The Prevalence of Stuttering, Voice, and Speech-Sound Disorders in Primary School Students in Australia

David H. McKinnon
Sharynne McLeod
Charles Sturt University, Bathurst, Australia
Sheena Reilly
La Trobe University, Melbourne, Australia
Royal Children’s Hospital, Melbourne, Australia
Murdoch Children’s Research Institute, Melbourne, Australia

Communication disorders are potentially disabling conditions with widespread and lifelong implications. Communication disorders may affect social and emotional well-being, cognition, and behavior (Baker & Cantwell, 1987; Beitchman et al., 1986; Bryan, 2004; Felsenfeld, McGue, & Broen, 1995; Lewis, Freebairn, & Taylor, 2000a, 2000b). Communication disorders impact on academic achievement in the school years and affect vocational choices later in adulthood (Ruben, 2000). People with communication disorders are more likely to be unemployed or in a lower income bracket than are people without disorders (Ruben, 2000). The unemployment rate in people who are unable to speak intelligibly is an astonishing 75.6%; the cost of communication disorders to the U.S. “communication-dependent economy” is said to be between 2.5% and 3% of the Gross National Product (Ruben, 2000).

Communication disorder is an overarching term that encompasses a variety of different disorders (Ruscello, St. Louis, & Mason, 1991). Defining and describing communication disorders remains an inexact science because we lack clear and empirically derived definitions, cut-off points, and classification systems. This has resulted in a poorly developed evidence base on which to base the identification and management of communication disorders (Reilly, Douglas, & Oates, 2004). The current article presents data regarding the prevalence of three particular communication disorders: disorders of fluency having a speech-sound disorder. There was a higher prevalence of speech disorders in males than in females. As grade level increased, the prevalence of speech disorders decreased. There was no significant difference in the pattern of prevalence across the three speech disorders and four socioeconomic groups; however, students who were identified with a speech disorder were more likely to be in the higher socioeconomic groups. Finally, there was a difference between the perceived and actual level of support that was provided to these students.

Conclusion: These prevalence figures are lower than those using initial identification by speech-language pathologists and similar to those using parent report.

KEY WORDS: epidemiology, stuttering, voice disorders, phonology, communication
(stuttering), voice, and speech-sound production (articulation/phonology)—areas that are traditionally referred to as speech disorders (cf. Ukrainetz & Fresquez, 2003). For brevity, throughout this article, speech disorders will be used as an umbrella term, although each disorder will be referred to specifically. It is important to note that in the present article, the use of the term speech disorders does not include language disorders. The prevalence of language disorders is summarized in Law, Boyle, Harris, Harkness, and Nye (2000), with an excellent example of prevalence research provided by Tomblin et al. (1997). Teacher-reported prevalence of the broadest definition of communication disorders (including speech and language) is documented in McLeod and McKinnon (in press), using a different data set from the present investigation. Before reviewing the prevalence of speech disorders, it is first necessary to consider how prevalence is determined.

Determining Prevalence

A variety of different methods have been used to establish case status or the presence of communication disorders. To some extent, the methods are dependent on both the age of the individual and the setting. Both direct (face-to-face assessment including screening and diagnostic techniques) and parent or teacher report methods (e.g., Keating, Turrell, & Ozanne, 2001) have been used extensively. Parent report measures are commonly used in children of preschool age (e.g., Fenson et al., 1993; Wetherby & Prizant, 1996); teacher report measures are commonly used with school-aged children (e.g., Leske, 1981). The validity and reliability of some prospective parent report measures of early language delay have been established in young children of preschool age (Fenson et al., 1993; Wetherby & Prizant, 1996) but not in school-aged children. Prevalence rates also vary according to the method used; lower prevalence rates are typically derived from questionnaire or survey methods (including parent or teacher reports) (e.g., Leske, 1981) in comparison to direct screening techniques (e.g., Shriberg, Tomblin, & McSweeny, 1999). Even higher prevalence rates are reported in some studies that have included face-to-face clinical diagnosis, such as that used by Tuomi and Ivanoff (1977). In a recent systematic review, Law et al. (2000) concluded that underreporting of the prevalence of communication disorders was more likely when studies did not include both a screening and a follow-up assessment. Duff, Proctor, and Yairi (2004) concurred with this finding: They discovered a lower prevalence of voice disorders when using the report of teachers and parents as compared to assessment by a speech-language pathologist (SLP). In contrast, Clarizio (1992) found that teachers were more likely to overidentify the number of children with learning disabilities compared to identification by a multidisciplinary team.

