Predictors of Children's Healthcare Use

The Value of Child versus Parental Perspectives on Healthcare Needs

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Objective: The objective of this study was to examine the relationship between healthcare use and children's healthcare needs as assessed from the perspectives of children themselves, parents, and healthcare practitioners.

Research Design: We conducted a prospective cohort study in which service use was monitored for the 12 months before and after administration of a health survey.

Subjects: We studied 384 parents and children aged 6 to 11 years enrolled for 2 years in a northern California health maintenance organization or a Medicaid managed care program in Rhode Island.

Measures: Child and parent perspectives on needs were determined using the Child Health and Illness Profile, Child Edition (CHIP-CE). Plan administrative data were used to develop a treated morbidity index, which was based on diagnosis codes recorded by practitioners during the year before the survey and to obtain prospective measures of service use.

Results: For both child- and parent-respondents, low satisfaction and comfort scale scores from the CHIP-CE were significant predictors of number of visits. CHIP-CE domain scales unrelated to future use were risk avoidance, resilience, and achievement. Multivariable regression using CHIP-CE information collected from children explained more variation in total physician visits than models that used parent-respondent data. The treated morbidity index was a weaker predictor of physician visits than the CHIP-CE scale scores. None of the domain scales were significant predictors of any emergency department use or any specialist use; however, the treated morbidity index was associated with any specialist use.

Conclusions: A child's sense of well-being and burden of symptoms predict future use. Perceived healthcare needs, as assessed by the CHIP-CE, is a better predictor of children's service use than evaluated needs as assessed by physician-diagnosed disorders. Our results support the validity of using the responses of children aged 6 to 11 years as a measure of need for future health care.

Key Words: child, utilization, health services needs, health status, CHIP-CE

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Delivering healthcare services in concordance with the needs of individuals is one of the fundamental challenges faced by healthcare systems. Although "need" is generally considered the strongest determinant of utilization, consensus on the approach for operationalizing need has been elusive.[1] According to the well-known behavioral model of utilization, need for health care can be separated into perceived and evaluated components.[2] Perceived need refers to individuals' views on their well-being, symptomatology, and functioning and can be assessed with self-reported health status measures. Evaluated need refers to healthcare practitioner judgments about individuals' health and can be assessed by physiological status and the medical conditions patients experience. Culyer has proposed an alternative view of needs as "the minimum amount of resources required to exhaust a person's capacity to benefit."[1] Health states and behaviors that are modifiable by healthcare services, according to Culyer, are needs. Thus, measurement of needs should focus not only on current health, but it should also include assessments of health-related behaviors and states that influence future health and are modifiable by healthcare services.

Identifying children's healthcare needs poses special methodologic challenges.[3] Their dependency on parents for accessing health services coupled with the difficulties associated with obtaining children's self-reports have led most instrument developers to produce parent-report versions of child health status tools. However, if healthcare systems are to be responsive to children's needs, considering both the child's and parent's perspectives will be necessary. Which perspective is most relevant for a given purpose, however, is generally unclear, and the validity of children's responses on their health as a valid measure of healthcare needs has not been established. A large body of research has shown poor concordance between children and their parents regarding health status items.[4]

Several generic health measures have been developed for children. Recently, our research group completed the development of a version of the Child Health and Illness Profile (CHIP) for children 6 to 11 years old.[5,6] This instrument uses the same conceptual framework as the adolescent edition of the CHIP[7] and includes both child- and parent-respondent versions. A salient difference between the CHIP and other measures of child health[8–11] is that the former comprehensively assesses child health by evaluating not only well-being, symptoms, and functioning, but also includes risky behaviors and resilience factors that influence future health.

Our work developing the child report form of the Child Health and Illness Profile, Child Edition (CHIP-CE) showed that children as young as 6 years old can provide reliable responses to a health survey.[5] We assess the validity of children's assessments of their health as predictors of future healthcare utilization. We tested 3 specific hypotheses: 1) the patterns of health associated with future healthcare use will not differ between child and parent respondents; 2) children's reports on their health status will explain similar levels of variation in future use as their parent's reports; and 3) perceived need, as assessed by self-reported health status, will be a stronger predictor of use than evaluated need, as assessed by the mix of health problems managed by practitioners seen over the course of a year. We used the CHIP-CE to obtain and contrast parents' and children's perspectives of child health. Administrative databases were used to assign Adjusted Clinical Groups (ACGs), a measure of evaluated need that is based on the range and severity of treated morbidities experienced by patients.[12]

METHODS

Study Population

Children 6 to 11 years of age were recruited from a hospital-based practice serving Medicaid managed care patients in Rhode Island (RI) and a group-model health maintenance organization in Northern California (CA). Both sites employed a physician gatekeeper model in which a designated practitioner either provided or arranged for an individual's healthcare services. The goal of sampling was to obtain 12 equally sized age–gender cells. In both sites, once 20 children in an age–gender cell had been interviewed, no further recruitment for that age–gender group was done.

