NATIONAL PROFILE OF DEAF AND HARD OF HEARING STUDENTS IN SPECIAL EDUCATION FROM WEIGHTED SURVEY RESULTS

D ATA FROM the 1999–2000 Annual Survey of Deaf and Hard of Hearing Children and Youth (GRI Annual Survey; Gallaudet Research Institute, 2000) are systematically compared with those summarized by the U.S. Department of Education (2001, 2002) in the Annual Report to Congress on the Implementation of the Individuals With Disabilities Education Act (IDEA) to estimate the degree to which findings based on the GRI Annual Survey sample are likely to be representative of the population of deaf and hard of hearing children and youth served under IDEA. An appropriate weighting system is then applied to provide more nationally representative estimates of the characteristics of deaf and hard of hearing students served under IDEA and, more important, to provide a better national description of these students and the services they receive than would otherwise be available.

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In the United States, deaf and hard of hearing students are experiencing changes across a wide range of contexts. For example, the political and educational context now demands that there be "no child left behind" by public school systems; this includes all students regardless of race or ethnicity, English-language proficiency, economic disadvantage, or disability status (No Child Left Behind Act of 2001; see 20 U.S.C. § 6311.b.2.c.v.II, 2002). At the same time, the social and medical contexts of childhood hearing loss are being transformed by a dramatic expansion of universal newborn hearing screening and early childhood cochlear implantation (see, e.g., Cone-Wesson, 2003; Spencer & Marschark, 2003). Given all that, it is time to revisit what is known about the

population of deaf and hard of hearing students and the circumstances of their schooling, and how this knowledge is obtained.

The most comprehensive national report available to date summarizing demographic and program services data for special education, the federal child count published in the *Twenty-Fourth Annual Report to Congress on the Implementation of the Individuals With Disabilities Education Act* (hereafter, IDEA Child Count; U.S. Department of Education, 2002), actually provides only modest demographic detail and limited specifics about program services, and only for children at least 6 years of age. Other sources must be consulted if one is to obtain detailed descriptions of the population of students with disabilities enumerated

in the IDEA Child Count, especially since it is compiled entirely from aggregated state-level reports and cannot be subjected to alternative or disaggregated analyses. However, to get a nationally representative picture, rather than one that is population based, one must consult sample-based studies. Ideally, samples would be drawn so that generalizations to the larger population would not be problematic, but this rarely happens. Given that, an explicit effort must be made to directly relate sample-based findings to the statistics reported annually to Congress by the U.S. Department of Education. Otherwise, the extent of bias or lack of generalizability of findings from any particular study will simply diminish or, worse yet, distort the importance of the knowledge base built on sample-based research.

In the present study, in order to respond to the need for updated and detailed information about students who are deaf or hard of hearing, a straightforward method for improving the generalizability of surveys of students in special education is applied to data from the Gallaudet Research Institute's more detailed Annual Survey of Deaf and Hard of Hearing Children and Youth (hereafter, GRI Annual Survey; Gallaudet Research Institute, 2000). The GRI Annual Survey, which is summarized for national consumption in reports posted on the World Wide Web (see, e.g., Gallaudet Research Institute, 2001, 2002, 2003), samples the population receiving IDEA-related services. It can therefore be used in making estimates concerning information beyond what is in the IDEA Child Count. In the present study, I examine the extent to which the GRI Annual Survey adequately represents the larger IDEA Child Count population, describe appropriate weighting criteria to adjust for sampling biases,

and provide examples of how these adjustments affect interpretation of the GRI Annual Survey data.

Population Definition

The population of interest in the present study is defined as deaf and hard of hearing children and youth who have been identified as requiring an individualized education program (IEP) or individualized family service plan (IFSP) as a consequence of their deafness or hearing loss (see the Individuals With Disabilities Education Act Amendments of 1997; hereafter, IDEA); this definition is the basis for the IDEA Child Count. Demographic summary reports for deaf and hard of hearing children identified by means other than their participation in programs under IDEA have been reported previously (e.g., Bess, Dodd-Murphy, & Parker, 1998; Blanchfield, Dunbar, Feldman, & Gardner, 1999; Niskar et al., 1998; Ries, 1982, 1986, 1994; Van Naarden, Decoufle, & Caldwell, 1999), but the largest samples of deaf and hard of hearing children and youth, and the most detailed and frequent studies, have adopted the IDEA-based population definitions for their sampling frame (most recently, Gallaudet Research Institute, 2003; U.S. Department of Education, 2002).

Question of Sample Representativeness

Can sample-based studies of students with disabilities be generalized to the national population from which they were sampled? The position taken in the present study is that sampling biases can be mitigated by using the IDEA Child Count to weight responses. This strategy is applied to the GRI Annual Survey. The focus is on whether the conclusions presented in Ries's (1986) comparative analysis of the national representativeness of the GRI An-

nual Survey relative to that of other national censuses and surveys remain true today. More specifically, is the GRI Annual Survey representative of the population of deaf and hard of hearing children and youth receiving IDEA-related services?

Almost 20 years ago, Ries (1986) stated:

> It appears that the [GRI] Annual Survey data offer a good basis for drawing conclusions about students receiving special educational services for the hearing impaired in the United States. However, conclusions regarding profoundly hearing impaired students and students in full-time special education for the hearing impaired will have a firmer basis than conclusions regarding students with lesser degrees of hearing loss or those receiving part-time services. (p. 28)

In the present study, I reevaluate this assessment using recently published data from the IDEA Child Count and the GRI Annual Survey. This is an attempt to establish whether the unweighted GRI Annual Survey appears to be a demographically and programmatically representative sampling of the population of students with hearing impairment reported in the annual report to Congress on the implementation of IDEA (U.S. Department of Education, 2001, 2002) and to demonstrate the utility of weighting responses from the GRI Annual Survey to provide more nationally representative statistics for variables unavailable from the IDEA Child Count.

