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Research Article

Who Receives Speech/Language Services by 5 Years of Age in the United States?

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Purpose: We sought to identify factors predictive of or associated with receipt of speech/language services during early childhood. We did so by analyzing data from the Early Childhood Longitudinal Study–Birth Cohort (ECLS-B; Andreassen & Fletcher, 2005), a nationally representative data set maintained by the U.S. Department of Education. We addressed two research questions of particular importance to speech-language pathology practice and policy. First, do early vocabulary delays increase children's likelihood of receiving speech/language services? Second, are minority children systematically less likely to receive these services than otherwise similar White children?
Method: Multivariate logistic regression analyses were performed for a population-based sample of 9,600 children and families participating in the ECLS-B.
Results: Expressive vocabulary delays by 24 months of age were strongly associated with and predictive of children's receipt of speech/language services at 24, 48, and 60 months of age (adjusted odds ratio range = 4.32–16.60). Black children were less likely to receive speech/language services than otherwise similar White children at 24, 48, and 60 months of age (adjusted odds ratio range = 0.42–0.55). Lower socioeconomic status children and those whose parental primary language was other than English were also less likely to receive services. Being born with very low birth weight also significantly increased children's receipt of services at 24, 48, and 60 months of age.
Conclusion: Expressive vocabulary delays at 24 months of age increase children's risk for later speech/language services. Increased use of culturally and linguistically sensitive practices may help racial/ethnic minority children access needed services.

Between 40% and 50% of children receiving services through the Individuals with Disabilities Education Act's Early Intervention or Early Childhood Special Education (EI/ECSE) programs do so because of speech and/or language impairments (Hebbeler et al., 2007; Scarborough, Hebbeler, & Spiker, 2006). Children with these impairments typically display lower reading, mathematics, and behavioral functioning at both the start of kindergarten and throughout elementary school (Harrison, McLeod, Berthelsen, & Walker, 2009; McCormack, Harrison, McLeod, & McAllister, 2011; Morgan, Farkas, Hillemeier, & Maczuga, 2012). Speech and/or language impairments increase children's risk of later being diagnosed as having reading (Catts, Fey, Tomblin, & Zhang, 2002) and behavioral disabilities (Yew & O'Kearney, 2013).

Receipt of services for speech/language impairments may result in gains in these children's communication abilities (Hebbeler et al., 2007), particularly if provided prior to or by school entry (Harrison et al., 2009; Law, Boyle, Harris, Harkness, & Nye, 1998; but see also Sullivan & Field, 2013). If sustained, these gains may help children with speech and/or language impairments as they progress through the educational system and may reduce their later risk for lower school functioning and for learning or behavioral disabilities. These services can initially be costly to provide. For example, Tarr and Barnett (2001) estimated that the state of New Jersey spent about $9,000 on average per Individualized Family Service Plan to provide services through EI/ECSE over the course of the study's fiscal year. However, the early provision of speech/language services may also reduce the later need for costly school-based special education and related services, including those for reading and behavioral disabilities. Given both their potential benefits and costs, establishing which groups of young children receive speech/language services in the United States has implications for policy and practice. For example, doing so can inform

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policymakers and practitioners as to how the services are allocated during a time of substantial federal- and state-level budgetary constraints and the resulting underfunding of early intervention (EI) programs (Rosenberg, Robinson, Shaw, & Ellison, 2013). Accurately identifying which young children receive speech/language services may help identify potentially modifiable factors (e.g., expressive vocabulary delays) that might be targeted in early screening and intervention efforts (Harrison & McLeod, 2010). In addition, these analyses may help establish whether some groups of young children are systematically less likely to receive speech/language services in the United States, suggesting the need for additional efforts to ensure that these groups of children are being appropriately evaluated (Morgan, Farkas, Hillemeier, & Maczuga, 2012; Nelson, Nygren, Walker, & Panocha, 2006).

Very little is currently known about which groups of children receive speech/language services in the United States. Inferences from the available studies are constrained due to (a) limited statistical control for confounding factors (e.g., Hebbeler et al., 2007), (b) small, homogenous samples of U.S. children with very specific risk profiles (e.g., only those born with very low birth weight; McManus, Robert, Albanese, Sadek-Badawi, & Palta, 2013), or (c) non-U.S. samples of limited racial/ethnic diversity (Harrison & McLeod, 2010). The extant work has mostly used cross-sectional rather than longitudinal designs (Scarborough et al., 2006) and has typically examined risk factors for speech/language service receipt only at or immediately before school entry (Harrison & McLeod, 2010). Therefore, generalizations to the diverse population of young U.S. children are constrained, as is the field's understanding of the earliest precursors of service receipt. Using nationally representative, longitudinal data would provide for analyses that examine predictive relations rather than associations. Analyses of the Early Childhood Longitudinal Study–Birth Cohort (ECLS-B; Andreassen & Fletcher, 2005), which followed a nationally representative sample of children born in the United States until they entered kindergarten, should help identify factors predictive of children's receipt of speech/language services as they age.

Early Vocabulary Delays and Later Speech/Language Service Use

One factor that may increase young children's likelihood of receiving speech/language services is experiencing expressive vocabulary delays (Hoff, 2013). Expressive vocabulary delays should result in greater difficulties in comprehending oral and written information, communicating with adults and age-mates, and self-regulating emotions (Cole, Armstrong, & Pemberton, 2010; NICHD Early Child Care Research Network, 2005; Perfetti & Stafura, 2014). Expressive vocabulary gaps begin to occur by 24 months of age and uniquely predict lower reading and mathematics achievement, lower behavioral self-regulation, and more frequent externalizing and internalizing problem behaviors by kindergarten entry (Morgan, Farkas, Hillemeier, Hammer, & Maczuga, 2015). Practitioners have been advised to assess and carefully monitor young children who begin to display expressive vocabulary delays (Whitehurst & Fischel, 1994).[1] Yet practitioners have also been advised that children displaying additional risk factors (e.g., a family history of delay or disability, difficulties initiating peer interactions) should be more closely monitored than those displaying only vocabulary delays (Paul & Roth, 2011). The existing empirical studies report mixed findings, leading to substantial ambiguity as to whether speech-language pathologists (SLPs) should consider the early onset of expressive vocabulary delays as potentially indicative of the need for speech/language services. Some longitudinal studies found that children experiencing these delays later display normal levels of school functioning performance (Paul, 1996; Rescorla, 2005, 2009), although the delayed children's level of functioning may be lower than their age-mates. Yet other studies find that 40%–60% of children with prior histories of vocabulary delays continue to experience relatively poor language ability (Dale, Price, Bishop, & Plomin, 2003; Law, Boyle, Harris, Harkness, & Nye, 2000; Määttä, Laakso, Tolvanen, Ahonen, & Aro, 2012). In addition, very few studies have directly examined the extent to which expressive vocabulary delays are uniquely associated with or predictive of speech/language service use, particularly beginning by 24 months of age. Harrison and McLeod (2010) identified factors predictive of Australian children's receipt of speech/language services (e.g., being male, having hearing problems). However, vocabulary delays were not included as a predictor in the study's analyses. Recent analyses by McManus et al. (2013) of a very low birth weight cohort similarly did not include vocabulary delays as a predictor. Morgan et al. (2012) reported that 48-month-old children with greater receptive vocabulary knowledge were less likely to be identified as developmentally delayed or disabled, including being diagnosed for communication problems. Yet they did not examine whether this relation with vocabulary knowledge extended specifically to speech/language service use or to the earlier onset of expressive vocabulary delays.

