

Methodological Notes

Developing Concise Measures of Childhood Activity Limitations

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Objectives: Although several national health surveys have implemented data collection efforts to identify and characterize disability among children, the large number of items these surveys have required to measure childhood disability prohibit their use in general population surveys. Using a conceptually based approach, we examine whether concise sets of survey items—feasible for use in general population surveys—can be used to measure functional limitations in activities among children. *Methods:* We analyze three nationally representative population surveys that contain detailed questions on childhood activity limitations. We first examine the full set of survey items and then eliminate survey items, one by one, exploring different combinations and examining the results of each successive elimination. *Results:* Across the three surveys, we consistently demonstrate that it is possible to reduce the number of survey items needed to measure childhood activity limitations and still produce comparable estimates. Concise sets of measures may contain as few as six items, making it possible to include in general population surveys. However, our concise sets of measures do not produce comparable estimates across surveys, which reflects differences in the types of questions and differences in the wording of questions found in the original survey instruments. *Conclusions:* On the basis of our findings, we reemphasize the importance of the wording of survey questions, the importance of validating survey questions, and finally, we recommend a concise set of items that can be used to measure childhood activity limitations in general population surveys.

KEY WORDS: disability; children; activity limitations; population surveys.

INTRODUCTION

Legislated mandates (including the Americans with Disabilities Act of 1990 and the Individuals with Disabilities Education Act of 1997 [a continuation and expansion of the Education for All Handicapped Children Act of 1975]) have focused attention on the identification, measurement, and analysis of children with disability. However, there is a troubling lack of consensus about what constitutes disability among children. The Maternal and Child Health Bureau has developed a broad and inclusive measure of children

with special health care needs, but without a specific conceptual foundation. Well-known theoretical models such as the model advanced by the Institute of Medicine (1) and the International Classification of Functioning, Disability, and Health advanced by the World Health Organization (2) differ in their emphasis on disease, performance of everyday tasks, social participation, and use of the term “function.” In addition to considering different theoretical frameworks, agencies responsible for collecting disability data have also had to take into account the differing needs of public policy. For some purposes they may need to identify all children with chronic health conditions or those with special health care needs. At other times, they may need to identify children with medical conditions who lack specialized care.

Major national population surveys have been used to respond to these scientific and policy concerns

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with several special data collection efforts to identify and characterize disability among children (3). The focus of these data collection efforts has varied, with attention to different aspects of disability and with the instruments used to measure disability. For instance, the 1994 and 1995 National Health Interview Surveys collected information on medical conditions, treatments, functional limitations, activity limitations, and ability to participate in school. Other surveys (Panel Study of Income Dynamics, Early Childhood Longitudinal Survey—Kindergarten Cohort) have been more focused on limitations in the performance of everyday tasks and focus much less on medical conditions and care. These various approaches have been based on a variety of conceptual models to study child disability and have not produced consistent estimates of population prevalence rates of children with chronic health needs or with disabilities. Indeed, many national surveys need to measure disability not to provide another estimate of the population prevalence of disability but to identify children with special needs and their families who face special challenges in successful child development. In this paper we examine survey measures that have been used to determine population prevalence in order to identify those items most critical for the identification of disability in government surveys with a focus on child and family outcomes.

Previous survey research examining child disability has produced estimates of prevalence rates as well as descriptive information on the characteristics of children who experience chronic conditions, functional limitations, and disabilities (4–7). However, these research efforts examining various aspects of child disability have been based on a large number of survey questions (16–75 questions). The very large number of items these surveys have used to measure disability are sufficiently extensive and time-consuming to prohibit their use in surveillance systems and in major national population surveys.

This project will identify a handful of questions that can substitute in a scientifically sound manner for these detailed instruments and that are suitable for use in population sample surveys and survey-based surveillance systems. The three major aims of the project are as follows. First, we identify concise sets of survey items and confirm whether or not they can adequately represent the population of children with activity limitations in place of the detailed set of items. We consider the extent to which the concise sets of measure produce similar estimates, overall, as well as within specific domains. Second, we examine preva-

lence estimates among children classified by key population subgroups—by sex, by race/ethnicity, and by family income. We want to ensure that the reduced sets of items capture the same variations in activity limitations associated with sex, race/ethnicity, and family income. Third, we compare results across surveys. We compare prevalence estimates and address the extent to which estimates are sensitive to the use of different survey instruments. This will be done for the overall population of children as well as for key social and demographic groups.

We focus attention on those surveys that are not primarily designed to measure disability among children or to identify children with special health care needs as defined by the Maternal and Child Health Bureau. We intend to identify a relatively small number of survey items that are adequate to identify children with functional disability in general population surveys. It is our contention that knowledge of functional limitations in children is critical to understand a variety of demographic and social behaviors of children and families that are policy relevant, including marital separation and divorce, mothers' labor force participation, wealth spend-down, entry into welfare, and reduced rates of exit from welfare. This information can also help explain high school dropout, adult children who are not working or in school and living at home, adolescent births, and off-time marriage.