The main reason for revisiting the question of the GRI Annual Survey's representativeness is that discussions of how the prevalence of deaf and

hard of hearing children and youth varies as a function of age, sex, race/ethnicity, geography, family composition, degree of hearing loss, age at onset of deafness or hearing loss, and reported cause of hearing loss, as well as trends reported in the literature on these variables, have depended almost exclusively on analyses of the GRI Annual Survey (e.g., Holden-Pitt & Diaz, 1998; Karchmer & Mitchell, 2003; Rawlings & Gentile, 1970; Schildroth & Hotto, 1995; Schildroth & Karchmer, 1986). This is because, with the exceptions of age, race/ethnicity, and geography, no data on demographic and audiologic characteristics are collected for the IDEA Child Count. Thus, it is critical to continuously monitor the degree to which conclusions based on the GRI Annual Survey may be generalized to the population of deaf and hard of hearing children and youth receiving services under IDEA.

Methodology

The present study uses data from two sources, the GRI Annual Survey (Gallaudet Research Institute, 2000) and the IDEA Child Count (U.S. Department of Education, 2001, 2002). Demographic and programmatic data from the 1999-2000 GRI Annual Survey (Gallaudet Research Institute, 2000, 2001) are compared with the data from both the latest year's and the previous year's IDEA Child Count (U.S. Department of Education, 2001, 2002) because statistics for programmatic data lag the demographic statistics by 1 year (i.e., there are IDEA Child Count statistics for programmatic data for the 1999-2000 school year, but none that correspond with the demographic data reported for the 2000-2001 school year).

The GRI Annual Survey is an ongoing project of the Gallaudet Research Institute; it collects basic demographic and program- and service-related data on a voluntary and confidential basis *for each child or youth* identified by schools and programs serving deaf and hard of hearing students (or clients) from prekindergarten through grade 12 in the United States (Holden-Pitt & Diaz, 1998; Ries; 1986; Schildroth & Hotto, 1993). The data are obtained by annually distributing machine-readable forms to all public and private schools and programs identified as providing services to deaf and hard of hearing children and youth and requesting that one form be completed by a school or program official for each student (or client) in the reporting source's institutional records. Though not all relevant schools or programs in the United States are going to be identified in a given year, and not all that are identified respond, the GRI Annual Survey provides detailed information about a large number of deaf and hard of hearing students (or clients) and their educational experiences. It should also be noted that, unlike the aggregated state-level reports used to compile the IDEA Child Count, which provide a very limited number of cross-tabulations, the GRI Annual Survey maintains individual-level data, making it possible to investigate a far wider range of educationally relevant characteristics and experiences of deaf and hard of hearing children and youth.

Sample Identification

The present study focuses on children and youth who are deaf or hard of hearing and are eligible for IDEA-related services, namely, qualifying persons less than 23 years of age (as of December 31, 1999). However, many deaf and hard of hearing children under the age of 6 years are not served through schools, either because it is not until they are in school that they are identified for and receive services or because their service provider is not affiliated with a school or educational program. This limits the GRI Annual Survey and the IDEA Child Count equally.

As a point of clarification, IDEA Child Count data for instructional settings are limited to children and youth 3 to 21 years of age, and programmatic data identified by specific disability status are restricted to those 6 to 21 years of age (U.S. Department of Education, 2001, 2002). Further, because the IDEA Child Count does not include any data identified by disability for children under 3 years of age, obtaining an estimate of the extent of reporting to the GRI Annual Survey for these younger, Part C eligible children is very difficult.

Description of Data

Student demographic data reported to the 1999–2000 GRI Annual Survey from current records only (i.e., newly reported, updated, or verified for the 1999–2000 school year) are included in the analyses provided in the present study, for a total sample of 36,123 children and youth up to 22 years of age as of December 31, 1999. Three demographic variables are analyzed for comparison with the IDEA Child Count: age (as defined in the preceding sentence), race/ethnicity, and geographic location. However, not all age comparisons are consistent because IDEA Child Count data are not identified by disability for student less than 6 years old. This being the case, current data from the 1999–2000 Annual Survey for 31,466 students 6 to 21 years of age are analyzed for comparison on race/ethnicity, geographic location, and program variables. Two program variables are considered in the present study: the school setting

and the number of hours per week of integration with nondisabled students. Finally, seven additional variables that are unique to the GRI Annual Survey (see the numbered lists later in the present section) are included to demonstrate the effect of weighting responses in proportion to the IDEA Child Count (for students 6 to 21 years of age).

On the GRI Annual Survey, identification of racial/ethnic group membership is similar to the system of categorization employed by the U.S. Department of Education, particularly the use of Hispanic/Latino as an independent category, with two exceptions. There is no forced single choice; multiple racial/ethnic identifications may be checked with no required primary identification. Also, an "other" category may be checked or specified; this allows for alternative identifications.

Geographic location is analyzed at the regional division level, which has been defined by the U.S. Census Bureau (Bureau of the Census, 1994). That is, the states are organized into nine clusters: (1) New England, (2) Middle Atlantic, (3) East North Central, (4) West North Central, (5) South Atlantic, (6) East South Central, (7) West South Central, (8) Mountain, and (9) Pacific. Puerto Rico and all other outlying areas (U.S. possessions and territories) together constitute a 10th regional division for the purposes of the present study. This regional division variable serves as the first of two variables used to stratify the sample in the weighting scheme described in the section of the present study titled "Sample Weighting."