Racial/Ethnic Minority Status and Speech/Language Service Use

Children's status as racial/ethnic minorities may also be related to their speech/language service use. Children raised in poverty, who are disproportionately minorities (DeNavas-Walt, Proctor, & Smith, 2013), can present with more severe speech and language impairments (Pruitt, Oetting, & Hegarty, 2011) and may be more likely to receive a diagnosis (Hebbeler, Spiker, Malik, Scarborough, & Simeonsson, 2003). An epidemiological study by Tomblin et al. (1997)

[1]A well-designed measure of expressive vocabulary likely indexes both expressive and receptive vocabulary. Children's receptive and expressive vocabularies display a strong positive correlation (e.g., $r = .66$; Sideridis & Simos, 2010). Tomblin and Zhang's (2006) study of young children's language abilities failed to find evidence of a distinction between their receptive and expressive vocabularies.

yielded a prevalence rate of 11% and 8% for specific language impairment in children who are Blacks and Hispanics, respectively. The contrasting prevalence rate for children who are Whites was about 6%. Yet substantial underidentification for the general sample was also observed, with only 29% of children meeting diagnostic criteria for specific language impairment subsequently reported by their parents to be receiving services. Other studies have also found that children who are minorities are less likely to be identified as delayed or disabled (Hibel, Farkas, & Morgan, 2010; McManus, McCormick, Acevedo-Garcia, Ganz, & Hauser-Cram, 2009; Morgan et al., 2015) including during the early childhood years (Morgan et al., 2012; Samson & Lesaux, 2009). Delgado and Scott's (2006) analysis of preschool referral rates in Florida indicated that children who are racial/ethnic minorities were less likely to be referred for services. Morrier and Gallagher (2012) reported that children who are minorities were less likely to be identified as having speech or language impairments.

These children's underrepresentation possibly results from socioeconomic, linguistic, or cultural obstacles (Blanchett, Klingner, & Harry, 2009; Danesco, 1997; Flores, Tschann, Dimas, Pasch, & de Groat, 2010; García Coll et al., 1996; Harry, 1992; O'Hara, 2003; Peña & Fiestas, 2009). For example, it may be that minority parents are less likely to solicit a professional's evaluation of their children's speech and language difficulties, instead preferring to rely on the advice and support of extended families (García Coll et al., 1996). SLPs may be reluctant to refer children who are minorities for fear of being viewed as racially biased (Hibel et al., 2010), especially when evaluating children who may be speaking an ethnic dialect of English or English as a second language. It is also possible that SLPs may not be accurately identifying impairments in children who come from culturally and linguistically diverse backgrounds.

Whether and to what extent U.S. racial/ethnic minorities are less likely to receive speech/language services is presently unclear. This is because the available studies have not examined disparities in service use specifically (Morrier & Gallagher, 2012) or, when doing so, have used samples not representative of the racial/ethnic diversity of the U.S. child population (Harrison & McLeod, 2010). Those few existing studies using samples of U.S. children have been unable to account for possible confounding between racial/ethnic group membership and lower socioeconomic status (SES; Tomblin et al., 1997). Yet finding that children who are racial/ethnic minorities are less likely to receive speech/language services after accounting for their greater likelihood of living in poverty would suggest that cultural and linguistic rather than economic factors may be resulting in an underreceipt of potentially helpful services, as well as suggest that SLPs may need to intensify their efforts to ensure that all U.S. children in need of EI services are being appropriately identified.

Importance of Control for Confounding Factors

Estimating the risk uniquely attributable to expressive vocabulary delays and, separately, children's status as racial/ethnic minorities necessitates extensive statistical control for factors (e.g., low birth weight, family history of disability, low SES, prior behavioral functioning) that may themselves explain observed variation in speech/language service receipt (Delgado & Scott, 2006; MacMillan & Reschly, 1998; Morgan et al., 2012). Doing so helps ensure that the children are otherwise similar in these characteristics, allowing for a more precise estimate of the risk uniquely associated with expressive vocabulary delays and racial/ethnic minority status.

These additional sociodemographic, gestational and birth, family, and child characteristics might also be expected to be related to children's receipt of speech/language services and so might be used in screening instruments as well as in constituting potential confounds for effects attributable to expressive vocabulary delays or to race/ethnicity. Examples of these factors include low family SES, low birth weight, a family history of mental illness or disability, maternal depression, and a prior history of behavioral problems. Low SES might result in less cognitively stimulating and higher stress environments that lower children's cognitive functioning and so increase the need for special services (McLoyd, 1998). Low SES co-varies with non-White race/ethnicity, maternal age at the child's birth, and being a single parent (DeNavas-Walt et al., 2013). Being born at low or very low birth weight may result in neurodevelopmental impairments in both general cognitive functioning (Hack, Klein, & Taylor, 1995) and academic readiness (Lynch, 2011), thereby increasing children's risk for developmental delays and disabilities. Because children born with very low birth weight are at heightened risk for persistent cognitive delays, they may require specialized services throughout childhood (Hack et al., 2005; Wilson-Costello, Friedman, Minich, Fanaroff, & Hack, 2005). However, whether and to what extent low or very low birth weight uniquely increases children's probability of receiving speech/language services is unclear. Harrison and McLeod (2010) recently reported that low birth weight was not a statistically significant predictor of service receipt. Medical risks during pregnancy (e.g., maternal substance use) and complications of pregnancy (e.g., gestational diabetes) and delivery (e.g., prolonged labor) have been associated with later developmental delays (e.g., Anthopolos, Edwards, & Miranda, 2013) and so might also increase children's need for speech/language services.

Less supportive parenting may result in children experiencing lower language growth due to less frequent and lower quality verbal interactions (Hart & Risley, 1995). In contrast, those parents who are warm and supportive, set consistent routines for their children, and provide more cognitively stimulating environments may facilitate their children's cognitive, behavioral, and academic development, even after accounting for SES and other sociodemographic characteristics (Iruka, LaForett, & Odom, 2012). Doing so may reduce the risk of having a limited vocabulary (Morgan et al., 2015). Parental mental and physical health problems are associated with cognitive and other delays in young children (Breaux, Harvey, & Lugo-Candelas, 2013; Mensah

& Kiernan, 2011) including in speech/language (Harrison & McLeod, 2010). For example, depressed mothers may be less attentive to delays in their children's health and development (Grace, Evindar, & Stewart, 2003) or interact less frequently with their children in cognitively stimulating ways (Murray, Hipwell, Hooper, Stein, & Cooper, 1996), thereby increasing their children's likelihood for identification for EI services generally (Feinberg, Donahue, Bliss, & Silverstein, 2012). However, whether this extends specifically to the receipt of speech/language services is unclear (Harrison & McLeod, 2010). Being in domestic child care has been reported to increase children's risk of language impairment (Cheuk & Wong, 2005), although whether this extends to center-based child care and service receipt in the United States has yet to be investigated. Young children's own level of behavioral functioning, particularly (a) lower self-regulatory or (b) more frequent externalizing-type problem behaviors should also strongly relate to their language development (Hooper, Roberts, Zeisel, & Poe, 2003; Menting, Van Lier, & Koot, 2011; Yew & O'Kearney, 2013), including vocabulary growth (Schmitt, Justice, & O'Connell, 2014), and so possibly increase their likelihood for services (e.g., Morgan et al., 2012; Nungesser & Watkins, 2005). However, whether and to what extent this occurs specifically for speech/language service use remains unclear.

