CHAPTER 2

Demographic and Achievement Characteristics of Deaf and Hard-of-Hearing Students

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Abstract

In this chapter, we focus on two essential concerns for the practice of primary and secondary education: (1) Who are the children for whom school programs are responsible, and (2) How well are the aims of education being accomplished? We review recent reports on the demographics of deaf and hard-of-hearing children in the various K-12 educational settings in the United States and reflect on how this profile has changed over the last three decades. We discuss the academic achievement patterns among deaf and hard-of-hearing students in the context of variations in outcomes among hearing students and present a synthesis of what is known about the link between student characteristics and achievement outcomes among program settings.

Keywords: deaf, hard-of-hearing, hearing loss, academic achievement, population distribution, reading achievement, student characteristics.

In this chapter, we focus on two essential concerns for the practice of primary and secondary education: (1) Who are the children for whom school programs are responsible, and (2) How well are the aims of education being accomplished by these young people? One might begin by asking, for example, are the students from wealthy or poor families, native or immigrant, speakers of English or users of a different language, or more specific to this volume, hearing, hard of hearing, or deaf? The nature of the school program—its facilities, personnel, curriculum, and instruction—is strongly influenced by the composition of the students it is intended to serve. We review recent reports on the demographics of deaf and hard-of-hearing children in the various K-12 educational settings in the United States and reflect on how this profile has changed over the last three decades.

Once the demographics of students in the various educational programs are understood, it is important to consider how the students are progressing in the development of basic skills, habits, and dispositions. For the most part, nationally representative data have been limited to standardized academic achievement test scores for deaf and hard-of-hearing students. The important exceptions are several special education evaluation studies commissioned by the U.S. Congress: the National Longitudinal Transition Study of Special Education Students (NLTS; see, e.g., Wagner & Blackorby, 1996; Wagner, Blackorby, & Hebbeler, 1993), the National Longitudinal Transition Study-2 (NLTS-2; e.g., Wagner, Marder, Blackorby, Cameto, et al., 2003; Wagner, Marder, Levine, et al., 2003; Wagner, Newman, Cameto, & Levine, 2006), and the Special Education Elementary Longitudinal Study (SEELS; e.g., Blackorby, Wagner,

Cadwallader, et al., 2002; Blackorby, Wagner, Cameto, et al., 2005; Blackorby & Knokey, 2006; Blackorby, Knokey, et al., 2007; Wagner, Marder, Blackorby, & Cardoso, 2002). The NLTS and NLTS-2 permit trend analyses of outcome measures for secondary level students such as grades, graduation rates, college-matriculation rates, and employment, as well as standardized test performance from 1987 to 2003. Nonetheless, when looking at longer-term trends, especially if we are to include elementary level students, our focus must be limited to the following question: How well are deaf and hard-of-hearing children in the various school programs acquiring the essential academic skills assessed by standardized tests? We discuss the academic achievement patterns among deaf and hard-of-hearing students in the context of variations in outcomes among hearing students and present a synthesis of what is known about the link between student characteristics and achievement outcomes among program settings.

Demographics

When it comes to the education of deaf and hard-of-hearing students in the United States, school composition has undergone a major transformation. The Education for All Handicapped Children Act of 1975 (EAHCA; Public Law 94–142) and the laws that have succeeded it (now known as the Individuals with Disabilities Education Act, or IDEA) have dramatically influenced the pattern and delivery of educational services for deaf and hard-of-hearing students (see, e.g., Johnson & Mitchell, 2008; Mitchell & Karchmer, 2006; Schildroth & Karchmer, 1986; U.S. Department of Education, 2009a).

By defining the right to a free, appropriate public education in the least restrictive environment for children who are hard of hearing or deaf, among other identified disabilities, a radical shift in educational ideology has occurred (see chapter 1, this volume). No longer are most deaf and hard-of-hearing children receiving their schooling in isolated settings primarily with specially trained personnel. To the maximum extent possible, children with educationally relevant disabilities are to be integrated into instructional settings with nondisabled children. As of fall 2004, nearly eight of every nine (87%) deaf and hard-of-hearing students receiving special education and related services under IDEA, Part B, spent at least some part of their instructional day in a regular classroom with hearing students (U.S. Department of Education, 2009a), whereas only seven of every nine (77%) did so in the fall of 1989 (Mitchell & Karchmer, 2006); the percentage enrollment in residential or day schools is less than half of what it was in 1975 (Gallaudet Research Institute, 2008). Over the last quarter of a century of trend analyses, the demographic profile of schooling for deaf and hard-of-hearing students has changed substantially as well (e.g., Holden-Pitt & Diaz, 1998; Mitchell & Karchmer, 2006; Schildroth & Hotto, 1995; Schildroth & Karchmer, 1986).

Who Are Deaf and Hard-of-Hearing Students?