It remains unknown whether different measures identify the same population of children with communication disorders. To date, the extent of overlap has not been explored and tested in an epidemiological study. Furthermore, no study has yet explored the relationship between a diagnostically determined communication disorder and functional communication outcomes as described by parent, teacher, and peer ratings. As a result of the varying definitions and cut-off points used for communication disorders, comparison across most studies is difficult. Existing prevalence data from longitudinal and cross-sectional studies suggest that some communication disorders (e.g., speech-sound disorders and stuttering) resolve with age; however, the degree to which residual errors may persist and fluency may fluctuate remains unknown.

The present investigation employed classroom teachers as the first point of identification of speech disorders followed by verification from a speech-language pathology report. There were a number of rationales for this. First, these data were collected by a school district that did not employ SLPs. The data reported in the present study were part of a larger study of teacher identification of children with a variety of special needs (including medical, sensory, and behavioral needs). Apart from this pragmatic reason, there were additional benefits of collecting prevalence data based on teacher report (see Clarizio, 1992, for a discussion). At a systemwide level, information about teachers’ judgements of disorders is valuable because teachers provide influential data in the process of determining eligibility for special needs support and funding (Ysseldyke & Thurlow, 1984). On an individualistic level, teachers interact with their pupils for many hours every day; thus, judgments are made on numerous incidents of continuous assessment, potentially signifying high content validity. Furthermore, within classrooms, teachers interact with children possessing a wide range of abilities. The normal distribution of behaviors within a classroom can enable teachers to see the range of children’s abilities and should promote reliable identification of students with difficulties. Teachers consider “a global judgement... about the child’s teachability in class” (Clarizio, 1992, p. 29) and describe the impact of these disorders on the education of these children. In the present investigation, teachers were asked not only to identify children, but also to rate their perception of each student’s support needs within their mainstream classrooms. Added to information about perception of needs was actual information about the extent of curriculum adaptations and the involvement of outside agencies to facilitate these students’ education. Thus, a benefit of teacher identification of prevalence and the impact of speech disorders was that data were gathered to ascertain optimal educational support for these children.

Prevalence of Speech Disorders

Prevalence of stuttering. Research concerning the prevalence, onset, and natural history of stuttering is limited and difficult to interpret (for a review, see Packman & Onslow, 1998). Data regarding the prevalence of stuttering are derived from a limited number of studies. Some knowledge has been gained from retrospective parent report, often many years later (Yairi & Lewis, 1984). The majority of published studies have used self-selected or referred samples of stutterers that almost certainly do not represent the population of children who begin to stutter. Stuttering is reported to begin in the third and fourth year for approximately 4% to 5% of children (Andrews, 1964; Yairi & Ambrose, 1999). Approximately 80% of children who begin stuttering recover without treatment, with 50% of these recovering within 1 year of onset (Andrews, 1964; Yairi & Ambrose, 1999). Mansson (2000) conducted a whole population survey of all 1,042 children born in a 2-year period (1990–1991) on the island of Bornholm in Denmark. The children were screened at 3 years of age, when 4.99% were determined to stutter. The known total incidence (assessed in subsequent follow-up studies over a 9-year period) was 5.19%, and a male–female ratio of 2.8:1 was reported. In an Australian telephone survey, Craig, Hancock, Tran, Craig, and Peters (2002) determined the prevalence of stuttering in the population to be 0.72%. Higher prevalence rates were reported for younger children (1.4%–1.44%); the lowest rate was reported for adolescents (0.53%). The incidence or risk of stuttering (obtained by combining prevalence data with reports of recovered stuttering) was estimated to be 2.8%
in children aged 2–5 years, 3.4% in children aged 6–10 years, and 2.1% in adults aged 21–50 years.

**Prevalence of voice disorders.** Oates (2004) reviewed the multiple methods used to describe voice disorders, including self-report; perceptual, acoustic, and physiological measurement; and direct laryngeal examination. A functional versus organic dichotomy for the classification of voice disorders is frequently used, although there is no universally agreed classification system. Oates emphasized that etiological and diagnostic confusions abound, and together these make the conduct of prevalence and natural history studies extremely difficult. Not surprisingly, there are little data on the prevalence of voice disorders in children. Aronson (1990) suggested that approximately 6% of children have voice disorders at any given moment in time. In one of the largest studies undertaken of the prevalence of voice disorders, Duff et al. (2004) studied rates of voice disorders in 2,445 preschool children (1,246 males and 1,199 females) aged between 2 and 6 years living in Illinois. Using three diagnostic indicators (i.e., teacher identification, parent identification, and investigator screening), voice disorders characterized by hoarseness were identified in 95 children, or 3.9% of the sample. No significant differences for age, gender, or race were identified.