Study's Purpose

We sought to identify, using an unusually diverse range of factors, which children in the United States are most likely to receive speech/language services by 5 years of age. We structured the study to address two research questions of particular importance to both speech-language pathology practice and policy. First, to what extent do early vocabulary delays increase children's likelihood of receiving speech/language services? We hypothesized that the onset of expressive vocabulary delays even relatively early during children's cognitive development would greatly increase their likelihood of receiving speech/language services and that this relation would maintain over time. Specifically, we hypothesized that children with expressive language delays would be more likely to be provided with speech/language therapy in the United States as practitioners sought to help the children better express themselves by acquiring larger vocabularies. Second, we asked if children who are minorities are systematically less likely to receive these services than White children who are otherwise similar in their background characteristics. Consistent with prior work, we hypothesized that otherwise identical children who are Black or Hispanic would be less likely to receive speech/language services as result of socioeconomic, cultural, and language factors. To better estimate these two aforementioned hypothesized relations, we included many potential confounding factors (e.g., low birth weight, maternal depression, externalizing problem behaviors, family SES) into the study's regression models. Doing so should allow for more precise estimates of the unique associations between children's (a) expressive vocabularies and/or (b) racial/ethnic status and (c) their likelihood of receipt of speech/language services. Our use of extensive statistical control also allowed us to estimate the risk associated with these additional factors, including low birth weight, that have previously been hypothesized to predict children's need to speech/language services and so might also be included in screening efforts by SLPs. To better assess for indirect as well as direct associative or predictive relations, we entered the study's factors sequentially through a series of multivariate logistic regression models.

Method

Design, Analytical Methods, and Samples

We conducted secondary data analyses of the ECLS-B. The ECLS-B data are collected and maintained by the U.S. Department of Education's National Center for Education Statistics (NCES; http://nces.ed.gov/ECLS/birth). The ECLS-B, when appropriately weighted, is representative of the population of infants born in the United States in 2001. The data set includes birth certificate information collected for each child, as well as direct and indirect assessments of children's cognitive, academic, behavioral, and physical functioning at approximately 9 months of age (in 2001–2002), 24 months of age (in 2003–2004), 48 months of age (in 2005–2006), and 60 months of age (in the fall of 2006 or 2007). At each of these time points, interviews were also conducted with parents. Data for our secondary analyses come from the ECLS-B's coded birth certificates and the child and parental assessments at 24, 48, and 60 months of age. We used multivariate logistic regression to analyze the ECLS-B data at one time point (i.e., at 24 months) as well as longitudinally (i.e., 24–48 months and, separately, 24–60 months). To identify risk factors for speech/language services receipt at 24 months of age (N = 9,500), we used a wide range of factors measured by this same time point. To identify risk factors for service receipt by 48 months (N = 8,600) and, separately, at 60 months of age (N = 6,550), we used factors again measured by 24 months of age. These cross-sectional and longitudinal multivariate logistic regression models allowed us to identify risk factors for service receipt by 24 months of age and so at a time when early screening and intervention efforts might be especially effective. All sample sizes have been rounded to the nearest 50 in accordance with NCES requirements for ensuring participant confidentiality.

Measures and Criterion Variables

Parent Report, Speech Therapy Receipt, 24, 48, and 60 Months

NCES field staff administered a parent interview at the 24-, 48-, and 60-month survey waves. During each interview, field staff said, "I'm going to read a list of services. Please tell me if your child or your family received this service to help with your child's special needs." Speech or language therapy was listed among the possible services surveyed. We coded 1 for those responding *yes* to receiving speech or language therapy and 0 for all other responses

including *no* to any service option. The total number of children whose parents reported that they had received speech or language therapy was summed at the 24-, 48-, and 60-month survey waves, respectively.

Parents reliably report developmental delays in their children requiring specialized intervention (Chen, Lin, Wen, & Wu, 2007; Glascoe & Dworkin, 1995; Johnson et al., 2004; Johnson, Wolke, Marlow, & Preterm Infant Parenting Study Group, 2008). Chen, Lee, Yeh, Lai, and Chen (2004) reported that the sensitivity rate between a parent's report and a professional's diagnosis was 77%–89%, which was obtained following the professional's independent administration of speech, motor, behavioral, cognitive, or global measures of developmental delay. Parents are appropriate and accurate sources of information on special services delivery to children who have not yet entered school (Palfrey, Singer, Walker, & Butler, 1987). Minority culture is thought to constitute an unlikely explanation of large disparities in parental reports (Weisz & McCarty, 1999).

Measures and Predictor Variables

Expressive Vocabulary Delays, 24 Months

NCES field staff administered a modified version of the MacArthur-Communicative Development Inventory (M-CDI; Fenson et al., 1993; for additional information on the M-CDI's modifications, please see Andreassen, Fletcher, & Park, 2007) at the 24-month survey wave to assess children's knowledge of 50 common words and phrases. Modifications to the M-CDI (which originally included a word list of 400 words) were made so that it could be administered to the ECLS-B's very large sample (Andreassen et al., 2007; Narajarian, Snow, Lennon, & Kinsey, 2010). These modifications were overseen by one of the measure's original designers (i.e., Philip Dale), who supplied the 50 words assessed during the 24-month survey wave (Andreassen et al., 2007). For each of the 50 words, staff asked parents, "Can the child say [i.e., *cat, thank you, all gone*]?" The total number of words and phrases parents reported their children could say was recorded as the total word score at 24 months. Children who scored in the bottom 10% were considered as having expressive vocabulary delays at 24 months of age (Paul & Roth, 2011). The modified M-CDI classifies children into language status groups with 97% accuracy (Skarakis-Doyle, Campbell, & Dempsey, 2009). The measure's internal consistency is high (a = .96); M-CDI ratings highly correlate with scores on other standard measures of language (Fenson et al., 1993).

Receptive Vocabulary Delays, 48 Months

Receptive vocabulary was assessed at the 48-month wave within the language portion of the ECLS-B early reading assessment. (A general receptive vocabulary assessment was not administered at the 24-month wave.) The vocabulary measure consisted of 36 items, with 20 items from the Preschool Language Assessment Scale (Duncan & DeAvila, 1998) and 16 items from the Peabody Picture Vocabulary Test–III (Dunn & Dunn, 1997). These items were selected as not displaying differential item functioning or other indicators of potentially biased items following initial field testing, with the resulting total score considered useful as a screening measures (please see Narajarian et al., 2010 for modification and further psychometric details). Children with scores in the lowest 10% on the receptive vocabulary measure were identified as having receptive vocabulary delays at 48 months of age.

Low Reading Achievement, 60 Months

ECLS-B field staff individually administered the untimed, 51-item Reading Test to children at 5 years of age to evaluate their language development, emergent literacy skills, and basic reading. Items were included that evaluated children's phonological awareness, letter and letter-sound knowledge, knowledge of print conventions, word recognition, vocabulary, and comprehension (Najarian et al., 2010). There was little evidence of differential item functioning. There were no floor or ceiling effects. The Reading Test used a two-stage routing procedure and item response theory scaling. All children initially took the same 24-item "core" routing test. They were then given a high-, medium-, or low-level follow-up test on the basis of the number of items they answered correctly on the routing test. Theta reliability coefficients of .92 and .93 indicate high reliability for the kindergarten entry measures (Narajarian et al., 2010). Children scoring in the lowest 10% on the Reading Test were identified as having low reading achievement (e.g., Morgan, Farkas, Tufis, & Sperling, 2008). The preschool version of the Reading Test was validated through concurrent administration with the Bracken Basic Concept Scale–Revised (Bracken, 1998). The correlation between the two measures was .82 (Narjarian et al., 2010).

