Communication Disorders: Prevalence and Comorbid Intellectual Disability, Autism, and Emotional/Behavioral Disorders

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Purpose: To determine a population-based estimate of communication disorders (CDs) in children; the co-occurrence of intellectual disability (ID), autism, and emotional/behavioral disorders; and the impact of these conditions on the prevalence of CDs.
Method: Surveillance targeted 8-year-olds born in 1994 residing in 2002 in the 3 most populous counties in Utah (n = 26,315). A multiple-source record review was conducted at all major health and educational facilities.
Results: A total of 1,667 children met the criteria of CD. The prevalence of CD was estimated to be 63.4 per 1,000 8-year-olds (95% confidence interval = 60.4–66.2). The ratio of boys to girls was 1.8:1. Four percent of the CD cases were identified with an ID and 3.7% with autism spectrum disorders (ASD). Adjusting the CD prevalence to exclude ASD and/or ID cases significantly affected the CD prevalence rate. Other frequently co-occurring emotional/behavioral disorders with CD were attention deficit/hyperactivity disorder, anxiety, and conduct disorder.
Conclusions: Findings affirm that CDs and co-occurring mental health conditions are a major educational and public health concern.

Key Words: communication disorders, speech disorders, language impairment, mental health conditions, autism spectrum disorders

Over the last 30 years, few epidemiological studies have been conducted on the prevalence of communication disorders (CDs) among U.S. children. Conducting large population-based studies can be particularly challenging because of the high costs associated with direct screening and diagnosis of children with mental health conditions, lack of centralized health care systems within the United States, and the potential for overlapping diagnostic criteria of childhood mental health conditions. Current best estimates of CDs in U.S. children come from two studies published in the late 1990s. Tomblin et al. in 1997 reported the prevalence of specific language impairment (SLI) in English-speaking kindergarten children living in a Midwestern area of the United States. In this study, 7,218 kindergarten children were screened for SLI using 40 items from the Peabody Picture Vocabulary Test and the Sentence Imitation and Grammatic Completion subtests of the Test of Language Development—Primary, Second Edition (TOLD–P:2;

Newcomer and Hammill, 1988), resulting in a screening failure rate of 26.2%. The authors found an overall prevalence rate of 7.4%; that is, 1 in every 13.5 kindergarteners was found to have an SLI. The rate was higher for males at 8%, compared with females at 6%. Screening the same kindergarten population for speech delays using the Word Articulation subtest of the TOLD–P:2 and conversational speech samples, Shriberg, Tomblin, and McSweeny (1999) reported the prevalence of speech delay to be 3.8% with a male-to-female ratio of 1.5:1. The comorbidity of speech delay and language impairment was reported to be 1.3%.

Other epidemiological studies of CDs published since 1985 have shown significant variability in the prevalence of CDs in children, ranging from 1.7% for speech disorders only (Keating, Turrell, & Ozanne, 2001) to 11.08% for speech and/or language disorders combined (Beitchman, Nair, Clegg, & Patel, 1986; see Table 1). This variability in CD prevalence rates across studies has been attributed to a number of different factors, including the severity and type of disorders exhibited, whether different types of speech and/or language disorders are included, the nature of the population surveyed, and the methodological criteria used to define cases (Law, Boyle, Harris, Harkness, & Nye, 2000). Overlapping diagnostic criteria between CDs and other mental health conditions further complicate obtaining accurate prevalence counts of these conditions. In some cases, the comorbidity of CDs with other mental health conditions may actually represent two distinct conditions, and in other cases it may represent two distinct diagnoses with a common underlying neurodevelopmental disorder of the brain. It could be speculated that deficits in intellectual disability (ID) may be implicated in a substantial number of cases identified with a CD, yet few studies on the prevalence of CDs have obtained rates in the absence of ID.

With recent dramatic increases in the reported prevalence rates of childhood conditions such as autism spectrum disorders (ASD), new questions are being raised about the relationship between possible changes in diagnostic patterns and the increase in ASD rates (Newschaffer, Falb, & Gurney, 2005). Researchers have speculated that, in part, some of the increase in ASD rates may be a result of diagnostic shifting of educational classifications (Shattuck, 2006). Since communication difficulties are a core feature of autism, the possibility of diagnostic shifting from CD to ASD has been implicated along with possible shifting from ID to ASD. For example, when using eight successive California birth cohorts from 1982 through 1994, Croen, Grether, Hoogstrate, and Selvin (2002) concluded that they could not determine whether there was a true increase in the incidence of autism or whether changes were due to different diagnostic patterns.