Before discussing current national demographics for deaf and hard-of-hearing students in the K-12 school system, clarity about which students are being counted is needed. This is an important question because, unlike blindness, there is no legal standard for defining who is deaf. Defining the relevant population is not a simple task—the boundaries are amorphous and contested. Though there are a variety of standards that have been developed for assessing hearing ability, there is no threshold beyond which a student is defined as "legally" deaf. When it comes to counting students, the federal government applies the generic and heterogeneous label of "hearing impairment" (e.g., U.S. Department of Education, 2009a) to identify those children who receive special services in response to an educationally relevant degree of deafness. Though some students will not be enumerated because their hearing loss is not deemed educationally relevant or because it has not been identified, the pragmatic solution to the problem of population definition is through counting those identified for special education services. The distribution of deaf and hard-of-hearing students receiving special education services may not necessarily be representative of the distribution of deaf and hard-of-hearing students in the schools.[1] Nonetheless, these are the students for whom the schools are making some effort to accommodate their deafness in order to provide an appropriate education, and these are the students of interest in this chapter.

By the definition above, the most comprehensive enumeration of this population of American deaf and hard-of-hearing students is found in each *Annual Report to Congress on the Implementation of the Individuals with Disabilities Education Act* (hereafter, the Child Count; e.g., U.S. Department of Education, 2009a, 2009b). However, as described by Mitchell and Karchmer (Mitchell, 2004; Mitchell & Karchmer, 2006), the population details provided by the Child Count are limited by a very

narrow congressional mandate. For additional demographic information spanning and preceding the existence of the Child Count, we must turn to the Annual Survey of Deaf and Hard-of-Hearing Children and Youth (hereafter, the Annual Survey) conducted by the Gallaudet Research Institute (for details on content see, e.g., Allen, 1992; Holden-Pitt & Diaz, 1998; Mitchell & Karchmer, 2005; for details on methodology and representativeness see Mitchell, 2004; Ries; 1986; Schildroth & Hotto, 1993). The only other sources consulted for the demographic discussion that follows are the small set of federal evaluation studies identified previously (i.e., NLTS, NLTS-2, and SEELS).

Student and Family Characteristics

The degree of hearing loss among deaf and hard-of-hearing students ranges from mild to moderate to profound. Whether defined audiometrically or by parental judgment (typically informed by audiological categories), these labels reflect real qualitative differences among students across a wide array of educational and personal experiences. Based on Blackorby and Knokey (2006), among deaf and hard-of-hearing students identified for special education, 3 of every 18 students have a "mild" hearing loss (17%), 7 of every 18 have a "moderate" hearing loss (39%), and 8 of every 18 have a severe-to-profound hearing loss (44%).

Many deaf and hard-of-hearing students have other educationally relevant disabilities or conditions (see chapter 6, this volume). After adjusting for sample biases in the Annual Survey, Mitchell (2004) estimated the proportion of students who have one or more additional conditions to be 45%. The estimate from SEELS was 50% (Blackorby & Knokey, 2006). At the same time, many students with primary disabilities not identified as deafness nonetheless have some degree of hearing loss. Deaf and hard-of-hearing students constitute only 11–15% of all students with disabilities who have, at minimum, a mild hearing loss or audiological processing disorder (see, respectively, Blackorby, Wagner, Cadwallader, et al., 2002; Wagner, Marder, Levine, et al., 2003), although more than half of all students with profound hearing loss are those for whom their primary disability is "hearing impairment" (see Blackorby, Wagner, Cadwallader, et al., 2002).

Mitchell and Karchmer (2006) showed that the proportion of students identified for special education due to deafness or hearing loss has been fairly stable over the first years of the twenty-first century—prevalence of 1.1 per 1,000—and the number of deaf and hard-of-hearing students rises and falls with the total population of children of similar ages. Demographically, deaf and hard-of-hearing students resemble the general student population as closely as, or more closely than, any other group of students with disabilities (U.S. Department of Education, 2009a; Wagner, Marder, Blackorby, & Cardoso, 2002; Wagner, Marder, Levine, et al., 2003). About 54% are boys and 46% are girls (Mitchell, 2004), which is closer to the general population's 51% boys and 49% girls than any other group (Wagner, Marder, Blackorby, & Cardoso, 2002; Wagner, Marder, Levine et al., 2003). Based on the 2003–2004 Child Count (U.S. Department of Education, 2008a, 2008b), American Indian/Alaska Native, Hispanic, and Asian/Pacific Islander deaf and hard-of-hearing students are overrepresented among students 6 to 21 years of age by at least 20% ("risk ratio" > 1.2) with White (not Hispanic) students being similarly underrepresented ("risk ratio" = 0.8) relative to the general population while African American students are slightly overrepresented ("risk ratio" = 1.1). White students are about 57.1% of students with hearing loss or deafness (vs. 62.6% of the general population), African Americans 16.5% (vs. 15.1%), Hispanic students 20.2% (vs. 17.3%), Asian/Pacific Islanders 4.9% (vs. 4.0%), and American Indian/Alaska Natives 1.3% (vs. 1.0%).