Sociodemographic Characteristics

Estimated risk factors pertaining to sociodemographic characteristics included children's race/ethnicity, gender, and SES status, as well as mothers' age at children's birth, mothers' marital status at the 24-month survey wave, and whether a language other than English was primarily used in the child's household. All sociodemographic information was obtained through parent interviews and from birth certificates. Following NCES procedures, children's race/ethnicity was identified from the listing on their birth certificates of the race/ethnicity of their mothers. Race/ethnicity categories included non-Hispanic White (reference group), Black, Hispanic, and other race. Age in months was included to account for any variation in children's actual age at the time of the 24-, 48-, and 60-month assessments. For gender, female was used as the reference category, and males were coded as 1.

Five SES quintiles, represented in regressions as a set of dummy variables, were included to evaluate whether SES was nonlinear in relation to children's academic and/or behavioral performance. The first quintile represented the lowest SES category. The fifth quintile, representing the highest SES, was used as the reference category. Placement into quintiles was determined on the basis of five parent-reported indicators. These indicators included the education and occupation of each parent or guardian as well as the household income. Marital status at the time of children's

assessment was also used. Married status was used as the reference category and unmarried mothers were coded as 1. Parents reported the household's primary language at the 24-month home interview. Use of a language other than English was coded as 1.

Gestational and Birth Characteristics

Maternal age at the time of birth was categorized as either less than or equal to 18 years of age, 19 to less than 35 years of age, or equal to or greater than 35 years of age. Nonsingletons were children born during multiple births (e.g., twins, triplets). Birth-related risk factors included medical and behavioral conditions, obstetric procedures, labor complications, and very low or moderately low birth weight, as described below. Information on medical risk factors during pregnancy was obtained through birth certificate records, and counts of each set of risk factors were used in the analyses. *Maternal medical risk factors* included issues experienced during pregnancy, including incompetent cervix, genital herpes, anemia, renal disease, eclampsia, cardiac disease, uterine bleeding, acute or chronic lung disease, hypertension (chronic or pregnancy-induced), diabetes, oligohydramnios, hemoglobinopathy, or Rh sensitization, as well as a history of previous preterm birth or previous birth of a child weighing 4,000+ grams. *Maternal behavioral risk factors* included maternal use of alcohol and/or tobacco during pregnancy. The use of each substance was coded as 1 and these were summed and represented as 2 if both were present and 0 if the mother did not use alcohol or tobacco. Each obstetric procedure was counted as 1 and all procedures were summed to obtain a total count. These procedures included stimulation of labor, induction of labor, cesarean section, amniocentesis, and tocolysis. A total count was also used to measure labor complications. Labor complications included the following: anesthetic complications, dysfunctional labor, abruption of the placenta, breech/malpresentation, cephalopelvic disproportion, prolapsed cord, excessive bleeding, fetal distress, fever higher than 100° F, seizures during labor, moderate/heavy meconium, precipitous labor (<3 hr), prolonged labor (>24 hr), and placenta previa. Birth weight was represented by two dummy variables identifying very low birth weight (<1,500 grams) and moderately low birth weight (>1,500 grams and <2,500 grams), with the reference group consisting of those with normal birth weights (2,500 grams or more).

Parental Support

Video-recorded interactions between parents and their children at the 24-month survey wave were coded and used to measure parents' interactive support on the basis of three constructs: parental sensitivity, cognitive stimulation, and positive regard. The measure used, the Two Bags Task, is a simplified version of the Three Bags Task, which was used in the Early Head Start Research and Evaluation Project and the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care (Nord, Edwards, Andreassen, Green, & Wallner-Allen, 2006). The Two Bags Task is designed to provide for semistructured interactions between parents and their children, with these interactions video-recorded and then coded by trained staff in regards to various support indictors, including parental sensitivity, cognitive stimulation, and positive regard (please see Najarian et al., 2010, for extensive information regarding the Two Bags Task selection and extensive coder training). Interview staff video-recorded 10-min interactions between parents and children. First, staff asked parents to interact with their children over a picture book (*Good Night, Gorilla*; Rathmann, 1994) and next using a set of toy dishes. These videos of the parent–child interactions were coded by assigning points on a scale of 1 to 7 (1 = *very low*; 7 = *very high*) for each of the three types of parent interactions described below that were observed during the two activities.

Parental sensitivity was observed when parents noticed and responded to their children's emotions and needs and then acted in consideration of their capabilities. *Cognitive stimulation* ratings were related to parents' efforts to support their children's perceptual, cognitive, or language development. Parents were rated as more cognitively stimulating when they used language or engaged in behaviors slightly beyond their children's developmental level. *Positive regard* ratings reflected the degree to which parents attentively watched and listened to their children and looked into their children's faces when talking to them or praising them. These rating scales displayed high mean interrater reliability (i.e., sensitivity = 97%; cognitive stimulation = 93%; positive regard = 94%; Andreassen et al., 2007; Najarian et al., 2010).

History of Mental or Physical Illness or Disabling Conditions

Family history of mental illness. At the 24-month survey wave, interview staff asked children's mothers if they or any of their blood relatives had ever had a variety of medical conditions including asthma, allergies, serious mental illness (including schizophrenia, a paranoid disorder, bipolar disorder, or manic episodes), diabetes, major depression, learning disability, and alcohol or drug abuse problems. Answers were coded as 1 for mothers answering *yes*, indicating family history of serious mental illness or major depression. Answers of *no*, indicating no history of serious mental illness or major depression, were coded as 0.

Family history of learning disability. Interviewers asked mothers in the 24-month interview, "Have you or any of your blood relatives ever had a learning disability?" In answer to this question, *yes* was coded as 1 and *no* was coded as 0.

Maternal health. Mothers were asked to rate their overall health from *excellent* to *poor* on a scale of 1 to 5. Answers from the 9-month interview were transformed into a dichotomous variable, with 4 or 5 (*fair* or *poor*) coded as 1 and all other responses coded as 0.

Household member with special needs. The interviewers asked mothers if they or any other household member had a special need, delay, or disability. Responses of *yes* in the 9-month interview were coded as 1 and *no* were coded as 0.

Maternal depressive symptoms. In the 9-month interview, mothers completed an abbreviated version of the

Center for Epidemiologic Studies-Depression (CES-D) scale (Radloff, 1977). The modified CES-D includes 12 items (e.g., poor appetite, loneliness, trouble focusing), and scores for each of the items were summed and a total score greater than 9 was coded as 1 for presence of depressive symptoms, which corresponds to the cutoff commonly used for the full CES-D of greater than 15 (Nord et al., 2006).

Maternal social isolation. Maternal social isolation was assessed on the basis of eight questionnaire items. Six interview questions assessed aspects of maternal isolation in the 9-month interview. One question asked whom the mother would ask for help or advice for a problem or if she was feeling depressed or confused about what to do, and mothers were instructed to list all who applied (e.g., mother, father, mother-in-law, friend, neighbor, etc.). Similar questions also asked who the mother would ask to borrow money from in an emergency, who she would call in an emergency in the middle of the night, and who she would ask for advice about care of her child. Additional questions at the 9-month interview asked how often mothers attended religious services and how close they felt to their own mothers. Two of these isolation-related questions were repeated in later interviews, including religious service attendance (at 24 months) and who the mother would ask for help or advice for a problem (at 48 months). Scores on these eight questionnaire items were summed, and mothers scoring in the lowest 23% of the distribution were classified as socially isolated.

