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Measuring Early Childhood Health and Health Disparities: A New Approach

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Abstract

Objective—Efforts to improve the health of U.S. children and reduce disparities have been hampered by lack of a rigorous way to summarize the multi-dimensional nature of children's health. This research employed a novel statistical approach to measurement to provide an integrated, comprehensive perspective on early childhood health and disparities.

Methods—Nationally-representative data (n=8,800) came from the Early Childhood Longitudinal Study, Birth Cohort. Latent class analysis (LCA) was used to classify health at 48 months, incorporating health conditions, functioning, and aspects of physical, cognitive, and emotional development. Health disparities by gender, poverty, race/ethnicity, and birthweight were examined.

Results—Over half of all children were classified as healthy using multidimensional latent class methodology; others fell into one of seven less optimal health statuses. The analyses highlighted pervasive disparities in health, with poor children at increased risk of being classified into the most disadvantaged health status consisting of chronic conditions and a cluster of developmental problems including low cognitive achievement, poor social skills, and behavior problems. Children with very low birthweight had the highest rate of being in the most disadvantaged health status (25.2%), but moderately low birthweight children were also at elevated risk (7.9% versus 3.4% among non-low birthweight children).

Conclusions—Latent class analysis provides a uniquely comprehensive picture of child health and health disparities that identifies clusters of problems experienced by some groups. The findings underscore the importance of continued efforts to reduce preterm birth, and to ameliorate poverty's effects on children's health through access to high-quality healthcare and other services.

Keywords

child health status; health disparities; socioeconomic status; low birth weight

Children are a large and vulnerable segment of the population and their health is regarded as intrinsically important and a key determinant of future productivity and well-being [1–3]. Numerous studies suggest that early childhood in particular is a critical period with far-reaching effects on physical and mental health in adulthood [2, 4–8]. Adverse biologic events occurring prenatally and in early life, such as nutritional deficits and toxic exposures, are linked to a range of subsequent conditions including cardiovascular disease, hypertension, and diabetes [5, 9–11]. Mental and physical problems in adulthood are also associated with early stressors such as emotional deprivation and poverty [5, 12–13].

Because early childhood health is so important, disparities in children's health are of considerable interest [14–16]. The American Academy of Pediatrics identifies health equity as a fundamental guiding principle [17], and a goal of DHHS' Healthy People campaign is elimination of disparities in child health outcomes [14]. Healthy People 2020 includes equity-related objectives for young children for prenatal and early childhood health promotion, reduction in preterm birth and low birthweight, promotion of optimal nutritional intake and weight, and healthy development for school readiness [14]. Annual reports from a Federal Interagency Forum provide numerous statistics on disparities in child well-being related to physical and mental health, behavior, family/social environments, economic circumstances, health care, education, physical environments, and safety [18]. For example, the most recent report indicates that the rate of preterm births ranges from 10.8 percent for non-Hispanic Whites to 17.1 percent for non-Hispanic Blacks. The pre-term birth rate for Hispanics is 11.8 percent and the rate for American Indians and Alaskan Natives is 13.6 percent. In addition, about one-fifth of children live in poverty, with substantial differences across racial/ethnic subgroups [18].

These monitoring efforts cast a wide net, reflecting evolution from a simplistic view of health as the absence of disease towards a holistic view of individuals' health in the population overall [19–21] and among children in particular [1–3, 22–23]. A recent National Research Council/Institute of Medicine (NRC/IOM) report recommends that "Children's health should be defined as the extent to which individual children or groups of children are able or enabled to (a) develop and realize their potential, (b) satisfy their needs, and (c) develop the capabilities that allow them to interact successfully with their biological, physical, and social environments" (p.4) [2]. While voluminous individual statistics are available on aspects of children's health, rigorous ways are needed to synthesize this disparate information into a cogent summary that simultaneously captures different dimensions of overall health status and provides insights into clustering of health disparities.