Wagner and coauthors (Wagner, Marder, Blackorby, & Cardoso, 2002; Wagner, Marder, Levine, et al., 2003) reported that the primary language used at home by deaf or hard-of-hearing students in the United States is overwhelmingly English (more than 70% of students). The other major spoken language is Spanish (about 5% reported use). American Sign Language (ASL) is the most frequently identified signed language and is reported more often than Spanish as the primary language used at home by deaf or hard-of-hearing students. However, its use varies quite a bit depending on the age of the child, being less commonly reported for elementary age students than for high school age students. We can only speculate that this is a consequence of sampling, but it may be due to delayed introduction or commitment to a signed language for communication as a consequence of late enrollment in a residential or day school for the deaf (see Bosso, 2008).

Following on language use, there is a strong relationship between how students communicate and their degree of hearing loss. Based on Blackorby and Knokey (2006), 72% of the students who use signed

communication have a severe-to-profound hearing loss, 22% have a moderate hearing loss, and only 6% have a mild hearing loss. Overall, less than half of elementary age deaf and hard-of-hearing students are reported to use signed communication (Blackorby & Knokey, 2006), but more than half of those who are high school age are reported to use signed communication (Wagner, Marder, Levine et al., 2003).

Also related to degree of hearing loss is use of assistive listening devices (we will consider separately whether a child has a cochlear implant). The SEELS reported rather modest use of assistive listening devices among deaf and hard-of-hearing students in elementary and middle schools (19%), but over 70% of those using a assistive listening device were found to have a severe-to-profound hearing loss (Blackorby, Wagner, Cadwallader, et al., 2002). The NLTS-2 reported greater use of assistive listening devices among deaf and hard-of-hearing students in high school (23%), and over 64% of those using a assistive listening device had a severe-to-profound hearing loss (Wagner, Marder, Levine, et al., 2003).

Because of its large sample size, we depend on reports from the Annual Survey for an estimate of the prevalence of cochlear implants among deaf and hard-of-hearing children. In 1999–2000, 5.4% of deaf and hard-of-hearing children and youth were reported to have a cochlear implant (Mitchell, 2004; note: for 6- to 21-year-old students, it was only 4.2%). The most recently analyzed 2007–2008 Annual Survey finds that 13.7% of deaf and hard-of-hearing children and youth have a cochlear implant (Gallaudet Research Institute, 2008), which means that the prevalence has more than doubled in less than a decade!

Deaf and hard-of-hearing children and youth are influenced by the attributes of their homes and families as well as their personal demographic profile. Wagner and coauthors (Wagner, Marder, Blackorby, & Cardoso, 2002; Wagner, Marder, Levine, et al., 2003) provided the only detailed descriptions of family circumstances for students with disabilities. Deaf and hard-of-hearing students come from homes where parental employment levels are not quite as high as that in the general population, though better or at least no worse than the parental employment levels among all other students with disabilities. Relative to the general population, the parents of deaf and hard-of-hearing students have significantly lower college graduation rates, but they have higher educational attainment than the average parent of students with other disabilities. Household income levels for deaf and hard-of-hearing students are roughly comparable to or slightly better than those of students with other disabilities, and their poverty levels are around the national average.

Extent of Integration

Given the long tradition of special schools for the deaf (see chapter 1, this volume) and the fact that a significant fraction of deaf and hard-of-hearing students primarily use a signed language, it will be worthwhile reviewing developments in the extent of instructional integration. In our original chapter, we described the four patterns that account for nearly all deaf or hard-of-hearing student placements: (1) regular school settings that do not involve the use of resource rooms; (2) regular education settings that also include a resource room assignment; (3) self-contained classrooms in regular schools; and (4) special schools or centers, such as residential or day schools for deaf students. All except the special school placements represent situations in which educational services are delivered in facilities serving hearing students. For brevity, the four instructional settings described above are referred to as: (1) regular education settings, (2) resource rooms, (3) self-contained classrooms, and (4) special schools. The first two settings represent services delivered in a regular education environment. Self-contained classroom settings provide separate education within facilities for hearing students. As shown below, many of the students in self-contained classrooms, although located physically in a mainstream school, participate little in regular education (see chapter 4, this volume).

Across the four settings, more than 86% of all students are integrated academically with nondisabled hearing students, at least to some degree (U.S. Department of Education, 2009a). As described in the first edition, however, the pattern of integration across the settings is not the same. Virtually all students in the regular education and resource room settings have some integration, with the majority receiving instruction with hearing students half the time or more. A large majority of the students in self-contained classrooms also are integrated, but the actual amount of integration for these students is fairly modest. Just more than one-sixth is integrated at least half of the time. Finally, few of the students in special schools are academically integrated with hearing students at all. From another

perspective, one can ask where the nonintegrated students are educated. The answer is clear: most nonintegrated students are in special schools; the rest are in self-contained classrooms.