Center-Based Child Care

Interviewers asked parents how many hours per week their children spent in day care at the 24-month survey wave. Responses were coded dichotomously with answers of greater than 10 hr coded as 1.

Learning-Related, Internalizing, and Externalizing Problem Behaviors, 24 Months

Immediately following the 24-month home interviews, ECLS-B field staff used a modified version of the Behavior Rating Scale (BRS; Bayley, 1993) to rate the developmental appropriateness of children's behaviors. The field staff observed the children's behavior as they worked to complete a measure of general cognitive and physical functioning (i.e., a modified measure of the Bayley Scale of Infant Development). Scores on the full BRS have moderate-to-high correlation with scores on other measures of young children's socioemotional adjustment (Buck, 1997). Ratings for learning-related, self-regulatory behaviors were obtained to determine the frequency of whether a child (a) pays attention to tasks, (b) is persistent in tasks, (c) is interested in task, and (d) adapts to change in materials. Cronbach's alpha for these items was .90. Ratings for externalizing behaviors were obtained to determine the frequency of whether a child displays (a) frustration in tasks and (b) cooperation. Cronbach's alpha for these items was .64. Ratings for internalizing behavior items were obtained to determine the frequency of whether a child displays (a) fearlessness and (b) social engagement. Cronbach's alpha for these items was .72. Each item was rated on a 5-point scale (e.g., *consistently lacks persistence*, *constantly off task/does not attend*, *no interest*, *consistently resists suggestions or requests*, and *consistently becomes frustrated*). Specific items were reverse coded as appropriate to be consistent with either appropriate (i.e., for learning-related behaviors) or problematic (i.e., for externalizing or internalizing) behavioral functioning. Ratings on each of the three scales were summed, and a scale score in the lowest 10% (e.g., Morgan, Farkas, Hillemeier, & Maczuga, 2009) of the scale distribution was coded as 1 (e.g., displaying learning-related behavior problems).

Missing Data

Missing data were imputed using IVEware, a Statistical Analysis System (SAS) program (Raghunathan, Solenberger, & van Hoewyk, 2002). The program was used to impute missing values of variables used to predict the dependent variables in the mulitivariate logistic regression models. Five data sets were created in the imputation process and results for each data set were then combined.

Sequence of Models Estimated

We conducted regression analyses predicting receipt of speech/language therapy services at three time periods—24, 48, and 60 months. Because our focus is on the relation between expressive vocabulary delays and receipt of these services, all models include expressive vocabulary delays (as indexed by the child's low total word score) as a predictor. For each of the three outcomes, the first estimated model also included sociodemographic control variables. We then followed a causal logic in which the child's birth conditions were entered next, followed by the household's characteristics such as whether or not English is the primary language spoken in the home, and ending with the child's behaviors at 24 months. As each set of variables was added to the regression, we examined the extent to which previously estimated coefficients are modified by the additional controls.

Results

Descriptive Statistics

Table 1 shows the (weighted) descriptive statistics for each of the three analysis samples used to predict service receipt at 24, 48, and 60 months, respectively. Although the sample size decreased at later ages, the three samples were quite similar in the means and standard deviations for all of the analysis variables. This provides at least suggestive evidence that sample attrition likely introduced relatively little bias into the analyses. We also observed that, using the final analytical sample, 2.2% of children received speech/language therapy at 24 months, a figure which increased to 3.9% at 48 months and 4.4% at 60 months. The mean total word score on the M-CDI was approximately 29 (of a total possible of 50 words), with a standard deviation of 11.9 words.

Table 2 shows the percent of children receiving speech/language services, separately according to their total word score at 24 months. By far the highest receipt of services

Table 1. Descriptive statistics of selected demographic variables.

Variable	Percentages or *M* (*SD*)		
	(*N* = 9,500[a])	(*N* = 8,600[a])	(*N* = 6,550[a])
Speech/language therapy, 24 months	2.1%	2.2%	2.2%
Speech/language therapy, 48 months		4.1%	3.9%
Speech/language therapy, 60 months			4.4%
Total word score, 24 months	29.0 (11.9)	28.8 (11.9)	29.1 (11.9)
Sociodemographics			
White	53.1%	53.3%	53.0%
Black	13.8%	13.9%	14.0%
Hispanic	25.6%	25.4%	25.6%
Other race	7.3%	7.2%	7.2%
Age	24.4 (1.3)	24.4 (1.2)	24.4 (1.2)
Male	51.3%	51.3%	51.3%
Lowest SES quintile, 24 months	20.1%	20.3%	20.0%
Second lowest SES quintile, 24 months	20.1%	20.1%	20.4%
Middle SES quintile, 24 months	20.1%	20.1%	20.4%
Second highest SES quintile, 24 months	20.0%	19.9%	20.1%
Highest SES quintile, 24 months	19.8%	19.6%	19.0%
Birth conditions			
Nonsingleton	3.2%	3.2%	3.2%
Mother's age >35 at child's birth	13.6%	13.6%	13.6%
Mother's age ≤18 at child's birth	7.2%	7.2%	7.4%
Mother not married, 24 months	32.7%	32.6%	32.4%
Very low birth weight	1.3%	1.2%	1.2%
Moderately low birth weight	6.2%	6.2%	6.2%
Labor complications	35.3%	36.0%	34.8%
Obstetric procedures	57.9%	58.2%	56.9%
Maternal medical risk factor at birth	17.9%	17.7%	17.7%
Maternal behavior risk factor at birth	11.2%	11.4%	10.9%
Household characteristics			
Non-English primary language, 24 months	19.3%	19.0%	19.2%
Parenting score, 24 months	10.3 (1.9)	10.3 (1.9)	10.3 (1.9)
Family member with mental illness, 24 months	10.5%	10.6%	10.7%
Family member with learning disability, 24 months	15.2%	15.4%	15.2%
Maternal health problems, 9 months	7.5%	7.6%	7.5%
Household has person with special needs, 9 months	7.4%	7.9%	7.7%
Mother depressed, 9 months	13.8%	14.1%	14.2%
Child is in day care center >10 hr/week, 24 months	14.3%	14.2%	14.0%
Mother isolated, 9 months	20.8%	20.8%	19.7%
Child behaviors			
Approaches to learning problems, 24 months	8.7%	8.8%	8.8%
Internalizing problems, 24 months	13.4%	13.1%	13.0%
Externalizing problems, 24 months	8.1%	8.2%	7.9%
Receptive vocabulary, 48 months		8.5 (2.0)	8.5 (2.0)
Reading test score, 60 months			37.9 (15.7)
Mathematics test score, 60 months			39.7 (11.9)

Note. SES = socioeconomic status.

[a]Sample size rounded to nearest 50 per ECLS-B confidentiality requirements.

occurred for children speaking five or fewer words, with service rates of 28.4%, 44.4%, and 31.2% respectively, at 24, 48, and 60 months of age. For each of the successively increasing expressive vocabulary categories, the percent of children receiving speech/language services declined monotonically.

Receipt of Services, 24 Months

Table 3 displays the results of the logistic regressions predicting receipt of services at 24 months of age. In Table 3, Model 1 used expressive vocabulary delays, race/ethnicity, male, age, and SES quintiles as predictors. Model 2 added additional demographics and gestational and birth characteristics. Model 3 added household characteristics, and Model 4 added 24-month behavior problems. The results show that expressive vocabulary delays at 24 months of age very strongly increased the odds of receiving speech/language therapy services at this age. Even with extensive controls (across Models 1–4), children with expressive vocabulary delays were much more likely to receive speech/language services (odds ratio [*OR*] range = 17.85 to 16.60). Model 1

Table 2. Parent report of receipt of services, by 24-month expressive vocabulary scores (unweighted).