Like the IDEA Child Count, the GRI Annual Survey samples children and youth from the District of Columbia, Puerto Rico, and the other territories and possessions of the United States. However, because the GRI Annual Survey is a voluntary activity, rather than a part of federally mandated state-level reporting, the response rate from any particular state or territory may vary from year to year. Only schools and programs in the 50 states, the District of Columbia, and Puerto Rico have current responses on the 1999–2000 GRI Annual Survey. Moreover, three states provided only one or two responses, making a complete state-by-state comparison impossible. Except where noted, regional division comparisons are made for the 50 states, the District of Columbia, and Puerto Rico, and not for any of the other outlying areas.

The GRI Annual Survey identifies the instructional setting as taking one or more of six possible forms: special school or center, self-contained classroom in a regular school setting, resource room, regular school setting, home, or other (specification requested). These categories are not identical to the categories in the IDEA Child Count, in which students are not counted as both attending a separate or residential facility (either public or private) and receiving less than half of their instruction in the regular classroom, even though some students do receive instruction in the regular classroom and at a separate or residential facility. Nonetheless, for the purpose of comparison, all students included in the GRI Annual Survey who receive their schooling in a special school or center are considered to be attending a separate or residential facility, and those who receive no services at a special school or center—i.e., are in a regular school setting—are considered to be attending a regular school facility. (Those receiving home-based or other services are excluded.) Students in the IDEA Child Count who are at a separate or residential facility are aggregated into one group, and those having some specific percentage of time outside the regular classroom are classified as attending a regular school facility. (Again, those receiving home-based or hospital-based services are excluded.) Thus, a comparison between data sources is now possible. This school setting variable serves as the second of the two used for stratifying the sample in the weighting scheme described in the present study under "Sample Weighting."

The number of hours per week that the deaf or hard of hearing student is integrated with nondisabled hearing students for academic classroom instruction is recorded on the GRI Annual Survey form in one of five categories: none, 1 to 5, 6 to 15, 16 to 25, or 26 or more (with the assumption being that the standard week of instruction is 30 hours). These categories are different from those reported in the IDEA Child Count for the percentage of time outside the regular classroom: "< 21%," "21–60%," and "> 60%." (All students reported as attending separate or residential facilities, or receiving home- or hospital-based services, are counted as being outside the regular classroom for more than 60% of the time for the purposes of this comparison.) Unfortunately, these ranges are not commensurate between the GRI Annual Survey and the IDEA Child Count. Also, the definitions have opposite orientations. Nonetheless, as is shown in the Results section of the present study, worthwhile comparisons are still possible.

Of the seven selected variables unique to the GRI Annual Survey that are provided in the present study, five are demographic:

1. The student's gender.

2. The student's degree of hearing

loss. This is derived from the American National Standards Institute classification of the better ear average (BEA) of unaided auditory perception thresholds (measured in dB) across three pure tones (500, 1,000, and 2,000 Hz), but the number of categories is reduced to three: less than severe (BEA < 71 dB), severe (BEA 71–90 dB), and profound (BEA > 90 dB).

3. Whether the student has ever had a cochlear implant.

4. The presence or absence in the student of any condition or disability other than deafness.

5. Parental hearing status. This has been recoded in a manner identical to that used by Mitchell and Karchmer (2004); namely, students with one or more parents identified as hard of hearing, but not deaf, are said to be from a home with a hard of hearing parent (but no deaf parent), while students with at least one parent identified as deaf, regardless of the hearing status of the second parent, are said to be from a home with at least one deaf parent. The remainder are identified as having no known deaf or hard of hearing parents.

The two additional program variables selected from the GRI Annual Survey are:

1. The *primary* mode of communication used for classroom instruction. This is recorded as one of five possibilities: speech only, sign and speech, sign only, cued speech, or other (with specification requested).

2. A selection among the services that may be received by the student in support of instruction, of which all, some, or none may be checked. Only sign interpretation, tutoring, speech training, note taking, counseling, and itinerant teacher services are reanalyzed in the present study, because the remaining services were rarely indicated as being received (much less than 5%, often less than 1%, of the students for whom responses were recorded).

Data Analysis
The sample description consists of univariate descriptive statistics (frequencies and percentages). With the exception of the presentation of student age for each individual year of age, data analysis is limited to school-age children and youth (i.e., students 6 to 21 years of age).

The determination that the proportion of respondents to the GRI Annual Survey is similar to that of the IDEA Child Count is based on the standard error of the proportion for the estimates derived from the GRI Annual Survey sample (see Levy & Lemeshow, p. 85). The IDEA Child Count is taken as the true population value (i.e., error free). Proportions are said to be statistically similar if the value from the IDEA Child Count falls within the two-tailed 95% confidence interval around the GRI Annual Survey estimate.

Sample Weighting
Distributions of students among the age and race/ethnicity variables are reestimated using geographical and school setting sampling weights. The IDEA Child Count is the reference point, and the GRI Annual Survey data are weighted in proportion to the IDEA Child Count simultaneously across two stratification variables: regional division and school setting. In order to weight the GRI Annual Survey programmatic data, I obtained state-by-state counts for students with hearing impairment in regular versus separate school settings from the *Twenty-Fourth Annual Report to Congress on the Implementation of the Individuals With Disabilities Education Act* (U.S. Department of Education, 2002), and then aggregated them into regional division totals for regular and separate school settings separately. There are 20 strata: 10 regional divisions crossed with 2 school settings. The weights are determined by dividing the proportion of students in each stratum from the IDEA Child Count by the proportion in each stratum from the GRI Annual Survey.

For the analyses in which weights are applied, both the estimation of standard errors and the sample from which those estimates are made differ from those in the analyses that use unweighted data. Per Levy and Lemeshow (1999, p. 135), standard errors for the proportions of students in a given category are derived from the errors associated with the estimates of each of the 20 strata—a weighted root mean square type of calculation. However, because students with incomplete geographical or school setting data on the GRI Annual Survey are excluded, these standard errors for the weighted estimates are based on a sample of 29,436 students 6 to 21 years old. This final note on sample size change is important because there are very slight changes (at most, less than 0.4%) in the *comparable* percentages for each race/ethnicity and age category when the values in Tables 1 through 3 are compared with the unweighted values in Table 5.