Perhaps the variable that most distinguishes the instructional settings is students' degree of hearing loss. There is fairly strong agreement on this matter between analyses of SEELS data by Blackorby and Knokey (2006) and Annual Survey data we reviewed in 2003. Special schools tend to enroll students with greater hearing losses. Over 80% have severe or profound hearing loss. Self-contained classrooms serve students across the entire hearing spectrum—about 60% have a severe of profound degree of hearing loss. Regular school settings, including resource rooms, predominately serve students with substantial residual hearing. Only about 30% have severe or profound losses.

In addition to dramatic differences in the degree of hearing loss across instructional settings, there are noteworthy demographic biases. Our chapter in the first edition provided the most thorough analysis. Of the variables previously discussed, gender is not one that is biased across setting, but age is. Special schools enroll more older students as compared to the other settings. Of students 6–21 years old, almost half of those in special schools are aged 14 or older, and one sixth are older than 18. The other three instructional settings tend to serve younger students, with relatively few students 18 or older.

The four instructional settings also differ significantly by racial and ethnic composition. White students are the clear majority in regular school settings and resource rooms, more so than in the general population. Hispanics/Latinos are next most numerous in these programs, followed by African American students. White students are the plurality in special schools, not the majority, with most of the rest of the students divided equally between Hispanic and African American students. Self-contained classrooms have the lowest percentage of white students, though still the plurality, and the highest percentage of Hispanic students. Asian/Pacific Islanders are about equally represented in each setting.

The presence of an additional disability is also related to educational placement. Students in regular education settings are much less likely than students in any of the other three settings to have additional conditions. We noted in 2003 that certain specific conditions are more prevalent in some settings than others. For example, resource rooms are far more likely to have learning disabled students than the other settings. Self-contained classrooms and special schools are more likely than the other two settings to have students described as mentally retarded.

The primary communication mode used to teach deaf and hard-of-hearing students is strongly related to students' degree of hearing loss (e.g., Jordan & Karchmer, 1986). Specifically, profoundly deaf students typically are in programs where signing or signing together with speech is used. Students with milder losses tend to be in programs where speech is the primary medium of instruction. Because of this, the four settings not only sort students by hearing level, they also sort them by primary mode of communication used in teaching. In 2003, 90% of students in special schools were receiving instruction primarily through signs or signs and speech. Just over two thirds of the students in self-contained classrooms also were in signing programs. In contrast, more than three-quarters of the students in the regular school settings, including those in resource rooms, received instruction through speech only.

Achievement

Questions about the academic achievements of deaf and hard-of-hearing students have been asked in a number of ways for nearly a century now. Mitchell (2008) considered problems of large-scale academic assessment validity and student performance in the context of heightened test-based accountability for schools serving deaf and hard-of-hearing students in the United States. Chamberlain and Mayberry (2000) examined the assessment of reading performance among North American deaf and hard-of-hearing children to better understand the nature of the relationship between ASL and reading. Turner (2000) considered research discussing English literacy development from both sides of the Atlantic, as did a team of British researchers (Powers, Gregory, & Thoutenhoofd, 1998), who provided an overview of American, British, and Canadian findings on a host of educational outcomes for deaf and hard-of-hearing children published between 1980 and 1998, from which were identified factors affecting educational achievement applicable to deaf learners in the United Kingdom.

Moores (2001) reviewed academic achievement quite broadly, with an interest in the relationship between the instructional setting and the level of student performance across the content areas, with

particular attention to high school mathematics achievement. Paul and Quigley (1990), in addition to providing a broad summary of achievement outcomes, specifically noted the strengths and limitations of various assessment strategies and instruments employed in the literature (also see Baker, 1991). Mertens (1990) reported on outcomes for deaf and hard-of-hearing students to provide a conceptual model of academic achievement that would inform and direct continuing research in this area. Regardless of emphasis or purpose, however, these reviews note the same overwhelming concern: the average performance on tests of reading comprehension for deaf and hard-of-hearing students is several grade equivalents lower than their high school age hearing peers (e.g., Allen, 1986; Traxler, 2000; Wagner, Marder, Blackorby, Cameto, et al., 2003).

Academic achievement may be defined in various ways. The most common strategies for evaluating a student's scholastic accomplishments include testing in one or more content areas at a specified level of difficulty, grading by teachers responsible for particular classes or subjects, and granting of credentials (certificates or diplomas) by schools. Additional indicators of academic achievement include grade-to-grade advancement and the successful completion or mastery of curricular units for which grades and credentials are not awarded. The research literature discussing the academic achievement of deaf and hard-of-hearing students is substantially limited to the analysis of commercially available, norm-referenced, standardized tests, and only infrequently have any of the other indicators been examined.

