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Center for Special Education Finance

Educating Students with Disabilities: Comparing Methods for Explaining Expenditure Variation

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Prepared by:

Jay G. Chambers, SEEP Director
María Pérez
Miguel Socías
Jamie Shkolnik
Phil Esra

Scott Campbell Brown, Project Manager OSEP

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Project Design Team: Jay Chambers (Project Director), Tom Parrish (Director, Center for Special Education Finance), and Roger Levine (Task leader for Sample Design).

Senior Consultants: Margaret McLaughlin, Institute for the Study of Exceptional Children and Youth, University of Maryland; Margaret Goertz, University of Pennsylvania, Philadelphia, Pennsylvania.

Technical Work Group: Stephen Chaikind, Gallaudet University; Doug Gill, Office of Superintendent of Public Instruction, Washington State; Diane Gillespie, Virginia Tech, Blacksburg, Virginia; Bill Hartman, Pennsylvania State University, University Park, Pennsylvania; John Herner, Division of Special Education, Ohio Department of Education; Donald Kates, Georgetown University, Child Development Center; Brian McNulty, Adams County School District 14, Commerce City, Colorado; Jim Viola, New York State Education Department.

State Directors of Special Education in the nine extended sample states: ***Alabama,*** Mabrey Whetstone, State Director, and Barry Blackwell, liaison; ***Delaware,*** Martha Brooks, State Director and Debbie Stover, liaison; ***Indiana,*** Robert Marra, State Director, and Hank Binder, liaison; ***Kansas,*** Bruce Passman, State Director, and Carol Dermyer, liaison; ***Missouri,*** Melodie Friedebach, State Director, and Bill Daly, liaison; ***New Jersey,*** Barbara Gantwerk, State Director, and Mari Molenaar, liaison; ***New York,*** Larry Gloeckler, State Director, and Inni Barone, liaison; ***Ohio,*** Ed Kapel, State Director; ***Rhode Island,*** Tom DiPaola, State Director, and Paul Sherlock, member, Rhode Island legislature.

Managers of data collection and processing: James Van Campen, Rafi Youatt, Marie Dalldorf, and Kristi Andes Peterson.

Data collectors and support teams include the following:

Team leaders: Peg Hoppe, Michael "Chad" Rodi, Jennifer Brown, Andy Davis, Leslie Brock, Jeanette Wheeler, and Jean Wolman. **Team members:** Mary Leopold, Claudia Lawrence, Patrice Flach, Bette Kindman-Koffler, Brenda Stovall, Danielle Masursky, Ann Dellaira, Eden Springer, Jack Azud, Nancy Spangler, Melania Page-Gaither, Raman Hansi, Chris White, Lori Hodge, Freya Makris, Megan Rice, Amynah Dhanani, Melinda Johnson, Carmella Schaecher, Iby Heller, Hemmie Jee, and Irene Lam.

Data collection support team: Emily Campbell, Ann Win, Sandra Smith and Diana Doyal.

Data analysis team: Maria Perez, Gur Hoshen, Jamie Shkolnik, Amynah Dhanani, Irene Lam, Bob Morris, and John DuBois.

Report production team: Phil Esra, Jenifer Harr, Jamie Shkolnik, Jean Wolman, and Michelle Bullwinkle.

SEEP Reports

This document is a part of a series of reports based on descriptive information derived from the Special Education Expenditure Project (SEEP), a national study conducted by the American Institutes for Research (AIR) for the U.S. Department of Education, Office of Special Education Programs (OSEP). SEEP is being conducted by AIR under the auspices of the Center for Special Education Finance (CSEF). It is the fourth project sponsored by the U.S. Department of Education and its predecessor, the Department of Health, Education and Welfare, in the past 40 years to examine the nation's spending on special education and related services. See Kakalik, Furry, and Carney (1981), Moore, Strang, Schwartz, and Braddock (1988), and Rossmiller, Hale, and Frohreich (1970).

The SEEP reports are based on analyses of extensive data for the 1999-2000 school year. The SEEP includes 23 different surveys to collect data at the state, district, and school levels. Survey respondents included state directors of special education, district directors of special education, district directors of transportation services, school principals, special education teachers and related service providers, regular education teachers, and special education aides. Survey responses were combined with other requested documents and data sets from states, schools, and districts to create databases that represented a sample of approximately 10,000 students with disabilities, more than 5,000 special education teachers and related service providers, approximately 5,000 regular education teachers, more than 1,000 schools, and well over 300 local education agencies.

The series of SEEP reports will provide descriptive information on the following issues:

- What are we spending on special education services for students with disabilities in the U.S.?
- How does special education spending vary across types of public school districts?
- What are we spending on due process for students with disabilities?
- What are we spending on transportation services for students with disabilities?
- How does education spending vary for students by disability and what factors explain differences in spending by disability?
- What role do functional abilities play in explaining spending variations for students with disabilities?
- What are we spending on preschool programs for students with disabilities?
- Who are the teachers and related service providers who serve students with disabilities?
- How are special education teaching assistants used to serve students with disabilities?
- What are we spending on special education services in different types of schools?
- How does special education spending vary across states classified by funding formula, student poverty, special education enrollment levels, and income levels?

One of the SEEP reports will also be devoted to describing the purpose and design of the study.

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Exhibits

Highlights

- **Disability categories alone explain only a small amount of the variance in special education expenditures.** A model that includes only the primary disability category explains only 10 percent of the variance in special education expenditures. Adding control variables such as students' background information and community/regional characteristics increases this percentage to 23 percent. Including secondary disability measures results in 27 percent of the variance being explained by the model.

- **The ABILITIES Index measure is designed to combat diagnostic ambiguity and the overlap of categories found in the traditional disability classification system.** The traditional classification system is useful in identifying a child's limitations so that resources and supports can be easily identified and applied based on a child's diagnosed disability. However, the disability categories are specific to one area of ability (e.g., vision) and may not address other areas in which the student may have needs. The ABILITIES Index allows students' characteristics to vary within each disability category and allows students to be assessed in several domains as opposed to a primary category.