For many years, it has been suggested that speech-language pathologists need to become familiar with the relationship between CDs and emotional/behavioral conditions because of the significant proportion of clients/patients who are likely to experience both (Prizant et al., 1990). Studies conducted at specialty health clinics—particularly psychiatric facilities and/or speech-language clinics—support the high co-occurrence of CD and emotional/behavioral disorders in

TABLE 1. Studies of prevalence of speech and/or language disorders.

Study	Country	No. of participants	Age of participants	Prevalence (%)	Confidence interval	Male-to-female ratio	Disorder	Method
Beitchman, Nair, Clegg, & Patel, 1986	Canada	1,655	5 years	11.08	9.58–12.58	1.5:1	Speech and/or language	Assessed representative sample
Centers for Disease Control and Prevention, 2003	USA	5,071	8 years	4.4	3.3–5.4		Stammering, stuttering, other speech problems	Phone survey
De Andrade, 1997	Brazil	2,980	1–11 years	4.19			Communication disorders	Assessment
Harasty & Reed, 1994	Australia	437	Grades K–6	8			Speech and/or language	Assessment
Keating et al., 2001	Australia	12,388	0–14 years	1.7		3.2:1	Speech disorders	Face-to-face survey
Kirkpatrick & Ward, 1984	Australia	2,251	Grades K–1	4.6			Speech disorders	Assessment
Kolasinsak & Rabe-Jablonska, 2005	Poland	7,881	8 years	2.9			Developmental language disorders	Screening and assessment
Shriberg et al., 1999	USA	7,218	6 years	3.8	2.9–5.0	1.5:1	Speech delay	Screening and assessment of representative sample
Silva et al., 1983	New Zealand	1,027	7 years	8.4		2:1	Language delay	Assessment
Tomblin et al., 1997	USA	7,218	5 years	7.4	6.8–8.5	1.3:1	Specific language impairment	Screening and assessment of representative sample

children and adolescents, with co-occurrence rates as high as 50% to 66% (Cantwell, Baker, & Mattison, 1981; Emerson & Enderby, 1996). However, the majority of studies conducted to date have reported the co-occurrence of CDs and emotional/behavioral disorders based on studying cases referred to or receiving specialty clinic services, and little is known about the co-occurrence of CDs and emotional/behavioral conditions in the general population.

In this article, we present a prevalence estimate of CDs among 8-year-old children in one area of the United States by race and gender based on a multiple-source record review of administrative diagnostic coding by health sources and school special education exceptionalities. The co-occurrence of ID, autism, and/or emotional/behavioral disorders with CDs by ascertainment source is reported with a discussion of the clinical implications for speech-language pathologists and other providers as they participate in the development of public policy and services for this population.

Method

Study Site and Population Characteristics

Surveillance activities targeted 8-year-olds born in 1994 residing in one of the three most populous counties in Utah (n = 26,315). Study population characteristics are shown in Table 2. The three counties, Davis (n = 4,509), Salt Lake (n = 14,736), and Utah (n = 7,070), had urban designations. They are located along the Wasatch Front, where approximately 1,588,640 individuals, or 67% of the state's total population, resided in 2002. Fifty-two percent of the total 8-year-old study population was male. Ninety-two percent of these subjects were White non-Hispanic. Proportions of other racial categories were significantly less and included 1.3% Asian, 1.2% Black, and 0.5% Native American. Even though Utah and the study area were fairly homogenous with regard to race and ethnicity, other demographic factors—the nation's highest fertility rate of 2.6 births, largest household size of 3.1 persons per household, and the youngest median population age of 27.5 years (Utah Governor's Office of Planning and Budget, 2004)—made Utah a conducive area to conduct population-based surveillance of childhood disabilities. In addition, Utah is one of three states designating ASD and/or related developmental disabilities as reportable health conditions to state health departments under state statute (Utah State Legislature, 2006). The state statute facilitated meeting criteria for expedited approvals through health facility institutional review boards and meeting compliance with privacy and confidentiality requirements.