In evaluating academic achievement based on standardized test scores, it is important to remember that test developers have endeavored to select those curriculum content elements that are most nearly universal from the wider range of possibilities. It must be acknowledged, therefore, that this form of assessment may suffer from misalignment with local curriculum variations. To their credit, standardized tests have well-defined psychometric properties (see, e.g., Spies & Plake, 2005). In contrast, subject grades have substantially more measurement error and are more contextually bound; credentials are only awarded at completion, which exclude those students still in the K-12 system and those who have left early. Standardized scholastic assessment offers a glimpse of some of the important academic achievements that students have made across multiple contexts and does so in a way that permits a fair measure of comparison among groups of students.

Analysis of standardized test scores, particularly norm-referenced scores, have led to insights and concerns (see Baker, 1991; Paul & Quigley, 1990, for reviews of tests used with deaf and hard-of-hearing students, and Johnson & Mitchell, 2008, on test-based accountability). A number of small-scale studies have used individually administered tests, such as the Peabody Picture Vocabulary Test (e.g., Davis, Elfenbein, Schum, & Bentler, 1986), as well as group-administered tests such as the Comprehensive Test of Basic Skills (CTBS; e.g., Bess, Dodd-Murphy, & Parker, 1998), Metropolitan Achievement Test (MAT; e.g., Stuckless & Birch, 1966), and Stanford Achievement Test (or Stanford; e.g., Bodner-Johnson, 1986; Brill, 1962; Vernon & Koh, 1970). Recent large-scale studies that used the individually administered Woodcock-Johnson III (WJ3) are the SEELS and the NLTS-2 (e.g., Blackorby, Wagner, Cameto, et al., 2005; Wagner, Marder, Blackorby, Cameto, et al., 2003). Overwhelmingly, however, the most widely generalizable findings have come from the use of group-administered tests, namely the MAT (e.g., Furth, 1966; Wrightstone, Aronow, & Moskowitz, 1963) and the Stanford (e.g., Allen, 1986; Holt, 1993; Mitchell, 2008; Traxler, 2000; Trybus & Karchmer, 1977).

Student Characteristics and Academic Achievement

Rooted in the American cultural value of equity (see Stout, Tallerico, & Scribner, 1995), school professionals and policymakers have paid close attention to differences in academic achievement test scores among politically and educationally relevant student groups in the United States since the 1960s (e.g., Coleman et al., 1966). For hearing, hard-of-hearing, and deaf students, educators have consistently been concerned with differences in achievement for children grouped by family socioeconomic status, race and ethnicity, gender, home language, English language proficiency, age or grade, and special education services received. Each of these child and family demographic factors has been researched in isolation or in combination with other factors, but not all of them carry the same meaning, nor are they identified by the same indicators for hearing, hard-of-hearing, and deaf students. Demographics that make sense across all three groups include family socioeconomic status (SES or class), race and ethnicity, and gender. But for deaf and hard-of-hearing

students, home language, English language proficiency, age or grade, and special education services received have not referenced the same set of constructs and indicators as they have for hearing students. That is, within the conceptually similar categories of language use, age-related progress through school, and special services for educationally relevant needs, there are important qualitative differences.

RACE, CLASS, AND GENDER

Racial and ethnic group membership is strongly associated with group mean academic achievement levels. In the United States, the reference group with which to compare all others has been white students, a designation representing the mix of numerous European ethnic groups. Though the identification of other ethnic groups is even more complicated, the socioeconomic distinction between underrepresented and overrepresented minorities is the most parsimonious for present purposes (see, e.g., National Task Force on Minority High Achievement, 1999).

Underrepresented minorities are those persons identified as belonging to a racial/ethnic group whose proportional representation in the various high-income professions and among recipients of higher-education credentials is less than would be expected based on their prevalence in the general population; the opposite pattern is true for the overrepresented minorities. Whites currently remain the majority and thus continue to serve as the reference group. Blacks/African Americans, Hispanics/Latinos, and Native Americans (American Indians/Native Alaskans) are the three underrepresented minorities that receive the greatest attention. Asian Americans are the one overrepresented minority that is given regular notice (this designation often excludes Pacific Islanders). For hearing students, underrepresented minorities have lower aggregate academic achievement scores than white students, but overrepresented minorities achieve more highly, as a group, than white students (e.g., Campbell, Hombo, & Mazzeo, 2000; Entwisle, Alexander, & Olson, 1997; Hedges & Nowell, 1999; Portes & MacLeod, 1999).