- **Adding the ABILITIES Index measures to the model increases the explanatory power.** By providing a more accurate representation of students' characteristics, the ABILITIES Index also improves our ability to explain expenditure variations among special education students. A model that includes a continuous measure of the ABILITIES Index among students' background information and community/regional characteristics, explains an additional 15 percent of the variation in expenditures.

- **One strength of the ABILITIES Index is that it provides a picture of the severity of students' abilities in nine functional domains.** When disability categories are not included in the model, the percentage of the variance explained by the ABILITIES Index is 40 percent. When disability categories are added into the model they explain an additional 2 percent of the variance.

I. Introduction

In 1999-2000, schools in the U.S. were spending an average of $6,556 to educate a student without disabilities. At the same time, schools were spending an average of $12,639 on each student eligible for special education.[1] This spending varied quite a bit by disability category, from a low of $10,058 for students with specific learning disabilities to a high of $20,095 for students with multiple disabilities, and there was considerable variation even within the disability categories.[2]

Identifying students with disabilities and determining the most appropriate array of services that these children should receive is a difficult task (Bailey et al. 1993). Professionals in the field of education, psychology, medicine, and health have addressed this challenge in a variety of ways. One common approach is to classify children according to the etiology of their impairment. Another approach is that mandated by IDEA, which establishes primary disability categories to determine whether or not a student is eligible for services under the Act. Each child is identified by one category and the severity of the disability within each category is not identified.

Although these disability categories are intended to be employed for diagnostic purposes to determine eligibility, the categories should not be driving the array of services that students received. The main determinant of services provided to students should be the evaluation provided through the Individualized Education Program (20 USC 1414, Section 614). The IEP is intended to determine individual needs and, hence, derive the configuration of services. However, a recent report published by the Center for Special Education Finance (CSEF) documents that no fewer than sixteen States having funding systems that are pupil weighted based on disability, and seven additional States have resource based systems that are nothing more than a pupil weighted system disguised as a resource based system in which staff are tied to students with certain disabilities (Parrish, Harr, Anthony, Merickel, and Esra, May 2003).

Given these practices in close to half of the States, one would then expect that a student's disability category should clearly delineate student need for particular services and, hence, expenditures. In recent years, however, scholarship in the disability field has indicated that a move away from disability categorical approaches and towards functional approaches may be in order. For instance, over twenty years ago, the World Health Organization (WHO 1980, p.143) defined disability as follows: “In the context of health experience, a disability is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being.” WHO then operationalized this definition in a classification system. More recently, WHO has abandoned defining disability in its newly developed International Classification of Functioning, Disability and Health (ICF) and has abandoned classification through negative terms. In its conceptual framework, WHO (2001, p. 212), states that… "Functioning is an umbrella term...It denotes the positive aspects of an individual (with a health condition) and that individual's contextual factors (environmental and

[1] See SEEP Report 1 (Chambers, Parrish, & Harr; 2002). This includes *all* spending to provide regular education, special education, English language learner programs (ELL), and compensatory education services, as well as the corresponding administrative, support, and transportation services necessary for special education students.
[2] See SEEP Report 5 (Chambers, Parrish, & Perez; 2002).

personal factors)." In such an approach, all aspects of function can be considered and assessed according to severity.

Because of the limitations of the traditional approaches to classifying a child's characteristics, a number of authors have proposed to describe children on the basis of a defined set of functional skills or abilities rather than by etiological or deficit category (Bailey et al. (1993); Holt (1957); Linden (1963)). Building on this earlier work, Simeonsson and Bailey (1988) developed the ABILITIES Index (AI), an index designed to assess functional characteristics rather than skills. Although the ABILITIES Index was not originally designed to link student characteristics to the patterns of expenditure variations, the size of the SEEP student sample offers a unique opportunity to apply the AI classification scheme to explore how such a tool might be used to explain the patterns of variations in expenditures on student with disabilities.[3] The AI is not necessarily a holistic diagnostic tool for need for an array of services, as envisioned by the ICF. It does, however, differ from the disability categories in three important ways: 1) each student's functional attributes are assessed in more than one domain, 2) the severity of the domains is taken into account and 3) the actual domains of the Index are somewhat different from the IDEA disability categories.

The study behind this report, the Special Education Expenditure Project (SEEP), provides a unique database with which to explore these patterns. The centerpiece for the analysis is the individual student database, containing information gathered in SEEP surveys sent to schools across the country. The database includes a nationally representative, stratified, random sample of over 9,000 individual students with disabilities.

The purpose of this paper is to compare the variance in expenditures explained by the IDEA disability categories with the dimensions delineated in the ABILITIES Index. This report does not suggest that the AI should replace the traditional system of disability categories or be used to develop a special education identification process or funding system. Rather, the report demonstrates that the AI and IDEA disability categories are useful both independently and together in explaining the variation in expenditures on students with disabilities, while controlling for other student background and community/regional variables.

The analysis that follows includes three stages. The first stage determines the percentage of the variation in spending explained by the student's primary disability (from among the 13 IDEA disability categories). The second phase explores whether a particular child has a second, third, or more disabilities, and explores the extent to which these disabilities contribute to expenditure variations. The third phase of the analysis examines an alternative approach to classifying students. It the ABILITIES Index to characterize special education students.