For the CA sample, the sampling frame was composed of all patients aged 6 to 11 years who lived within 20 miles of the medical center, made a visit to the clinic in the previous 12 months (to increase the chances that we would have an up-to-date telephone number), and had a telephone number. From each age–gender cell, 50 parents were sent a letter inviting them and their child to participate. Nonrespondents were directly contacted by research staff. Additional information was not collected on nonrespondents. The CA sample was representative of children enrolled in the group-model HMO.

The RI clinic sample was composed predominantly of children enrolled in Rite Care (Rhode Island's Medicaid managed care program). Children 6 to 11 years old in Rite Care, enrolled with the primary care clinic of Hasbro Children's Hospital, and scheduled to make a routine visit at the clinic were sent a letter inviting them to participate in the study. Actual recruitment was done among patients waiting to be seen for a routine visit in the clinic. Thus, the RI sample was a convenience sample and representative of children obtaining care from the primary care clinic.

All children were given a brief reading-proficiency test. An interviewer administered a health survey to children aged 6 to 7 years and those 8 to 11 years who did not pass the reading test. Other children and parents completed the survey without assistance. Interviews were done in English.

In the CA sample, 246 children and their parents participated in the survey from March to May 1999. In the RI sample, 220 children and their parents participated from June to September 1999. Because the RI sample did not have accurate registration records, we required at least 1 visit in both years of the study period to ensure that each respondent was a user of either the California HMO or Rhode Island primary care clinic during the 2-year study period. Exclusion of nonusers was done to ensure comparability between the 2 samples. This selection criterion resulted in final samples of 199 children (81% of the original sample) in Northern California and 185 children (84% of all the original sample) in Rhode Island for a combined sample size of 384 children. We found no significant differences in responses to the CHIP between those included versus those excluded from the study sample.

Health Survey

The health survey was composed of the CHIP-CE questionnaire. The CHIP-CE assesses the health of children aged 6 to 11 years from the perspectives of children themselves and their parents. Both the child-respondent and parent-respondent versions are completed by paper-and-pencil method. The domains of the CHIP-CE are the same as those contained in the adolescent edition of the CHIP (CHIP-AE). They include satisfaction (with one's health and self), comfort (symptoms and limitations in activity as a result of illness), resilience (health states and behaviors that enhance health), risk avoidance (risk behaviors), and achievement (developmentally appropriate role functioning).[5,6] Higher-domain scale scores indicate better health. For example, higher scores on satisfaction suggest higher levels of well-being, and higher comfort scores indicate fewer symptoms and limitations. Personal characteristics of the respondents were assessed for each of the 2 study samples. These characteristics were obtained from parent responses to a sociodemographic section in the survey.

We used a 56-item version of the instrument for child respondents and a parallel instrument with the same items for parents. (It should be noted that the final version of the child report form of the CHIP-CE contains 45 items, some of which are slightly different from those used in this study.) Item scores were averaged to construct domain scale scores if at least 70% of the items in the scale were scoreable. This approach imputes the mean scale value to missing items. Additional information on the CHIP-CE instruments and on the details of the research design can be found elsewhere.[5,6]

Extensive formative research shaped the development of the CHIP-CE to enhance children's comprehension of the health concepts and response options.[13] Each item is anchored by cartoons that depict the extreme response categories for the health state or behavior being addressed. For all items, 5 response options were arrayed between the cartoons and ordered by graduated circles. The smallest circle indicated the least amount or "never" and the largest circle indicated the most or "all the time." The wording for each response option was written below the circle. Respondents reported on symptoms and behaviors that occurred in the past 4 weeks to achieve a reliable assessment of current health status.

Administrative Databases

All healthcare claims submitted for services delivered in outpatient settings were obtained for 12 months before (retrospective claims) and 12 months after (prospective claims) CHIP-CE survey administration. The retrospective claims were used to identify physician-diagnosed disorders, and the prospective data provided information on healthcare use. We excluded diagnosis codes submitted for laboratory and radiologic services, because they have high proportions of "rule-out diagnoses."

We defined a physician visit as an encounter with a unique date of service to a primary care clinic, specialty clinic, or emergency department. The number of physician visits was summed for each patient to give a measure of total visits, the main dependent variable.