Results

Demographic Variables

The Gallaudet Research Institute (2001) has provided a description of the entire GRI Annual Survey sample, which includes respondents whose records may not have been updated for 2 years, so a similar description is necessary in the present study because it is restricted to the group of respondents whose records are known to be current.

Sample demographics are presented in Tables 1 through 4. The distribution of deaf and hard of hearing children and youth from the GRI Annual Survey sample ages 6 through 22 years is given in Table 1. The distribution for children less than 6 years of age is presented in Table 2.

Two important age distribution patterns in the sample should be noted immediately. First, there is a decline in the number of children identified as deaf or hard of hearing by each year of age below 6 and for youth by each year of age above 17. Young adults ages 18 years and older appear to be overrepresented in the GRI Annual Survey relative to the IDEA Child Count, whereas for those 6 to 17 years of age in the GRI Annual Survey compared to same-age students with hearing impairments in the IDEA Child Count, the age distributions are more similar.

Unfortunately, the declines in the number of children by each year of age below age 6 in the GRI Annual Survey can only be compared with the data for children across all disabilities in the IDEA Child Count, because the data are not disaggregated by dis-

Table 1

Age Distributions of Deaf and Hard of Hearing Students Ages 6–22 Years, 1999–2000 School Year

	GRI Annual Survey		*IDEA Child Count*	
Age (years)	*n*	*%*	*n*	*%*
6	1,837	5.83[a]	4,393	6.13
7	2,140	6.80[a]	5,117	7.14
8	2,273	7.22[a]	5,698	7.95
9	2,545	8.08[a]	6,166	8.60
10	2,697	8.56	6,161	8.59
11	2,563	8.14[a]	6,312	8.80
12	2,639	8.38	6,075	8.47
13	2,568	8.15	5,773	8.05
14	2,544	8.08	5,694	7.94
15	2,402	7.63	5,365	7.48
16	2,254	7.16	5,111	7.13
17	2,168	6.88	4,882	6.81
18	1,574	5.00[a]	3,087	4.31
19	766	2.43[a]	1,210	1.69
20	358	1.14[a]	474	0.66
21	138	0.44[a]	153	0.21
22	27	0.09[a]	24	0.03
Totals	31,493	100.01[b]	71,695	99.99[b]
Proportion of IDEA Child Count	43.93%		100.00%	

Sources. GRI Annual Survey, Gallaudet Research Institute (2000); IDEA Child Count, U.S. Department of Education (2001, Table AA6).
Note. The IDEA Child Count is of children with hearing impairments who are served under Part B of the Individuals With Disabilities Education Act (IDEA), including those children in outlying areas other than Puerto Rico, and does not make a distinction between children who are deaf and those who are hard of hearing.
[a] The percentage from the IDEA Child Count is outside the 95% confidence interval around the estimate from the GRI Annual Survey (i.e., statistically different); all other percentages are within the confidence interval of the estimate (i.e., statistically similar).
[b] Percentage does not equal 100.00 because of rounding.

Table 2

Age Distributions of Deaf and Hard of Hearing Children Under Age 6 Years, 1999–2000 School Year

	GRI Annual Survey		*IDEA Child Count*	
Age (years)	*n*	*%*	*n*	*%*
< 1	114	2.46[a]	35,847	4.51
1	307	6.63[a]	66,885	8.42
2	540	11.66[a]	103,037	12.98
3	968	20.91[a]	121,768	15.33
4	1,163	25.12	205,107	25.83
5	1,538	33.22	261,425	32.92
Totals	4,630	100.00	794,069	99.99[b]
Proportion of IDEA Child Count	0.58%		100.00%	

Sources. GRI Annual Survey, Gallaudet Research Institute (2000); IDEA Child Count, U.S. Department of Education (2001, Tables AA7 and AH1).
Note. The IDEA Child Count is of all children served under Part C of the Individuals With Disabilities Education Act (IDEA), as well as those 3–5 years old served under IDEA, Part B, including those in outlying areas other than Puerto Rico, because no disaggregation by disability category was reported.
[a] The percentage from the IDEA Child Count is outside the 95% confidence interval around the estimate from the GRI Annual Survey (i.e., statistically different); all other percentages are within the confidence interval of the estimate (i.e., statistically similar).
[b] Percentage does not equal 100.00 because of rounding.

ability group for infants, toddlers, and preschool-age children. Nonetheless, the overall proportion of children and youth 6 to 22 years of age with hearing impairments in the IDEA Child Count is 1.14%, which, when multiplied by the 43.93% estimated sampling rate from Table 1, yields a value (0.49%) less than the 0.58% expected overall sampling rate for deaf and hard of hearing children under 6 years of age shown in Table 2. If reporting of children less than 6 years of age is evenly distributed among disability groups, then the percentage of children under 4 years of age reported to the GRI Annual Survey is not in line with that reported to the IDEA Child Count.

The racial/ethnic group membership distribution for deaf and hard of hearing children and youth 6 to 21 years of age is shown in Table 3.

Of those for whom race/ethnicity is known (valid percentage), White students are the majority (53.32%), followed by Hispanic/Latino (21.77%) and Black/African American (16.59%) students, with small proportions of Asian/Pacific Islander (4.24%) and American Indian (0.97%) students. The "other" and "multiethnic" groups together (1.62% + 1.49% = 3.11%) number less than the Asian/Pacific Islander group, but more than the American Indian group.