Case Definitions and Surveillance Methods

Case definitions for CDs relied on special education classifications and/or *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*; World Health Organization, 1997) diagnostic codes contained in the ascertainment source's medical and/or school record. A CD case was defined as a child diagnosed with an *ICD-9-CM* diagnostic code of 315.3, Developmental Speech and Language Disorder; 315.31, Expressive Language Disorder; and/or 315.32, Mixed Receptive-Expressive Language Disorder by a qualified professional and/or a school special education classification of CD.

A special education exceptionality of CD was defined by the Utah State Office of Education as a stuttering, articulation, language, and/or voice impairment that adversely affects a student's educational performance (Utah State Office of Education, 2001). Because only the primary special educational exceptionality could be obtained from educational sources, children receiving speech and/or language school services under a different educational exceptionality could not be identified from school sources but may have been captured through health sources. Health sources were not queried by the *ICD-9-CM* diagnostic codes for stuttering (*ICD-9-CM,* 307.0), phonological disorder (*ICD-9-CM,* 315.39), and voice disorders (*ICD-9-CM,* 784.49), but these cases may have been captured by school sources if the disorder significantly affected educational performance.

Case definitions for ID and ASD were based on the methodology used by the Metropolitan Atlanta Developmental Disabilities Surveillance Program and those specifically utilized by the 2002 Autism and Developmental Disabilities Monitoring Network (Centers for Disease Control and Prevention [CDC], 2007). The Metropolitan Atlanta Developmental Disabilities Surveillance Program is an active population-based surveillance program that monitors developmental disabilities, including the occurrence of ID and ASD

TABLE 2. Population characteristics of study area.

Study area	Davis County	Salt Lake County	Utah County	All 3 counties
Total 8-year-olds in study area	4,509	14,736	7,070	26,315
Percentage of total Utah population	1.77%	1.59%	1.74%	1.66%
White non-Hispanic 8-year-olds	4,229	13,277	6,695	24,201
Hispanic 8-year-olds	320	2,549	643	3,512
Other 8-year-olds	280	1,459	375	2,114
Girls	2,156	7,138	3,450	12,744
Boys	2,353	7,598	3,620	13,571
Percentage of all 8-year-olds with health disability diagnosis (n = 1,840)				7.00%
Percentage of all 8-year-olds receiving school special education services (n = 3,397)				12.90%
Percentage of all 8-year-olds with a health disability diagnosis and/or special education exceptionality (n = 4,549)				17.30%

among children age 8 in the metropolitan Atlanta area. Utah, under the direction of the Utah Registry of Autism and Developmental Disabilities, was one of 14 U.S. sites that collected ASD prevalence data and one of 5 sites that collected ID prevalence data as part of the 2002 Autism and Developmental Disabilities Monitoring Network. Children were classified as having ASD if they had either had a previous special education classification of autism, had an autism diagnosis by a qualified provider, or if the ascertainment source record contained behaviors consistent with an ASD diagnosis as defined by the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM–IV–TR*; American Psychiatric Association, 2000).

ID was defined as cases having an IQ score of ≤70 on the most recent psychometric test. Psychometric test scores were abstracted if the most recent test score was 70 or below or if the record was abstracted for purposes of ASD surveillance. The type of test administered was recorded, as well as composite and subtest scores. The five most frequently used psychometric tests with cases meeting the ID case definition were the Wechsler Intelligence Scale for Children—Third Edition (27%); Stanford–Binet Intelligence Scale, Fourth Edition (14.4%); Slosson Intelligence Test (9.5%); Battelle Developmental Inventory-Cognitive Domain (7.2%); and Wechsler Preschool and Primary Scale of Intelligence—Revised (7.2%). Emotional/behavioral disorders were based on *ICD-9-CM* diagnostic codes for mental health disorders. All information used was dated prior to December 31, 2002.

Multiple-source screening was conducted at all schools (eight school districts) within the catchment area and 33 major health sites including, but not limited to, state health clinics, hospitals, clinics, diagnostic centers, and individual providers specializing in services for children with disabilities. All sources were queried for children who had dates of birth between January 1, 1994, and December 31, 1994, and who had 2002 zip codes within the study area. Health sources were also queried by child's name, provider evaluations prior to December 31, 2002, and any corresponding *ICD-9-CM* codes associated with diagnosed developmental disabilities. The list of *ICD-9-CM* codes was based on the 2002 Autism and Developmental Disabilities Monitoring Network study year and included approximately 200 diagnostic codes. Educational sources were queried for all school special education classifications for children receiving services during the 2001–2002 and/or 2002–2003 school years.