All of these are topics, of course, that have received the extensive attention of researchers, yet very few of these studies have considered child disability as a key factor. By ignoring child disability, these analyses are subject to serious omitted variable bias, and fail to develop a behavioral model consistent with actual individual and family situations. Our goal is to suggest ways to measure child disability that will enable researchers to examine these various processes and outcomes and to take this information into account in appropriate mixture models. The measurement of disability among children in these surveys thus is not so much to determine overall prevalence levels of disability in the population, but to identify a critically important factor in the lives of children and families that may have a pervasive impact on child development and families. Our prior research indicates that, for these types of outcomes, functional limitation is of greater importance than medical conditions (8–10).

At the outset, it should be mentioned that we bring to this project certain views of the role of population surveys in the study of child disability. We believe, as do other experts in survey research, that population surveys perform best when used (a) to identify a

group of persons who are sufficiently prevalent in the sample for reliable population estimates, and (b) with instruments in which the population of interest is easily identified by parental respondents. Particular medical conditions (with the exception of asthma) occur relatively rarely in the overall population (e.g., Down syndrome, cerebral palsy, juvenile diabetes), and it is difficult to collect useful data in population surveys (other than those focused directly on health). These impairments are best measured in clinical settings and studied with clinical data. Accordingly, we argue that measuring disabilities in social surveys requires a fundamentally different approach from measuring disabilities in clinical settings or in a survey focused on health.

Our prior experience with the 1994–1995 NHIS has indicated that even in population surveys focused on health, with very large numbers of respondents, and which employ a checklist for medical conditions that are common in children, *specific* chronic medical conditions (cerebral palsy, Down syndrome, autism) among children are reported relatively rarely. (An exception is the identification and specific analyses of children with asthma (10, 11)). This is largely because these conditions occur only rarely in the population. But another source of error is that the seemingly simple act of answering yes to item(s) on the checklist is the result of a complex process for parents, requiring a previous medical diagnosis (involving, seeking, and accessing medical care), and parental ability to understand and correctly report what may be a complex medical condition. Children from advantaged families are likely to have better access to health care and are more likely to have particular medical conditions diagnosed, and more likely to have this information articulated on a questionnaire, potentially biasing results. Thus, we argue that, especially in surveys that do not have a primarily health focus, the collection of information on medical conditions should be a low priority, better left to clinical studies or studies based on specialized sampling designs.

Given this, we argue that population surveys measuring child disability, in order to understand the lives of children and their families more fully, should concentrate on identifying limitations in age-appropriate everyday activities of children (i.e., functioning—ability to get in and out of a chair, ability to walk across the room, ability to feed oneself). For these surveys, we want to avoid using an instrument that is biased with respect to socioeconomic class (or race/ethnicity or sex). Children from advantaged families are more likely to afford and utilize medical

and rehabilitative services and treatments. If information about a child seeing a medical specialist and/or the child's use of medical or rehabilitation services are used to define the population with a disability, we believe this is also likely to create a socioeconomic bias.

In order to avoid these likely biases, our attempt in this paper is to develop concise measures of childhood disability focusing on measures of childhood functional activity limitations. To further minimize the possibility of cultural or socioeconomic biases in the reporting of disability, we concentrate on questions that are designed to measure activities that are simple to report (e.g., can this child walk across a room, can this child bathe him/herself, can this child feed him/herself), and that have been used previously in major national surveys. We try to avoid more complex questions, especially those that are subjective in nature (e.g., would you say this child's general health status is . . .). Discussions with numerous government officials, survey researchers, and participants in the NICHD Network on Family and Child Well-Being indicate that any instrument intending to measure functional limitation in a general population survey should have fewer than 8–10 questions and take less than 2 min to administer. With the data available to us, it is not possible to do a formal study of the validity and reliability of this strategy of measuring functional limitations in activities. But the gerontological literature offers compelling evidence for the utility of measuring functional capacities (ADL and IADL), and the advantages of these measures for studies of the lives of elderly persons and their families (12).

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studies have considered child disability as a key factor. By ignoring child disability, these analyses are subject to serious omitted variable bias, and fail to develop a behavioral model consistent with actual individual and family situations. Our goal is to suggest ways to measure child disability that will enable researchers to examine these various processes and outcomes and to take this information into account in appropriate mixture models.