If attention is limited to the single-race/ethnicity groups (i.e., if one ignores the remainder), then comparison with the IDEA Child Count is possible (in Table 3, under "GRI Annual Survey," see the column labeled "Comparable percentage"). The comparison suggests that the GRI Annual Survey sample has higher proportions of Hispanic/Latino and Black/Af-

rican American students than would be expected, and a concomitantly lower White proportion (with a lower proportion for American Indians as well).

The distribution of students by geographic location (regional division) is provided in Table 4. The largest percentage of students reported to the GRI Annual Survey was in the West South Central states (17.25%), followed by the East North Central states (16.74%), and the Pacific states (16.61%). The smallest percentages of students reported are from Puerto Rico and the outlying areas (0.70%), New England (4.62%), and the East South Central states (4.04%).

The regions with the three lowest percentages of students are the same for the GRI Annual Survey and the IDEA Child Count, but the order of the remaining clusters of states

Table 3

Racial/Ethnic Group Membership Distributions of Deaf and Hard of Hearing Students Ages 6–21 Years, 1999–2000 School Year

Responses				GRI Annual Survey		IDEA Child Count		
Type	Indicated racial/ ethnic group	Frequency	%	Valid %	Comparable %	Frequency	%	Valid %
Valid	White	16,553	52.61	53.32	55.03[a]	41,536	58.07	59.12
	Black/African American	5,152	16.37	16.59	17.13[a]	11,381	15.91	16.20
	Hispanic/Latino	6,760	21.48	21.77	22.47[a]	13,284	18.57	18.91
	American Indian	301	0.96	0.97	1.00[a]	873	1.22	1.24
	Asian/Pacific Islander	1,316	4.18	4.24	4.37	3,184	4.45	4.53
	Other	503	1.60	1.62				
	Multiethnic	462	1.47	1.49				
	Valid total	31,047	98.67	100.00	100.00	70,258	98.22	100.00
Missing								
	Unknown/not reported	184	0.58			1,265	1.77	
	All blank	235	0.75					
	Missing total	419	1.33			1,265	1.77	
	Sample total	31,949	31,466	100.00			71,523	100.00
	Proportion of IDEA Child Count	40.49%	43.99%				100.00%	

Sources. GRI Annual Survey, Gallaudet Research Institute (2000); IDEA Child Count, U.S. Department of Education (2001, Table AA14).
Notes. The IDEA Child Count is of children with hearing impairments who are served under Part B of the Individuals With Disabilities Education Act (IDEA), and does not make a distinction between children who are deaf and those who are hard of hearing.
[a] The valid percentage from the IDEA Child Count is outside the 95% confidence interval around the comparable percentage estimate from the GRI Annual Survey (i.e., statistically different); all other percentages are within the confidence interval of the estimate (i.e., statistically similar).

Table 4

Geographical Distribution of Deaf and Hard of Hearing Students
Ages 6–21 Years, 1999–2000 School Year

Regional division	GRI Annual Survey		IDEA Child Count	
	Frequency	%	Frequency	%
New England	1,360	4.62	3,170	4.48
Middle Atlantic	2,937	9.98[a]	9,752	13.77
East North Central	4,927	16.74	11,797	16.66
West North Central	2,151	7.31	4,988	7.05
South Atlantic	4,440	15.08	10,718	15.14
East South Central	1,190	4.04[a]	3,560	5.03
West South Central	5,079	17.25[a]	8,044	11.36
Mountain	2,255	7.66	5,329	7.53
Pacific	4,890	16.61	12,595	17.79
Puerto Rico and outlying areas	207	0.70	843	1.19
Totals	29,436	99.99[b]	70,796	100.00
Proportion of IDEA Child Count	41.58%		100.00%	

Sources. GRI Annual Survey, Gallaudet Research Institute (2000); IDEA Child Count, U.S. Department of
Education (2001, Table AA2).
Note. The IDEA Child Count is of children with hearing impairments who are served under Part B of the
Individuals With Disabilities Education Act (IDEA), and does not make a distinction between children
who are deaf and those who are hard of hearing.
[a] The percentage from the IDEA Child Count is outside the 95% confidence interval around the estimate from
the GRI Annual Survey (i.e., statistically different); all other percentages are within the confidence interval
of the estimate (i.e., statistically similar).
[b] Percentage does not equal 100.00 because of rounding.

is not the same. The primary reason for the differences is that the West South Central is substantially overrepresented among the GRI Annual Survey responses while the Middle Atlantic is appreciably underrepresented. The proportional representation on the GRI Annual Survey is statistically different from that of the IDEA Child Count for half of the regional divisions, which include the substantially different West South Central and Middle Atlantic clusters.

Program Variables
The extent of integration of deaf and hard of hearing students with nondisabled students in the GRI Annual Survey is as follows: about two thirds of these students, almost evenly divided, receive none (34.87%) or virtually all (32.54% at 26+ hours per week) of their academic instruction in the regular classroom; the remaining third (32.59%) are nearly evenly distributed among the three intermediate categories for extent of integrated academic instruction. The percentage of time outside the regular classroom for students with hearing impairment from the IDEA Child Count is summarized differently: a substantial majority (81.47%) of the students are fairly equally divided between being largely outside the regular classroom (42.78% at > 60% of the time) and in the regular classroom (38.69% at < 21% of the time); the remaining students (18.53%) are outside the regular classroom for an intermediate proportion of the time (21% to 60%).