To account for the number and severity of conditions diagnosed by physicians, we assigned a previously "treated morbidity index" to each patient.[14] The index was based on aggregated diagnostic groups (ADGs), the building blocks of the Johns Hopkins Adjusted Clinical Groups Case-Mix System.[12] The 32 ADGs are morbidity groups defined by a set diagnostic codes (International Classification of Diseases, 9th Revision, Clinical Modification) that are similar with respect to expected use of healthcare resources. An index score was obtained for each subject by summing ADG-specific weights used in previous studies.[14] Larger scores suggest greater healthcare needs. For both children and adults, the index increases with patient age,[15] varies by type of primary care delivery site,[15] and is associated with being referred to a specialist.[14]

Data Analysis

CHIP-CE domain scale scores were dichotomized into the lowest third verus the middle and highest thirds. These categories allowed comparisons between children with poor health (lowest tertile) with those who had average/good health in a given domain. Associations between each domain scale score and total visits, adjusting for children's age, sex, and site of survey administration, were calculated separately for survey data obtained from children and from their parents. The treated morbidity index was centered at a mean of 0 and standardized to a standard deviation of 1. The coefficient of this variable can be interpreted as the amount of change in physician visits expected with a change of 1 standard deviation of the index score.

We constructed multivariable regression models using ordinary least squares (OLS) estimation to examine total visits as a function of CHIP-CE health scores as reported by children and parents with and without the comorbidity index. The models controlled for children's age, sex, and site of survey administration. The site indicator was entered into the model to account for differences in the 2 delivery systems such as access to physician services. We examined and then excluded race/ethnicity, English as a second language, and poverty as control variables, because they did not add to the explanatory performance of the regression models. We were unable to construct other regression models that account for both nonusers and users, because our sample population was composed of users of health care during both years of the study period.

Because the distribution of total number of visits is nonnormal and right-skewed (a large number used few services, whereas a smaller number used many services), we did a sensitivity analysis in which the log transformation of total number of visits was the dependent variable. The R-square values did not substantively change, nor did the direction or relative size of parameter estimates. We present results from the OLS model because the parameter estimates have an intuitive meaning (ie, change in number of visits associated with the covariate).

Using the same independent variables as those used in the OLS models, we conducted logistic regression analyses to identify predictors of emergency department use and specialist physician use. Model fit for the logistic regression models was assessed using the "r" statistic proposed by Zheng and Agresti.[16] The value of the r statistic has a range from 0 to 1, and is the correlation between the observed and predicted values of the response variable.

RESULTS

Characteristics of the study population are shown in Table 1. The age distribution and proportion of girls in the samples were similar between the RI and CA samples. The RI sample had larger shares of Hispanic, low-income and single-parent families than the CA sample. The RI sample on average made a total of 3.97 physician visits, whereas the CA sample had a mean of 3.00 physician visits. All parent respondents were mothers or female caregivers. In the CA sample, 95% were birth mothers, and in the RI sample, 93% were birth mothers.

TABLE 1. Study Population

Characteristic	Northern California Sample (N = 199)	Rhode Island Sample (N = 185)	*P* Value
Age, mean (SD) standard deviation	8.57 (1.68)	8.52 (1.70)	0.779
Age (%)			
6	13.1	16.2	
7	19.1	16.2	
8	17.1	16.8	
9	16.6	17.3	
10	16.6	16.8	
11	17.6	16.8	0.947
Percent girls	52.8	55.1	0.641
Race/ethnicity (%)			
White, non-Hispanic	30.2	17.9	
Black, non-Hispanic	40.7	21.2	
Hispanic	11.6	43.0	
Other	17.6	17.9	<0.001
Annual pre-tax family income* (%)			
<$10,000	1.6	39.2	
$10,000–$14,999	2.6	29.1	
$15,000–$19,999	5.8	19.6	
$20,000–$29,999	14.3	6.8	
$30,000–$39,000	14.8	2.7	
$40,000–$79,999	32.8	2.7	
$80,000–$119,000	16.4	0	
$120,000 or more	11.6	0	<0.001
Percent below federal poverty line*	21.7	91.0	<0.001
Percent with English as first language	89.3	72.7	<0.001
Biologic parents in home (%)			
None	1.0	5.0	
Father only	1.0	.6	
Mother only	39.7	71.3	
Both father and mother	58.3	23.2	<0.001
Healthcare use in year before health survey			
Primary care physicians			
Percent with any prior use	90.4	95.7	0.046
Mean no. visits per person	2.24	3.01	0.001
Specialist physicians			
Percent with any prior use	22.6	20.0	0.532
Mean no. visits per person	.51	.53	0.918
Emergency department			
Percent with any prior use	19.1	30.3	0.011
Mean no. visits per person	.24	.44	0.009

*The numbers of children with missing values for income-related items were 37 in the Rhode Island sample and 10 in the California sample.