PREVIOUS WORK

Recently, researchers have been exploring ways in which to measure disability using a reduced number of survey items. Durkin (13) developed a 10-question screening device as the first phase of a two-phase method to measure childhood disability (the second phase being clinical assessments). Consistent with our focus, the screening questions address activity limitations (rather than conditions and service usage), however, Durkin's instrument is intended for young children (age 2–9) and has only been tested in developing countries. Results generated from the two-phase method reveal that the screening device, used by itself, yields a large percentage of false negatives. Thus, the author concludes that this particular set of 10 screening questions is not sufficient, by itself, to identify children who experience an activity limitation.

Researchers at Statistics Canada (the Canadian counterpart to the U.S. Census Bureau) have also attempted to measure activity limitations with a reduced set of survey questions (14). Researchers tested 25 screening questions against a limited set of 4 filter questions. Using the full set of 25 questions, 17% of Canadian adults surveyed are identified as having an activity limitation. However, when the reduced set of four questions is implemented, only 10% are identified as such. Of further concern, results show that 53% of the adults identified as experiencing an activity limitation with 25 questions are *not* identified as such with only four questions. This suggests that four questions may be too few to adequately measure activity limitations, or alternatively, that this particular constellation of four questions is inadequate. Statistics Canada has since decided to use a modified set of four filter questions on the 2001 Census. Incidentally, the long form of the 2000 U.S. Census contains six items on conditions and limitations, although only four apply to children.

Stein and her colleagues have carefully analyzed data from the National Health Interview Surveys

in an attempt to develop sound measures of child disability with a reduced set of survey items (15). Stein and her colleagues had earlier developed the Questionnaire for Identifying Children with Chronic Conditions (QuICCC), which consisted of 39 items (15 items related to functional limitations, 12 pertaining to reliance on compensatory mechanisms or assistance, and 12 related to service use and need) (7, 16, 17). More recently, they developed a shorter, revised version of the questionnaire, the QuICCC-Revised or QuICCC-R, which contained 16 items (the items contained in both survey questionnaires are presented in Stein *et al.* (15)). The researchers tested the QuICCC-R against the full instrument and found that at least 95% of children identified with 39 items can also be identified with 16 items (15). However, it is important to emphasize that Stein's work focuses on the chronic health conditions of children, whereas our work focuses specifically on activity limitations.

Another brief survey instrument which may be used to measure child disability is the Survey of Children with Special Health Care Needs (CSHCN) screening tool (presented in van Dyck *et al.* (18)). The greatest strength of this screener is its theoretical and conceptual basis in the Maternal and Child Health Bureau's definition of children with special health care needs. According to the Maternal and Child Health Bureau, "children with special health care needs are those who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally" (19). The CSHCN screener was developed under the Child and Adolescent Health Measurement Initiative (CAHMI) of the Foundation for Accountability (FACCT), a national nonprofit advocacy group. The screening device consists of five consequence questions (each with two follow-up subquestions) intended to identify children with special health care needs. The screening tool focuses on the need or use of prescription medicines, specialized therapies, counseling, and services. It includes one question to measure functional capacity: "Is your child limited or prevented in any way in his or her ability to do the things most children of the same age can do?" The screener was incorporated within the National Survey of Children with Special Health Care Needs, which uses the survey mechanism of the State and Local Area Integrated Telephone Survey (SLAITS). This screening instrument is entirely appropriate, and indeed is highly recommended, for studies designed to accord with Maternal and Child

Health Bureau definitions of child health, and for studies with interests in the appropriateness and adequacy of medical care and rehabilitation. But we argue that this screener is not the appropriate instrument to use in general population surveys. Functional limitations are more generally important in general population surveys that lack a strong interest in health conditions and health care issues. It is activity limitations in children, more than impairments that are the better predictor of child and family consequences of disability.

Both the CSHCN screener and the QuICCC-R employ a consequences-based framework. However, even as implied by their names, these survey instruments measure different aspects of child disability: the CSHCN screener focuses on special health care needs of children whereas the QuICCC-R focuses on children's chronic health conditions and their consequences. In addition, the QuICCC-R is longer, is more specific, inquires about more consequences, and includes several items that are not restricted to the last 12 months. As part of the first pretest of the National Survey of Children with Special Health Care Needs, these instruments were tested against one another. *Both* screeners were administered by telephone to a national sample of parents with children ages 0–17 in the household. The CSHCN screener identified 16% of children as having special health care needs, while the QuICCC-R provided an estimate of 24% (50% more than identified with the CSHCN screener) (20). Children identified by the QuICCC-R but not the CSHCN screener were more likely to have health conditions not well-understood by parents, not previously diagnosed, and not resulting in service usage.

Given the results discussed above, it appears that it is possible to reduce the number of survey items needed to measure disability. At the same time, it appears that reductions can be too drastic—to the point that large percentages of children and adults with disabilities are not identified, and to the point that the concise set of measures is not a useful instrument for measuring disability. With these lessons in mind, we attempt to identify a concise set of measures that can be used to measure activity limitations among children in three large population surveys.