[3] Another attractive feature of the AI for the SEEP data collection and analysis is that the AI requires a fairly minimal investment of time for a teacher to complete on behalf of a student. Moreover, further research of Bailey, Simeonsson, and Buysse (1993), and Buysse, Smith, and Bailey (1993) suggests that the AI is fairly reliable across different raters including parents, clinicians, and educational professionals

II. The Role of Disability Categories

Professionals in the field of education, psychology, medicine, and health have addressed the challenge of describing and categorizing a child with disabilities in a variety of ways. One of the approaches used has been to categorize children according to their disability category. Classifying children on this basis enables one to determine their eligibility for services (Bailey et al. (1993)). This report initially uses the student's primary and secondary disability categories to try to infer the level of spending. The assumption behind this approach is that students who fall into similar disability categories may also have similar needs, and therefore require similar educational services.

This section analyzes the variation in expenditures by the IDEA disability categories. The 1997 reauthorization of the Individuals with Disabilities Education Act (IDEA97) states (20 USC 1401, Section 602 Definitions 3A), "IN GENERAL, the term 'child with a disability' means a child (i) with mental retardation, hearing impairments (including deafness), speech or language impairments, visual impairments (including blindness), serious emotional disturbance (hereinafter referred to as 'emotional disturbance'), orthopedic impairments, autism, traumatic brain injury, other health impairments or specific learning disabilities; and (ii) who, by reason thereof, needs special education services." Developmental delay, the most recently added disability category, is applicable only to children ages 3 through 9, and its use for students ages 6 through 9 is optional for States and Local Educational Agencies (LEAs).[4]

More than half of the students served under IDEA during the 1999-2000 academic year had a primary disability category of specific learning disability. The top four categories—specific learning disability, speech or language impairment, mental retardation, and emotional disturbance—account for about 90 percent.

In addition to each student's primary disability, the SEEP survey asked whether the student could be classified according to any secondary disabilities. Exhibit 1 shows the percentage of students in each primary disability category that have secondary disabilities.

[4] Source: U.S. Department of Education, Office of Special Education Programs (1999, March). In 1999-2000, 22 States used the developmental delay category for children ages 6 through 9.

Exhibit 1. Percentage of Students within Each Disability Category Who have None, One, Two or Three, and Four or More Secondary Disabilities[5]

Primary Disability	No secondary disabilities	One secondary disability	Two or three secondary disabilities	Four or more secondary disabilities
Autism	38%	28%	29%	5%
Deaf-blindness	50%	9%	32%	10%
Developmental delay	63%	30%	3%	5%
Emotional disturbance	45%	37%	17%	1%
Hearing impairment/deafness	44%	36%	15%	5%
Mental retardation	46%	33%	18%	4%
Multiple disabilities	22%	21%	37%	21%
Orthopedic impairment	43%	36%	19%	2%
Other health impairment	33%	45%	20%	3%
Specific learning disability	63%	28%	10%	0%
Speech or language impairment	72%	21%	6%	0%
Traumatic brain injury	51%	31%	11%	6%
Visual impairment/blindness	54%	28%	17%	1%

The exhibit shows that students with the more common disabilities, such as specific learning disability, appear to have fewer secondary disabilities. For example, only 10 percent of students with specific learning disability and 6 percent of students with speech or language impairment have two or three secondary disabilities. Almost none of these students have more than three secondary disabilities.

Variation In Expenditures due to Disability Category

To analyze how accurately the educational expenditures on a student can be predicted by that student's disability category, multivariate regression analyses were conducted, using data on total expenditures for students with disabilities. The expenditure figures presented in this report are based on *total spending to educate a special education student* for the school year 1999-2000. These figures include *all* school resources, including both the special and regular education services used to provide a complete educational program. This is important because special education students spend a substantial amount of time in the regular education program and benefit from the same administrative and support services as other students without disabilities.[6]

Exhibit 2 shows the percentage of the variation in total expenditures explained by information about student's disability, student background, and community/regional characteristics. The results displayed in Exhibit 2 suggest that primary disability categories explain about 10 percent of the variation in total expenditures on special education students. The number of secondary disabilities explains about 8 percent of the variation in total expenditures when taken by itself.

[5] The sum of each row should equal 100 percent except for rounding errors.
[6] For a more detailed explanation about total spending used to educate special education students, refer to Chambers, Parrish, & Harr (2002).

Student background information, such as age, gender, and ethnicity, accounts for only 2 percent of the variation in expenditures. This suggests that student background characteristics alone do not provide much information about student needs nor influence the process by which the patterns of services and expenditures are determined. On the other hand, community/regional characteristics, measured by district size, the cost-of-education index, and state indicators, explain 13 percent of the variation. When combined, measures of student needs, background information, and community/regional characteristics are able to explain 27 percent of the variation in total expenditures for students in special education.[7]

Exhibit 2. Percentage of the Variation in Total Expenditures Explained by Characteristics of Student With Disabilities, 1998-1999

Method of Categorizing Students (Sample Size: 8,390 students)	Percentage of the Variation Explained
1. Students' disability:	
Primary disability category	10%
Number of secondary disabilities	8%
2. Students' background information (age, gender, & ethnicity)	2%
3. Community/regional characteristics (district size, cost-of-education index, & state indicators	13%
All Combined (1, 2, and 3)	27%

The following exhibit presents results for two different models used for analyses in this report. Model 1 includes information about the primary disability of the student, plus student background information and community or regional characteristics as control variables. Model 2 adds information about the number of secondary disabilities. The "percent effect" is how much more is spent on a student in a given disability category than is spent on a student in the control group of specific learning disability. For example, 66 percent more is spent on a student with autism than on a student with a specific learning disability.

[7] The combined variation explained is not simply the sum of the percentage of variation explained by each component because these components move together to some degree—when taken one at a time, each reflects some component of the variation in the other explanatory variables.