A total of 5,941 records were requested on 4,549 children. Personal identifiers were used to match records for the same child across sources to ensure unduplicated counts. Once children's records were matched across all sources by the Utah Department of Health, a tracking identification number was assigned for each child. Individual records were then de-identified prior to further analysis. CD cases were grouped into four unduplicated subcategories based on ascertainment source and CD educational classification. Group 1 captured cases found only at health sources with one or more *ICD-9-CM* diagnostic codes for a CD. Group 2 contained cases found at health and school sources with one or more *ICD-9-CM* diagnostic codes for a CD and a special education classification of CD. Group 3 contained cases found at health and school sources with one or more *ICD-9-CM* diagnostic codes for CD and a special education classification other than CD. Group 4 contained cases found only at school sources with a school special education classification of CD. CD cases were then matched to ASD and/or ID cases identified through surveillance activities conducted by the Utah Registry of Autism and Developmental Disabilities.

Analytic Methods

Gender, race, and ethnicity for each child were obtained from source records and, if unavailable, linked to birth certificate information. Prevalence estimates of CD were calculated using the number of 8-year-old children residing in the study area in 2002 according to race- and gender-specific reports from Utah's Indicator Based Information System for Public Health (Utah Department of Health, n.d.). Poisson approximation to the binomial distribution was used to calculate 95% confidence intervals (CIs) for prevalence rates. The prevalence rates were reported per 1,000 8-year-old children. Race/ethnicity categories were grouped as White non-Hispanic, Hispanic, and "Other," which included Asian, Black, and Native American. Chi-square and significance probabilities were computed using SAS Version 9.1.

Results

An overall prevalence estimate of CDs was found to be 63.4 per 1,000 (95% CI = 60.4–66.2; see Table 3). The prevalence rate of male cases significantly differed from females ($p < .001$) and was approximately double that of female cases with a male-to-female ratio of 1.8:1. Significant differences were found between the White non-Hispanic group and Hispanic group ($p = .003$), with a White-non-Hispanic-to-Hispanic ratio of 1.2:1. In addition, the prevalence rate significantly differed between the White-non-Hispanic-to-Other

TABLE 3. Communication disorder (CD) prevalence estimates among 8-year-olds by gender and race.

	Prevalence per 1,000 children	95% confidence interval
Gender		
Male (n = 1,097)	80.8	76.2–85.4
Female (n = 570)	44.7	41.2–48.3
Male-to-female ratio = 1.8:1 ($p < .001$)		
Race		
White non-Hispanic (n = 1,403)	58.0	55.0–60.9
Hispanic (n = 166)	47.3	40.3–54.3
Other (n = 98)	46.4	37.4–55.3
White-to-Hispanic ratio = 1.2:1 ($p = .003$)		
White-to-Other ratio = 1.3:1 ($p = .008$)		
Total CD prevalence (n = 1,667)	63.4	60.4–66.2
Total CD prevalence without ASD and ID cases	59.1	56.2–61.9

Note. ASD = autism spectrum disorders; ID = intellectual disability.

TABLE 4. CDs and ASD by record source and by gender.

Record source	Group 1: Health only	Group 2: Health and school CD	Group 3: Health and school other	Group 4: School CD only	All sources
Overall percentage of CD cases by source and CD exceptionality	7.0	3.0	6.0	84.0	100.0
Percentage of CD cases with ASD	5.0	13.2	37.0	0.8	3.7
Boys	100.0	86.0	81.0	91.0	85.0
Girls	0.0	14.0	19.0	9.0	15.0
Percentage of ASD cases with CD					89.0
Overall male-to-female ratio of CD/ASD = 5.7:1					

race group ($p = .008$), with a ratio of 1.3:1. The percentage of CD cases identified exclusively at school sources was 84% (Group 4), while the percentage identified only at a health source was 7% (Group 1). Only 9% of CD cases were identified at both school and health sources (Groups 2 and 3; see Table 4).