Some data are emerging regarding the prevalence of particular types of voice disorders in children. For example, Akif Kilic, Okur, Yildirim, and Guzelsoy (2004) determined that the prevalence of vocal nodules among 617 school-aged children in Turkey was 30.4% (13.3% minimal lesions, 14.3% immature nodules, 2.6% mature nodules, and 0.2% vocal polyps). Powell, Filner, and Williams (1989) conducted a mass screening of 847 children aged 6–10 years in rural schools in the United States. Of these, 203 children were identified to have a voice disorder. Follow-up testing was conducted 1 and 4 years later, and 39.9% and 38% were found to have persisting voice disorders characterized by hoarseness in 95 children, or 3.9% of the sample. No significant differences for age, gender, or race were identified.

Some data are emerging regarding the prevalence of particular types of voice disorders in children. For example, Akif Kilic, Okur, Yildirim, and Guzelsoy (2004) determined that the prevalence of vocal nodules among 617 school-aged children in Turkey was 30.4% (13.3% minimal lesions, 14.3% immature nodules, 2.6% mature nodules, and 0.2% vocal polyps). Powell, Filner, and Williams (1989) conducted a mass screening of 847 children aged 6–10 years in rural schools in the United States. Of these, 203 children were identified to have a voice disorder. Follow-up testing was conducted 1 and 4 years later, and 39.9% and 38% were found to have persisting voice disorders characterized by hoarseness in 95 children, or 3.9% of the sample. No significant differences for age, gender, or race were identified.

Some data are emerging regarding the prevalence of particular types of voice disorders in children. For example, Akif Kilic, Okur, Yildirim, and Guzelsoy (2004) determined that the prevalence of vocal nodules among 617 school-aged children in Turkey was 30.4% (13.3% minimal lesions, 14.3% immature nodules, 2.6% mature nodules, and 0.2% vocal polyps). Powell, Filner, and Williams (1989) conducted a mass screening of 847 children aged 6–10 years in rural schools in the United States. Of these, 203 children were identified to have a voice disorder. Follow-up testing was conducted 1 and 4 years later, and 39.9% and 38% were found to have persisting voice disorders characterized by hoarseness in 95 children, or 3.9% of the sample. No significant differences for age, gender, or race were identified.

**Prevalence of speech-sound disorders.** There is wide variation in the reported prevalence rates of speech-sound disorders. Law et al. (2000) indicated that there was more variability in the prevalence rates for speech-sound disorders compared to language delay. Among the studies reviewed for this article, prevalence estimates ranged from 6.4% (Beitchman et al., 1986) to 43.9% (Dudley & Delage, 1980). These data were derived from a variety of different types of studies, and there are numerous reasons to explain this variation.

- A range of designs, both cross-sectional and longitudinal, were employed (e.g., Beitchman et al., 1986; Calnan & Richardson, 1976; Campbell et al., 2003; Peckham, 1973).
- Varying age cohorts were studied. Higher prevalence rates were reported for younger ages (e.g., 15.6% of 3-year-olds; Campbell et al., 2003); lower prevalence rates were reported in older children (e.g., 3.8% of 6-year-olds; Shriberg et al., 1999). Some studies included a range of ages (e.g., Dudley & Delage, 1980; Hull, Mielke, Timmons, & Willeford, 1971; Keating et al., 2001); others focused on single-age cohorts (e.g., Beitchman et al., 1986; Campbell et al., 2003; Ovarnström, Laine, & Jaroma, 1991; Shriberg et al., 1999).
- Some samples were not representative of the entire population and some were clinic-referred samples (e.g., Aithal, 1985; Bax & Hart, 1976; Broomfield & Dodd, 2004; Stewart, Hester, & Taylor, 1986).
- Varying definitions, classification systems, and measures were used (e.g., Beitchman et al., 1986; Campbell et al., 2003).
- Studies were conducted in different countries (including Australia [e.g., Harasty & Reed, 1994; Kirkpatrick & Ward, 1984], Britain [e.g., Broomfield & Dodd, 2004], Canada [e.g., Beitchman et al., 1986], and the United States [e.g., Shriberg et al., 1999]), where there may be differential categorization of dialectal variants and speech-sound errors (such as /s/ for th).

Unfortunately, few epidemiological studies of the prevalence of speech-sound disorders have been conducted on samples that are representative of the population. Cross-sectional longitudinal data concerning a wide age range (0–14 years) are available from the “1995 Australian Health Survey,” which was conducted on 12,388 children (Keating et al., 2001). On the basis of parent report, the overall prevalence rate reported for this survey was 1.7%. Rates varied across ages and according to gender, with a peak prevalence being 7.4% for boys at 5 years and 1.9% for girls at 4 years.