Bivariate associations between the CHIP-CE domain scales and total number of physician visits, adjusted for population characteristics, are shown in Table 2. Low scale scores indicate poor health in a given domain and suggest greater need for health care. The satisfaction and comfort scales, but not the other 3 domains, were associated with total number of visits for data obtained from both children and their parents. Total visits was weakly correlated with the treated morbidity index (Pearson's r 0.13; $P < 0.001$).

Table 3 presents results from OLS regression analyses, done separately for child- and parent-respondents, in which total physician visits was regressed on all 5 domain scale scores with and without the treated morbidity index. Once the treated morbidity index was added to the models, there was no significant site effect. Low scores on the satisfaction and comfort domains were associated with higher healthcare use for both the child- and parent-respondent models. No other factors were associated with volume of physician visits.

TABLE 2. Perceived Health Status and Future Healthcare Use, Bivariate Associations Adjusted for Population Characteristics

	Adjusted Total No. Future Visits*	
CHIP-CE Domain Scales	**Child Respondent**	**Parent Respondent**
Satisfaction		
Low	4.31	4.05
Mid/high	3.03	3.07
Difference in healthcare use	1.28 ($P < 0.001$)	.98 ($P = 0.004$)
Comfort		
Low	4.10	4.12
Mid/high	3.14	3.14
Difference in healthcare use	.96 ($P = 0.001$)	.98 ($P = 0.006$)
Risk avoidance		
Low	3.61	3.64
Mid/high	3.39	3.36
Difference in healthcare use	.22 ($P = 0.542$)	.28 ($P = 0.450$)
Resilience		
Low	3.77	3.66
Mid/high	3.30	3.36
Difference in healthcare use	.47 ($P = 0.183$)	.30 ($P = 0.397$)
Achievement		
Low	3.96	3.46
Mid/high	3.20	3.46
Difference in healthcare use	.76 ($P = 0.032$)	0 ($P = 0.998$)

*Total number of visits was adjusted for age, sex and site of survey administration.

The regression model using the child-respondent domain scores explained more variation than the parent-respondent models, although the absolute level of variance explained was small. The addition of the treated morbidity index had negligible impact on the R-square statistic.

We did additional analyses using data from the child-respondent version of the CHIP-CE to identify items in the satisfaction and comfort domains with the largest effects on healthcare use. Of the 5 possible responses for each item, the lowest 2 response levels (poorest health) were contrasted with the 3 healthier responses to predict healthcare use. All analyses controlled for child age, sex, and site of survey administration. The satisfaction items with the largest effect sizes (low scores increased use by 0.9 visits or more compared with higher scores) were: having a lot of energy, feeling happy, feeling loved, how many kids like you, and general assessment of health. Similar analyses done for items in the comfort domain showed that the following items were associated with an increase of 0.9 visits or more: having a runny nose, having an earache, having a sore throat, having a cough, having a stomachache, pain that really bothered you, trouble breathing, crying a lot, feeling afraid, and too sick to go to school.

None of the CHIP-CE domain scale scores was significantly associated with emergency department use for both the child- and parent-respondent models. The only significant predictor of any specialist use was the treated morbidity index (odds ratio, 1.28; 95% confidence interval, 1.01–1.63). Data from the child-respondents provided better model fit than data obtained from parents (Pearson's r for the correlation between observed and predicted responses was 0.28 for children but 0.15 for parents).

DISCUSSION

Children with lower satisfaction with their self and health and those who reported more physical and emotional symptoms had more ambulatory physician visits in the year after the health assessment than counterparts. Aspects of self-reported health unrelated to ambulatory utilization included risk avoidance, resilience, and achievement of developmentally appropriate goals in school and with peers. A treated morbidity index derived from diagnoses given by physicians was more weakly associated with future utilization than self-reported health status. Thus, perceived healthcare needs were stronger predictors of utilization than evaluated needs (ie, physician-diagnosed morbidities).