Exhibit 3. Relationship Between Total Expenditures and Characteristics of Students with Disabilities, 1998-1999

	Model 1 Primary Disability Model	Model 2 Primary Disability & Number of Secondary Disabilities Model
	Percent Effect	
Primary Student Disability		
Specific learning disability	*Control group*	*Control group*
Autism	66	54
Deaf-blindness	(sample too small)	(sample too small)
Developmental delay	(sample too small)	(sample too small)
Emotional Disturbance	24	18
Hearing Impairment/Deafness	45	38
Mental Retardation	45	36
Multiple Disabilities	75	48
Orthopedic Impairment	44	37
Other Health Impairment	20	11
Speech or Language Impairment	1	3
Traumatic Brain Injury	36	30
Visual Impairment/Blindness	51	46
Number of Disabilities		
Primary disability only	*Control group*	*Control group*
One secondary disability		17
Two secondary disabilities		31
Three secondary disabilities		40
More than three secondary disabilities		56
Adjusted R-Square	0.23	0.27

In Model 1, the speech or language impairment category is the only disability that does not exhibit statistically significant expenditure differences when compared with the specific learning disability category. All other disability categories show positive and statistically significantly higher levels of spending. These expenditure differences from specific learning disabilities range from a low of 20 percent more for other health impairment to a high of 75 percent more for multiple disabilities.

When the number of secondary disabilities is included in the model (Model 2), the percent effects of the primary disability categories decline. For example, the percent effect of autism decreases from 66 percent to 54 percent. This suggests that the disability category itself is correlated with the number of secondary disabilities reported by individual children, and that the disability category in Model 1 is picking up some of the variation that should have been attributed to the existence of these secondary disability conditions. The adjusted R-square, a statistical measure of ability to predict relative expenditure levels, increases from .23 to .27 for Model 2. In other words, the information in Model 2 is able to explain 27 percent of the variation in spending on special education students, compared with 23 percent for Model 1.

The percent effects for number of disabilities in Model 2 indicate that students who have more than one disability exhibit higher total expenditures than students with only one disability. The effects range from about 17 percent more for one secondary disability to 56 percent more for more than three secondary disabilities.

III. The ABILITIES Index: A Measure of Students' Needs

The ABILITIES Index was developed by Rune J. Simeonsson and Donald B. Bailey in response to concerns about the existing way students with disabilities were classified:

> *A number of limitations have contributed to long-standing problems of inappropriate categorization of children and inadequately defined populations in special education practice and research. Diagnostic ambiguity and overlap of categories have served to complicate communication about individual children and the design of appropriate interventions. There is a need for functional approaches to document child characteristics, which build on conceptual models of disability and yield consistent terminology. (Simeonsson, Bailey, Smith, & Buysse, 1995, p. 267)*

In response to these concerns, Simeonsson and his colleagues developed the ABILITIES index as a functional measure that encompasses nine major domains of ability/disability in order to provide an accurate child profile. Ultimately, the ABILITIES Index seeks to evaluate a child holistically so the child can receive appropriate intervention.

The ABILITIES Index builds upon earlier efforts to assess function. The first work presented in this direction was PULHESTIB scale (Holt, 1957). This PULHESTIB scale consisted of ordinal ratings from 1 (normal) to 4 (abnormal) assigned to major domains of **P**hysique, **U**pper limbs, **L**ocomotion, **H**earing, **E**yes, **S**peech, **T**oilet, **I**ntelligence, and **B**ehavior. Subsequently, Lindon (1963) proposed the PULTIBEC scale, where nine areas of abilities are rated from 1 (normal) to 6 (abnormal). These areas include **P**hysical capacity, **U**pper limbs, **L**ocomotion, **T**oilet, **I**ntelligence, **B**ehavior, **E**yes, and **C**ommunication.

The ABILITIES Index is a potential system designed to combat diagnostic ambiguity and the overlap of categories found in the traditional IDEA disability classification system. According to Simeonsson *et al*., the traditional categorical system for classifying students has three specific problems. First, terms like disability, dysfunction, and deficit are incorrectly used interchangeably, often leading to complicated communication about a subject's profile. Second, because the disability categories are specific to one area of ability (e.g., vision), they do not give a complete picture of the student's needs. Third, the disability classification system is often subjective and arbitrary, and children are often evaluated differently based on a primary observation.[8]

[8] For a more complete discussion and the rationale for the development of the ABILITIES Index, the reader should refer to Simeonsson, Bailey, Smith, & Buysse (1995). Also, for a discussion of the psyhometric properties of the Abilities Index, see appendix F in this report.

The central feature of the ABILITIES Index is an assessment of characteristics along a range of ability/disability. ABILITIES is an acronym that represents these nine domains:

	Domain	Sub-domain
A	Audition	Left Ear, Right Ear
B	Behavior & Social Skills	Social Skills, Inappropriate Behavior
I	Intellectual Functioning	—
L	Limbs	Left Hand, Left Arm, Left Leg, Right Hand, Right Arm, Right Leg
I	Intentional Communication	Understanding Others, Communicating with Others
T	Tonicity	Degree of Tightness, Degree of Looseness
I	Integrity of Physical Health	—
E	Eyes	Left Eye, Right Eye
S	Structural Status	

The resulting profile provides a more comprehensive picture of the child's abilities and disabilities than a disability category alone. It not only identifies differences between individuals, but also tries to detect intra-individual variability. In each domain, the teacher rates the student, where normal is assigned a score of 0 and profound disability is assigned a score of 5. The maximum score that a student can get is 95; meaning completely disabled in all domains; and the minimum score is 0, meaning that the student is rated *normal* in all of the measured domains.

It is useful to explain the terms we use to describe special education students in relation to the ABILITIES Index. As mentioned, the ABILITIES Index score ranges from 0 to 95. The higher the score, the higher the level of dysfunction, or disability. Students with higher scores may have higher levels of need, and may require more resources and more time in special education programs.

The *International Classification of Functioning (ICF)*, in its effort to standardize the language used in describing disability, has taken the approach that classification should be applicable to all people irrespective of health condition. Furthermore, the ICF suggests that domain names be worded neutrally, so that classification can express positive or negative aspects. The ABILITIES Index takes a similar approach, rating individuals on an axis of functional ability across several domains, rather than using one term to summarize a student's disabilities. The following exhibit shows the ABILITIES Index chart that was included in the SEEP student questionnaire.