**Comorbidity.** High rates of comorbidity have been reported in children with communication disorders, particularly speech-sound and language disorders (Beitchman et al., 1986; Harasty & Reed, 1994; Keating et al., 2001). Speech-sound disorders are reported to be more likely to resolve, whereas coexisting speech-sound and language disorders are pervasive and are also reported to be associated with poorer academic outcomes (Bishop & Adams, 1990; Johnson et al., 1999; Lewis, O’Donnell, Freebairn, & Taylor, 1998). Arndt and Healy (2001) surveyed SLPs about children on their caseloads who stuttered. Forty-four percent of the children were reported to have at least one communication disorder additional to stuttering. However, more recently, Nippold (2004) highlighted that this was possible because SLPs were more likely to recommend children who stuttered and had an additional disorder for treatment. Nippold suggested that caseload surveys may overestimate the rate of additional disorders in children who stutter and that more rigorous methods are needed to accurately report the rate of co-existing disorders (Nippold, 2001).

**Context of the Current Study**

**Support for students with communication disorders in Australian schools.** The role of SLPs in assisting students with communication disorders in schools has been widely documented (Justice & Fey, 2004; McCartney, 2004; Prelock, 2000; Rahilly, 2003; Roseberry-McKibbin, O’Hanlon, & Brice, 2004; Roulstone, Owen, & French, 2005; Smith & Prelock, 2002; Sunderland, 2004; Terry & Kelman, 2004; Wolf Nelson, 2002). However, within Australia, school systems are not a principle employer of SLPs (Speech Pathology Australia, 2001). In the state of New South Wales (NSW), where the present study was undertaken, few SLPs are employed in the education sector, whether in public or private schools. The majority are employed in the health sector (L. McAllister, personal communication, November 10, 2004). Thus, the present investigation into the prevalence of children with communication disorders in NSW, Australia provides a unique insight into the identification of and provisions made for children with speech disorders within a schooling system where the ultimate responsibility for appropriate education rests within the education department. The majority of support for these children is provided by classroom and special education teachers within the education system, and not by SLPs.

A Catholic diocese in Sydney, Australia, in collaboration with the first author, undertook extensive data collection between 1994 and
2001 in order to “assist schools to focus their support for students and properly allocate school resources” (Catholic Schools Office, 2001, p. 1). The “Special Needs Survey” (Catholic Schools Office, 1996) was developed to facilitate identification of all students requiring additional support.

There were four waves of data collection. The data collected during the 1990s (Waves 0, 1, and 2) were focused on broad priority areas of need, including communication disorders, specific learning disabilities, intellectual disability, vision impairment, hearing impairment, behavioral/emotional difficulty, physical/medical disability, and early achievers/advanced learners. These areas were identified by the diocesan special needs consultant in consultation with the three special needs advisors. Data collected in the 1990s under the heading of communication disorders included difficulty with understanding language, producing oral and written language, social communication, articulation, voice, and/or fluent speech (Catholic Schools Office, 1998). Prevalence figures from Waves 1 and 2 are reported elsewhere (McKinnon & McLeod, 2005; McLeod & McKinnon, 2006).

The final wave of data collection (Wave 3, reported in the present study) focused on children with disorders who did not attract educational funding from government agencies (Catholic Schools Office, 2001), including children who stuttered or had a voice or speech-sound disorder. Thus, this 2001 phase of data collection provided a unique opportunity to examine the prevalence of stuttering, voice disorders, and speech-sound disorders as identified by teachers and confirmed by speech-language pathology report.

Consequently, the aims of the present investigation were threefold: (a) to report Australian teachers’ estimates of the prevalence of three speech disorders (specifically, stuttering, voice, and speech-sound disorders) in 36 primary schools in one Catholic diocese in Sydney, Australia in 2001; (b) to consider the correspondence between the prevalence of speech disorders and the following variables: gender, grade level, and socioeconomic status (SES); and (c) to describe Australian teachers’ perceptions concerning the level of support and planning that is provided to children with speech disorders. It is recognized that the prevalence figures of these speech disorders as identified by teachers will be different from the prevalence figures that were generated from studies employing initial identification by SLPs (e.g., Tomblin et al., 1997). Nonetheless, with limited Australian prevalence data available and no SLPs directly available to the NSW (e.g., Tomblin et al., 1997). Nonetheless, with limited Australian prevalence data available and no SLPs directly available to the NSW, there were generated from studies employing initial identification by SLPs.