24-month total word score	Parent report, speech services at 24 months (*N* = 9,500)	Parent report, speech services at 48 months (*N* = 8,600)	Parent report, speech services at 60 months (*N* = 6,550)
0–5	28.4%	44.4%	31.2%
6–10	10.2%	16.2%	13.3%
11–15	8.1%	10.4%	10.2%
16–20	4.1%	8.0%	5.6%
21–25	2.3%	3.2%	5.4%
26–30	1.4%	2.3%	2.0%
31–35	0.8%	1.9%	1.8%
36–40	0.4%	1.1%	1.1%
41–45			0.9%
46–50			

also shows that Black children were about half as likely or less as otherwise similar White children to receive speech/language services. Children from SES backgrounds below the top quintile were less likely to receive services, although these effects consistently achieved statistical significance only for the middle SES quintile.

Model 2 indicated that very low birth weight predicted a sevenfold increase in the odds of service receipt.

Table 3. Odds ratios of a parent report of child having speech/language therapy at 24 months (*N* = 9,500[a]).

Explanatory variable	Model 1	Model 2	Model 3	Model 4
Low total word score, 24 months	17.85***	16.51***	17.16***	16.60***
Sociodemographics				
Black	0.55*	0.47*	0.43*	0.42*
Hispanic	0.73	0.81	1.04	1.05
Other race	0.62	0.61	0.63	0.61
Age	1.01	0.98	0.98	0.98
Male	1.23	1.32	1.38	1.36
Lowest SES quintile, 24 months	0.47	0.38*	0.42*	0.42*
Second lowest SES quintile, 24 months	0.63	0.50*	0.52	0.53
Middle SES quintile, 24 months	0.54*	0.47*	0.45*	0.45*
Second highest SES quintile, 24 months	0.57	0.54*	0.52*	0.52*
Birth conditions				
Nonsingleton		0.87	0.95	0.96
Mother's age >35 at child's birth		0.95	1.02	1.03
Mother's age ≤18 at child's birth		0.87	0.72	0.72
Mother not married, 24 months		1.03	0.95	0.93
Very low birth weight		7.48***	7.76***	7.68***
Moderately low birth weight		2.11**	2.22**	2.21**
Labor complications		1.22	1.20	1.20
Obstetric procedures		0.98	0.98	0.97
Maternal medical risk factor at birth		1.03	0.99	0.99
Maternal behavioral risk factor at birth		1.84*	1.61	1.59
Household characteristics				
Non-English primary language, 24 months			0.70	0.70
Parenting score, 24 months			0.92	0.94
Family member with mental illness, 24 months			2.15**	2.14**
Family member with learning disability, 24 months			2.18***	2.16***
Maternal health problems, 9 months			1.46	1.46
Household has person with special needs, 9 months			0.73	0.71
Mother depressed, 9 months			1.39	1.40
Child is in day care center >10 hr/week, 24 months			1.63	1.65
Mother isolated, 9 months			0.56*	0.56*
Child behaviors				
Approaches to learning problems, 24 months				1.35
Internalizing problems, 24 months				0.79
Externalizing problems, 24 months				1.09

Note. SES = socioeconomic status. Weighted regressions. Age and parenting scores are standardized with $M = 0$, $SD = 1$.

[a]Sample size rounded to nearest 50 per ECLS-B confidentiality requirements.

*$p < .05$. **$p < .01$. ***$p < .001$.

Moderately low birth weight about doubled these odds. Both of these effects were essentially unchanged when additional variables were controlled in Models 3 and 4. Model 3 indicated that, when a family member has either a mental illness or a learning disability, the odds of service receipt increased. Possibly this is related to heritability or because the family was already interacting with the health care delivery system, facilitating diagnosis and treatment of the child's speech/language impairments. This model also indicated that being raised by a socially isolated mother reduced children's odds of service receipt by 44% (1–.56). This result also suggests that household social connections to the health care system may be related to young child's access to speech/language therapy. Model 4 added behavioral problems at 24 months to the regression equation. However, they were not significantly related to service receipt. Throughout Models 1–4, the very powerful effect of expressive vocabulary delays on receipt of services is essentially unchanged. Also, across these models, Black children remained significantly less likely than otherwise similar White children to receive speech/language services.

Receipt of Services, 48 Months

Table 4 displays results of the logistic regressions for receipt of speech/language services at 48 months. We added the measure of receptive vocabulary delays at 48 months to the predictors, while maintaining the other variables in the successively estimated regression models. As before, the 24-month expressive vocabulary delays strongly predicted children's receipt of speech/language services (*OR* range = 11.74 to 9.12, Models 1–4). Receptive vocabulary delays at 48 months also significantly predicted service receipt, but at odds indicating a much smaller association. Expressive vocabulary delays at 24 months were much more predictive of service receipt at 48 months than receptive vocabulary delays contemporaneously measured at 48 months.

As with the 24-month receipt of speech/language services, Model 1 shows that Black children were significantly less likely than otherwise similar White children to receive the services at 48 months of age. The estimated odds ratio is approximately 0.5:1, indicating that Black children are only half as likely as Whites to receive the services. Black children's lower likelihood of receiving speech/language services remains evident despite increasingly extensive statistical control (i.e., Models 2–4). The results also indicate that Hispanic children were less likely to receive services than otherwise similar White children. This model also shows that boys were particularly likely to receive services, even after controlling whether or not they had expressive vocabulary delays, a result that is evident across all the models.

Model 2 indicated that, as at 24 months age, very and moderately low birth weight children were more likely to receive speech/language services at 48 months of age, as were children of mothers with a behavioral risk factor (alcohol, smoking, drug use) at birth. Model 3 added household characteristics to the equation. Speaking a language other than English at home strongly decreased the odds of receiving therapy and, with this variable controlled, the Hispanic coefficient moved toward 1.0 and loses statistical significance. Thus, the significant underutilization of services by Hispanics was explained by the use a language other than English being spoken in the home. This model also indicated that households where a family member has a learning disability or has special needs were more likely to access speech/language therapy services. Last, Model 4 added the child's 24-month behaviors to the equation. Children displaying externalizing behavior problems were significantly more likely to receive services.

Receipt of Services, 60 Months

Table 5 displays estimates of factors predictive of or associated with receiving speech/language services at 60 months of age. We included expressive vocabulary delays at 24 months, receptive vocabulary delays at 48 months, and low reading achievement at 60 months as predictors. Despite the lag of 3 years since expressive vocabulary delays were measured, this factor continued to be by far the strongest predictor of the receipt of speech/language services at 60 months of age. The covariate-adjusted odds ratios varied from 6.10 to 4.32 across the different models. As in the previous analyses, receptive vocabulary delays at 48 months continued to be significant but with an odds ratio slightly over 2.1. A low reading score at 60 months significantly increased the odds of service receipt in Model 2 but lost statistical significance when additional controls were added in Models 3 and 4.