METHODS

Data

We concentrate on three nationally representative population surveys that have detailed questions

on activity limitations as well as sufficient numbers of children 6–14 to support detailed analysis. Children under age 6 are still rapidly developing motor, communication, and cognitive skills and extensive variation exists in the timing of skill acquisition such that more detailed assessments are required to identify activity limitations among very young children. While surveys vary with respect to the exact age at which they ask about child disability, surveys conventionally have collected data on disability for children who are well beyond infancy and the toddler years. Surveys examining functional capacities at these earlier ages typically use questions designed to identify possible developmental delays (21). Surveys also vary in the age at which young persons are administered adult questions, with the decision often based on whether a child age 15–17 is considered a potential member of the labor force. Since our goal is to do a comparative analysis of a number of major surveys to develop a concise instrument for the study of disability in general population surveys, we analyze samples consisting of an age range that is appropriate to all of the surveys (ages 6–14). Within this age range, common types of questions on activity limitations are asked of children (although the number of questions and wording of questions may differ across surveys). The three pooled survey data sets involved in our instrument development work (derived from seven actual surveys) are

1. The 1994 and 1995 National Health Interview Survey Disability Supplements, which contain a variety of questions regarding child disability, including 43 items on activity limitations. Pooled data from these two surveys yield a large sample of 29,153 children age 6–14.
2. The 1997, 1998, 1999, and 2000 National Health Interview Surveys, which are complete redesigns of the traditional NHIS. The 1997–2000 NHIS includes 13 items on activity limitations and attempts to adequately measure child disability while foregoing much of the detail found in the 1994–1995 NHIS. The 1997–2000 NHIS contain data for 25,663 children age 6–14.
3. The 1996 panel of the Survey of Income and Program Participation. The fifth wave of this survey included modules focusing on activity limitations and disabilities of children. Fourteen items on limitations in activities are found within these modules and data exist for 11,919 children age 6–14.

Table I. Example of Elimination Process, Domain of Learning Limitations, 1994–1995 NHIS

Set of survey items	Survey item eliminated	Positive responses	% of cases retained
Full set of 5 survey items	—	2883	(100.0)
Reduced set of 4 survey items	Does R have SERIOUS difficulty learning how to do things that most people of their age are able to learn?	2849	98.8
Reduced set of 3 survey items	Do you think that R NOW has any problems or delays in understanding things, that is, delays in cognitive or mental development?	2770	96.1
Reduced set of 2 survey items	Does R have significant problems at school with understanding instructional materials?	2574	89.3

Note. The three survey items ultimately retained are Does R have significant problems at school with understanding instructional materials? Does R have a learning disability? Does R have significant problems at school with paying attention in class?

Analytical Approach

The first major aim of the project—identifying concise sets of survey items—will be accomplished through the use of a step-by-step process of elimination (discussed in detail below). Building on these results, the second and third major aims of the project will be achieved by directly comparing estimates across demographic groups and across surveys.

Using a conceptually based approach to determine which separate dimensions of activity limitations should be included, we examine whether fewer items from existing surveys can be used to measure activity limitations among children. Four particular domains of activity limitations serve as the conceptual framework for our study. The four domains used in our study are also domains included in the World Health Organization's International Classification of Functioning, Disability, and Health (2) and are organized under the broader component of Activity Limitations and Participation Restrictions. We focus on limitations in the following domains:

Mobility

Self-care

Learning and applying knowledge (which includes focusing attention)

Communication (to which we include seeing and hearing functions)

Prior to beginning the data analysis, specific items from each of the three surveys were organized within the four domains. We analyze the three surveys separately, using a process of elimination to obtain our concise sets of measures. Within each of the four domains, we first examine the full set of items and then eliminate items, one by one, exploring different combinations and examining the results of each successive elimination. We continue eliminating items until we reach a threshold of 90% retention. This procedure

assures us of 90% retention within each domain and more than 90% retention overall.

An example of the elimination process is presented in Table I. In the 1994–1995 NHIS, five survey items are contained within the learning limitations domain. Using these five items, 2883 children are identified as experiencing a limitation in learning. We eliminate one survey item and examine each of the five possible combinations, each containing four items. The maximum number of cases is retained by eliminating the item pertaining to serious difficulty learning to do things that most people of their age are able to learn. After eliminating this item, the results indicate that we retain almost 99% of children originally identified as experiencing a learning limitation. Since we have successfully retained at least 90% of the original cases, we repeat the elimination procedure. We proceed by eliminating another item and examining each of the four possible combinations, each containing three survey items. The maximum number of cases is retained by eliminating the survey item pertaining to delays in cognitive or mental development; retaining 96% of the children initially identified as experiencing a learning limitation. We repeat the procedure by eliminating another item and investigating the three possible combinations of items, each containing two survey items. The maximum number of cases is retained by eliminating the item pertaining to problems understanding instructional materials. Nonetheless, this elimination drops the number of retained cases below our threshold of 90%, thus we halt the elimination procedure and reinstate the last survey item dropped. On the basis of this procedure, within the learning limitations domain, we decide to eliminate two survey items and retain three items. Using this reduced set of three survey items, we are still able to identify at least 90% of the children originally identified as experiencing a learning limitation with the five survey items. We repeat this process within

