Comparison of Referral Rates for Preschool Children at Risk for Disabilities Using Information Obtained From Birth Certificate Records

Christine E. F. Delgado and **Keith G. Scott**
University of Miami

This study demonstrates the utility of integrating birth certificate record data with an existing disability-tracking database for the purpose of evaluating early identification efforts. The authors examined referral rates of preschool-age children for several known disability risk factors. Low birthweight, low maternal education, and prematurity were associated with increased odds of referral. The authors also examined referral rates for gender, race, and ethnicity. The odds of referral for boys were nearly twice those for girls. Compared to White children, the odds of referral were greater for Native American children and lower for Black and Asian/Pacific Island children. Odds of referral for non-Hispanic/non-Haitian children were greater than those for Hispanic or Haitian children. Identifying factors that are associated with the likelihood of referral will alert clinicians, parents, teachers, and policy makers to the existence of biasing factors and can be used to further improve Child Find procedures.

Early identification has become recognized nationwide as a necessary tool in providing the most effective treatment and intervention services to children with disabilities. The responsibility of early identification often falls on Child Find, a process of locating, identifying, and assessing children in need of special services that was mandated by the 1997 amendments to the Individuals with Disabilities Education Act (IDEA). Children identified as at risk for a disability are typically referred for further screening and evaluation. This initial referral is often considered the most important step in the special education eligibility process because it (a) identifies which children will be considered for services and (b) is an important predictor of future eligibility for special education (Artiles & Trent, 1994; Ysseldyke & Algozzine, 1983). As such, it is essential that Child Find efforts result in the referral of those children who are at the most risk for disabilities.

Numerous disability risk factors have been identified and have typically been classified into the following three categories:

1. established conditions that are apparent at or soon after birth;
2. physical or medical trauma at the prenatal, perinatal, or neonatal stages; and
3. physical, social, familial, and/or emotional risk factors (Bergen, 1994; Pavri, 2001).

Information for a number of important risk indicators, including prematurity, low birthweight, low maternal education, teenage mother, and single mother, can be obtained from birth certificate records. Although specific risk factors vary for different disabilities, these factors are related to most developmental disabilities, including mental retardation, specific learning disability, specific language impairment, emotional handicap, and severe emotional disturbance (Andrews, Goldberg, Wellen, Pittman, & Struening, 1995; Chapman, Scott, & Mason, 2002; Hollomon, Dobbins, & Scott, 1998; Mason, Chapman, & Scott, 1999; Nonkin Avchen, Scott, & Mason, 2001; Scott, Mason, & Gonzalez, 2000; Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002; Stanton-Chapman, Chapman, & Scott, 2001). In the present study, we evaluated the effectiveness of the Child Find process by comparing the odds of referral for these factors.

Disproportionate representation by gender, race, and ethnicity can also be examined using information from birth certificate records. Although these factors are not typically considered to be disability risk factors (Kraemer et al., 1997), representation in special education is biased in terms of these factors. Boys are consistently identified with disabilities at higher rates than are girls (Andrews et al., 1995; Campbell et al., 2003; Mason et al., 1999; Stanton-Chapman et al., 2002; Stanton-Chapman et al., 2001; Zhang & Tomblin, 2000). African American students are often overrepresented in mental retardation, specific learning disability, and emotional handicap classifications, and Native American students are often overrepresented in the specific learning disability classification. Asian American students are typically underrepresented in al-

Address: Christine Delgado, Department of Psychology, University of Miami, PO Box 248185, Coral Gables, Florida, 33124-0751;
e-mail: cdelgado@umiami.edu

most every eligibility category, with the exception of speech–language impairment (Cartledge, 1999; Chinn & Hughes, 1987; Finn, 1982; Oswald, Coutinho, Best, & Singh, 1999).