This study utilized an integrated, comprehensive approach to measuring early childhood health. Data from the birth cohort of the Early Childhood Longitudinal Study (ECLS-B) were used to address two objectives. The first was to estimate a set of health statuses that captured the multidimensional nature of health at 48 months. At 48 months, a broad range of developmental and physical health problems can be detected through child assessment and parent report, and opportunity exists for intervention prior to school entry. The second objective was to examine disparities in health status by gender, poverty, race/ethnicity, and birthweight. Latent class analysis, a statistical approach to identifying underlying population subgroups (i.e. latent classes) defined by multiple characteristics, was used to achieve these goals. Twelve indicators of health drawn from three domains of health (health conditions, functioning, and health potential) served as indicators of individuals' membership in the population subgroups. Each subgroup was characterized by a particular profile of health, which are referred to in this study as their health status, defined by the individuals' profile of responses to the twelve indicators.

In contrast to much of the existing child health disparities literature, which typically includes comparisons of discrete frequencies of selected health conditions, this study analyzed multiple health indicators as well as higher-order interactions among them. Because there were over four thousand possible patterns of responses to the health indicators included in the analyses, the integrative latent class analysis approach was uniquely well-suited to the task of producing a statistically sound and holistic picture of the health of U.S. children and patterns of health disparities.

METHODS

Data and Sample

The ECLS-B is a nationally-representative, longitudinal cohort study fielded by the National Center for Educational Statistics to provide detailed information about children's health, development, child care, and education from birth through kindergarten entry. The ECLS-B enrolled approximately 10,200 children (all sample sizes are rounded to the nearest 50 per confidentiality requirements) whose names were drawn from U.S. birth certificates in 2001, compiled by the National Center for Health Statistics. Several groups were oversampled, including Chinese, other Asian and Pacific Islanders, American Indian and Alaska Natives, twins, and low and very low birth weight children. In addition to compiling birth certificate data, the ECLS-B also conducted parent interviews and in-person developmental assessments at 9, 24, 48, and 60 months. The present analyses used birth certificate data, baseline information at 9 months, and health and functioning information for 8,800 children whose parents were interviewed at 48 months. The analyses were weighted using the ECLS-B weight variable W3R0 to account for oversampling and attrition in producing nationally representative estimates.

Measures

Early childhood health—The NRC/IOM report described three child health domains. The first domain covered health conditions. Separate indicators of the two most prevalent childhood conditions, asthma and overweight/obesity, were included in our study (Table 1). A third indicator reflected other chronic conditions parents reported on that occur less frequently, including epilepsy, heart defects, autism, oppositional defiant disorder, attention-deficit/hyperactivity disorder, diabetes, mental retardation, and cerebral palsy.

The second child health domain was functioning; or the manifestation of health in daily life. Functional problems are parent-reported diagnoses by a professional concerning difficulty in paying attention or learning, activity level, use of limbs, ability to communicate, hearing, or vision [17]. An additional category captured daily prescription medicine use.

The third domain was health potential. This encompasses positive aspects of health including developmental capacity and competence. Health potential was quantified by indicators of physical, socioemotional, and cognitive development, obtained by observation or parent report. Fine motor skills were assessed using the revised Early Screening Inventory (ESI-R) [24], a test that involves the construction of a tower and gate with blocks and copying forms like a circle [25]. This assessment has internal consistency in the range of .73 to .79 and predictive validity in the range of .72 to .75. Parent-report items from the Preschool and Kindergarten Behavior Scales measured externalizing behavior, social skills, and empathy (PKBS-2; internal consistency of .81–.95 predictive validity >.90) [25]. Early reading skills and early math skills were assessed using items capturing reading and math skills related to school readiness [25]. The PKBS-2 also contained parent reported approaches to learning including eagerness to learn new things, paying attention, working/

playing independently, working until finished on tasks, and difficulty concentrating [25]. Scores for each assessment were recoded as dichotomous indicators of being at-risk.

Socio-Demographic and Birth-Related Characteristics—Birthweight was classified as very low (<1,500 grams), moderately low (1,500–2,500 grams), or above the low birthweight threshold (>2,500 grams). Parent-reported Race/ethnicity was classified as non-Hispanic white, non-Hispanic Black, Hispanic, Asian or Pacific Islander, and other. Families were classified as in poverty if their incomes were below federal thresholds based on family size and composition. Poverty status was measured at 48 months, to reflect current living conditions.