Table II. Unweighted Frequencies and Percentages of Children Identified as Experiencing an Activity Limitation

	Full set of 43 survey items			Selected set of 14 survey items		
	Number of survey items	Positive responses (<i>N</i> = 29,153)	Percentage	Number of survey items	Positive responses (<i>N</i> = 29,153)	Percentage
<i>1994–1995 NHIS</i>						
Domain						
Communication	8	1642	5.6	3	1557	5.3
Mobility	14	76	.3	5	69	.2
Self-care	16	129	.4	3	113	.4
Learning	5	2883	9.9	3	2770	9.5
Total	43	3390	11.6	14	3273	11.2
	Full set of 13 survey items			Selected set of 6 survey items		
	Number of survey items	Positive responses (<i>N</i> = 25,663)	Percentage	Number of survey items	Positive responses (<i>N</i> = 25,663)	Percentage
<i>1997–2000 NHIS</i>						
Domain						
Communication	2	1671	6.5	2	1671	6.5
Mobility	4	560	2.2	1	539	2.1
Self-care	4	143	.6	1	135	.5
Learning	3	2982	11.6	2	2973	11.6
Total	13	4511	17.6	6	4498	17.5
	Full set of 13 survey items			Selected set of 6 survey items		
	Number of survey items	Positive responses (<i>N</i> = 11,919)	Percentage	Number of survey items	Positive responses (<i>N</i> = 11,919)	Percentage
<i>1996 SIPP</i>						
Domain						
Communication	3	356	3.0	3	356	3.0
Mobility	5	264	2.2	1	255	.2
Self-care	4	86	.7	2	78	.7
Learning	2	981	8.2	2	981	8.2
Total	14	1245	10.5	8	1240	10.4

each of the domains in each survey. Results are presented in Table II and are discussed in more detail below.

RESULTS

Of the three sets of data, the 1994–1995 NHIS contains the largest number of cases and the largest number of items regarding limitations in activities, and thus will be discussed first. As seen in the top panel of Table II, the 1994–1995 NHIS surveys contain 43 questions related to activity limitations of children. Using information from the full set of 43 questions, 5.6% of children in the sample experience a communication limitation, 0.3% experience a mobility limitation, 0.4% experience a limitation in self-care, and 9.9% of children experience a limitation in learning. If all 43 survey items are considered simultaneously, 3390 of the 29,153 children (11.6%) age 6–14 in the

sample would be identified as experiencing some type of activity limitation. Children may experience more than one type of limitation, thus the sum of percentages corresponding to each individual domain may exceed the total percentage.

These are very compelling results given the coverage and large number of survey items found in the NHIS. However, 43 items addressing limitations in children’s activities are not feasible for use in general population surveys. As seen in the right-hand side of the table, our analysis reveals that a vast majority of the children identified with the full set of measures can also be identified using a concise set of measures. (The analysis was performed on unweighted data, however, when testing the reduced set of items against the full set of items, consistent results are produced using weighted data.) Consider the first domain—communication limitations. Using three items, we are able to provide an estimate that is fairly comparable to the estimate generated by eight items. Similarly,

within the mobility domain, our estimate using five survey items is quite comparable to the estimate which is obtained using 14 items. Similar patterns are found within the other domains, where again, we were able to reduce the number of items, yet still provide comparable estimates of childhood activity limitations. If we were to consider all children who are experiencing an activity limitation, we arrive at an overall estimate of 11.2% using 14 survey items. This compares quite well to the overall figure of 11.6% using all 43 items. Thus, the results reveal that our concise set of measures from the 1994–1995 NHIS provides relatively comparable estimates within each of the four domains as well as in the aggregate. (An appendix containing the full and reduced sets of survey items is available from the authors by request.)

Results presented in the middle panel of Table II demonstrate once again that activity limitations can be identified more efficiently. On the basis of the full set of 13 items in the 1997–2000 NHIS, 6.5% of children are identified as experiencing a communication limitation, 2.2% experience a mobility limitation, 0.6% experience a limitation in self-care, and 11.6% of children experience a limitation in learning. Overall, 17.6% of the children in the sample are identified as experiencing some type of activity limitation. Our analysis reveals that the number of survey items needed to identify children with activity limitations can be reduced 50%—from 13 to 6. Because of the smaller number of items appearing in the 1997–2000 NHIS, we find that we cannot reduce the number of items in the communication domain and still meet the 90% retention threshold. In each of the other domains, we find it possible to eliminate survey items and still produce comparable estimates. In reducing the number of survey items from 13 to 6, only 13 of the 4511 children originally identified as experiencing an activity limitation would no longer be identified as such. Consequently, prevalence estimates remain virtually unchanged, overall as well as within each of the four domains.