Exhibit 4. ABILITIES Index Measurement Tool

	A		B		I	L						I		T		I	E		S
	Audition (Hearing) **Rate Both**		Behavior & Social Skills **Rate Both**		Intellectual Functioning	Limbs (Use of hands, arms, and legs) **Rate All**						Intentional Communication **Rate Both**		Tonicity (Muscle Tone) **Rate Both**		Integrity of Physical health	Eyes (Vision) **Rate Both**		Structural Status
	Left Ear	Right Ear	Social Skills	Inapprop. Behavior	Thinking & Reasoning	Left Hand	Left Arm	Left Leg	Right Hand	Right Arm	Right Leg	Under-standing others	Communicating with others	Degree of tightness	Degree of looseness	Overall Health	Left Eye	Right Eye	Shape, Body Form & Structure
0	Normal		All behaviors typical & appropriate for age		Normal for age			Complete normal use				Normal	Normal	Normal	Normal	General good health	Normal		Normal
1	Suspected hearing loss		Suspected disability	Suspected inapprop. Behaviors	Suspected disability			Suspected difficulty				Suspected disability	Suspected disability	Suspected disability	Suspected disability	Suspected health problems	Suspected vision loss		Suspected difference or interference
2	Mild hearing loss		Mild disability	Mildly inapprop. Behaviors	Mild disability			Mild difficulty				Mild disability	Mild disability	Mild disability	Mild disability	Minor ongoing health problems	Mild vision loss		Mild difference or interference
3	Moderate hearing loss		Moderate disability	Moderately inapprop. Behaviors	Moderate disability			Moderate difficulty				Moderate disability	Moderate disability	Moderate disability	Moderate disability	Ongoing but medically-controlled health problems	Moderate vision loss		Moderate difference or interference
4	Severe hearing loss		Severe disability	Severely inapprop. Behaviors	Severe disability			Severe difficulty				Severe disability	Severe disability	Severe disability	Severe disability	Ongoing poorly-controlled health problems	Severe vision loss		Severe difference or interference
5	Profound hearing loss		Extreme disability	Extremely inapprop. Behaviors	Profound disability			Profound difficulty				Profound disability	Profound disability	Profound disability	Profound disability	Extreme health problems, near total restriction of activities	Profound vision loss		Extreme difference or interference

Exhibit 5 shows the ABILITIES Index profile for two special education students who have different disability classifications. One of the students has speech or language impairment, and the other has emotional disturbance. As shown, the two students, despite different classifications in the traditional system, have a very similar ABILITIES Index profile.

Exhibit 5. Profile for Two Students in Different Disability Categories

	A		B		I	L						I		T		I	E		S
	Audition (Hearing) **Rate Both**		Behavior & Social Skills **Rate Both**		Intellectual Functioning	Limbs (Use of hands, arms, and legs) **Rate All**						Intentional Communication **Rate Both**		Tonicity (Muscle Tone) **Rate Both**		Integrity of Physical health	Eyes (Vision) **Rate Both**		Structural Status
	Left Ear	Right Ear	Social Skills	Inapprop. Behavior	Thinking & Reasoning	Left Hand	Left Arm	Left Leg	Right Hand	Right Arm	Right Leg	Under-standing others	Communicating with others	Degree of tightness	Degree of looseness	Overall Health	Left Eye	Right Eye	Shape, Body Form & Structure
0	Normal		All behaviors typical & appropriate for age		Normal for age			Complete normal use				Normal	Normal	Normal	Normal	General good health	Normal		Normal
1	Suspected hearing loss		Suspected disability	Suspected inapprop. behaviors	Suspected disability			Suspected difficulty				Suspected disability	Suspected disability	Suspected disability	Suspected disability	Suspected health problems	Suspected vision loss		Suspected difference or interference
2	Mild hearing loss		Mild disability	Mildly inapprop. behaviors	Mild disability			Mild difficulty				Mild disability	Mild disability	Mild disability	Mild disability	Minor ongoing health problems	Mild vision loss		Mild difference or interference
3	Moderate hearing loss		Moderate disability	Moderately inapprop. behaviors	Moderate disability			Moderate difficulty				Moderate disability	Moderate disability	Moderate disability	Moderate disability	Ongoing but medically-controlled health problems	Moderate vision loss		Moderate difference or interference
4	Severe hearing loss		Severe disability	Severely inapprop. behaviors	Severe disability			Severe difficulty				Severe disability	Severe disability	Severe disability	Severe disability	Ongoing poorly-controlled health problems	Severe vision loss		Severe difference or interference
5	Profound hearing loss		Extreme disability	Extremely inapprop. behaviors	Profound disability			Profound difficulty				Profound disability	Profound disability	Profound disability	Profound disability	Extreme health problems, near total restriction of activities	Profound vision loss		Extreme difference or interference

A. Speech Language Impairment **B. Emotional Disturbance**

On the other hand, Exhibit 6 shows how two students with the same disability categories can have very different ABILITIES Index profiles, confirming that the traditional system can lead to variability within a category. Ultimately, combining disability categories with the ABILITIES Index methodology allows a more accurate profile of a child's needs, facilitating personalized and effective interventions.