Analyses

The research objectives relied on identifying health statuses that captured the multidimensional nature of health at 48 months. This was accomplished with LCA where 12 items from the ECLS-B, each assessing a different aspect of health, were used as indicators of latent class membership. Two sets of parameters were estimated in a latent class model. The first set was a vector of class membership probabilities, reflecting the relative sizes of the latent classes in terms of the proportion of individuals in each health status (Table 2). The second set was a matrix of item-response probabilities. The item-response probabilities show the association between the 12 health indicators and the health statuses (i.e., latent classes), and provide insight into the meaning of the health statuses. For each health status, these probabilities reflected the proportion of individuals in that status who respond ‘yes’ to each of the 12 health indicators.

Selecting the optimal number of latent classes to include in the final model was done by comparing information criteria (e.g., AIC and BIC) from competing models, where models with criteria closer to zero were considered to be optimal in terms of balancing fit to the data and parsimony, as well as how clearly the latent classes could be interpreted in a given model. For the current study, models with one through ten latent classes were considered, and the model with the optimal number of latent classes selected for subsequent analyses. Next, we added four grouping variables, one at a time, to the selected model so that the proportion of individuals in each health status could vary across groups. This approach permitted a nuanced view of health disparities across gender, poverty status, race/ethnicity, and birthweight (Table 3). A conceptual introduction to LCA and technical details appear elsewhere [26–27]. All weighted latent class models were estimated using PROC LCA in SAS [28].

RESULTS

The study sample was approximately equally divided by gender, and the racial/ethnic composition was 53.3 percent non-Hispanic white, 13.8 percent non-Hispanic Black, 25.5 percent Hispanic, 2.7 percent Asian or Pacific Islander, and 4.6 percent of other race/ethnicities. Just over 1 percent of children were born at very low birthweight, and an additional 6.2 percent had birthweights that were moderately low. About one-quarter of the children lived in families with incomes below the poverty level.

Table 1 describes the measurement in the 48 month ECLS-B assessment of the child health indicators included in the analysis. The final column of the table also provides the weighted percentage of children that exhibit each health indicator. For example, 11.5 percent of children had asthma, and 36.1 percent were overweight or obese. One or more other chronic conditions affected 7.4 percent of children. At 48 months, 16.2 percent of children had one or more functional problems, and 10.1 percent used prescription medication daily.

Table 2 presents a comprehensive set of mutually exclusive and exhaustive health statuses that vary in the patterns of health problems experienced. The model with eight latent classes was selected from a set of competing models on the basis of model fit statistics and careful inspection of parameter estimates. The latent classes are referred to as health statuses. These statuses are identified with column labels and the percentages of children in each status are shown in the top row. The 12 major indicators of child health are presented in the remaining rows, along with the status-specific probabilities of reporting each health problem. Only half of children at 48 months were characterized as Healthy; that is, as having relatively low probabilities of reporting any health or developmental problem. The 4.1 percent of children in the Asthma status had a very high probability (0.84) of having asthma and of daily prescription use (0.85), which is consistent with current asthma treatment regimens. At 48 months, 4.0 percent were classified in the Functional Problems status, with a 1.00 probability of reporting problems with functioning and low probabilities of experiencing all other health problems. The 16.7 percent of children in the fourth status, Low Cognitive Achievement, primarily had high probabilities of low early reading (0.72) and math (0.82) skills.

The other statuses represented health indicator groupings spanning different domains. The Externalizing Behavior plus Approaches to Learning Difficulties status represented 2.7 percent of children exhibiting both these types of behaviors, but with lower probabilities of other problems. Low Social Skills was a status that described 12.1 percent of children with relatively high probabilities of scoring poorly on measures of social skills and empathy. The seventh health status represented 6.0 percent of children who exhibited a Cluster of developmental problems including low fine motor skills, high externalizing behavior, low social skills, low empathy, low early reading and math skills, and approaches to learning difficulties. Lastly, Cluster plus Chronic Conditions included 3.9 percent of children with the most pervasive health issues. They had high probabilities of experiencing each developmental problem in the Cluster status and also of experiencing other chronic conditions (0.85) and functional problems (0.91). Interestingly, the probability of being overweight or obese ranged from 0.32 to 0.45, indicating that this health issue was not unique to any particular health status but cut across all statuses at 48 months.