The following definitions from the descriptors booklet (Catholic Schools Office, 2001, p. 7) were used by the teachers to identify students with the specific speech disorders of interest to the present investigation:

- **Stuttering**: Students produce a “repetition or prolongation of syllables, sounds, and speech pauses.”
- **Voice disorders**: Students have a “consistently hoarse or husky voice with some periods of voice loss; voice has a nasal quality; voice is too soft/loud/high/low.”
- **Articulation**: “Articulation disorders are those characterized by substitution, omission or distortion of speech sounds.”
- **Verbal dyspraxia**: “Verbal dyspraxia is the difficulty controlling voluntary movements of the musculature involved in speech, e.g., sound production (mispronunciation of words and/or age-appropriate sounds), poor saliva control and muscle coordination.”

It is acknowledged that the identification of stuttering included only those children who stuttered at school. No parent report was sought during the identification process; thus, it was possible that the prevalence of stuttering may have been underidentified. The categories of articulation and verbal dyspraxia were combined post hoc under the label speech-sound disorders because differentiation between different speech-sound disorders is controversial, even when...
within the speech-language pathology profession (see discussions of the controversy surrounding the identification of verbal dyspraxia [also called childhood apraxia of speech] in Forrest, 2003; McCabe, Rosenthal, & McLeod, 1998; and Shriberg, Aram, & Kwiatkowski, 1997). Ninety-eight children were identified as having an articulation disorder, and 13 children were identified as having verbal dyspraxia.

The third phase of identification entailed the learning support teacher in each school reviewing the teacher’s recommendations and confirming the assessment using supporting documentation. An SLP’s report was required as supporting documentation for confirmation of a speech disorder. As mentioned earlier, school systems in Australia in general, and NSW in particular, do not have direct access to SLPs. Rather, in NSW, speech-language pathology is a service that is typically funded from within the Department of Health. The private school system, of which the diocesan system is but one part, had to pay for the assessment of students with communication disorders. Alternatively, students could access an SLP outside the school system in the Department of Health or in private practice. This third phase of identification was likely to have excluded a number of children with speech disorders due to difficulties accessing speech-language pathology services. This conservative approach was used in order to ensure robustness within the sample; however, it has the potential limitation of underreporting children with speech disorders. It is typical for Australian SLPs to use perceptual, instrumental, and/or standardized assessments for the identification of voice, stuttering, and speech-sound disorders. The identification of stuttering by the SLPs would have been heavily influenced by the work of Onslow and colleagues (e.g., Onslow & Packman, 1999), who are Australian researchers and educators.

In the fourth stage, the principal and learning support teacher reviewed the information about each identified student and presented the data to the schools’ special needs committees. Each committee included a diocesan-based special needs advisor who was an educational psychologist who worked with each school’s special needs committee to vet all students who were identified as requiring support. The advisor provided a measure of external validation to the process and ensured consistency across schools.

Although this four-stage process was designed to increase the reliability of identification of all students with special learning needs, no interrater reliability data were funded or collected by the diocese in relation to the specific identifications by teachers. The careful vetting process over the four stages was designed to provide a conservative estimate of teacher-identified prevalence of communication disorders within the school district.

It is important to note that identification of all students with special needs (medical, behavioral, communication, etc.) had been undertaken using this four-stage process on four occasions (Waves 0–3) spanning 8 years, this being the fourth occasion. Consequently, the majority of people involved in the data collection process had received training, feedback, and professional development sessions regarding student identification. However, on this fourth occasion (2001), additional specific categories were added to the data collection process, including the identification of students with speech disorders as well as other medical and behavioral disorders that are not mentioned further in this article.

Data Analysis

Prevalence figures for the areas of stuttering, voice disorders, and speech-sound disorders were analyzed using the Statistical Package for the Social Sciences (SPSS, 2004). Measures of association involving chi-square with gender and SES were examined. Finally, the provision of support and planning was determined.

RESULTS

Prevalence of Speech Disorders

Overall, 34 students were identified as stuttering at school, 13 were identified as having a voice disorder, and 111 were identified as having a speech-sound disorder (see Table 1). Thus, the estimated prevalence of stuttering was 0.33%, voice disorders was 0.12%, and speech-sound disorders was 1.06%. The combined prevalence of speech disorders (excluding language disorders) in this population was estimated to be 1.51%.

The Impact of Variables on Prevalence Figures

Gender. Table 2 shows the prevalence of speech disorder by gender. The pattern of prevalence of the three speech disorders was significantly different according to gender ($\chi^2 = 8.243, df = 2, p = 0.016$). There was a higher prevalence of all three speech disorders in males as compared to females. For example, the ratio of males to females was 2.85:1 for speech-sound disorders.

Grade level. Table 3 shows the prevalence of speech disorder by grade level. It was not possible to test the association of this due to the small numbers in the majority of cells; however, it can be seen that there was an overall decreasing prevalence of identified speech disorders with increasing grade level. For example, the prevalence of speech-sound disorders was higher in kindergarten as compared with all other grades.