Model 1 also shows that, adjusting for sociodemographics, Hispanic children were significantly less likely than White children to receive speech/language therapy. Model 3 subsequently indicated that this was partially explained by use of a primary language other than English. Model 1 also indicated a pattern in which the likelihood of service receipt decreased monotonically with the increasing SES quintiles. Models 2 and 3 generally confirmed the prior findings, with particularly strong effects of very low birth weight on receipt of services. Model 4's results are largely consistent with Model 3's results. Model 4 also indicated a significant predictive relation between 24 months externalizing behavior problems and speech/language service receipt at 60 months of age. This coefficient was also positive in Model 4 of the 48-month regressions, indicating that children displaying these behaviors may be more likely to be referred to receive speech/language services prior to or around 60 months.

Discussion

We sought to identify which children in the United States were more or less likely to receive speech/language services by 5 years of age. Results indicated that children displaying expressive vocabulary delays at 24 months of age were much more likely to receive these services as they aged. These extensively corrected odds ratios (results from

Table 4. Odds ratios of a parent report of child having speech/language therapy at 48 months (N = 8,600[a]).

Explanatory variable	Model 1	Model 2	Model 3	Model 4
Low total word score, 24 months	11.74***	10.49***	10.14***	9.12***
Low receptive vocabulary, 48 months		2.13***	2.37***	2.25***
Sociodemographics				
Black	0.54*	0.54*	0.50*	0.48*
Hispanic	0.36***	0.38***	0.65	0.63
Other race	0.44**	0.45**	0.47*	0.43**
Age	1.03	1.03	1.04	1.04
Male	1.66**	1.74**	1.73***	1.65**
Lowest SES quintile, 24 months	1.01	0.77	0.70	0.72
Second lowest SES quintile, 24 months	0.94	0.73	0.66	0.66
Middle SES quintile, 24 months	0.95	0.84	0.78	0.81
Second highest SES quintile, 24 months	0.72	0.68	0.69	0.70
Birth conditions				
Nonsingleton		0.85	0.85	0.82
Mother's age >35 at child's birth		1.12	1.16	1.19
Mother's age ≤18 at child's birth		0.50	0.43*	0.42*
Mother not married, 24 months		1.03	0.90	0.88
Very low birth weight		4.00***	3.92***	4.00***
Moderately low birth weight		1.57*	1.58*	1.60*
Labor complications		1.09	1.04	1.04
Obstetric procedures		1.08	1.10	1.10
Maternal medical risk factor at birth		1.15	1.13	1.10
Maternal behavioral risk factor at birth		2.02***	1.68*	1.65*
Household characteristics				
Non-English primary language, 24 months			0.40**	0.43*
Parenting score, 24 months			0.89	0.93
Family member with mental illness, 24 months			1.24	1.29
Family member with learning disability, 24 months			1.74**	1.73**
Maternal health problems, 9 months			1.05	1.03
Household has person with special needs, 9 months			1.81**	1.84**
Mother depressed, 9 months			1.39	1.36
Child is in day care center >10 hr/week, 24 months			1.45	1.47
Mother isolated, 9 months			1.18	1.18
Child behaviors				
Approaches to learning problems, 24 months				1.43
Internalizing problems, 24 months				1.17
Externalizing problems, 24 months				1.86*

Note. SES = socioeconomic status. Weighted regressions. Age and parenting scores are standardized with M = 0, SD = 1.

[a]Sample size rounded to nearest 50 per ECLS-B confidentiality requirements.

*p < .05. **p < .01. ***p < .001.

Model 4 in Tables 3–5) ranged from 16.60 to 4.32 depending on the time period evaluated. Expressive vocabulary delays at 24 months of age remained strongly predictive of speech/language service receipt at 60 months with extensive statistical control, including both receptive vocabulary knowledge delays at 48 months of age and low reading achievement at 60 months of age. Very low birth weight also consistently increased children's likelihood of receiving speech/language services. Externalizing problem behaviors by 24 months of age increased children's likelihood of receiving services at 48 months and, separately, 60 months of age. In contrast, Black children were consistently less likely than White children to receive speech/language services, controlling for differences in background characteristics in multivariate analyses. The likelihood that Black children would receive these services was about 45%–60% lower than for otherwise similar White children. This same magnitude of disparity was evident whether the children were 24, 48, or 60 months of age. Hispanic children's lower likelihood of service receipt was explained by use of language other than English at home.

Contributions and Implications

Our results are consistent with other work, indicating that the early onset of vocabulary delays can quickly begin to interfere with children's language development (e.g., Catts, Fey, Zhang, & Tomblin, 1999; Hart & Risley, 1995; Walker, Greenwood, Hart, & Carta, 1994). Newly available work indicates that having a smaller expressive vocabulary by as early as 24 months of age uniquely increases children's risk for lower academic achievement and behavioral functioning by kindergarten entry (Morgan et al., 2015). Results from the present study indicate that expressive vocabulary delays uniquely increase 24-month-old children's risk for speech/language services, thereby providing additional

Table 5. Odds ratios of a parent report of child having speech/language therapy at 60 months (N = 6,550[a]).

Explanatory variable	Model 1	Model 2	Model 3	Model 4
Low total word score, 24 months	6.10***	5.19***	4.61***	4.32***
Low receptive vocabulary, 48 months		2.10**	2.37**	2.21**
Low reading test score, 60 months		1.76*	1.63	1.63
Sociodemographics				
Black	0.68	0.68	0.59*	0.55*
Hispanic	0.38**	0.36**	0.55	0.51
Other race	1.19	1.19	1.26	1.04
Age	0.93	0.96	0.96	0.97
Male	1.39	1.45	1.45	1.32
Lowest SES quintile, 24 months	2.94***	2.13*	1.70	1.65
Second lowest SES quintile, 24 months	1.96*	1.58	1.28	1.27
Middle SES quintile, 24 months	1.83	1.62	1.40	1.39
Second highest SES quintile, 24 months	1.41	1.36	1.23	1.28
Birth conditions				
Nonsingleton		0.94	0.97	0.94
Mother's age >35 at child's birth		0.85	0.93	0.93
Mother's age ≤18 at child's birth		0.82	0.70	0.72
Mother not married, 24 months		0.90	0.81	0.80
Very low birth weight		3.37***	3.31***	3.18***
Moderately low birth weight		1.20	1.15	1.16
Labor complications		1.02	1.00	1.01
Obstetric procedures		0.84	0.84	0.86
Maternal medical risk factor at birth		1.15	1.08	1.00
Maternal behavioral risk factor at birth		1.56	1.23	1.19
Household characteristics				
Non-English primary language, 24 months			0.41*	0.47
Parenting score, 24 months			0.77	0.81
Family member with mental illness, 24 months			1.84	1.88*
Family member with learning disability, 24 months			1.56	1.43
Maternal health problems, 9 months			1.53	1.52
Household has person with special needs, 9 months			1.18	1.18
Mother depressed, 9 months			1.58*	1.65*
Child is in day care center >10 hr/week, 24 months			1.06	1.03
Mother isolated, 9 months			1.09	1.12
Child behaviors				
Approaches to learning problems, 24 months				1.74
Internalizing problems, 24 months				0.65
Externalizing problems, 24 months				2.26*

Note. SES = socioeconomic status. Weighted regressions. Age and parenting scores are standardized with M = 0, SD = 1.

[a]Sample size rounded to nearest 50 per ECLS-B confidentiality requirements.