In Table 3, the health statuses were used to accomplish the second research objective – to demonstrate disparities by gender, poverty status, race/ethnicity, and birthweight. The health statuses are on the left, and each column shows the percentage of children in each status within a particular subgroup. Columns sum to 100 percent. Gender was significantly related to health status membership (twice loglikelihood difference=82.08, 7 df, $p<.0001$). Over 60 percent of girls, but just 42 percent of boys were classified as Healthy status. Examining the other statuses, the largest gap was in the Externalizing Behavior + Approaches to Learning Difficulties status, which was nearly three times more prevalent among boys. Boys were also more likely to be in the Low Cognitive Achievement, Cluster, and Cluster + Chronic Conditions statuses. Because some attributes, such as Low Cognitive Achievement, were present alone (i.e., in the Low Cognitive Achievement status) as well as in combination (i.e., in the Cluster and Cluster + Chronic Conditions statuses), to identify the total proportion of children who exhibited low cognitive achievement alone or in combination the percentages in these three categories should be summed ($18.5\% + 8.4\% + 5.6\% = 32.5\%$ for boys; $15.0\% + 3.2\% + 2.3\% = 20.5\%$ for girls).

The health status distribution also differed substantially by poverty status (twice loglikelihood difference=290.87, 7 df, $p<.0001$). More than half (55.7 percent) of non-poor children were classified as Healthy, compared to one-fourth of poor children. Poor children were over 4 times more likely to be in the Cluster status, and over twice as likely to be in the Low Cognitive Achievement status. Membership in the most severely affected group—

Cluster + Chronic Conditions—was also more likely among poor children (5.0 versus 3.5 percent).

Race/ethnicity was also significantly related to health status membership (twice log-likelihood difference=761.52, 2 df, $p<.0001$). Non-Hispanic white children were most likely to be considered Healthy (54.7 percent), followed by Asian/Pacific Islander children (43.2 percent). The corresponding percentages were sharply lower among Blacks and Hispanics at 33.1 and 29.2, respectively. The proportion of children in the Asthma (9.0 percent), Cluster (13.1 percent), and Cluster + Chronic Conditions (3.9 percent) statuses were highest among Black children. The greatest disadvantage for Hispanic children was in the Low Cognitive Achievement status (34.0 percent); Hispanic representation in the Cluster status was also high (12.9 percent) compared to the population overall (6.0 percent). Asian/Pacific Islander children were generally comparable to non-Hispanic whites, but stood out as much more likely than other groups to be classified in the Low Social Skills status (34.7 percent), and the least likely to be in the Low Cognitive Achievement (8.4 percent) and Cluster + Chronic Conditions (1.6 percent) statuses.

Table 3 also presents birthweight comparisons. Birthweight classification (less than 1500 grams, 1500 to 2500 grams, greater than 2500 grams) was significantly related to health status membership (twice log-likelihood difference=143.72, 2 df, $p<.0001$). Only one-fifth of very low birthweight and onethird of moderately low birthweight children were classified as Healthy, compared to 51.8 percent of those not low birthweight. Very low birthweight children were starkly over-represented in the Cluster + Chronic Conditions status (25.2 versus 3.4 percent among non-low birthweight), and were also more likely to be in the Asthma, Functional Problems, Low Cognitive Achievement, Externalizing Behavior + Approaches to Learning Difficulties, and Cluster statuses. Compared with non-low birthweight children, those with moderately low birthweight were also more likely to be in the Asthma, Functional Problems, Low Cognitive Achievement, Cluster, and Cluster + Chronic Conditions statuses.

DISCUSSION

Accurately characterizing health and health disparities in early childhood is critical if current goals of improving population health are to be realized [1, 14]. LCA is a promising new approach that integrates multiple indicators to provide a holistic and comprehensive picture of child health. In quantifying the proportions of subgroups that are “healthy” as well as the proportions in less optimal statuses, this approach brings disparities by poverty, race/ethnicity, and other factors into sharp relief. The wealth of statistical information currently collected by the government and professional organizations on aspects of children’s health is useful. However, numerous separately available measures can be difficult to summarize and do not convey the co-occurrence of problems experienced by some children or interrelationships between these problems [22]. Indexes of chronic conditions are helpful, but they vary widely in conceptualization and scope [29], and do not capture the range of negative consequences of these conditions for children [23]. Most importantly, such indexes do not specify which particular health problems intersect, and which groups of children are most likely to suffer from clusters of adverse conditions.