Finally, we turn our attention to the 1996 SIPP. Using the 14 items found in the topical module, 3.0% of children in the sample are identified as experiencing a communication limitation, 2.2% experience a mobility limitation, 0.7% experience a limitation in self-care, and 8.2% of children experience a limitation in learning. Using the full set of measures found in the 1996 SIPP, approximately 10.5% of children age 6–14 in the sample would be identified as experiencing some type of activity limitation. However, once again we see that activity limitations can also be

identified more efficiently. We find that a reduced set of eight items can be used in place of the full set of 14 items. Once again, because of the small number of items originally appearing in the instrument, we were not able to make any reductions within the communication domain nor within the learning domain. However, results presented in the bottom panel of Table II show that in reducing the number of survey items from 14 to 8, only five fewer children are identified as experiencing a limitation in activities. Given such a small difference, the overall prevalence estimate generated from the reduced set of items is very comparable to that produced by the full set of items. A high degree of comparability is also achieved within each domain.

In the next stage of our analysis, we examine the demographic composition of children identified as experiencing an activity limitation. We want to ensure that the reduced set of measures does not distort overall demographic variations. Weighted percentages are presented in Table III. (One can see that weighted prevalence estimates in Table III vary only slightly from unweighted prevalence estimates in Table II.) Contained in Table III are overall and group-specific prevalence estimates. The figures in parentheses, appearing alongside prevalence estimates in columns 1 and 2, reflect the composition of children experiencing an activity limitation. For example, given 43 items, the percentage of boys identified as experiencing an activity limitation (15.1%) is higher than the overall figure of 11.7%, and boys represent 65.5% of all children identified as experiencing an activity limitation. As shown in column 3, boys represent only 51.0% of the children age 6–14 in the 1994–1995 NHIS, thus it is easy to see that boys are overrepresented among children with a limitation.

Across all three data sets, boys are highly overrepresented among those with an activity limitation (the overall disparity can mostly be attributed to differentials in learning limitations; although results are not shown separately). Children from low-income families are also disproportionately overrepresented among children identified as experiencing an activity limitation. Consistent with well-known patterns, blacks and whites are overrepresented among children experiencing limitations in activities, while Hispanics are underrepresented, as are children from “other” racial/ethnic groups (6, 7). (However, two small exceptions to this general pattern are found—in the 1994–1995 NHIS, white children are equally represented among those with activity limitations; in the 1996 SIPP, blacks are slightly underrepresented among children with activity limitations.)

Table III. Demographic Characteristics of Children Identified as Experiencing an Activity Limitation, Weighted Percentages

	Full set of 43 survey items		Selected set of 14 survey items		Composition of sample
<i>1994–1995 NHIS</i>					
Total	11.7		11.3		
Sex					
Boys	15.1	(65.5)	14.6	(66.0)	(51.0)
Girls	8.2	(34.5)	7.8	(34.0)	(49.0)
	(100.0)		(100.0)		(100.0)
Race/ethnicity					
Hispanic	10.3	(11.8)	10.0	(11.9)	(13.4)
Non-Hispanic black	13.8	(18.0)	13.3	(18.1)	(15.3)
Non-Hispanic white	11.7	(67.1)	11.3	(67.0)	(67.0)
Other	8.4	(3.1)	8.1	(3.1)	(4.3)
	(100.0)		(100.0)		(100.0)
Family income					
Less than \$20,000	16.1	(37.8)	15.5	(37.4)	(27.4)
\$20,000 or more	10.1	(61.1)	9.8	(61.1)	(70.7)
Unknown	8.3	(1.3)	8.1	(1.5)	(1.9)
	(100.0)		(100.0)		(100.0)
	Full set of 13 survey items		Selected set of 6 survey items		Composition of sample
<i>1997–2000 NHIS</i>					
Total	17.9		17.8		
Sex					
Boys	22.0	(62.8)	22.0	(62.9)	(51.1)
Girls	13.6	(37.2)	13.5	(37.1)	(49.9)
	(100.0)		(100.0)		(100.0)
Race/ethnicity					
Hispanic	14.3	(11.7)	14.2	(11.6)	(14.7)
Non-Hispanic black	18.3	(15.8)	18.3	(15.8)	(15.5)
Non-Hispanic white	19.0	(69.5)	18.9	(69.5)	(65.3)
Other	12.6	(3.0)	12.4	(3.0)	(4.3)
	(100.0)		(100.0)		(100.0)
Family income					
Less than \$20,000	24.2	(25.5)	24.1	(25.6)	(18.9)
\$20,000 or more	16.6	(71.2)	16.5	(71.2)	(76.9)
Unknown	14.1	(3.3)	14.1	(3.3)	(4.2)
	(100.0)		(100.0)		(100.0)
	Full set of 14 survey items		Selected set of 8 survey items		Composition of sample
<i>1996 SIPP</i>					
Total	10.1		10.1		
Sex					
Boys	13.0	(65.6)	12.9	(65.8)	(51.2)
Girls	7.1	(34.4)	7.1	(34.2)	(48.8)
	(100.0)		(100.0)		(100.0)
Race/ethnicity					
Hispanic	7.8	(11.6)	7.7	(11.6)	(15.1)
Non-Hispanic black	9.6	(14.6)	9.5	(14.6)	(15.5)
Non-Hispanic white	10.9	(69.4)	10.8	(69.6)	(64.6)
Other	8.9	(4.3)	8.7	(4.2)	(4.9)
	(100.0)		(100.0)		(100.0)
Family Income					
Less than \$20,000	12.6	(30.6)	12.5	(30.6)	(24.6)
\$20,000 or more	9.3	(69.4)	9.3	(69.4)	(75.4)
	(100.0)		(100.0)		(100.0)