The same relative performance differences across groups are observed for deaf and hard-of-hearing students as well, except that Asian American students are less likely to outperform white students (e.g., Allen, 1986; Blackorby, Knokey, Wagner, et al., 2007; Holt, 1993; Holt, Traxler, & Allen, 1997; Wagner, Newman, Cameto, & Levine, 2006). However, handling race and ethnic-group membership as a simple divide between the underrepresented and the overrepresented misses an important confound with English language proficiency. Ethnic groups with high proportions of recent immigrants (non-English speakers)—namely, Latinos and Asian Americans—tend to perform lower on tests of reading than on the relatively less English-loaded tests of mathematics, whether these students are hearing or not (for hearing students, see Abedi, 2002; for deaf and hard-of-hearing students, see Allen, 1986; Blackorby, Knokey, Wagner, et al., 2007; Jensema, 1975; Kluwin, 1994).

Student socioeconomic status is typically assigned by indicators such as parental education, parental occupational status, and family income levels. Though there is some variability in the strength of the association between SES and academic achievement due to the indicators used, a positive relationship is consistently observed (Sirin, 2005). However, compared to hearing students (e.g., Biddle, 2001; Campbell, Hombo, & Mazzeo, 2000; Portes & MacLeod, 1999; Sirin, 2005), there has been much less extensive examination of the relationship between SES and achievement for deaf and hard-of-hearing students. Further, the confounding of race and ethnicity with lower socioeconomic status in the United States, particularly for recent immigrants, has made it more difficult to identify the impact of SES for deaf and hard-of-hearing students.

Studies of deaf and hard-of-hearing students and their families have not included the collection of family SES data with samples either large enough or representative enough to make reliable estimates of the independent effect of parental income, education, or occupation on student achievement. Nonetheless, deaf and hard-of-hearing students from higher SES families score higher on standardized tests of academic achievement, on average, than students from lower SES families (Blackorby, Knokey, Wagner, et al., 2007, Jensema, 1977, Kluwin, 1994; Kluwin & Gaustad, 1992; Kluwin & Moores, 1989; Wagner, Newman, Cameto, & Levine, 2006).

The relationship between gender and academic achievement has been the object of study for quite some time. Unlike ethnicity or family SES, gender is fairly straightforward, requiring little explanation and having little ambiguity in measurement. Female students have, in the aggregate, performed better than male students on standardized tests of language arts, but not in mathematics (see, e.g., Campbell et al, 2000). In recent years, however, the gender gap for hearing students is no longer statistically reliable for mathematics achievement—girls have

essentially caught up with boys (e.g., Hall, Davis, Bolen, & Chia, 1999; Leahey & Guo, 2001; Nowell & Hedges, 1998). For deaf and hard-of-hearing students, the only difference is that there is mixed evidence on whether there is reliably higher mathematics achievement for older boys for the last three decades (e.g., Allen, 1986; Blackorby, Knokey, Wagner, et al., 2007; Trybus & Karchmer, 1977; Wagner, Newman, Cameto, & Levine, 2006).

LANGUAGE, AGE, AND SPECIAL EDUCATION

When it comes to more strongly school-relevant characteristics, there are important differences as well as similarities between hearing students and deaf and hard-of-hearing students. That is, the achievement impact of home language, language of instruction and assessment, age–grade correlation of curriculum, and the need for special educational services is similarly understood, but the student characteristics to which educators attend are qualitatively different for deaf and hard-of-hearing students. Consider first the problem of the relationship between language and academic achievement. In the United States, there are a large number of languages used by children and youth in their homes, communities, and schools, with English and Spanish being the most common. English is far and away the preferred, if not the only, language used in large-scale assessments in schools, but not all children are equally proficient in the use of English. As such, schools have complied with bilingual education program requirements by recording the dominant spoken language of each student's home, if it is not English, and determining the English language proficiency of each student whose home language is not English (see August & Hakuta, 1997). However, this practice does not facilitate the identification of limited English proficiency (LEP) that is relevant to performance on standardized assessments for those students who use nonstandard English dialects (see, e.g., Baron, 2000; Ogbu, 1999) or who use signed languages (see, e.g., Commission on Education of the Deaf, 1988; Woodward, 1978).

Whether students can hear or not, LEP has devastating impact on standardized test performance when the test is written in English. Large differences in academic achievement are observed among hearing students when comparing the aggregate performance of LEP students with fluent English-proficient students, students who are native English speakers, and other hearing students for whom the designation of LEP does not apply (e.g., Hao & Bonstead-Bruns, 1998; Portes & MacLeod, 1999; Schmid, 2001). Wagner, Marder, Blackorby, Cameto, et al. (2003) found that students with disabilities from homes where there was a primary language other than English were expected to attain lower reading test scores even after controlling for a variety of factors known to be associated with test performance.