Despite the well-described discordance between parental and child reports on children's health,[4] most pediatric utilization studies use parental proxy reports for assessments of healthcare need. In this study, children and parents responded to the same set of items from the CHIP-CE, which

TABLE 3. Multivariable Regression Models for Predicting Total Number of Future Visits Using CHIP-CE Data Obtained From Children and Their Parents

	CHIP-CE, Child Respondent		CHIP-CE, Parent Respondent	
Variable	**Model Without Treated Morbidity Index**	**Model With Treated Morbidity Index**	**Model Without Treated Morbidity Index**	**Model With Treated Morbidity Index**
Beta (SE)				
Intercept	3.15 (.37)	3.01 (.39)	3.15 (.40)	3.03 (.43)
Age (years)				
6–7	−.30 (.38)	−.27 (.40)	−.10 (.36)	−.08 (.39)
8–11	ref	ref	ref	ref
Gender				
Female	.38 (.34)	.49 (.36)	.51 (.34)	.63 (.36)
Male	ref	ref	ref	ref
Survey administration site				
Northern California	−.87 (.33)‡	−.66 (.36)	−.81 (.34)†	−.63 (.36)
Rhode Island	ref	ref	ref	ref
Satisfaction				
Low	1.22 (.38)‡	1.21 (.41)‡	.86 (.38)†	.85 (.40)*
Mid/high	ref	ref	ref	ref
Comfort				
Low	.81 (.40)†	.83 (.42)*	.88 (.38)†	.87 (.41)†
Mid/high	ref	ref	ref	ref
Risk avoidance				
Low	−.13 (.37)	−.14 (.40)	.04 (.40)	.07 (.42)
Mid/high	ref	ref	ref	ref
Resilience				
Low	−.21 (.39)	−.21 (.41)	−.16 (.38)	−.06 (.41)
Mid/high	ref	ref	ref	ref
Achievement				
Low	.26 (.39)	.30 (.41)	−.39 (.40)	−.45 (.42)
Mid/high	ref	ref	ref	ref
Treated morbidity index*		.39 (.18)†		.21 (.20)
Adjusted R^2	.07	.09	.06	.06

*The treated morbidity index was centered at the mean and standardized using the full study population. The beta coefficient for the treated morbidity index can be interpreted as the amount of change in total physician visits associated with a 1 standard deviation increase in the co morbidity score.
†.01 < P < 0.05.
‡.001 < P < 0.01.
§P < 0.001.
SE = standard error.

permitted a comparison between information from the 2 sources. The patterns of associations between self-reported health and healthcare use were the same for data obtained from children versus their parents. These results support the validity of using children's responses as a measure of need for healthcare services. Additional research should be done to confirm whether the better explanatory power of regression models associated with children's reports compared with their parents that we found in this study is consistent across other populations.

Items with the largest effects on future use included some measures of satisfaction with health (eg, having a lot energy, feeling happy), satisfaction with self (eg, how many kids like you, feeling loved), physical symptoms (eg, having a runny nose, cough, or stomachache), emotional symptoms (eg, crying a lot, feeling afraid), and limitations in activity as a result of illness (feeling too sick to go to school). In other words, the relationships between service use and children's overall sense of well-being and comfort were not a consequence of extreme values for any single item within the scale.

From a methodologic perspective, these results argue for assessments of healthcare need using true scales that provide psychometric integrity in the measurement of the concepts of satisfaction and comfort rather than specific items.

In a review on pediatric utilization, Horowitz and colleagues proposed that future research in this area use prospective designs to examine temporal effects, use better measures of health status, provide clearer descriptions of the type of use being investigated, and incorporate measures of social stress and psychologic stressors.[17] Strengths of our study included the prospective design, use of multiple measures of healthcare need, and evaluation of different types of use. However, we did not determine if healthcare use was patient-initiated (eg, first-contact visits for new health problems) or practitioner-initiated (eg, follow-up visits for ongoing problems). The relationships between needs and use could differ for these 2 types of utilization. Furthermore, the study was restricted to patients who were healthcare users. Our data do not provide any information about the decision to become a healthcare user.

The regression models from this study did not account for the well-known association between use of medical care among children and their mothers,[18–20] or maternal psychosocial variables previously found to be important predictors of children's use.[19,20] In part because of the absence of these variables, the regression models explained a small amount of variation (<10%) in total number of physician visits. The low R-square values suggest that there are other, unspecified variables that explain how many physician visits children use.

We found no relationship between healthcare needs and use of emergency departments. This finding could be a consequence of urgent care-seeking being related to the unpredictable onset of new health problems. Similar to this study, other research has found an association between disease burden and use of specialists.[14,21]

Finally, the study population included 6- to 11-year-old children and their parents who resided in 2 geographic regions. Although the patient mix and propensities to use health care differed markedly between the 2 samples, we found consistent relationships between health and use in the 2 samples. Additional research replicating our findings in other populations will strengthen the credibility of the associations we report between children's overall sense of well-being and comfort and their future healthcare utilization.

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