Exhibit 6. Profile for Two Students in the Same Disability Category

	A		B		I	L						I		T		I	E		S
	Audition (Hearing) **Rate Both**		Behavior & Social Skills **Rate Both**		Intellectual Functioning	Limbs (Use of hands, arms, and legs) **Rate All**						Intentional Communication **Rate Both**		Tonicity (Muscle Tone) **Rate Both**		Integrity of Physical health	Eyes (Vision) **Rate Both**		Structural Status
	Left Ear	Right Ear	Social Skills	Inapprop. Behavior	Thinking & Reasoning	Left Hand	Left Arm	Left Leg	Right Hand	Right Arm	Right Leg	Under-standing others	Communicating with others	Degree of tightness	Degree of looseness	Overall Health	Left Eye	Right Eye	Shape, Body Form & Structure
0	Normal		All behaviors typical & appropriate for age		Normal for age			Complete normal use				Normal	Normal	Normal	Normal	General good health	Normal		Normal
1	Suspected hearing loss		Suspected disability	Suspected inapprop. behaviors	Suspected disability			Suspected difficulty				Suspected disability	Suspected disability	Suspected disability	Suspected disability	Suspected health problems	Suspected vision loss		Suspected difference or interference
2	Mild hearing loss		Mild disability	Mildly inapprop. behaviors	Mild disability			Mild difficulty				Mild disability	Mild disability	Mild disability	Mild disability	Minor ongoing health problems	Mild vision loss		Mild difference or interference
3	Moderate hearing loss		Moderate disability	Moderately inapprop. behaviors	Moderate disability			Moderate difficulty				Moderate disability	Moderate disability	Moderate disability	Moderate disability	Ongoing but medically-controlled health problems	Moderate vision loss		Moderate difference or interference
4	Severe hearing loss		Severe disability	Severely inapprop. behaviors	Severe disability			Severe difficulty				Severe disability	Severe disability	Severe disability	Severe disability	Ongoing poorly-controlled health problems	Severe vision loss		Severe difference or interference
5	Profound hearing loss		Extreme disability	Extremely inapprop. behaviors	Profound disability			Profound difficulty				Profound disability	Profound disability	Profound disability	Profound disability	Extreme health problems, near total restriction of activities	Profound vision loss		Extreme difference or interference

A. Multiple Disabilities **B. Multiple Disabilities**

While the ABILITES Index was not designed for analyzing patterns of expenditure variations, it provides information about student's characteristics that helps explain patterns of services and expenditure. However, in order to incorporate the ABILITIES Index into a regression analysis in which total expenditure was the dependent variable, it was necessary to restructure the data. Eight final domains were included in the regression analysis: audition, behavior and social skills, intellectual function, intentional communication, overall health, vision, limbs, and tonicity and structural status. Note that the estimated effects of each of the factors are relative to a control group. For instance, the expenditure effect of having one functional domain with a mild disability is relative to the effect of the control group, in this case, to *normal* functionality in that domain.

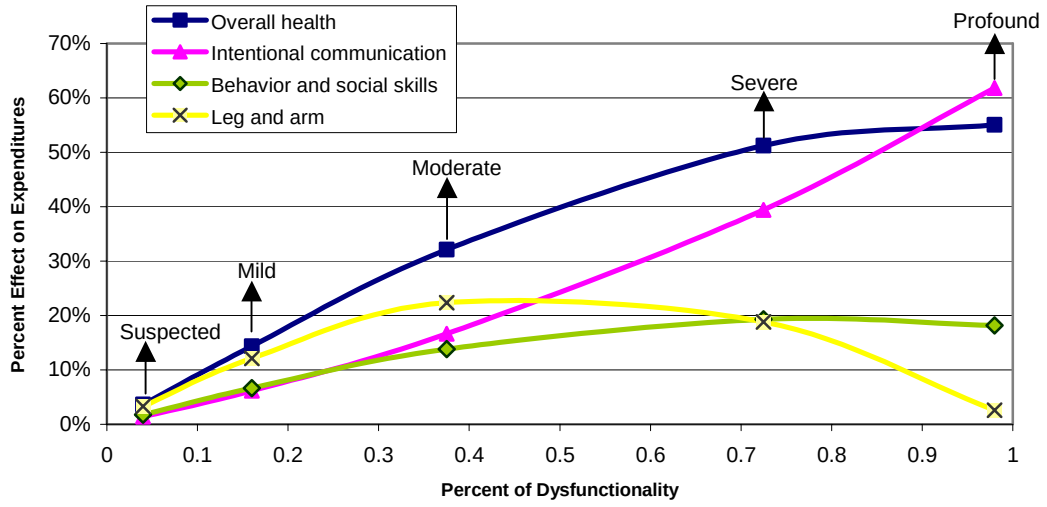
IV. The Contribution of the ABILITIES Index

As shown in Section II, disability categories are able to explain only 27 percent of the variation in total educational expenditures on students with disabilities (see Exhibit 2). This is because students' characteristics vary considerably within disability categories. In order to obtain a richer picture of students' needs, and therefore of the expenditures on these students, Model 3 adds the ABILITIES Index to the analysis, which permits each domain to have different effects on expenditures depending on the degree of dysfunctionality.

The adjusted R-square (a statistical measure of the model's ability to predict relative expenditure levels) increases from 0.27 (Model 2, Exhibit 3) to 0.42 in Model 3. This suggests that incorporating the ABILITIES Index may explain an additional 15 percent of the variation in the total educational expenditure for special education students. This is a significant increase in the explanatory power of the model. (On a technical note, an F-test shows that this increase in the R-square is statistically significant at 1 percent.)

Exhibit 7 presents results obtained from Model 3 (results are included for all the domains that are statistically significant at the 5 percent level). Expenditures appear to increase at a rising rate for students rated with suspected or mild dysfunctionality in overall health, but increase at a decreasing rate after that point. In the domain of intentional communication, expenditures increase at a rising rate as the level of dysfunctionality rises. Spending appears to rise with the level of dysfunctionality in behavioral and social skills, but flattens out beyond a certain point. With respect to limbs, expenditures appear to increase to a point and then decrease thereafter, a somewhat counterintuitive result.