Racial disparities across eligibility classifications have been well documented, but very little research has been conducted on potential disparities at referral. Investigating the factors affecting referral rates and processes is essential to fully understanding the roots of disproportionate representation in special education (Hosp & Reschly, 2003). Hosp and Reschly conducted a meta analysis of 10 relatively small studies (i.e., conducted on individual school districts) containing information on referral rates for children ages 5 years to 21 years. These researchers found that although referral rates varied greatly across individual studies, a significant overall discrepancy existed between the referral rates for African American students and those for White students, with African American students more likely to be referred. However, the referral rates for Hispanic and White students were found to be similar. Additional research on infants and preschoolers demonstrated that developmental delays in children from culturally and linguistically diverse backgrounds often were not detected at an early age (Bondurant-Utz & Luciano, 1994; Lequerica, 1995). Potential disparities among referral rates for preschool-age children, however, have not been examined.

In the study on which we report here, the utility of database integration for evaluating Child Find and examining issues related to disproportionate referral was demonstrated. We integrated referral information from the Children's Registry and Information System (CHRIS) with birth certificate record information for a statewide sample of preschool-age children. This research addresses the need for comparative population proportions for referral rates, as recently stated by Hosp and Reschly (2003). In addition, the present study used a sample of preschool-age children. Previous research on referral rates has examined only school-age children (kindergarten–12th grade). Information regarding referral rates for young children is needed to document the effectiveness of Child Find in identifying children with disabilities prior to school entry.

This study provides information not previously reported regarding risk factors and expands on previous research regarding disproportionate representation by gender, race, and ethnicity. Given the increased rates of disability associated with the risk factors studied, we hypothesized that a greater proportion of children with these risk factors would be referred when compared to rates for the general population. We expected representation by gender, race, and ethnicity to follow the trends identified in previous research. Studies of young children, such as this one, are necessary to more fully understand the origins of disproportionate representation.

Method

For the purposes of the present study, we integrated data from the state of Florida's Department of Health birth certificate records (1994 and 1995) with preschool exceptionality records from the CHRIS database.

Birth Certificate Records

We obtained birth certificate record data for all children born in 1994 or 1995 from the Florida Department of Health for the purpose of conducting health-related research. The National Center for Health Statistics, a division of the Centers for Disease Control and Prevention, standardizes the data contained in birth certificate records. Information for the records is obtained shortly after the child's birth from medical records and through parent report.

Children's Registry and Information System

CHRIS is a database project funded by the Florida Department of Education. It was developed in 1990 in response to the need to track children who are potentially eligible for services under IDEA, Part B. The CHRIS database contains referral, screening, evaluation, and eligibility information for preschool-age children throughout the state who have been referred to the Florida Diagnostic and Learning Resources System (FDLRS). In addition, service coordination information (e.g., appointments, family contacts, follow-up actions needed) may be entered into the database, and this information is available to service providers who work with individual children to ensure the efficient use of time and resources. The data contained in CHRIS provide the Florida Department of Education with a means of documenting Child Find efforts to locate, evaluate, and provide necessary services to at-risk preschool-age children.

The CHRIS database program is utilized statewide at FDLRS centers. FDLRS is a network of 19 state and federally funded associate centers that provide support services to educators, families of students with exceptionalities, and community agencies throughout Florida. These centers provide Child Find services by locating preschool-age children who are potentially eligible for services under IDEA and linking the families of those children with needed services. FDLRS coordinates with district diagnostic staff and other providers for completion of multidisciplinary evaluations of appropriate Child Find referrals and assists with diagnostic services for those students who require assessment. In addition, FDLRS provides screening services at a variety of locations, including FDLRS centers, day-care centers, Head Start centers, and Native American and migrant centers. FDLRS and Child Find share the goal of identifying all preschool-age children with, or at risk for, disabilities.

Database Integration

We accomplished the integration of databases by using automated deterministic data linkage techniques: A child's unique record was identified in both databases and joined across datasets to establish one record. We based this data linkage method on previously established techniques (Boussy & Scott, 1993; Newcombe, 1988; Redden, Mulvihill, Wallander, & Hovinga, 2000). Records were linked based on an exact match of the child's last name, first name, and date of birth. If any of the matching variables differed, the linkage software considered the pair to be a nonmatch and did not include it in the linked sample. We removed all identifying information immediately following the automated data linkage process and prior to data analysis to maintain confidentiality.