*p < .05. **p < .01. ***p < .001.

empirical support for expressive vocabulary delays as a potential target of early screening and intervention efforts by SLPs. A resulting contribution and implication of our study is that reducing the later need for costly specialized services, including special education services delivered prior to, by, or following school entry, may require screening for and targeting the very early onset of expressive vocabulary delays. Our analyses suggest that these screening and intervention efforts may need to occur as early as 24 months of age. Our results consistently indicated that 24-month-old children's expressive vocabulary delays are by far the strongest predictor of speech/language service use as they age across very early childhood. That we detected this relation between expressive vocabulary delays at 24 months of age and speech/language service receipt at 24, 48, and 60 months of age using a very brief, parent-reported measure suggests that the M-CDI may be a clinically useful tool for SLPs, pediatricians, nurses, and other professionals to use in early screening and intervention efforts.

Our findings also contribute to the field's knowledge base about additional factors related to speech/language service use. For example, and to date, whether and to what extent being born with moderately or very low birth weight increases children's receipt of speech/language services has been unclear. Another resulting implication of our study's findings is that children born with low birth weight and especially very low birth weight should begin to be monitored very soon after their birth to ensure that their speech and/or language abilities are developing appropriately. U.S. children displaying externalizing problem behaviors are more likely to be provided with speech/language services as they age, possibly in an attempt to provide these children with greater capacities to express their needs or frustrations and thereby help them avoid engaging in externalizing-type

problem behaviors. Our study also suggests that a family history of learning disabilities increases children's risk for speech/language services, possibly due to heritability of disabling conditions (Felsenfeld & Plomin, 1997) and/or due a parent's resulting greater familiarity with the health care system. We observed that maternal depression also increases children's risk of needing speech/language services by 60 months, which is consistent with an increased risk by children of depressed mothers for EI services generally (Feinberg et al., 2012). Taken together, our study's analyses identify factors in addition to expressive vocabulary delays that uniquely increase children's likelihood of receiving speech/language services and so might be used in screening instruments.

Our repeated finding that Black children and Hispanic children from homes where a language other than English is spoken are less likely than otherwise similar White children to receive speech/language services is consistent with other work investigating minority disproportionate representation in special education prior to, by, and following school entry (Hibel et al., 2010; Morgan et al., 2012; Morgan et al., 2015; Samson & Lesaux, 2009), particularly in studies that similarly used longitudinal designs and multivariate analyses that allow for extensive statistical control. Why these disparities in speech/language service use are occurring is presently unclear. Yet they have major implications for policy and practice. For example, SLPs and other clinicians may need to increase their monitoring efforts to ensure that cultural and linguistic factors are not interfering with the ability of minority families to access speech/language services. Socioeconomic factors do not themselves explain these racial/ethnic disparities. One way to increase minority children's participation in speech/language services may be to inform parents about the availability of services, as well as to discuss the possible benefits of these services (Hebbeler et al., 2007) and to share the possible substantial consequences of unaddressed speech/language impairments over the children's early life course (Paul & Roth, 2011; Stanovich, 1986). SLPs and educators may need to more actively communicate with minority communities and provide needed information about language development, the availability services, and the importance of EI, while also ensuring that that any concerns regarding prejudice or other inappropriate factors in the screening process are satisfactorily addressed (Yeh, Forness, Ho, McCabe, & Hough, 2004). Efforts should be made to reach out to community leaders and professionals from diverse backgrounds to ensure that information about the potential benefits of EI is made available in a culturally relevant and accessible manner.

In addition, it appears that increased efforts are needed on the part of preservice educators, employers, and the American Speech-Language-Hearing Association to better train future and practicing SLPs on ways of effectively reaching out to families of diverse backgrounds and on the process of identifying children with speech/language impairments. Studies have repeatedly shown that preservice and practicing SLPs would like additional training on serving bilingual children and lack confidence in their abilities to provide services to this population (Hammer, Detwiler, Detwiler, Blood, & Qualls, 2004; Hammer et al., 2003; Roseberry-McKibben, Brice, & O'Halon, 2005). Without sufficient training, SLPs may be reluctant to identify children from diverse backgrounds as being speech and language delayed or disordered. More specifically, SLPs may not have sufficient understanding of how to differentiate a language disorder from a language difference that results from learning two language or use of a nonmainstream American dialect of English. As a result, Black and Hispanic children may be less likely to receive needed services.

In addition, there is a great need for speech and language assessments that are culturally and linguistically appropriate for children from diverse backgrounds (cf. Barrueco, López, Ong, & Lozano, 2012; Hammer, Hoff, Uchikoshi, Gillanders, & Sandilos, 2014). Although most commercially available assessments have norming samples that are representative of the U.S. population, the content of these assessments may not be sufficiently culturally and linguistically sensitive for use with Black and Hispanic children. Although information needs to be gathered from multiple sources when assessing children, the availability of more culturally and linguistically appropriate assessment instruments with guidelines for proper interpretation of evaluation results will also assist SLPs to accurately diagnose and serve children from diverse backgrounds in the United States.

Limitations

This study has a number of limitations. Our analyses depend on parents accurately reporting whether their child received speech/language services. For example, it may be that the disparities we attribute in actual service receipt for Black children are instead attributable to systematic underreporting by their parents. We were unable to independently confirm with speech-language practitioners whether parents accurately reported on their child's receipt of services. We were also unable to report on the quality of services being provided (e.g., Biancone, Farquharson, Justice, Schmitt, & Logan, 2014). Considerable differences in eligibility criteria for EI and special education services exist among and within the United States. Thus, a child who qualifies for services in one state may not qualify for services in another state. Eligibility criteria also change as children age (e.g., services resulting from EI versus from early childhood special education). Our analyses were not designed to evaluate service receipt among children identified as having speech/language impairments. Doing so would have allowed for a more specific determination of disparities among children formally identified as having such impairments. Yet, from a methodological standpoint, limiting our sample in this way would have severely constrained a general examination of factors contributing to service delivery (e.g., vocabulary delays, low birth weight) across a larger, more diverse population of children. Statistical power would also have been greatly reduced as a result of using a much smaller, less diverse reference group. The ECLS-B's very large sample size resulted in a considerable age range of the children

during the 24-, 48-, and 60-month survey waves. We were unable to directly contrast whether expressive or receptive vocabulary delays at 24 months of age were more predictive of speech/language service receipt. This is because this survey wave did not include both types of vocabulary measures. However, strong positive correlations have been found between receptive and expressive vocabulary (e.g., $r = .66$; Sideridis & Simos, 2010). These two types of vocabulary knowledge may not actually constitute distinct constructs. Tomblin and Zhang's (2006) large-scale investigation of young children's language abilities yielded no evidence for a distinction between receptive and expressive vocabulary. Our analyses are based on secondary data. Although such data allow for both hypothesis generation as well as rigorously estimated risk factors estimates, they do not allow for strong causal inferences.

Conclusion

This study's analyses of a population-based, longitudinal, and multivariate data set help extend the field's knowledge base about the factors associated with or predictive of receiving speech/language services in the United States. These analyses identified a relatively consistent set of predictors of receipt of these services. These included expressive vocabulary delays by 24 months of age, being Black, and being born with very low birth weight. Additional but more intermittent risk factors included being born with moderately low birth weight, being from a non-English speaking home, maternal depression, and a prior history of externalizing problem behaviors. Although experiencing receptive vocabulary delays at 48 months or low reading achievement at 60 months of age also increased children's risk, expressive vocabulary delays at 24 months were the strongest predictor of service receipt and so might constitute an especially promising target of intervention efforts by SLPs and other professionals. In contrast, and despite being otherwise similar with White children, we observed that Black children were disproportionately less likely to receive speech/language services in the United States, suggesting that professionals may need to undertake additional efforts to ensure that these culturally and linguistically diverse children are able to access potentially helpful speech/language services by or soon after entering U.S. schools.

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