The LCA findings underscored the stark health disadvantages experienced by children in poverty. By 48 months, only one in four poor children was healthy—less than half the proportion among non-poor children. Poor children were more likely to have asthma, and to be in the most severely affected category that includes both chronic health conditions and relatively low developmental achievement. Furthermore, one-third of poor children exhibited low cognitive achievement, and poor children also had over four times higher risk

of experiencing these problems combined with low social skills and externalizing behavior problems. Poverty is associated with multiple exposures that can adversely affect physical, cognitive, and behavioral development, such as suboptimal intake of essential nutrients like iron [30–31] as well as residence in neighborhoods that contain sources of lead and other neurotoxins [32–33]. Poverty has also been linked to less developmentally stimulating community, home, and childcare environments [34–35].

The study findings also revealed prominent disparities by race/ethnicity, particularly among Blacks and Hispanics. This is consistent with previous research (summarized in a recent comprehensive review by Flores [15]), and builds upon existing knowledge in quantifying disadvantages for a comprehensive set of child health dimensions. Black children had the highest likelihood of experiencing multiple problems including chronic conditions and diminished health potential. This concentration of health threats reflects the double jeopardy Black children experience because of their relative risks of exposure to two factors strongly associated with less optimal child health---poverty and low birthweight. In 2009, 24.6 percent of Black families had incomes below poverty, over three times the non-Hispanic white poverty rate of 7.1 percent [36]. Additional disproportionate risk for Black children relates to low birthweight (13.6 percent of births in 2009) and very low birthweight (3.1 percent); their rates are far greater than those of non-Hispanic whites (7.2 percent and 1.2 percent), Hispanics (6.9 percent and 1.2 percent), and Asian/Pacific Islanders (8.3 percent and 1.1 percent) [37]. The adverse health outcomes associated with very low birthweight were found to encompass all dimensions of child health, including greater incidence of chronic conditions, decreased functioning, and diminished health potential as measured by developmental achievement. Even among children born at moderately low birthweight, only one third were classified as healthy, and they experienced elevated risks of clustered developmental problems and chronic conditions.

While Hispanic children generally do not have elevated low birthweight risk, their likelihood of living in poverty (24.2 percent of Hispanic families in 2009) is similar to Black families. In LCA analyses, Hispanic children were particularly at risk of low cognitive achievement, alone and in combination with other developmental problems. Limited exposure to English at home could be a factor if it puts Hispanic children at a disadvantage on assessments administered in English. The ECLS-B used an English screening test prior to administering the cognitive and other assessments in English, although very few children (100 Spanish speakers) failed the screening test (and were therefore not included in the analyses). It is possible that comprehension of instructions and assessment content in English was less optimal among Hispanic children. However, Akresh and Akresh [38] recently found that U.S.-born Hispanic children with immigrant parents scored higher on achievement tests administered in English than on the same tests administered in Spanish, suggesting that language of administration may not have had a major influence on test results.

Our LCA approach is conceptually consistent with the identification of children with special health care needs (CSHCN), who have or are at risk of a chronic physical, developmental, behavioral, or emotional condition and require health care and related services of a type or amount beyond that required by children generally [39]. The broad and inclusive CSHCN designation, however, is non-specific with regard to criteria for being “at risk”[1], and has been critiqued for failing to differentiate variation in complexity and the interaction of health-related issues within the child population [40–41], which is a strength of LCA.

One limitation of this study is that replication of this particular analysis is only possible using data that include the same 12 health indicators. We are not aware of other national

studies that contain these measures, indeed we chose to analyze data from the ECLS-B because of its inclusiveness in health assessments.

CONCLUSIONS

The NRC/IOM has called for a holistic re-conceptualization of children's health encompassing development and functioning in addition to specific diseases and conditions that are usually thought of in connection with the term "health." Consistent with this recommendation, the goals of the present study were to use LCA to estimate a set of health statuses that capture the multidimensional nature of health at 48 months, and to use the health statuses to examine disparities in children's health. Results of these analyses revealed the clustered nature of problems and the emergence of significant disparities in early childhood health that have implications for well-being throughout the life course [4–7]. Specifically, increased risk for impairment across multiple dimensions of health for low and very low birthweight children suggests that the current emphasis on research to prevent preterm birth remains critically important [16], and that primary care providers should remain vigilant regarding these children's heightened health risks throughout the preschool years. The recent economic downturn and resulting increase in child poverty rates are also of great concern [42]. The study findings underscore the importance of redoubling efforts to ameliorate the health effects of poverty through improved access to high-quality health care, nutritional support programs, and education and material support to families and communities to facilitate developmentally stimulating home and child care environments [3, 42–43]. Related to health care, the findings emphasize the importance of regular monitoring of multiple dimensions of children's health [1–2], including in-depth assessment of developmental status. Further population-based research is also needed that incorporates assessments of multiple dimensions of health in order to further characterize childhood health disparities and inform effective intervention strategies.