SES. Table 4 shows the prevalence of speech disorder by SES. There was no significant difference in the pattern of prevalence across the three speech disorders and four SES quantiles ($\chi^2 = 10.89, df = 9, p = 0.283$). Nonetheless, students who were identified with a speech disorder were more likely to be in the higher SES groups.

Table 1. Prevalence of speech disorder by type.

<table>
<thead>
<tr>
<th>Speech disorder</th>
<th>Frequency</th>
<th>Prevalence in the population (N = 10,425)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttering</td>
<td>34</td>
<td>0.33%</td>
</tr>
<tr>
<td>Voice disorder</td>
<td>13</td>
<td>0.12%</td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>111</td>
<td>1.06%</td>
</tr>
<tr>
<td>Total</td>
<td>158</td>
<td>1.51%</td>
</tr>
</tbody>
</table>

Table 2. Prevalence of speech disorder by gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Speech disorder</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttering</td>
<td>30</td>
<td>4</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Voice disorder</td>
<td>12</td>
<td>1</td>
<td>13</td>
<td></td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>75</td>
<td>36</td>
<td>111</td>
<td></td>
</tr>
<tr>
<td>Total (frequency)</td>
<td>117</td>
<td>41</td>
<td>158</td>
<td></td>
</tr>
<tr>
<td>% of total population (N = 10,425)</td>
<td>2.29%</td>
<td>0.77%</td>
<td>1.51%</td>
<td></td>
</tr>
</tbody>
</table>
Level of Support and Planning Provided

The next series of analyses determined the level of support needed and planning that was provided for students with speech disorders. Teachers’ perception of students’ support needs. The teachers were required to indicate their “perception of the level of support required to successfully include each identified student in their classroom” (Catholic Schools Office, 2001, p. 4). A six-point scale was used from 0 = no support needed to 5 = very high level of support needed. Table 5 shows that 7.6% (12) of the students needed no support to be included successfully in the classroom, 22.8% (36) needed a very low level of support, and 15.8% (25) needed a low level of support. However, the majority of students needed a moderate (34.8%), high (13.3%), or very high (5.7%) level of support. Of the 9 students who required a very high level of support, 3 stuttered, 5 had a speech-sound disorder, and 1 had a voice disorder.

Actual level of learning support. The classroom teachers then were asked to describe the actual level of learning support that was provided for each identified student in order to be maintained in that particular classroom. The hierarchical scale ranged from least to greatest level of need and is described in greater detail in McKinnon and Gordon (1999). The interrater reliability of the scale was determined by Thomas (1997) to be 0.82. For the students with speech disorders, one third (n = 53) received no learning support (see Table 6), and 22% (n = 35) received minimal support whereby the class teacher, after consultation with the learning support teacher, observed, collected data, monitored, reviewed, and modified teaching strategies. Some students (7.5%, n = 12) received direct short-term support mechanisms such as peer tutoring, reading tutor programs, volunteer helpers and/or mentors, and/or short-term support from the learning support teacher. Almost a quarter of the students (21.5%, n = 34) received occasional direct long-term support. This level of support entailed the learning support teacher/assistant/volunteer supporting the classroom teacher by working directly with the student (in the classroom setting or by withdrawing individuals or small groups) once or twice a week on a long-term basis. Some students (13.3%, n = 21) received direct support as outlined in the previous category, but occurring three or more times per week (i.e., frequently). The final category applied to only 3 students with speech-sound disorders.

Curriculum adaptation. Table 7 shows that no curriculum adaptation was made for 38.6% (61) of the students, whereas minor curriculum adaptations were made for 46.2% (73) of the students. Moderate or major curriculum adaptations were made for only 13.9% (22) and 1.2% (2) students, respectively.

Provision of IEPs. Only 8.9% (14) of the students with communication disorders had a developed IEP or ITP (individual transition program) in place (see Table 8). The rest (91.1%) did not. IEPs are not mandatory in NSW, Australia, unlike countries such as the United States where it is mandatory, by law, to have an IEP for students with special needs.

Involvement of outside agencies. Table 9 provides cross-tabulations of students with different types of speech disorders by the involvement of outside agencies in their education. Slightly more than 24% (38) of the students had no involvement with outside agencies; 19.6% (31) of the students’ teachers consulted with outside agencies (such as SLPs) regarding teaching strategies, assessment, and

Table 3. Prevalence of speech disorder by grade level.