There are two issues that are commonly considered when discussing the relationship between deafness and English language fluency. First, there is the matter of first-language fluency development (see reviews by Marschark, 2001; Quigley & Paul, 1989). Children who learn English before they are no longer able to hear, often referred to as postlingual deafness, generally achieve higher scores on standardized tests, particularly in reading, than children who were unable to hear in their first years of life, called prelingual deafness (e.g., Allen, 1986; Jensema, 1975; Reamer, 1921). Among those who begin life deaf, however, those who grow up with deaf parents or parents who competently facilitate visual language interaction have higher English language reading achievement than those deaf children who did not grow up with competent visual language support (see reviews by Chamberlain & Mayberry, 2000; Kampfe & Turecheck, 1987).

Second, deafness and English language fluency are related through access to linguistic interaction both inside and outside of the family, home, or classroom setting (Marschark, 2001). For interaction in English, the focus has been on the student's speech intelligibility, ease with which the student can speechread, and ease of speech perception (except for speechreading, these concerns pertain to hearing students as well). There is little research on the association of either speech intelligibility or the ability to speechread with academic achievement. One study found that students with superior speech intelligibility and better speechreading skills were more likely to have higher standardized test scores (Pflaster, 1980, 1981). Though there are few studies that directly estimate the impact of ease of speech perception on academic achievement, the better ear average (or a subjective holistic judgment) has been frequently used as a proxy indicator. Consistently, students who are profoundly deaf perform lower than students with lesser hearing losses, especially those referred to as hard of hearing (e.g., Blackorby & Knokey, 2006; Holt, 1993; Holt et al., 1997; Jensema, 1975; Karchmer, Milone, & Wolk, 1979). Additionally, the lesser the degree of deafness, the

greater the gain in reading comprehension achievement, on average, over a 3- to 5-year period (Trybus & Karchmer, 1977; Wolk & Allen, 1984).

All of these deaf and hard-of-hearing students, possibly including those with minimal sensorineural hearing loss (Bess, Dodd-Murphy, & Parker, 1998), have lower aggregate reading achievement than hearing children. Further, the central tendency in reading achievement as a function of age has been observed to diverge: deaf and hard-of-hearing students are relatively further behind their same-age hearing peers in the high school years (e.g., Allen, 1986; Blackorby, Wagner, Cameto, et al., 2005; Holt, 1993; Traxler, 2000; Wagner, Marder, Blackorby, Cameto, et al., 2003). Mathematics performance is much higher, on average, for deaf and hard-of-hearing students, but the difference from hearing students remains noteworthy.

For interaction in sign language (e.g., ASL), the development of fluency and sophistication appears to depend on the deaf student's having access to a sign language discourse community (see Marschark, 2001). With the exception of the important, but small, fraction of deaf students who grow up in presumably ASL-fluent homes (see Mitchell & Karchmer, 2005), many deaf students do not have daily access to a natural, sophisticated, and diverse sign language discourse community. Unfortunately, there is only one large-scale study that has attempted to link a student's ASL fluency with academic achievement (Moores et al., 1987; Moores & Sweet, 1990). That study, limited to high school students, had a relatively insensitive measure of ASL fluency and was unable to adequately examine this linkage (but see Chamberlain & Mayberry, 2000, for a review of small-scale studies). So instead of student fluency and the ability to express knowledge and understanding in sign language as a bridge to English language fluency development, the proxy for access to linguistic interaction has been whether the deaf child has one or more deaf parents.

As with hearing students (e.g., Blackorby, Wagner, Cameto, et al., 2005; Reynolds & Wolfe, 1999; Wagner, Marder, Blackorby, et al., 2003), deaf and hard-of-hearing students who have an additional condition do not achieve as highly on standardized tests, on average, as those with no additional conditions (e.g., Allen, 1986; Blackorby, Wagner, Cameto, et al., 2005; Holt, 1993; Holt et al., 1997; Wagner, Marder, Blackorby, 2003). Further, as with hearing students, the kind of additional disability is important. Cognitive and behavioral disabilities have more negative impacts on achievement than do physical disabilities. For hearing students and deaf and hard-of-hearing students alike, an additional disability is associated with lower aggregate achievement.

The final consideration in reviewing the relationship between student characteristics and academic achievement is a comparison between the distribution of outcomes for hearing students and deaf and hard-of-hearing students. This contrast provides an estimate of the impact of deafness across the range of student achievement. However, the problem of age–grade correlation, or lack thereof, introduces an important caveat to the hearing versus deaf and hard of hearing comparison. The normative standard for group-administered educational testing is to test all students of the same age-grade with tests of the same level of difficulty, a practice that is including a greater share of deaf and hard-of-hearing students than ever before (see Johnson & Mitchell, 2008). Though there may be some students who have been retained or accelerated, so that their age may not be the same as their classmates, students are generally close in age for a given grade in school. This age–grade correlation also tends to assure that test items sample a curriculum that has been learned recently rather than materials and objectives learned earlier or that have yet to be encountered.