Assuming that students not in academic instruction with nondisabled hearing students for at least 12 hours per week are outside the regular classroom more than 60% of the time, then

more than 45% (34.87% + 10.83%) – possibly more than 57% (34.87% + 10.83% + 11.37%)—of the deaf and hard of hearing students sampled by the GRI Annual Survey are outside the regular classroom more than 60% of the time. Similarly, assuming that deaf and hard of hearing students who receive at least 24 hours per week of instruction with nondisabled hearing students are outside the regular classroom less than 21% of the time, then at least 32% (i.e., 32.54%)—but certainly not more than about 43% (32.54% + 10.84%)—of the deaf and hard of hearing students reported to the GRI Annual Survey are outside the regular classroom less than 21% of the time. This suggests that there is likely to be overrepresentation of students outside the regular classroom more than 60% of the time in the GRI Annual Survey sample relative to the IDEA Child Count. Underrepresentation of students outside the regular classroom less than 21% of the time is possible as well.

The proportion of students in special schools or centers and the proportion of students with some sort of classroom instructional arrangement in the regular school setting as shown in the GRI Annual Survey are: 28.81% attending special schools or centers; 71.19% receiving instruction in one or more of a variety of regular school settings. The proportion of students in regular school facilities and the proportion of students in a separate or residential facility (public or private), according to the IDEA Child Count, are: 80.90% receiving instruction in a regular school facility; 19.10% receiving instruction in a variety of separate or residential school facilities.

The comparison between the GRI Annual Survey and the IDEA Child Count on instructional settings reveals discrepancies. The GRI Annual Survey

Table 5

Prevalence Estimates for Selected Characteristics of Deaf and Hard of Hearing Students
Ages 6–21 Years, 1999–2000 GRI Annual Survey

Variable	Response	GRI Annual Survey Unweighted	Weighted	IDEA Child Count
Race/ethnicity	American Indian	1.00[a]	0.97	1.24
	Asian/Pacific Islander	4.36	4.43	4.53
	Black	17.19[a]	15.70	16.20
	Hispanic	22.42[a]	21.39[a]	18.91
	White	55.03[a]	57.51[a]	59.12
Age range (years)	6–11	44.72[a]	46.38[b]	47.23
	12–17	46.42	46.10	45.90
	18–21	8.86[a]	7.52	6.87
Gender	Male	53.91	53.56	
	Female	46.09	46.44	
Degree of hearing loss	Less than severe	50.11	57.63[c]	
	Severe	16.06	14.56[c]	
	Profound	33.83	27.81[c]	
Cochlear implant	Never had	95.53	95.76	
	Have	4.47	4.24	
Additional disability/condition	None	54.57	54.98	
	One or more	45.43	45.02	
Parental hearing status	No known deaf or hard of hearing	91.65	92.11[c]	
	Hard of hearing, but no deaf	4.05	4.54	
	At least one deaf	4.30	3.35	
Primary mode of communication for classroom instruction	Speech only	44.30	52.41[c]	
	Sign and speech	48.39	41.9[c]	
	Sign only	6.17	4.59[c]	
	Cued Speech	0.43	0.48	
	Other	0.70	0.61	
Sign interpreter services	No	77.19	76.76	
	Yes	22.81	23.24	
Tutorial services	No	94.14	93.56[c]	
	Yes	5.86	6.44	
Speech training	No	39.47	43.72[c]	
	Yes	60.53	56.28[c]	
Note taker services	No	94.42	93.68[c]	
	Yes	5.58	6.32	
Counseling services	No	90.22	91.11[c]	
	Yes	9.78	8.89	
Itinerant teacher services	No	63.29	56.56[c]	
	Yes	36.71	43.44[c]	

Sources. GRI Annual Survey, Gallaudet Research Institute (2000); IDEA Child Count, U.S. Department of Education (2001).
Note. IDEA, Individuals With Disabilities Education Act.
[a] The percentage from the IDEA Child Count is outside the 95% confidence interval around the estimate from the GRI Annual Survey (i.e., statistically different); all other percentages are within the confidence interval of the estimate (i.e., statistically similar).
[b] The percentage from the IDEA Child Count is within 99% confidence interval around the comparable percentage estimate from the GRI Annual Survey, but outside the 95% confidence interval.
[c] The difference between the weighted percentage and the unweighted percentage is outside the 95% confidence interval for difference in the estimates.

data appear to overrepresent students who attend special schools or centers and correspondingly underrepresent students who receive instruction in regular school settings.

Reestimation Using IDEA Child Count Weights

The geographically and programmatically weighted estimates from the GRI Annual Survey for *comparable* variables from the IDEA Child Count are presented in the uppermost part of Table 5. However, for ease of presentation, the age distribution has been reported in a more aggregated format, namely, in three groups: 6 to 11, 12 to 17, and 18 to 21 years of age. The weighted racial/ethnic group membership distribution within the GRI Annual Survey is substantially more like that of the IDEA Child Count, but continues to differ. Both the White and Hispanic/Latino percentages noticeably change in the direction of the IDEA Child Count but remain statistically different, while the Black/African American percentage is much closer to, but now below, the IDEA Child Count value and is statistically similar. The distribution of age groups is also more similar to that in the IDEA Child Count, but the young adult (18 years and older) group remains overrepresented, though not to a statistically significant extent, and this continues to cause the younger school-age group to appear underrepresented.

Weighted estimates from the GRI Annual Survey for selected variables unavailable in the IDEA Child Count are presented in the middle and lower parts of Table 5. The additional demographics occupy the middle part of the table. The percentages of male and female deaf and hard of hearing students effectively do not change when responses are weighted. However, the weighted distribution of the degree of hearing loss substantively differs from the unweighted distribution. The weighted percentage of students with a profound hearing loss is significantly lower; the weighted percentage of students with a severe hearing loss is also lower. The prevalence of deaf and hard of hearing students who have ever had a cochlear implant remains roughly the same regardless of weighting, as is the case for the percentage of students reported to have an additional condition or disability. The weighted percentage of deaf and hard of hearing students with at least one deaf parent is estimated to be a bit lower than the unweighted estimate. Both the percentage of students with no known deaf or hard or hard of hearing parents and the percentage with hard of hearing, but no deaf, parents increase slightly.