Our analysis reveals a high degree of comparability in group-specific prevalence estimates between the full sets of items and the reduced sets of items. In general, prevalence estimates drop by less than one percentage point. In addition, as demonstrated by the figures in parentheses, we see very little change in the composition of children experiencing an activity limitation according to sex, race/ethnicity, and family income.

At this point, we turn to the third stage of our analysis and compare results across the three surveys. As discussed above, *within* surveys there is a high level of comparability between figures produced by the full sets of survey items and the reduced sets of survey items. However, there is dissimilarity in estimates *across* surveys. Consider the full sets of measures found in the three survey instruments before any item reduction had taken place. In the 1996 SIPP, 10.1% of children are identified as experiencing an activity limitation, while 11.7% of children in the 1994–1995 NHIS are identified as experiencing an activity limitation, and 17.9% of children in the 1997–2000 NHIS are identified as experiencing an activity limitation. Notable differences are also uncovered across each of the four conceptual domains. In addition, group-specific prevalence estimates are shown to vary across surveys. For example, the percentage of boys identified as experiencing an activity limitation varies from 13.0 to 15.1 to 22.0% while the percentage of girls identified as experiencing an activity limitation varies from 7.1 to 8.2 to 13.6%, with estimates being lowest in the 1996 SIPP and highest in the 1997–2000 NHIS. Although a sex disparity consistently arises from the three sets of data, the size of the disparity is shown to vary from 5.9 percentage points to 8.4 percentage points. Similarly, estimates are shown to vary across surveys with respect to race/ethnicity and family income and disparities according to race/ethnicity and family income are also shown to vary across the three surveys.

Clearly, the prevalence estimates produced by the full sets of measures vary widely across data sets and, consequently, so do those produced by the concise sets of measures. Thus, although we have been able to identify concise sets of measures that produce comparable estimates *within* surveys, these concise sets of measures cannot produce estimates that are comparable *across* surveys. We have considered several factors that could potentially account for this.

Discrepancies in findings across surveys are not due to differences in the compositions of samples. Figures in the last column of Table III show that the

three samples of 6–14-year-old children are very similar in terms of sex, race/ethnicity, and family income.

In addition, the focus of the surveys cannot account for differences across data sets. Granted, the NHIS is primarily concerned with health issues while the SIPP is concerned with income, poverty, and program use; nonetheless, despite their similar focus, the 1994–1995 NHIS and the 1997–2000 NHIS produce very different estimates, which must be attributed to other factors.

Other possibilities include differences in data collection and differential attrition. The NHIS is a cross-sectional survey, administered at one point in time whereas the SIPP is a panel survey, with multiple waves of data collection taking place across several points in time. Although differential attrition may have occurred within the SIPP, with minorities and low-income families attriting at a higher rate, the consequences seem negligible, as the composition of the 1996 SIPP sample is very similar to the compositions of the 1994–1995 NHIS and 1997–2000 samples. In addition, despite similar data collection techniques, the 1994–1995 NHIS and 1997–2000 NHIS produce substantially different estimates, as mentioned above.

Finally, it appears that the length of the survey instrument cannot account for different estimates across data sets. The 1996 SIPP and the 1997–2000 NHIS contain similar numbers of items addressing limitations in activities, but produce very dissimilar estimates. In addition, the 1994–1995 NHIS contains the most items regarding activity limitations of children, but produces intermediate estimates.