Sample

We obtained the birth certificate record information for all children born in Florida in 1994 or 1995 (*n* = 375,508). We also obtained referral information from CHRIS for all children born in 1994 or 1995 who were also referred between the ages of 2 years 6 months and 4 years 11 months. Of the 36,698 children in the CHRIS database who met these criteria, we were able to link 24,539 (67%) to the birth certificate records. Some of the children whose CHRIS records we were unable to link to birth certificate records were born outside of Florida but had moved to the state prior to being referred. We were unable to link other children's records due to inconsistent data in the name or date-of-birth fields between the CHRIS and birth certificate records datasets. For example, records would not be linked for a child if the first name was entered as "William" in the birth certificate record database and as "Bill" in the CHRIS database.

Following database integration, we created the following two groups:

1. Referred—children who had been referred to FDLRS with a presenting problem or concern that required further action, such as a screening or evaluation (*n* = 24,539), and
2. Not Referred—children who were born in Florida but were not referred to FDLRS (*n* = 350,969).

To provide a consistent sample for analysis, we removed records for which information for any factor was missing. For the Referral group, we removed173 records (0.7%), resulting in a final sample size of 24,366 for that group. For the Not Referred group, we removed 2,759 records (0.8%), resulting in a final sample size of 348,210 for that group. Missing data did not exceed 0.6% for any individual factor.

Factors

We examined the following factors: gestational age, birthweight, maternal age, maternal education, maternal marital status, gender, race, and ethnicity (see Note). The birth certificate record did not include child ethnicity; therefore, we used maternal ethnicity for this study. Paternal ethnicity was not used because it was unreported on the birth certificate record to a much greater extent (19%) than was maternal ethnicity (0.05%).

Because we obtained our data from birth certificate records, the status of the child or mother was that at the time of the child's birth. For example, maternal education represents the level of educational attainment the mother reported at the time of the child's birth. Any additional education obtained since the birth was not reflected in these data.

Analyses

Due to the dichotomous nature of the outcome (Referred vs. Not Referred), we employed logistic regression to evaluate the association of each factor with referral status. Logistic regression yields an odds ratio (OR) that indicates the relative increase or decrease in the odds of a given outcome relative to a reference group. We dummy-coded groups based on the group we expected to be associated with the lowest risk for disability (i.e., the group least likely to be referred), and designated it as the reference group. We chose White and non-Hispanic/non-Haitian as the reference groups for race and ethnicity, respectively, because they represented the largest groups in Florida and presented the most theoretically interesting comparisons.

For each OR, we calculated 95% confidence intervals. These intervals indicate the lower and upper limits of the OR, which contains the true parameter 95% of the time over unlimited repetitions of the study, assuming there was no bias. Thus, we considered ORs that were not significantly different from 1.0 to not be meaningful because we could not be confident that the rate of referral was truly different across the levels of the predictor variable.

Results

The distribution of factors examined for the Referred and Not Referred groups is presented in Table 1. We entered the factors into a logistic regression and evaluated the unique contribution of each factor using the Wald chi-square statistic. Adjusted ORs indicated the OR for each factor, adjusted for all other factors studied (see Table 2).

Risk Factors for Disability

Prematurity (OR = 1.14), very low birthweight (OR = 1.79), low birthweight (OR = 1.31), maternal education of less than 12 years (OR = 1.29), and maternal education equal to 12 years (OR = 1.15) were associated with significantly increased odds for referral. Maternal age and marital status were not associated with increased odds for referral.

