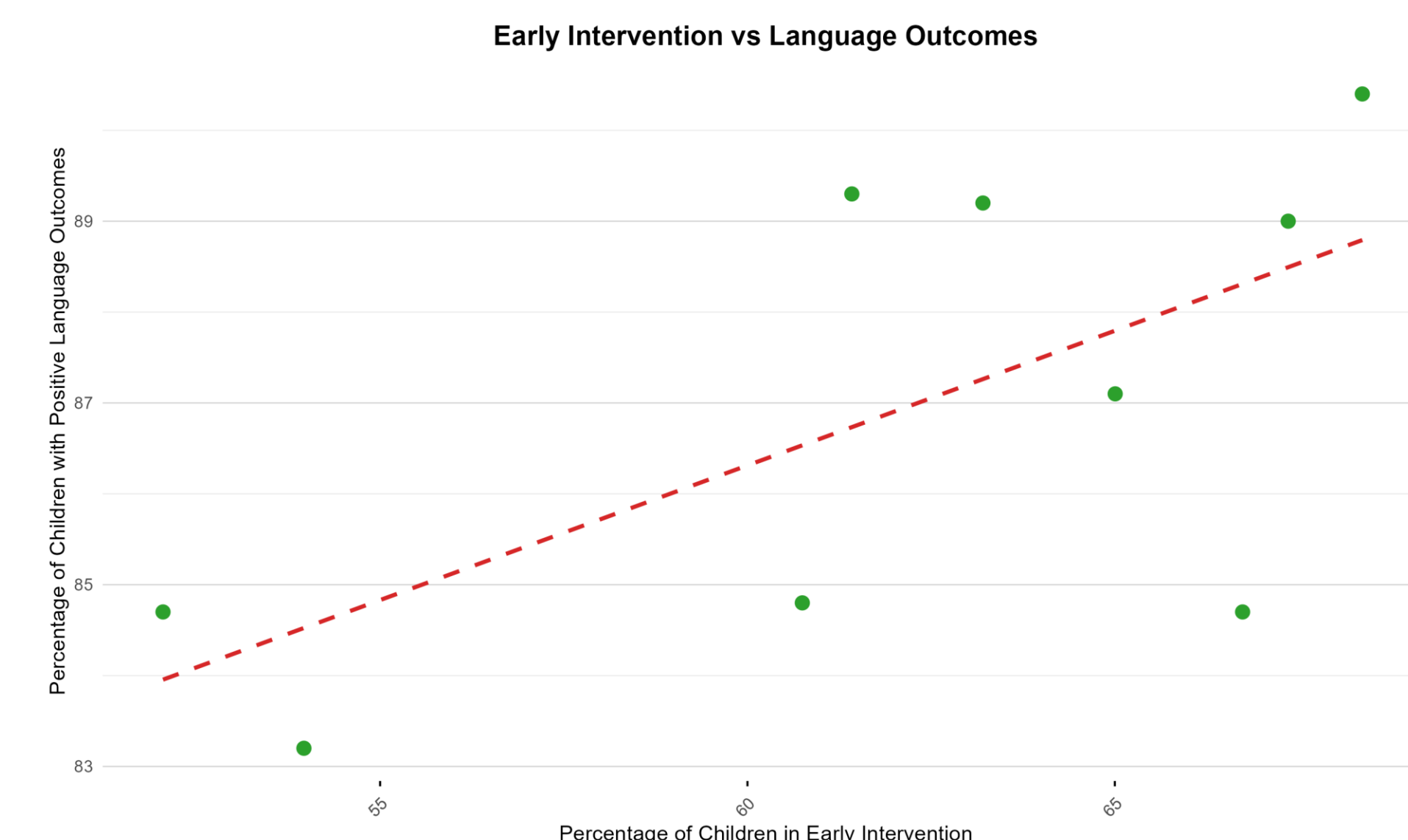


Figure 1: Higher early intervention enrollment is associated with higher LEAD-K language outcomes

Qualitative Findings



Dimension #1: Parents

- Parents reported to the time essence of enrollment in early intervention services is often being downplayed by medical professionals (Werfel et al., 2025)
- Insurance was a factor in delaying enrollment in early intervention services due to physician referrals (Werfel et al., 2025)



Dimension #2: Medical Providers

- Health providers face problems with inconsistent referrals and continuum of care (Cree et al., 2025)
- Lack of knowledge of meeting EHDI's 1-3-6 benchmarks and access to resources (Cree et al., 2025)
- Decentralized reporting system leads to delays in continuum of care (Cree et al., 2025)