The program variables occupy the lower part of Table 5. The weighted distribution of students by the primary mode of communication used for classroom instruction is significantly different from the unweighted distribution. Now, more than half of the deaf and hard of hearing students are estimated to receive classroom instruction primarily through speech only, and less than half receive classroom instruction that includes signing as part of the primary mode of communication. Nonetheless, the percentage of students receiving sign interpreter services is essentially the same. For relatively low-frequency services, namely, tutoring, note taking, and counseling, weighting does not significantly increase the percentage reported to be receiving tutorial or note-taking services. Similarly, the weighted estimate for students receiving counseling services is not significantly lower than the unweighted estimate. However, there are statistically significant changes in the percentage of students *not* receiving these services. This is largely a consequence of the fact that statistical significance is more readily attained when sample sizes are larger rather than a clear indication that the change in affirmative or "yes" responses should be judged as significant (i.e., the same size fluctuation is more readily evaluated as statistically different for the much larger number of "no" responses than for the fewer "yes" responses). Finally, for the relatively high-frequency services, namely, speech training and itinerant teacher services, weighting results in a statistically significant decrease in the percentage of students receiving speech training and increase in the percentage of students getting itinerant teacher services.

Discussion

The GRI Annual Survey does not representatively sample the geographic distribution of deaf and hard of hearing children and youth in the United States based on the population defined by the IDEA Child Count. This makes sense when one discovers that the organization managing the GRI Annual Survey has had or currently has state education agency contracts to collect and analyze demographic and programmatic data on deaf and hard of hearing students in states within the West South Central regional division. That is, the substantial overrepresentation of states in this regional division is readily explained by the established formal relationships between the states and the organization managing the GRI Annual Survey.

On the other hand, the low response rates from other regional divisions are not readily explained by past or current relationships with various state or local agencies. One could plausibly conclude that identifying and recruiting the participation of schools and

programs with students mainstreamed alone or in small numbers across large numbers of schools is more difficult. In other words, the growing trend toward mainstreaming or academically integrating deaf and hard of hearing students with nondisabled hearing students makes these students a moving and more diffuse target, and thus decreases their representation in the GRI Annual Survey.

It appears that the GRI Annual Survey does a better job of representatively sampling students who have been mainstreamed when it obtains relatively higher response rates. Large programs, which are typically special schools or centers or self-contained classrooms within the regular school setting, are easier to identify and more likely to respond than smaller programs for deaf and hard of hearing students. This survey participation behavior is consistent with the explanation I have offered that overrepresentation is most likely when a greater share of responses from schools and programs in the regular school setting are received. This means that geographical weighting and program weighting are required because accounting only for geographic sampling biases would diminish rather than improve the ability to gain generalizable insights from the program- and service-related data collected by the GRI Annual Survey.

When the GRI Annual Survey responses are weighted, the comparison with the age group and racial/ethnic group distributions reported by the IDEA Child Count improves greatly. Nonetheless, there is a persistent overrepresentation of young adults (i.e., students over 17 years of age). This bias is likely to be explained by the oversampling of special schools or centers because programs in these settings are typically better able to provide the intensive support necessary

for older students who are not able to succeed in the more mainstreamed environment. That is, to the extent that students receiving academic instruction with nondisabled hearing students are sampled at a lower rate than those in separate settings, the probability that older students are overrepresented will increase, a finding that has been observed in the present study.

The nonuniform distribution of racial/ethnic groups across the United States is a significant issue, and weighting helps to correct biases introduced by over- or undersampling any particular regional division or instructional setting. However, weighting does not eliminate all discrepancies between the GRI Annual Survey and the IDEA Child Count. Here, there is an important interaction between the overrepresentation of separate and self-contained programs and the distribution of students by race/ethnicity. As noted by Karchmer and Mitchell (2003), relative to students receiving instruction in the regular school setting, with or without resource room support, Hispanic/Latino and Black/African American students are overrepresented in self-contained classrooms and special schools or centers. This helps to explain the persistent overrepresentation of Hispanic/Latino students but not the lower proportion of Black/African American students as a result of weighting. Oversampling of states with high Hispanic/Latino enrollments may account for this asymmetry. White students are underrepresented in the mainstream in the GRI Annual Survey sample because they are not as likely to be served in self-contained classrooms as in other regular school settings.

Evaluating Deafness-Specific Findings

Though there is no direct way to determine if the GRI Annual Survey samples students with greater hearing loss more than those with lesser degrees of hearing loss, as Ries (1986) inferred, the weighted estimates provided in the present study would support this conclusion. This finding is attributed to the fact that deaf and hard of hearing students in settings with less academic instruction with nondisabled hearing students are oversampled. This is also consistent with findings reported by Karchmer and Mitchell (2003), who identified a substantive correlation between setting and the distribution of hearing loss. Self-contained classrooms in the regular school and separate schools or centers are more likely to have students with severe to profound hearing loss than regular classrooms and resource rooms. The demographic and programmatic patterns observed in the present study are consistent with a greater share of students with severe to profound hearing loss being sampled by the GRI Annual Survey.

Consistent with the identified historical and current biases toward obtaining a disproportionately greater share of data for students in separate schools and programs, weighted estimates indicate that the GRI Annual Survey is less successful at collecting data on students who receive itinerant teacher services (i.e., the proportion of students receiving itinerant teacher services increases when weighted by the IDEA Child Count). Similarly, a tendency to collect relatively more data from students with greater degrees of hearing loss helps to explain why the weighted estimate for the percentage of students receiving instruction through speech only is greater than the unweighted estimate, and why the

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weighted estimate for the percentage of students receiving speech training is less than the unweighted estimate. Students who can hear speech better can receive their instruction through speech only and are less likely to need speech training to produce intelligible speech.