<table>
<thead>
<tr>
<th>Speech disorder</th>
<th>Kindergarten</th>
<th>Grade 1</th>
<th>Grade 2</th>
<th>Grade 3</th>
<th>Grade 4</th>
<th>Grade 5</th>
<th>Grade 6</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttering</td>
<td>9</td>
<td>10</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>1</td>
<td>0</td>
<td>34</td>
</tr>
<tr>
<td>Voice disorder</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>40</td>
<td>27</td>
<td>17</td>
<td>20</td>
<td>4</td>
<td>1</td>
<td>2</td>
<td>111</td>
</tr>
<tr>
<td>Total (frequency)</td>
<td>49</td>
<td>38</td>
<td>26</td>
<td>26</td>
<td>11</td>
<td>3</td>
<td>5</td>
<td>158</td>
</tr>
<tr>
<td>Total in entire grade</td>
<td>1,611</td>
<td>1,555</td>
<td>1,526</td>
<td>1,585</td>
<td>1,423</td>
<td>1,367</td>
<td>1,358</td>
<td>10,425</td>
</tr>
<tr>
<td>% of total in each grade</td>
<td>3.04%</td>
<td>2.44%</td>
<td>1.70%</td>
<td>1.64%</td>
<td>0.77%</td>
<td>0.22%</td>
<td>0.37%</td>
<td>1.51%</td>
</tr>
</tbody>
</table>

Table 4. Prevalence of speech disorder by socioeconomic status quantile.

<table>
<thead>
<tr>
<th>Speech disorder</th>
<th>&gt;90%a</th>
<th>75%–90%</th>
<th>50%–74%</th>
<th>25%–49%</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttering</td>
<td>21</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>34</td>
</tr>
<tr>
<td>Voice disorder</td>
<td>8</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>63</td>
<td>18</td>
<td>20</td>
<td>10</td>
<td>111</td>
</tr>
<tr>
<td>Total (frequency)</td>
<td>92</td>
<td>26</td>
<td>26</td>
<td>14</td>
<td>158</td>
</tr>
<tr>
<td>Number of children with special needs</td>
<td>873</td>
<td>419</td>
<td>387</td>
<td>200</td>
<td>1,879</td>
</tr>
<tr>
<td>% of children with special needs</td>
<td>10.54%</td>
<td>6.21%</td>
<td>6.72%</td>
<td>7.00%</td>
<td>8.41%</td>
</tr>
</tbody>
</table>

a >90% is equivalent to the highest level of socioeconomic status.
adaptations required; and 17.1% (27) of the students worked directly with outside agencies on a short-term basis (up to one school term, i.e., 10 weeks). The remainder of the students, 39.2% (62), worked with an outside agency (such as an SLP) on a continuous long-term basis.

**DISCUSSION**

Prevalence refers to “the proportion or percentage of cases in a given population at a specified time” (Law et al., 2000, p. 166) and is of interest for a number of reasons. Prevalence figures assist in the planning of service delivery by informing decisions about resource allocation. Prevalence data can also be used to calculate the level of impact of intervention and to indicate the boundaries between impairment and typical development (Law et al., 2000). The current study has provided new data on the prevalence of stuttering, voice, and speech-sound disorders in a large cohort of primary school students. The combined prevalence of speech disorders (excluding language disorders) in this population was estimated to be 1.51%. The present study has much in common with the Keating et al. (2001) study that reported the prevalence of communication disorders in Australian children to be 1.7%. Both studies collected data via report from a significant adult (the Keating et al. study employed parent report; the present study employed teacher report) on a large number of children (the Keating et al. study reported on 12,388 children; the present study reported on 10,425 students). The age range of the cohort. A number of studies have acknowledged the decreasing incidence of communication disorders with age (Craig, Hancock, Tran, Craig, and Peters, 2002), who determined the prevalence of stuttering in their population to be 0.72%. In the present study, the estimated prevalence of voice disorders was 0.12%. Again, this was lower than the reported prevalence from Aronson (1990), who suggested that 6% of children have voice disorders, and Akif Kilic et al. (2004), who determined that the prevalence of vocal nodules in schoolchildren was 30.4%. The estimated prevalence of speech-sound disorders in the present study was 1.06%. Again, this was lower than the prevalence in studies reviewed for this manuscript, which reported the prevalence of speech-sound disorders to range from 6.4% (Beitchman et al., 1986) to 43.9% (Dudley & Delage, 1980). One of the major reasons for the lower estimate figures is the differing methodologies employed. Typically, studies that use screening or diagnostic techniques report higher prevalence figures than those that use parent or teacher reports (Keating et al., 2001). Another reason for lower prevalence figures in the present investigation is the age range of the cohort. A number of studies have acknowledged the decreasing incidence of communication disorders with age (Craig et al., 2002; Harasty & Reed, 1994; Keating et al., 2001; Kirkpatrick & Ward, 1984), and the data from the present study confirmed that this trend continues through primary school.