The dissimilar estimates produced from the three surveys squarely reflect differences in the content of the survey instruments. Certain types of questions do not appear in each of the three surveys. For example, the 1996 SIPP does not contain items addressing limitations with attention, while the 1994–1995 NHIS does not contain survey items inquiring about limitations with walking or running. This obviously affects prevalence estimates and accounts for much of the variation in estimates across surveys.

However, even when similar types of items do appear across surveys, differences in question wording may produce dissimilar results. We examined 14 particular items that were common to at least two of the three surveys and conducted independent sample *t* tests in order to test for significant differences in percentages across surveys. Very few questions are worded the same, consequently, several significant differences emerge, as shown in Table IV. Thus, it appears that differences in the types of questions and

Table IV. Weighted Percentages for Individual Survey Items

	1994–1995 NHIS	1997–2000 NHIS	1996 SIPP
Has difficulty seeing	0.3 ^{ab}	2.9 ^c	0.7
Has difficulty hearing	0.6 ^a	4.2 ^c	0.7
Has difficulty with speech	2.8 ^b		2.1
Uses cane, crutches, or walker	0.1		0.1
Uses a wheelchair or scooter	0.2		0.2
Is limited in ability to walk or run		2.0	2.1
Requires help from another person:			
Getting in and out of bed or chairs	0.1	0.2	0.2
Getting around inside the home	0.1 ^b	0.2	0.2
Bathing	0.3 ^a	0.5	0.4
Dressing	0.3 ^{ab}	0.4	0.5
Eating	0.1 ^a	0.2	0.2
Toileting	0.2	0.3	0.3
Has learning disability	4.8 ^{ab}	8.7 ^c	3.5
Has difficulty paying attention	6.5 ^a	7.2	

^aDifferences between 1994–1995 NHIS and 1997–2000 NHIS are statistically significant at $p < 0.05$.

^bDifferences between 1994–1995 NHIS and 1996 SIPP are statistically significant at $p < 0.05$.

^cDifferences between 1997–2000 NHIS and 1996 SIPP are statistically significant at $p < 0.05$.

differences in the wording of questions can account for varying prevalence estimates.

DISCUSSION

The results of our analysis are mixed. On one hand, we have consistently demonstrated across three different surveys that is possible to reduce the number of survey items needed to measure childhood activity limitations and still produce comparable estimates. In addition, there is very little change in the demographic composition of children experiencing an activity limitation when a limited set of survey items is employed. On the other hand, our concise sets of measures do not produce comparable estimates across surveys. This can be attributed to differences between the concise sets of measures in terms of the number of questions and types of questions that are ultimately retained. The particular survey items that are retained in the concise sets of measures are a function of

- the items originally appearing in each survey,
- our decision not to consider survey items related to medical conditions or service usage,
- our decision to categorize items into four separate domains and to include at least one item from each domain,
- our use of a 90% retention threshold within each domain,
- and the other particular survey items which exist within each domain.

Although our discussion of survey items and prevalence estimates across surveys has emphasized differences, there exist similarities as well. In addition, there exist opportunities for producing even greater similarity in estimates across surveys. This can be achieved with a concise set of survey items provided that there exists a high degree of consistency and uniformity in question wording. Given our focus on limitations in activities among children and given the performance of the survey items examined in our analysis, we recommend for use in general population surveys a set of concise measures that focuses on limitations in

- Seeing
- Hearing
- Communicating
- Walking or running
- Learning
- Paying attention

More specifically, we recommend for use in general population surveys a concise set of survey questions worded very similar to the following:

- Does R have any trouble seeing, even when wearing glasses or contact lenses?
- Does R have any trouble hearing what is said in normal conversation (even when wearing a hearing aid)?
- Does R have difficulty communicating so that people outside the family understand?
- Is R limited in his/her ability to walk, run, or play?

Does R have difficulty learning how to do things that most people of their age are able to learn?

Does R have significant problems at school with paying attention in class?

Each of the questions above is very similar or exactly similar to questions included in current or previous versions of the National Health Interview Survey. The first four questions are probably easiest to ask and subject to the least socioeconomic or cultural bias. The latter two questions have the advantage that they do not require an expert opinion (avoiding bias associated with seeking and obtaining medical and/or educational assistance), but they do require more complex thought processes to answer (leaving open the possibility of potential cultural or socioeconomic bias).

Because of this consistency and because this concise set of survey questions is very small, we recommend *against* any further merging of items together (as done in the 2000 Census long form). The particular set of concise measures identified above, comprised of six survey items that take fewer than 2 min to administer, can efficiently measure activity limitations among children and should be included in general population surveys.

ACKNOWLEDGMENTS

Funding for this research was provided by the Assistant Secretary for Planning and Evaluation, Department of Health and Human Services and the National Institute of Child Health and Human Development R24 Population Center Grant to Brown University.

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