Finally, some estimates remain the same regardless of weighting. Significantly, the weighted estimates of the prevalence of students with cochlear implants and those with additional disabilities or conditions are the same as the unweighted estimates (though this is not true for the distribution of hearing loss). This means that the national summary reports of the GRI Annual Survey for these two characteristics, which can significantly affect program and service design and delivery, are likely to be accurate without the application of any statistical adjustments. Similarly, prevalence estimates for auxiliary in-the-classroom services (i.e., sign interpreting, tutoring, and note taking) are essentially the same regardless of weighting, even though the prevalence of selected direct instructional services and practices (i.e., teacher use of signing for instruction and itinerant teacher services) require adjustment for sampling biases.

Beyond the Present Study

Regardless of possible improvements in sample recruitment and survey instruments, comparisons between the GRI Annual Survey and the IDEA Child Count are likely to remain difficult for three important reasons. First, the IDEA Child Count does not distinguish between children and youth who are deaf and those who are hard of hearing, which seriously limits its utility. By contrast, the GRI Annual Survey collects data that permit making audiologic and functional hearing distinctions among students.

Federal regulations specify two categories for the purpose of defining a child's disability (34 CFR §§ 300.7.c.3, 300.7.c.5, 2002), but the distinction between "deafness" and "hearing impairment" is not maintained when IDEA Child Count statistics are reported. Instead, all students with deafness or lesser hearing impairments are enumerated in the IDEA Child Count as a single and undifferentiated group labeled "students with hearing impairment," which is consistent with the statutory language (IDEA; 20 U.S.C. § 1401.3.A.i, 2001) but not the regulatory language.

Second, the IDEA Child Count utilizes information-reducing definitions to describe the school setting in which the deaf or hard of hearing child receives an education. For example, it is not possible to determine from the IDEA Child Count whether students attending separate schools or residential facilities for more than 50% of their instructional day are also attending regular education classes for the remaining fraction of the day. The GRI Annual Survey does not impose such arbitrary cutoffs when collecting data on the kinds of settings in which deaf and hard of hearing students are schooled. This is because the IDEA Child Count is oriented toward describing the extent to which students are outside of the regular education classroom, whereas the GRI Annual Survey is designed to identify all settings in which deaf and hard of hearing students are educated without preferential regard for any particular instructional setting.

Third, the race/ethnicity data collection requirements under Part B of IDEA are lagging behind current practices (Office of Special Education Programs, 2003):

In November 1997, OMB

[Office of Management and Budget] announced its decision concerning the revision of Race and Ethnic Standards for Federal Statistics and Administrative Reporting. In that announcement, OMB reported that there would be five racial categories—American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander, and White—and one ethnic category—Hispanic or Latino. Additionally, OMB announced that individuals would be allowed to select as many race/ethnicity categories as were applicable. Under the new reporting requirements a single, multiracial category cannot be used. OSEP [Office of Special Education Programs] is currently working with OMB and other offices within [the Department of Education] to develop reasonable categories for capturing aggregated data. OSEP expects to use the new categories in the coming years. (p. 3)

Though the GRI Annual Survey has not adopted a definition for recording race/ethnicity data that is identical to that proposed by OMB, its definition is much closer than that used for the IDEA Child Count. In order to improve comparability, the GRI Annual Survey should not simply move to mirror all of the definitions currently used for the IDEA Child Count because, at least for race/ethnicity, IDEA Child Count definitions are likely to change soon.

Regardless of the future alignment of the two surveys on key demograph-

ic and program service measures, there are important next steps to take. Currently, there is insufficient wide-scale collection of indicators of program or service outcomes that would allow for evaluation of models for deaf and hard of hearing students. In an era when "What works" is the catchphrase for education research, it seems reasonable to investigate how various special education programs and services are or are not advancing the social, emotional, and cognitive development of deaf and hard of hearing children and youth. An effort needs to be made simultaneously to collect data that clearly define program and service parameters, along with outcomes, so that what works for whom can begin to be determined. There is a particularly pressing need to identify which programs and services are most effective at increasing the number of deaf and hard of hearing students making adequate yearly progress.

Conclusion

The present study highlights some of the strengths and limitations of the GRI Annual Survey and demonstrates that the IDEA Child Count can serve as the basis for improving the generalizability of findings from this survey of students in special education. The GRI Annual Survey is a valuable data source for more detailed demographic and programmatic investigations of America's deaf and hard of hearing children and youth, particularly given the success of weighting as a method for correcting the identified sampling biases. Because the distributions of some variables in the GRI Annual Survey are substantively altered by the weighting procedure, however, I strongly recommend that general statements about the characteristics and schooling experiences of deaf and hard of hearing students be made

using weighted rather than unweighted response data in order to correct for sampling biases. Nonetheless, without the GRI Annual Survey, the IDEA Child Count completely fails to provide information about a number of demographic and program variables that are considered essential information for education, health, and social service providers, policymakers, and researchers.

In sum, it appears that Ries's (1986) conclusions remain true today. Even though the GRI Annual Survey has done exceptionally well at collecting data on the students who increasingly have been mainstreamed in regular schools and classrooms (Holden-Pitt & Diaz, 1998), the GRI Annual Survey continues to be more effective at obtaining responses from the schools and programs serving larger numbers of children and youth, which more often deliver a greater share of services in settings other than the regular classroom. Nonetheless, weighting by the IDEA Child Count provides a method that makes the GRI Annual Survey useful for reporting more nationally representative findings pertaining to the demographic diversity of, and the range of educational services received by, deaf and hard of hearing children and youth served under IDEA in the United States.

Note

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