TABLE 1. Distribution of Factors for Preschool Children Referred and Not Referred Who Were Born in Florida in 1994 or 1995

Factor	Referred[a]		Not Referred[b]	
	n	%[c]	*n*	%[c]
Gestational age				
Premature (< 37 wks)	2,914	12.0	30,371	8.7
Full-term (≥ 37 wks)	21,452	88.0	317,839	91.3
Birthweight				
VLBW (< 1500 g)	622	2.6	4,555	1.3
LBW (1500–2499 g)	1,952	8.0	20,997	6.0
NBW (≥ 2500 g)	21,792	89.4	322,658	92.7
Maternal age				
< 18 yrs	1,499	6.2	19,223	5.5
≥ 18 yrs	22,867	93.8	328,987	94.5
Maternal education				
< 12 yrs	5,997	24.6	77,611	22.3
= 12 yrs	9,176	37.7	125,603	36.1
> 12 yrs	9,193	37.7	144,996	41.6
Maternal marital status				
Married	15,451	63.4	227,005	65.2
Single	8,915	36.6	121,205	34.8
Child gender				
Male	15,953	65.5	173,976	50.0
Female	8,413	34.5	174,234	50.0
Child race				
White	18,069	74.2	255,965	73.5
African American	5,900	24.2	82,635	23.7
Asian/Pacific Islander	235	1.0	7,661	2.2
Native American	137	0.6	1,463	0.4
Other	25	0.1	486	0.1
Maternal ethnicity				
Non-Hispanic/Non-Haitian	20,594	84.5	276,565	79.4
Hispanic	3,440	14.1	62,992	18.1
Haitian	332	1.4	8,653	2.5

Note. VLBW = very low birthweight; LBW = low birthweight; NBW = normal birthweight.
[a] *n* = 24,366. [b] *n* = 348,210. [c] Due to rounding, the sum of percentages may not total 100.0.

Gender

We found a large disparity for referral based on gender. The odds of referral for boys were 1.9 times greater than the odds of referral for girls.

Race

We compared each racial category with the White category. The odds of referral for African American children were significantly lower than the odds of referral for White children (OR = 0.94), as were the odds of referral for Asian/Pacific Island children (OR = 0.42). The inverse of this value indicates that the odds of referral for White children were 2.4 times greater than those for Asian/Pacific Island children, whereas the odds of referral for Native American children were significantly greater than those for White children (OR = 1.22).

Ethnicity

We compared each ethnic category to the non-Hispanic/non-Haitian category. The odds of referral for Hispanic (OR = .70) and Haitian (OR = .49) children were significantly lower than were the odds of referral for non-Hispanic/non-Haitian children. The inverse of these values indicated that the odds of referral for non-Hispanic/non-Haitian children were 1.4 times greater than the odds of referral for Hispanic children and 2.0 times greater than those for Haitian children.

Discussion

Integration of birth certificate records with the CHRIS database allowed us to examine referral rates across a variety of factors. The results indicated that Child Find efforts in Florida are effectively targeting services to those children who are at an increased risk for disability, but that representation at referral is disproportionate by race and ethnicity, even after adjusting for associated risk factors.

The biological risk factors (prematurity and low birthweight) that we studied were associated with significantly increased odds of referral. This is probably due in part to the biological relation between these factors and disability outcome. In addition, service providers who work directly with young children (e.g., pediatricians, other health-care providers, day-care providers, preschool teachers) are likely to be aware of the presence of these biological factors. Professional awareness of factors known to be related to disability, such as prematurity and low birthweight, may contribute to an increased monitoring of children for early delays, which would result in an increased likelihood of referral.

Of the environmental risk factors (low maternal age, low maternal education, and single marital status) we studied, only low maternal education was associated with significantly increased odds of referral. Maternal education serves as an indicator of family income and overall socioeconomic status (Hernandez, 1997) and is associated with the experiences of children through cognitive stimulation, parental knowledge of child development, parenting practices, nutrition, health care, and quality of the language environment (Benasich & Brooks-Gunn, 1996; Entwisle & Astone, 1994; Hart & Risley, 1995; Satcher, 1995). Although the relation of maternal education and

TABLE 2. Wald Chi Square and Adjusted Odds Ratios with 95% Confidence Intervals Associated with Factors Present at Birth