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Table 1

Description of Child Health Domains and Their Quantification at the 48 Month ECLS-B Assessment

Child Health Domain	ECLS-B Measurement	Definition of Indicator (Percentage)
Health Conditions		
Asthma	Has a doctor, nurse, or other medical professional told you your child has asthma?	Asthma (11.5%)
Overweight/Obesity	Body Mass Index (BMI) calculated from measured height and weight	BMI 85th percentile for age (36.1%)
Other Chronic Conditions	Has a doctor ever told you your child has the following conditions: a) epilepsy or seizures; b) heart defect; c) autism or PDD (pervasive developmental disorders); d) oppositional defiant disorder; e) ADHD; f) diabetes; g) mental retardation; h) a problem with mobility such as cerebral palsy; i) another developmental delay. Does child have any impairment or health problem that requires him/her to use special equipment, such as a wheelchair, brace, hearing aid, or corrective shoes?	One or more conditions (7.4%)
Functioning		
Functional Problems	Did you obtain diagnosis of a problem from a professional regarding: a) ability to pay attention or learn; b) overall activity level; c) use of limbs; d) ability to communicate; e) hearing; f) vision.	One or more diagnosis (16.2%)
Daily Prescriptions	Does child take a prescription medicine every day?	Daily prescription use (10.1%)
Health Potential		
Fine Motor Skills	Scale scores calculated by ECLS-B based on standardized fine motor tasks including building with blocks and copying forms (e.g., vertical line, circle)	Fine motor scale score < 3 (~lowest quartile) ^a (28.7%)
Externalizing Behavior	How often in the last 3 months have the following things occurred? Child a) is physically aggressive; b) is angry; c) acts impulsively without thinking; d) is overly active; e) has temper outburst or tantrums; f) bothers and annoys other children; g) destroys things that belong to others [never=0; rarely=1; sometimes=2; often=3; very often=4]	Externalizing behavior score > 19 (~highest quartile) (22.0%)
Social Skills	How often in the last 3 months have the following things occurred? Child a) invited to play by other children; b) accepted and liked by others; c) makes friends easily [never=0; rarely=1; sometimes=2; often=3; very often=4]	Social skills score < 12 (~lowest quartile) (24.4%)
Empathy	How often in the last 3 months have the following things occurred? Child a) volunteers to help other children complete tasks; b) comforts other children who are upset; c) appropriately uses a variety of words to describe feelings; d) invites other children to play; e) stands up for other children's rights; f) tries to understand another child's behavior [never=0; rarely=1; sometimes=2; often=3; very often=4]	Empathy score <20 (~lowest quartile) (19.0%)
Early Reading Skills	Scale scores calculated by ECLS-B based on standardized assessment of early reading skills related to English language skills, phonological awareness letter and letter-sound knowledge, print conventions, word recognition, and vocabulary.	Early reading skills scale score <17.595 (~lowest quartile) (25.6%)
Early Math Skills	Scale scores calculated by ECLS-B based on standardized assessment of early math skills related to number sense, counting, operations, measurement, geometry and spatial sense, patterns, algebra and functions.	Early math skills scale score <22.240 (~lowest quartile) (25.1%)
Approaches to Learning	How often in the last 3 months have the following things occurred? Child a) shows eagerness to learn new things; b) pays attention well; c) works or plays independently; d) keeps on working until finished with whatever s/he is asked to do; e) has difficulty concentrating or staying on task (reverse coded) [never=0; rarely=1; sometimes=2; often=3; very often=4]	Approaches to learning difficulties: approaches to learning score <17 (~lowest quartile) = 1 (16.2%)

^aQuartiles approximate due to empirical distributions of scales on which they were based

Table 2
Probability of Exhibiting Problems in Child Health Domains Conditional on Membership in Health Statuses (N=8,800^a)