The age–grade connection tends to remain fairly true for deaf and hard-of-hearing students as well, but the level at which they are tested does not always follow the normative pattern. Because the reading/English language proficiency levels attained by many deaf students are much lower than most of their hearing age-grade peers, these students are accommodated by being tested "out of level" (see Pitoniak & Royer, 2001, pp. 53–58, for a review of issues related to testing accommodation; also see Abedi, 2002; and several chapters in Johnson & Mitchell, 2008). This out-of-level testing results in many deaf and hard-of-hearing students being much older than the age-grade range for which their test is typically administered. (The appropriate level, in the case of the Stanford, is determined by a screening test that indicates at which level students may be reliably assessed [e.g., Allen, White, & Karchmer, 1983; Gallaudet Research Institute, 1996a].) Out-of-level testing means that caution needs to be exercised when interpreting academic achievement test scores. Despite the fact that test developers provide vertical equating scales, the difficulty level of the items is not perfectly comparable when the performance estimate is more than two grade levels from the intended level for testing.

Additionally, the age appropriateness of the test items may be compromised. For these reasons, comparing the scores of deaf or hard-of-hearing 15-year-old students taking a 4th grade level reading test with 15-year-old hearing students taking a 10th grade level reading test, the modal comparison (Holt et al., 1997), is not entirely satisfactory.

Mitchell (2008) analyzed both Stanford Achievement Test (10th edition) data, which have the problematic out-of-level test scores, and WJ3 data, which have scores derived from age-based norms without respect to grade in school. The observed range of performance on both tests is much larger for a greater share of the deaf and hard-of-hearing students compared to hearing students. Although higher performing deaf and hard-of-hearing students are likely to be making the same amount of annual achievement growth as hearing students, the level of performance among the top deaf and hard-of-hearing students is only on par with middle-of-the-pack hearing students (also see Blackorby & Knokey, 2006). Moreover, the lower performing deaf and hard-of-hearing students are further behind with each year of age (also see Blackorby, Wagner, Cameto, et al., 2005; Wagner, Marder, Blackorby, Cameto, et al., 2003).

Additional Academic Achievements

Standardized test results are not the only academic achievements to consider. Wagner, Newman, Cameto, and Levine (2006) found a number of positive attributes among deaf and hard-of-hearing high schools students as compared to other students with disabilities. First, they have higher grades and are more able to keep up in general education classes. When it comes to habits and dispositions, deaf and hard-of-hearing students are more highly engaged in school, better behaved, have better social skills, are more likely to belong to groups, enjoy school more, have lower absenteeism, and exhibit higher levels of independence and responsibility. Wagner, Newman, Cameto, and Levine (2005) found deaf and hard-of-hearing students among the most likely of all students with disabilities to complete high school (82.2% in 2003). Moreover, compared to other youth with disabilities, they were not only among the most likely to attend postsecondary school (53.1%) and participate in volunteer or community service activities (47.2%), they were doing so at dramatically higher rates than in 1987 (32.4% and 12.5%, respectively). These substantial improvements in postschool outcomes are particularly heartening given the rather static and disappointing record on standardized tests of academic achievement (Qi & Mitchell, 2007).

Summary and Conclusions

The first part of this chapter described how deaf and hard-of-hearing students differed in four instructional settings, suggesting that students are not randomly distributed among school programs. The deliberate process of student assignment, however accomplished, results in distinctly different student profiles for each program type. And as reviewed in the latter part of this chapter, these dissimilarities in student characteristics across settings are associated with academic achievement differences as well. Is there evidence that program placement is associated with group achievement differences (see chapter 4, this volume)?

In our view, it is readily apparent that the purposeful sorting of students into differentiated programs among the various regular school settings (i.e., regular education settings, resource rooms, and self-contained classrooms) led to distinct academic achievement profiles, but the total distribution of achievement in regular schools and in special schools is similar nonetheless. It is difficult to attribute any differences in academic achievement to the programs themselves. A handful of studies have tried to establish whether there is any link between the type of program and academic achievement, but the results of these investigations suggest that there is little independent explanation of achievement differences attributable to student placement (Allen & Osborn, 1984; Kluwin & Moores, 1985, 1989). In fact, there is some reason to believe that student placement dynamics are sensitive to student performance differences, where options exist, thereby increasing the likelihood that program settings reflect sorting and selecting decisions more strongly than instructional efficacy (see Oakes, Gamoran, & Page, 1992, on ability grouping and tracking). However, because there have been few longitudinal analyses of student academic performance related to program placement changes, it is difficult to determine whether programs are responsive to student differences or whether they serve to consolidate student differences, thereby restricting opportunities (Kluwin, 1993; Mitchell & Mitchell, 2005).

Note

1. Students may be recognized as requiring deafness-related accommodations outside of the IDEA mandates. In particular, the Americans with Disabilities Act of 1990 (ADA; P.L. 101-336)

and Section 504 of the Vocational Rehabilitation Act of 1973 (P.L. 93-112) provide guarantees that affect school operations and services.

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