The overall percentage of CD cases with ASD was 3.7%. The proportion of CD cases with ASD varied by the source of case ascertainment (school and/or health) and whether the child was classified under a school CD special education exceptionality. The percentage of CD cases with ASD ranged from 0.8% in school cases with a CD special education exceptionality (Group 4) to 37.0% in both health and school cases with a special education exceptionality other than CD (Group 3). The overall male-to-female ratio of CD cases with ASD was 5.7:1. A review of all diagnostic summary statements from ASD case records was conducted. Eighty-nine percent of the ASD cases had a CD diagnosis contained in the written summary diagnostic statement from at least one qualified provider.

The proportion of CD cases with ID and the proportion of cases with cognitive test results abstracted significantly varied by source of case ascertainment and school special education classification (see Table 5). Cognitive test results were abstracted on 66% of CD cases identified at both a health and school source and with a school special education classification other than CD (Group 3). In contrast, cognitive test results were abstracted on 2% of cases identified only at a school source and with a school CD special education classification (Group 4). Across all sources and special education exceptionalities, cognitive test results were abstracted on 8% of the CD cases. Of the 8% of CD cases with cognitive test results abstracted, 44% of these cases had an IQ $\leq$ 70. It is not known whether the 92% of the CD cases without cognitive test results abstracted were a result of having an IQ score above 70 on the most recent cognitive evaluation or a result of no cognitive test results contained in the source record. The overall percentage of CD cases with an IQ $\leq$ 70 was 4%. The majority (87%) of CD cases with ID were male, with a male-to-female ratio of 6.5:1.

Emotional/behavioral disorders co-occurring in CD cases are shown in Table 6. The most frequent disorder co-occurring with CD was attention deficit/hyperactivity disorder (ADHD; 6.1%), followed by anxiety disorders (2.2%), and conduct disorders (1.7%). The co-occurrence of emotional/behavioral disorders varied by ascertainment source and school special education exceptionality and was seen relatively more frequently in CD cases identified at a health source with a special education exceptionality other than CD. Other less common co-occurring emotional/behavioral disorders included bipolar disorder (0.6%), separation anxiety (0.5%), tic disorder (0.4%), emotional disorder (0.3%), obsessive-compulsive disorder (0.2%), and psychosis (0.2%).

Discussion

The CD prevalence estimate of 63.4 per 1,000, or 6.3% of the population, generated by this study is within the midrange of those reported earlier (see Table 1). The gender ratio of 1.8 males to 1 female is consistent with other studies, suggesting that the CD rate in males is approximately double that found in females. A gender ratio of 6 males to 1 female for CD + ASD cases or CD + ID cases was found. The male-to-female ratio of CD + ASD is comparable to the male-to-female ratio of 6.5:1 of ASD in this same Utah 8-year old population (CDC, 2007).

The prevalence estimates of CD in this study were statistically significantly higher among White non-Hispanics compared with Hispanics (1.2:1) or the Other racial/ethnic category (1.3:1). However, the small case numbers in the Hispanic and Other racial/ethnic categories contribute to more imprecise estimates reflected by the wider CIs for these two groups, and case numbers are too limited to provide reliable prevalence estimates. While this study did not have

TABLE 5. CDs and ID by source and by gender.

Source	Group 1: Health only	Group 2: Health and school CD	Group 3: Health and school other	Group 4: School CD only	All sources
Percentage of CD cases with cognitive testing abstracted	15	38	66	2	8
Total percentage of all CD cases with IQ < 70	9	26	18	1	4
Percentage of CD cases with cognitive testing that have IQ < 70	61	70	27	55	44
Percentage of males with CD and IQ < 70	82	79	94	88	87
Percent females with CD and IQ < 70	18	21	6	12	13
Overall male-to-female ratio of CD/IQ < 70 = 6.5:1					

TABLE 6. Percentage of children with CDs by type of emotional/behavioral condition and by record source.