	(Status 1) Healthy	(Status 2) Asthma	(Status 3) Functional Problems	(Status 4) Low Cognitive Achievement	(Status 5) Externalizing Behavior + Approaches to Learning Difficulties	(Status 6) Low Social Skills	(Status 7) Cluster	(Status 8) Cluster + Chronic Conditions
Percentage of Children in Each Health Status:	50.5%^b	4.1%	4.0%	16.7%	2.7%	12.1%	6.0%	3.9%
<i>Item-Response Probabilities:</i>								
<i>Indicators of Child Health</i>								
Asthma	.07	.84^c	.11	.10	.20	.02	.15	.22
Overweight/Obesity	.35	.45	.38	.39	.37	.32	.41	.37
Other Chronic Conditions	.03	.09	.34	.04	.06	.00	.04	.85
Functional Problems	.06	.25	1.00	.13	.20	.10	.11	.91
Daily Prescription Use	.05	.85	.15	.05	.10	.06	.05	.35
Low Fine Motor Skills	.15	.30	.16	.52	.26	.30	.61	.70
High Externalizing Behavior	.12	.23	.14	.22	1.00	.23	.56	.57
Low Social Skills	.09	.17	.22	.15	.47	.66	.70	.65
Low Empathy	.03	.07	.14	.10	.52	.58	.63	.69
Low Early Reading Skills	.08	.14	.04	.72	.16	.13	.91	.55
Low Early Math Skills	.04	.17	.06	.82	.16	.11	.83	.61

	(Status 1) Healthy	(Status 2) Asthma	(Status 3) Functional Problems	(Status 4) Low Cognitive Achievement	(Status 5) Externalizing Behavior + Approaches to Learning Difficulties	(Status 6) Low Social Skills	(Status 7) Cluster	(Status 8) Cluster + Chronic Conditions
Percentage of Children in Each Health Status:	50.5% ^b	4.1%	4.0%	16.7%	2.7%	12.1%	6.0%	3.9%
Approaches to Learning Difficulties	.03	.09	.10	.07	1.00	.26	.65	.69

^aSample size rounded to nearest 50 per ECLS-B confidentiality restrictions

^bWeighted estimates

^cItem-response probabilities greater than .50 are by convention an indication of membership in a cluster, and are shown in bold to facilitate interpretation

Table 3
Prevalence of Health Statuses by Gender, Race/Ethnicity, Poverty, and Birth Weight ($n=8800^a$)

Health Status	Gender			Poverty			Race/Ethnicity				Birthweight ^b			
	Overall ^c	Male	Female	Below	Above	Non-Hispanic White	Non-Hispanic Black	Hispanic	Asian/Pacific Islander	Other	Less than 1500	1500 to 2500	Over 2500	
		%	%	%	%	%	%	%	%	%	%	%	%	%
Healthy	50.5	42.0	60.2	25.5	55.7	54.7	33.1	29.2	43.2	43.4	20.6	33.1	51.8	
Asthma	4.1	3.2	3.4	4.6	4.0	4.7	9.0	4.0	3.0	6.3	7.4	7.4	4.1	
Functional Problems	4.0	4.7	3.1	2.3	4.3	4.7	1.2	1.9	0.3	3.6	8.6	5.4	3.7	
Low Cognitive Achievement	16.7	18.5	15.0	32.9	12.9	12.4	27.5	34.0	8.4	17.3	19.8	24.9	16.2	
Externalizing Behavior + Approaches to Learning Difficulties	2.7	8.1	3.0	4.1	2.2	2.9	3.6	1.7	3.2	4.9	3.9	2.6	2.7	
Low Social Skills	12.1	9.5	9.9	10.9	14.5	14.0	8.7	13.1	34.7	14.6	5.5	11.0	12.4	
Cluster ^d	6.0	8.4	3.2	14.8	2.9	1.6	13.1	12.9	5.6	7.2	8.9	7.7	5.8	
Cluster + Chronic Conditions	3.9	5.6	2.3	5.0	3.5	5.0	3.9	3.2	1.6	2.8	25.2	7.9	3.4	
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	
Proportion of N	100.0	50.9	49.1	24.3	75.7	43.3	15.1	20.4	10.5	10.7	10.6	15.6	73.8	

^a All sample sizes rounded per ECLS-B confidentiality requirements

^b n = 8750, 50 observations are missing.

^c Columns sum to 100%

^dCluster comprises Low Cognitive Achievement, Low Social Skills, and Behavior Problems