Factor	Wald χ^2	Adjusted odds ratio	(95% CI)
Gestational age	21.57*		
Premature (< 37 wks)		1.14	(1.08–1.20)
Full-term (≥ 37 wks)		—	
Birthweight	163.01*		
VLBW (< 1500 g)		1.79	(1.62–1.98)
LBW (1500–2499 g)		1.31	(1.23–1.39)
NBW (≥ 2500 g)		—	
Maternal age	1.75		
< 18 yrs		0.96	(0.90–1.02)
≥ 18 yrs		—	
Maternal education	172.34*		
< 12 yrs		1.29	(1.24–1.34)
= 12 yrs		1.15	(1.12–1.19)
> 12 yrs		—	
Maternal marital status	0.11		
Married		—	
Single		1.00	(0.96–1.03)
Child gender	2,155.81*		
Male		1.91	(1.86–1.96)
Female		—	
Child race	185.60*		
White		—	
African American		0.94	(0.91–0.98)
Asian/Pacific Islander		0.42	(0.37–0.48)
Native American		1.22	(1.02–1.46)
Other		0.76	(0.51–1.14)
Maternal ethnicity	471.08*		
Non-Hispanic/non-Haitian		—	
Hispanic		0.70	(0.68–0.73)
Haitian		0.49	(0.44–0.55)

Note. CI = confidence interval; VLBW = very low birthweight; LBW = low birthweight; NBW = normal birthweight; — indicates reference group.
$^*p < .001$.

disability outcome is probably less direct than that associated with the biological factors we studied, its influence is important and should not be overlooked. Mason and colleagues (1999) reported that the magnitude of risk for emotional problems associated with low maternal education is larger than that associated with prematurity or low birthweight. Another study indicated that low maternal education was associated with the following increases in risk:

- 9.9 times for educable mental handicap
- 5.3 times for emotional handicap, and
- 2.1 times for specific learning disability.

By comparison, low birthweight was associated with the following increases in risk:

- 3.5 times for educable mental handicap,
- 1.3 times for emotional handicap, and
- 1.4 times for specific learning disabilities (Scott et al., 2000).

In addition to being an important risk factor, maternal education was considerably more prevalent than either low birthweight or prematurity. From a public policy standpoint, funds should be targeted to prevention and intervention efforts that will have the largest impact on the population. Due to this greater prevalence of low maternal education, successful prevention and early identification efforts targeted toward mothers with low levels of education could have a greater effect on reducing the overall prevalence of special education placements at a population level than targeting these efforts toward children who were born prematurely or with a low birthweight (Hollomon et al., 1998).

Our study also identified a disproportionate referral rate for boys, which was nearly twice that of girls. This is in accord with other research indicating that boys are consistently identified with disabilities at higher rates than are girls (Andrews et al., 1995; Campbell et al., 2003; Mason et al., 1999; Stanton-Chapman et al., 2002; Stanton-Chapman et al., 2001; Zhang & Tomblin, 2000). The extent to which this reflects a true increase in risk for boys or a bias in the eligibility process requires further study. It is important to recognize, however, that this discrepancy is present at the initial stage in the eligibility process for preschool-age children.

Previous research has indicated a tendency for African American and Native American children to be overrepresented in special education and for Asian/Pacific Island children to be underrepresented. The present study replicated these findings in a preschool-age sample with regard to Native American and Asian/Pacific Island children but did not reflect the overrepresentation of African American children. The odds of referral for Native American children were 1.2 times greater than those of White children, while the odds of referral for Asian/Pacific Islander children were 2.4 times less than those of White children. Although Native American and Asian/Pacific Islander populations in Florida are small (0.4% and 2.1% of the total population, respectively), our results indicate a disparity in referral rates for these children, even as preschoolers, that may well continue through to special education placement in the school years.

Previous research on referral rates in school-age children indicated that African American children were more likely to be referred than were White children (Hosp & Reschly, 2003). This trend was not identified in the present study. After we adjusted for the other factors, the odds of referral for White children were 1.1 times those of African American children, indicating that White children were slightly, although significantly, more likely to be referred than were African American children.