Condition	Group 1: Health only (n = 119)	Group 2: Health and school CD (n = 53)	Group 3: Health and school other (n = 100)	Group 4: School CD only (n = 1,395)	All sources (n = 1,667)
Anxiety	6.7	3.8	9.0	1.2	2.2
Attention deficit/hyperactivity disorder	13.4	26.4	33.0	2.7	6.1
Bipolar	0.0	0.0	4.0	0.4	0.6
Conduct	5.0	7.5	11.0	0.5	1.7
Elective mutism	0.0	0.0	1.0	0.0	0.1
Emotional disorder	0.8	0.0	0.0	0.3	0.3
Obsessive-compulsive	0.0	1.9	1.0	0.1	0.2
Physical abuse	1.7	1.9	0.0	0.0	0.2
Psychotic	0.0	0.0	3.0	0.1	0.2
Separation anxiety	2.5	0.0	3.0	0.2	0.5
Tic disorder	0.8	0.0	3.0	0.1	0.4

enough racial/ethnic CD prevalence data to be reliable, the 2002 Autism and Developmental Disabilities Monitoring Network 14-site ASD prevalence study found that across all sites, the ASD prevalence rate was lower for Hispanic than for White non-Hispanic children (CDC, 2007). The difference between Hispanic children and White non-Hispanic children reached statistical significance ($p < .05$) for 6 of the 14 sites (Arizona, Colorado, Georgia, Pennsylvania, Utah, and Wisconsin). Because few epidemiological studies of CDs have addressed racially or ethnically diverse populations, and the multisite ASD prevalence shows variance to some extent by race and ethnicity, further study of CD prevalence by race or ethnicity may be warranted.

The most obvious difference in the CD prevalence data among previous studies summarized in Table 1 is the variability in prevalence rates. Differences in methodological procedures have long been cited as a reason for the variability across studies (Beitchman, Nair, Clegg, Ferguson, & Patel, 1986; Shriberg et al., 1999) and likely account for differences in CD prevalence rates between this study and other studies. For example, the prevalence estimates in this study are lower than those reported by Beitchman, Nair, Clegg, and Patel (1986) and Harasty and Reed (1994), but higher than those reported by De Andrade (1997; see Table 1). Even though all these studies looked at the combined prevalence of speech and/or language impairment, important differences exist among studies in the methods used to screen the population, age of children, and case definitions. For example, case definitions in this study relied on receipt of a CD clinical diagnosis and/or a school special education CD exceptionality contained in the medical record and did not rely on direct assessment of a target population.

Epidemiological studies that rely on record reviews may be hampered by the amount and quality of information available from the record (Van Naarden Braun et al., 2007). Diagnostic patterns may significantly differ among ascertainment sources. Certain diagnostic labels may be used minimally or not at all in very young children. Prevalence rates may be affected by the rate of referral of children into the ascertainment source for developmental evaluations, the sensitivity of the evaluations used, and administrative eligibility requirements of the source.

Lower prevalence estimates in this study may also be the result of more stringent criteria in order to meet an administrative diagnosis or special education exceptionality than those utilized during screening or direct assessment. For example, in the Beitchman, Nair, Clegg, and Patel study (1986), case status was determined by direct testing and receiving a test score of 1 or more *SD*s below the mean. Ascertainment sources in the current study would likely use a cutoff criterion greater than 1 *SD* below the mean for diagnosis and/or to qualify for school CD services. This factor alone would significantly reduce the number of eligible cases for this prevalence estimate.

Further limitations exist when using administrative records to identify affected children and to differentiate the type of CD. This study did not directly capture potential cases who may have been home-schooled, under a school 504 plan, attending a private school, in special education under a classification other than speech-language disorders and/or with an *ICD-9-CM* code for an articulation, voice, or fluency disorder at a health source. However, it is believed that many of these children were identified through another participating source. For example, 7% of cases were exclusively identified from a health source, thus capturing a subset of cases not receiving any services through the public school special education system.

A major strength of epidemiological research utilizing multiple source record review is that costs may be substantially reduced when cost comparisons are made with surveillance systems based on direct screening and assessment. Obtaining complete access to an entire population for case ascertainment can be particularly challenging in the United States due to regulatory guidelines, such as the Family Educational Rights and Privacy Act and the Health Insurance Portability and Accountability Act. In this study, all public education and major health sources in the ascertainment area agreed to participate. In addition, many of the methodological procedures utilized in this study were based on standardized procedures utilized by the 2002 Autism and Developmental Disabilities Monitoring Network, including ongoing monitoring of quality assurance (Van Naarden Braun et al., 2007).