Dimension #3: System Infrastructure

- Lack of standardization in data collection and reporting can cause difficulties in accurately evaluating the effectiveness (Alam et al., 2016)
- Timely communication between healthcare providers and early intervention providers is often inconsistent (Cree et al., 2025)
- GAO recommends increased funding and training to support providers in ensuring timely early intervention services (GAO, 2025)

Policy Implications

- Lack of data standardization and reporting practices can result in variability in language outcomes among DHH children and inability to effectively evaluate EHDI systems (Alam et al., 2016)
- Weak communication may be a result of ineffective database infrastructure, resulting in higher gaps in accessing early intervention services
- Concerns about ensuring timely early intervention services can be addressed with increased cross-agencies communication and data sharing (Cree et al., 2025)
- Small workforce and lack of training may contribute to the inter-agency communication and referrals (GAO, 2025; Cree et al., 2025)
- Barriers to accessing early intervention services can be exacerbated by parents' knowledge and medical professionals' referral systems (Werfel et al., 2025; Cree et al., 2025)
- Current EHDI systems value the medical model of hearing loss, excluding language and developmental milestones.

Policy Proposals

Centralized Data Infrastructure

- Design an effective database management system
- Ensure easy user interface for healthcare providers and early intervention providers to coordinate effective timely early intervention services
- Track students' outcomes originating from the birth to high school graduation

Language-Centric EHDI Systems

- Develop standardized language assessments to evaluate the effectiveness of EHDI systems
- Design EHDI systems to be responsive to language acquisition and developmental milestones

Standardized Data Collection & Reporting Practices

- Standardized data collection and reporting practices will help with identifying areas for improvement in future program evaluations
- Reduce the likelihood of the inconsistency in referrals between healthcare providers and early intervention providers

References

- Alam, S., Satterfield, A., Mason, C. A., & Deng, X. (2016a). Progress in Standardization of Reporting and Analysis of Data from Early Hearing Detection and Intervention (EHDI) Programs. *Journal of Early Hearing Detection and Intervention*, 1(2), 2. <https://jehdi.ncbi.nlm.nih.gov/articles/PMC5102258/>
- Cree, R. A., Bakko, R., Grimm, C., Naak, A., Cahill, E. S., Durham, E., Logan, N., McKay, S. L., Martinez, D. R., & Gaffney, M. (2022). Provider Perspectives: Identification and Follow-up of Infants who are Deaf or Hard of Hearing. *American Journal of Perinatology*, 41(Suppl 1), e004. <https://doi.org/10.1054/a.1532-9965.41.S1.004>
- Grosse, S. D. (2017). What You Don't Know Can Hurt You: The Risk of Language Deprivation by Impairing Sign Language Development in Deaf Children. *Maternal and Child Health Journal*, 21(5), 961-965. <https://doi.org/10.1007/s10985-017-2287-5>
- Humphries, T., Kuhlthau, P., Mathur, G., Napoli, D. J., Padden, C., Rethman, G., & Smith, S. R. (2012). Language acquisition for deaf children: Reducing the harms of zero tolerance to the use of alternative approaches. *Harm Reduction Journal*, 9(1), 16. <https://doi.org/10.1186/1477-7571-9-16/METRICS>
- Khetani, M. A., Richardson, Z., & McManus, B. M. (2017). Social disparities in early intervention service use and provider-reported outcomes. *Journal of Developmental and Behavioral Pediatrics*, 38(7), 501. <https://doi.org/10.1097/DBP.0000000000000474>
- Supporting Deaf & Hard of Hearing Children in California | LEAD-K Family Services. (n.d.). Retrieved April 20, 2026, from <https://www.leadfamily.org/>
- Werfel, K. L., Osofi, E., Grey, B., Swindle, C., & Lund, E. A. (2024). Understanding Barriers to Timely Enrollment of Early Intervention Services for Children who are Deaf and Hard of Hearing. *Journal of Early Hearing Detection and Intervention*, 9(1), 7. <https://doi.org/10.26077/43E9-9F6E>
- Yoshinaga-Itano, C., Sedey, A. L., Coulter, D. K., & Mehl, A. L. (1998). Language of Early- and Later-identified Children With Hearing Loss. *Pediatrics*, 102(5), 1161-1171. <https://doi.org/10.1542/PEDS.102.5.1161>
- Yoshinaga-Itano, C., Sedey, A. L., Wiggan, M., & Chung, W. (2017). Early Hearing Detection and Vocabulary of Children With Hearing Loss. *Pediatrics*, 140(2). <https://doi.org/10.1542/PEDS.2016-2964>