Exhibit 7. Relationship Between Total Expenditures and Overall Health, Intentional Communication, Behavior and Social Skills, and Limbs



V. The ABILITIES Index with and without IDEA Disability Categories

The previous sections have shown that the ABILITIES Index improves our ability to explain variation in expenditures for special education students by identifying the level of dysfunction within each disability category and allowing students to be assessed in more than one category. It is important to realize, however, that the ABILITIES Index can be used in conjunction with analysis of traditional disability categories. Using the ABILITIES Index as a measure of students' characteristics without the traditional disability categories generates an adjusted R-square of 40, indicating that this model explains 40 percent of the variation in expenditures. Model 3, which includes disability category information, has an adjusted R-square of 42, explaining 42 percent of the variation, a slight improvement.

Exhibits 8 through 10 show the relationship between different ABILITIES Index domains for Model 3 (with traditional disability categories) and Model 4 (without disability categories).

As shown in Exhibit 8, using the ABILITIES Index for behavior and social skills without the disability categories creates an upward bias in the relationship between this domain and total expenditure. In other words, the coefficients associated with behavior and social skills in Model 4 are capturing part of the effects that are actually due to the disability categories that are not accounted for in Model 4. Once the disability categories are included (Model 3), those effects are isolated and the effect of this domain does not appear as strong; in other words, the accuracy of the demonstrated relationship between total expenditures and students' behavior and social skills increases when the disability categories are added to the model.

Exhibit 8. Relationship Between Total Expenditures and *Behavior and Social Skills*

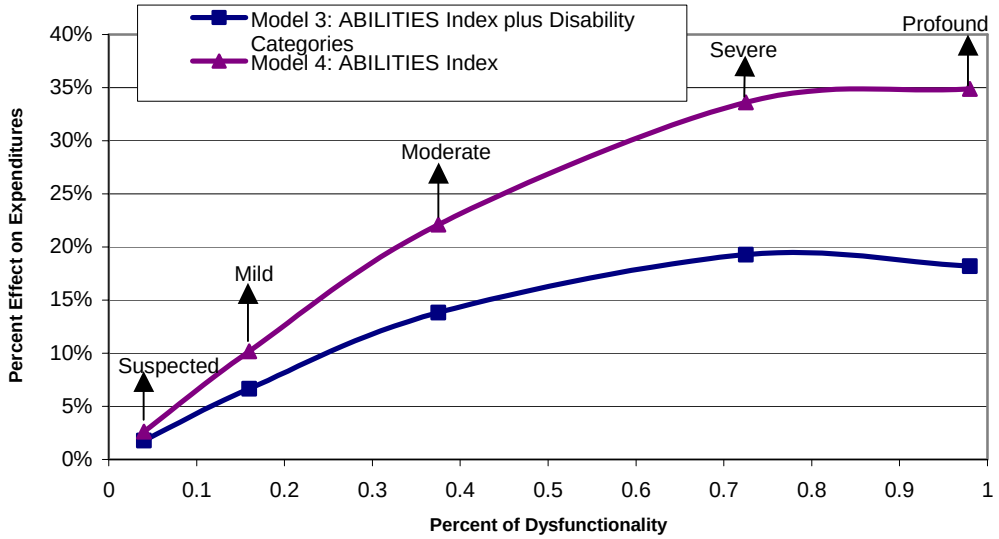


Exhibit 9. Relationship Between Total Expenditures and Measures of *Overall Health*

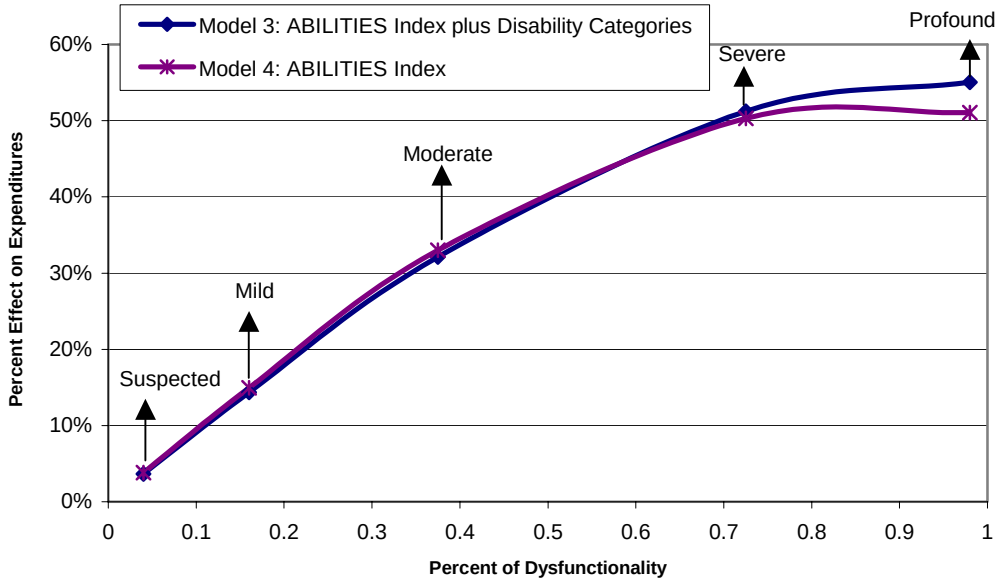
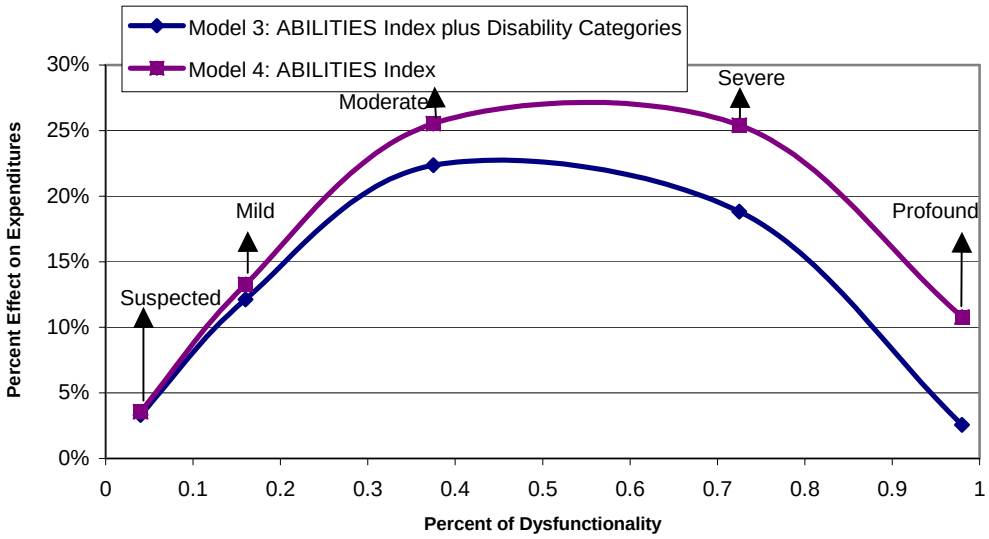