Most prevalence studies of CDs have not investigated the impact of ID and/or ASD on the prevalence rates of CDs. It has been estimated that 1.2% of children under age 8 are diagnosed with mental retardation (Bhasin, Brocksen, Avchen, & Van Naarden Braun, 2006). The Metropolitan Atlanta

Developmental Disabilities Surveillance Program, in collaboration with the CDC, has used an IQ quotient of 70 or below to determine the administrative prevalence of mental retardation (Murphy, Yeargin-Allsopp, Decoufle, & Drews, 1995). Since *DSM–IV–TR* criteria for mental retardation include subaverage intellectual functioning (as defined by an IQ of 70 or below) as well as concurrent deficits or impairments in adaptive functioning, using a cutoff of 70 or below without the adaptive criteria may have significantly affected the number of CD + ID cases identified in this study. It can only be speculated that the overall impact of CD cases with an unidentified or overidentified ID would be minimal. However, further study to define the level of cognitive and adaptive functioning among CD cases would be warranted.

It has been suggested that impaired intellectual ability could account for a substantial number of children with speech and language delays due to the correlation between language and other intellectual deficits (Law et al., 2002). Our data agree, in that the percentage of ID in the Utah CD population was approximately triple that of the mental retardation rate in the general 8-year-old population in Atlanta in 2000 reported by Bhasin et al. (2006). However, if the prevalence of CD were adjusted to exclude all cases with an IQ of 70 or below, the overall CD prevalence rate would not be significantly decreased (6.35% to 6.14%). It should be emphasized that only 8% of all CD cases had cognitive test results abstracted from the source records. In our sample, cognitive test results that were abstracted differed significantly by source and school special education exceptionality. For example, 66% of CD cases with a school special education exceptionality other than CD (Group 3) had cognitive test results abstracted. It is likely that children with ID are receiving special education services under an exceptionality other than CD, so this high rate of cognitive test results in this group was not surprising. It was unexpected, however, that 26% of CD cases identified from a health source (Group 2) have an IQ of 70 or below but were classified under a school special education CD exceptionality.

With recent studies showing marked increases in the number of children being identified with ASD, ongoing questions are being raised about the diagnosis and prevalence of ASD as they relate to CDs. Fombonne (2006) reported the combined median prevalence rate of autism from 18 studies published from 1966 to 1993 and 18 studies published from 1994 to 2004. The median prevalence rate increased from 4.7/10,000 to 12.7/10,000. Current U.S. estimates are dramatically higher than the last decade, and it is estimated that 1 in every 150 children in the United States has an ASD (CDC, 2007). Increases in the numbers of children with ASD have been attributed to a number of different factors, including increased public awareness, broadened diagnostic criteria, and the study method used to determine ASD case status.

Current ASD estimates from the United States (CDC, 2007) were determined based on a retroactive record review utilizing a coding scheme based on *DSM–IV–TR* criteria. Children may have qualified as an ASD case if one social behavior and either one communication or behavioral criterion was reported along with an autistic specific behavior of sufficient quality or intensity to be highly indicative of an ASD. Since this study utilized the same method to determine ASD case status as other U.S. sites conducting ASD surveillance, a proportion of children may have qualified as an ASD case based only on behaviors described in the child's records without a previously documented ASD diagnosis or school exceptionality of autism, and it remains uncertain how many of these cases actually had an ASD. Individual cases may have met the study case definition for ASD based on coding of *DSM–IV–TR* criteria without an ASD administrative diagnosis and also met the study case definition for an emotional/behavioral disorder based on an emotional/behavioral *ICD-9-CM* administrative diagnosis contained in the source record.

Children meeting diagnostic criteria for autism or pervasive developmental disorder-not otherwise specified (American Psychiatric Association, 2000) likely experience speech and/or language difficulties. As awareness and diagnosis of ASD increases, separate diagnostic coding for ASD and speech and/or language difficulties may be utilized by providers. It has been speculated that with increases in the prevalence of ASD, the rates of CDs may be affected. In 2005, Newschaffer et al. reviewed the national trends based on United States special education data from annual birth cohorts from 1975 to 1995. They reported that the prevalence of speech/language impairment was many times higher than autism overall, but they found no differences in the presence of speech and language impairment among various birth cohorts. Newschaffer et al. concluded that school special education data did not support diagnostic shifting from speech/language impairment to ASD to account for increases in the educational classification of autism in the public schools.