In the present study, the ratio of males to females with a speech-sound disorder was 2.85:1. This significantly higher presence of speech-sound disorders in males as compared to females was similar to findings of other studies of prevalence of speech-sound disorders (e.g., Aithal, 1985; Beitchman et al., 1986; Keating et al., 2001), age of acquisition of speech sounds (e.g., Dodd, Holm, Hua, & Crosbie, 2003; McCormack & Knighton, 1996; Smit, Hand, Frelinger, Bernthal, & Bird, 1990), and risk factors for speech-sound disorders.
Table 7. Speech disorder by curriculum adaptation.

<table>
<thead>
<tr>
<th>Speech disorder</th>
<th>None</th>
<th>Minor curriculum adaptation</th>
<th>Moderate curriculum adaptation</th>
<th>Major curriculum adaptation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttering</td>
<td>14</td>
<td>16</td>
<td>3</td>
<td>1</td>
<td>34</td>
</tr>
<tr>
<td>Voice disorder</td>
<td>3</td>
<td>8</td>
<td>1</td>
<td>1</td>
<td>13</td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>44</td>
<td>49</td>
<td>18</td>
<td>0</td>
<td>111</td>
</tr>
<tr>
<td>Total (frequency)</td>
<td>61</td>
<td>73</td>
<td>22</td>
<td>2</td>
<td>158</td>
</tr>
</tbody>
</table>

Table 8. Speech disorder by presence of an individualized education plan (IEP).

<table>
<thead>
<tr>
<th>Speech disorder</th>
<th>IEP Absent</th>
<th>IEP Present</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuttering</td>
<td>30</td>
<td>4</td>
<td>34</td>
</tr>
<tr>
<td>Voice disorder</td>
<td>13</td>
<td>0</td>
<td>13</td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>101</td>
<td>10</td>
<td>111</td>
</tr>
<tr>
<td>Total (frequency)</td>
<td>144</td>
<td>14</td>
<td>158</td>
</tr>
</tbody>
</table>
within the NSW health sector, but a number of these services are only provided for preschool children. Once these children go to school, their access to speech-language pathology services often is limited.

CONCLUSION

To summarize, 0.33% of the 10,425 students in this study were identified as stuttering, 0.12% were identified as having a voice disorder, and 1.06% were identified as having a speech-sound disorder. Identification occurred initially via classroom teachers and was confirmed by evidence from speech-language pathology reports. The pattern of prevalence of the three speech disorders was significantly different according to gender. There was an overall decreasing prevalence of identified speech disorders with increasing grade level, and there was no significant difference in the pattern of prevalence across the three speech disorders and four socioeconomic groups; however, students who were identified with a speech disorder were more likely to be in the higher SES groups. The “Special Needs Survey” serves as a specific example of how large-scale studies can identify shortcomings in service provision, leading to the development of policies and procedures to facilitate support for teachers in including children with speech disorders within their classrooms.

ACKNOWLEDGMENTS

The authors wish to thank the Catholic Schools Office, Broken Bay Diocese, for their collaboration in conducting the survey. In particular, we wish to thank Dennis Doherty, Mary Goy, Danny Rankin, and their special needs advisors in each cluster who assisted in the data collection. We also thank Steven Gibbs from the Spatial Analysis Network (SPAN) at Charles Sturt University for assisting with analyzing the socioeconomic data.

REFERENCES


Table 9. Speech disorder by involvement of outside agencies.

<table>
<thead>
<tr>
<th>Speech disorder</th>
<th>Outside agenciesa</th>
<th>Outside agencies</th>
<th>Outside agencies</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None</td>
<td>Outside agencies</td>
<td>Outside agencies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>consulted</td>
<td>short-term direct</td>
<td>long-term direct</td>
<td></td>
</tr>
<tr>
<td>Stuttering</td>
<td>6</td>
<td>6</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>Voice disorder</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Speech-sound disorder</td>
<td>27</td>
<td>20</td>
<td>18</td>
<td>46</td>
</tr>
<tr>
<td>Total (frequency)</td>
<td>38</td>
<td>31</td>
<td>27</td>
<td>62</td>
</tr>
</tbody>
</table>

Outside agencies included speech-language pathologists.
and secondary school students. *International Journal of Language and Communication Disorders.*


Received December 16, 2004
Revision received July 11, 2005
Accepted April 10, 2006
DOI: 10.1044/0161-1461(2007/002)

Contact author: Sharynne McLeod, PhD, School of Teacher Education, Charles Sturt University, Panorama Avenue, Bathurst, NSW 2795, Australia. E-mail: smcleod@csu.edu.au

McKinnon et al.: Prevalence of Speech Disorders 15