Exhibit 9 shows the percent effects for the overall health domain. In this case, no significant bias is observable when disability categories are excluded from the expenditure equation. That is, both models produce a similar relationship between total expenditures and the measure of the overall health domain. Only when the rating changes from severe to profound do the coefficients associated with overall health in Model 4 (without disability categories) fail to capture the entire effect on expenditures.

Exhibit 10 shows the percent effects on expenditures of changes in the degree of limb dysfunction. When disability categories are not included (Model 6), the coefficients associated with the ABILITIES Index show a higher percent effect on expenditures. When disability categories are included in the model, the percent effects are much lower. Without disability categories, a false picture of expenditures is given.

Exhibit 10. Relationship Between Total Expenditures and Measures of *Limbs*



As mentioned at the beginning of this chapter, when disability categories are not included in the model, the percentage of the variation explained by the ABILITIES Index is 40 percent. When disability categories are included, they explain an additional 2 percent of the variation. This suggests that disability categories often do not add significant explanatory power to the models. Overall, the data above suggest that the effect of combining disability category and AI measures on variation in expenditures is inconsistent across functional domains. The exhibits above suggest that in some domains, such as overall health (Exhibit 9), the percent effects associated with changes in the degree of dysfunctionality on total expenditures do not vary much once disability categories are included in the model. In other domains of measure, such as limbs, the percent effects do change when disability categories are included. In this case the percent effects on total expenditures tend to be much lower once disability categories are incorporated. Opposite results are observed when analyzing the behavior and social skills domain, where once disability categories are included in the model, the percent effect tend to be higher than when disabilities are not included.

This report does not suggest that the AI should replace the traditional system of disability categories. Rather, it shows how the ABILITIES Index and the IDEA disability categories are useful both independently and together in explaining the variation in expenditures on students with disabilities, while controlling for other student background and community or regional characteristics.

VI. Conclusions

This report has analyzed the association between various measures of student's characteristics and total expenditures to educate students with disabilities who are eligible for special education services. The analysis shows that the traditional disability categories used by IDEA to classify special education students explains a relatively small percentage of the variance (about 10 percent) in total educational expenditures. The analysis also shows that number of secondary disabilities reported for a student when taken alone explains about 8 percent of the variance in expenditures.

An important drawback of the traditional classification approach is that the disability categories themselves do not quantify the severity of the student's disability conditions and not quantify more than one of each student's conditions. Moreover, the traditional categorization tends to classify children rather than their functional characteristics.

The ABILITIES Index, developed by Rune J. Simeonsson and Donald B. Bailey, is a functional assessment measure that can be employed for children with disabilities. It provides a detailed description of the students' degree of dysfunction in nine domains: audition, behavior and socials skills, intellectual functioning, limbs, intentional communication, tonicity, integrity of health, eyes, and structural status. This detailed profile of students adds important information to the disability categories of students, enhancing our understanding.

When either a continuous or discrete measure of the ABILITIES Index is introduced in the expenditure regression analysis, our ability to understand the variance in total expenditures increases from about 27 percent to about 42 percent. At the same time, taking into account this information decreases significantly the effect on expenditures previously assigned to the different disability categories.

When disability categories are not included in the model, the percentage of the variance explained by the ABILITIES Index variables is 40 percent. When disability categories are included, they explain an additional 2 percent of the variance. The strength of the AI is that it considers the severity of each student's abilities in each of nine functional domains. The fact that the traditional disability categories continue to contribute in explaining the variance in expenditures suggests that the ABILITIES Index may require some additional dimensions to capture fully the needs of students, perhaps in the area of personal functioning.

Simeonsson, Buysse, Smith, and Bailey (1993) have demonstrated a high degree of reliability in the index when different individuals, such as parents and clinicians, rate the same children. More research by psychologists and other medical specialists is required to develop and refine tools like the ABILITIES Index measures to capture behavior and social dimensions, along with the dimensions of intellectual functioning and communication. Additional work is also necessary to continue to understand the underlying relations between student' characteristics, student's need and resource requirements for educational and related services. One goal would be to find more objective measures by which one can classify the needs of students in order to be able to deliver the necessary the financial resources required to provide appropriate educational services to students with disabilities.

If nothing else, the results of this paper should make one wary of special education funding systems that are based on disability categories of children. This is of particular concern given the fact that almost half the states rely on funding systems that to some degree use disability categories as the basis for determining differential levels of state aid for special education.

Next steps in this research will also involve exploration of how the ABILITIES Index might help us to explain the patterns of assignment of students with disabilities to different kinds of services and placements. That is, do these types of measures relate to student needs as reflected by the amount of time students spend in the regular classroom or the specific combinations and intensities of services received by students with disabilities?

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