Although concerns regarding the disproportionate representation of African American children in special education are growing, we need to recognize that representation in special education should be proportional to the needs of different groups, not their percentage of the population (Hosp & Reschly, 2003). African American children are more likely than White children to have significant risk factors for disability. For example, data from the present study indicated that the rate of African American children born in Florida with very low or low birthweight (< 2,500 g) is double the rate for White children (12% and 6%, respectively). This is consistent with the findings from other research (Bennett, 1988). In addition, the proportion of African American children with mothers who had completed 12 or fewer years of education was 74%, compared to 54% for White children. The influence of these factors on referral was evident in the present study: We observed a reduction in the odds of referral for African American children when the risk factors studied were included in the analyses. When these additional factors were not included, the odds of referral did not significantly differ for African American and White children. These findings demonstrate the importance of taking risk factors into account when considering issues related to disproportionate representation. All children with significant risk factors for disability should be closely monitored at young ages for any sign of delay.

With regard to ethnicity, the present study indicated that the odds of referral for non-Hispanic/non-Haitian children were 1.4 times greater than those of Hispanic children and twice those of Haitian children. The underreferral of Hispanic and Haitian children can have a negative impact on their educational outcomes by denying them access to services, programs, and resources designed to meet their unique educational needs (Poon-McBrayer & Garcia, 2000; Salend, Garrick Duhaney, & Montgomery, 2002). Reasons for these reduced referral rates are undoubtedly multifaceted and probably include a lack of awareness regarding the availability of services, differences in cultural attitudes regarding disabilities, and limited English proficiency that results in (a) limited access to materials disseminated by Child Find agencies and (b) a reduced ability to communicate with medical, educational, and childcare personnel (Pavri, 2001).

Study Limitations

Although the large scope of the present study provides a unique look at referral rates in preschool-age children that has not previously been possible, we need to acknowledge certain limitations.

Using large extant datasets allows researchers to efficiently and inexpensively address issues associated with referral on extremely large samples of children; however, incomplete data linkage is a limitation of this methodology. Sixty-seven percent of children with records in CHRIS were linked to their corresponding birth certificate records. This value underestimates the true linkage rate because some of the unlinked records represent children who were born outside of Florida, but the linkage rate remains less than optimal. CHRIS does not contain the demographic information needed to determine the number of children in the database who were born outside of Florida or the information needed to evaluate potential biases in the linkage process (i.e., the potential for lower linkage rates for racial and ethnic minorities).

In addition, although the CHRIS database provides a unique opportunity for research at the state level, data limited to a single state may not generalize to other areas of the country. Florida contains a large and diverse minority population that allows researchers to study minority groups in ways that are not possible in other areas of the country, but it also limits the application of findings to other regions of the country with less diverse populations. In addition, Florida has a unified, statewide system for the identification of preschool-age children with or at risk for disabilities that probably differs from the referral systems of other states. Referrals for further diagnostic services (i.e., screening and evaluation) are made through the statewide network of the FDLRS and are recorded in the CHRIS database. Parents contact FDLRS as a result of their own concerns or of concerns raised by another source (e.g., physician, day-care provider, teacher, relative, friend). FDLRS staff members also conduct Child Find activities at a variety of locations, including FDLRS, day-care centers, Head Start centers, Native American centers, and migrant centers. These efforts result in the referral of a broad range of children from varied backgrounds.

Conclusions

Birth certificate records are a readily available and inexpensive source of information that is useful for evaluating Child Find efforts and other aspects of service provision for children with disabilities. The identification of factors that are associated with the likelihood of referral or service receipt will alert clinicians, parents, teachers, and policymakers to the existence of biasing factors and can be used to further improve Child Find procedures. As states establish and revise tracking systems for young children with disabilities, the potential for integration with existing statewide datasets (e.g., birth certificate records, birth defect registries, public school records, WIC records) should be seriously considered. These efforts will provide information fundamental to the improvement of early identification and intervention services for young children.

AUTHORS' NOTES

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NOTE

We identified racial and ethnic groups in the present study using the terms provided in the birth certificate records. *Race* was classified into the following categories: White, Black, Native American, Asian/Pacific Islander (Chinese, Japanese, Hawaiian, Filipino, or Other Asian/Pacific Islander), and Other (other non-White). *Ethnicity* was classified into the following categories: non-Hispanic/non-Haitian, Hispanic (Mexican, Puerto Rican, Cuban, Central/South American, other/unknown Hispanic), and Haitian.

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