This study supported findings that the CD prevalence estimate is many times higher than current national estimates of ASD and was not significantly affected by removing ASD cases. The CD prevalence findings in this population are 8.5 times higher than the ASD prevalence rate in this same population (CDC, 2007). When CD cases with ASD were excluded, the CD prevalence estimate changed from 6.4% to 6.1%. Even though individually excluding ASD or ID cases did not significantly affect the prevalence estimate of CD, the combined impact of removing both of these conditions was significant (6.35% to 5.91%, $p = .02$).

It has long been accepted that speech-language pathologists need to understand the relationship between CDs and emotional/behavioral disorders. CD cases identified from a health source, regardless of special education exceptionality (Groups 1–3), were more likely to have a comorbid emotional/behavioral disorder. The rate of comorbid emotional/behavioral disorder was highest in CD cases identified from a health care source with a school special education exceptionality other than CD (Group 3). In this group, 33% had ADHD, 11% had conduct disorder, 11% had anxiety disorder, and 4% had bipolar disorder.

Prevalence estimates of ADHD in school-age children have ranged from 2% to 18% in community samples (Rowland, Lesesne, & Abramowitz, 2002). In 2003, a report from the National Survey of Children's Health (NSCH) estimated 8.8% of U.S. children age 6 through 17 years had been diagnosed with ADHD (CDC, 2003). The NSCH survey was conducted by phone and included questions

TABLE 7. Percentage of mental health conditions in 8-year-olds from the 2003 National Survey of Children's Health.

Question: Has a doctor or health professional ever told you that [selected child] has the following condition?	Utah survey sample (n = 55)		U.S. survey sample (n = 5,071)	
	%	CI	%	CI
Attention deficit disorder or attention deficit/hyperactivity disorder	9.7	0.4–18.1	7.2	5.9–8.5
Depression or anxiety	1.4	0–4.2	3.2	2.2–4.2
Behavioral or conduct problem	7.4	0–15.8	6.0	4.7–7.3
Autism	3.4	0–8.2	1.0	0.3–1.5

Note. CI = confidence interval.

about other commonly occurring emotional health conditions (Blumberg et al., 2005). NSCH survey findings specific to mental health issues in 8-year-olds are shown for Utah and the United States in Table 7. The 6.1% rate of ADHD in this CD population was significantly lower (p = .03) than the NSCH phone survey results (7.2%) of ADHD in 8-year-olds nationally. However, the prevalence of ADHD in the three CD groups identified from health sources range from 1.9 (Group 1) to 4.6 (Group 3) times higher than NSCH results. Similarly, the proportion of anxiety and conduct disorders was higher in CD cases identified through health sources than the proportion found in the general population. Although the overall rate of comorbid emotional/behavioral disorders in this CD population did not reach the rates of those previously reported in specialty health clinics, the rate of comorbid emotional/behavioral disorders in CD cases identified at health or at both a health and school source was significantly higher than the proportion of these conditions found in the general population.

Clinical Implications

A clear understanding of the prevalence of CDs and comorbid mental health conditions such as intellectual disabilities, autism, and emotional behavior disorders is crucial for determining the overall public health impact and planning for future needs of these children affected by these conditions. With an estimated 6.3% of U.S. children likely to be identified with a CD, the need for highly trained professionals in speech-language pathology is apparent. Whether speech-language pathologists work in a school or clinical settings, they will encounter a significant number of CD cases with complicated mental health conditions such as ID, autism, and behavioral/emotional disorders. With progressive increases in the number of children identified with ASD across birth cohorts (Newschaffer et al., 2005) and the high co-occurrence of communication concerns found in this ASD study population (89%), it is anticipated that an increase in the number of speech-language pathologists with specialty training in autism may be needed to provide services to this growing population. With most CD cases (93%) receiving special education services through the public schools, a large proportion of the burden to serve this population is resting with school speech-language pathologists.

Developing ongoing collaborative relationships between health and education sources is crucial in conducting future population-based surveillance of CDs and to assist in planning for services. National administrative tracking of children qualifying for school speech-language services regardless of special education exceptionality as well as national reporting by type of CD condition would be helpful. If implemented, this would enhance the ability to conduct large population-based surveillance of CDs in the United States and to establish important linkages with public health data systems monitoring childhood health conditions and important demographic information. It is hoped that as researchers continue to conduct surveillance of CDs and other urgent health conditions, collaboration between health and education may lead to the identification of risk factors, earlier identification and treatment, and ultimately to identifying the etiology of these conditions.

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