Health Insurance, Primary Care, and Preventable Hospitalization of Children in a Large State

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Objectives: To analyze variations in the admission rate to hospitals of children with ambulatory care-sensitive (ACS) conditions and to test the relationship of ACS admission rates to insurance coverage, health maintenance organization (HMO) enrollment, availability of primary care, severity of illness, distance to hospital, and a number of other factors.

Study Design: Hypotheses were derived from basic considerations about demand and use of primary care and preventive services and then were tested with a weighted linear regression model of the ACS admission rate for children residing in each county.

Patients and Methods: The principal data were all hospital discharges for New York resident children admitted to hospitals in New York, Pennsylvania, New Jersey, or Connecticut in 1994. The data and methodology were noteworthy for including out-of-area hospital admissions.

Results: There was a substantial negative association of the ACS rate with private HMO coverage. There also were sizable negative effects of the availability of primary care services in physician offices and the distance traveled. Large differences related to racial and ethnic composition of the population were found independent of other determinants. There was a positive association with the proportion of all admissions (admissions for all conditions) covered by Medicaid or self-pay. Severity of illness and use of emergency departments were controlled. There was no independent effect of a location in New York City.

Conclusions: The results are consistent with smaller-scale studies suggesting that improved health insurance for children could reduce hospital admissions. Contracting with HMOs also appears to be beneficial. Independently, programs to increase the availability of primary and preventive services could substantially reduce ACS admissions.

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For more than 3 decades, public policies have attempted to reduce the barriers to ambulatory care by increasing enrollment in health insurance plans and by providing subsidies for the supply of primary care. One of the indicators that might be used to track the access to cost-effective ambulatory care and to make comparisons across geographic areas and population segments is the rate of hospitalizations that are mostly preventable with routine primary and preventive care. The clinical conditions seen in these hospitalized patients are commonly called ambulatory care-sensitive (ACS) conditions. A number of studies have identified and validated such conditions and measures of preventable hospitalization.[1-4]

The rate of ACS hospitalizations can be used for evaluating the impact of new programs and demonstrations. For example, a recent initiative by federal and state governments, the Children's Health Insurance Program (SCHIP), begun under the Balanced Budget Act of 1997, will increase the insurance coverage of children in low-income families (see Rosenbaum et al for a description and discussion[5]). Analysts will use a number of indicators about children's health status and use of healthcare to evaluate the new programs. One indicator proposed by a

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number of states for evaluating their programs is the number of preventable hospitalizations. Friedman and colleagues provided national baseline data in 1995 and 1990 for the top 10 ACS conditions in children: dehydration; asthma; severe ear, nose, and throat infections; cellulitis; epilepsy; failure to thrive; immunization-related conditions; nutritional deficiencies; hypoglycemia; and tuberculosis.[6] Substantial differences in rates of ACS hospitalization were shown across insurance groups and between states. One potential benefit of the new program is to shrink these differences.

Insurance coverage is likely to be only 1 among several major factors affecting the rate of ACS hospitalization for children. The availability of primary care services, as well as hospital capacity, should be considered, as should other determinants of demand, physician decision making, and supply of services. The purpose of this study is to clarify the magnitude of the various influences on the ACS hospitalization rate among a large group of children in a fixed geographic area by analyzing the variation across counties in a large state—specifically, New York in 1994. This type of information could be useful for policy makers because reducing preventable hospitalization (and any permanent damage from preventable illness itself) is a worthwhile end in itself as well as an indicator of cost-effective use of healthcare.

This study builds on the past work of several authors whose research was concerned with preventable hospitalization, although most did not deal specifically with children. The studies of ACS conditions point to both supply and patient demand for ambulatory services as determinants of "local" (variously defined) admission rates. The methodology generally used in these studies was to compare the rates for several geographic areas and for different populations representing differences in demographics, insurance, income, or supply factors. The present study aims to be more explicitly and thoroughly multivariate and to overcome a number of obstacles such as "border crossing" for treatment outside the patient's county and state of residence.

··· STUDY DESIGN ···

The actual use of primary care and preventive services in this study of preventable hospitalization was not observed (consistent with most other similar studies in the literature). Therefore, the conceptual framework regarding the behavior of consumers and service providers had to link observable variables with unobserved behavior. Consumers (patients and families) are 1 group of actors who seek and pay for services. Primary care suppliers (physicians or physician-directed providers), managed care plans, and hospital managers are independent groups of actors supplying services and sometimes making decisions on behalf of patients.

Hypotheses About Demand

Consumers are faced with the problem of weighing the cost and expected benefits of primary care, where benefits include lowering future costs due to episodes of illness and hospital care. Such future episodes of illness also may leave the patient with irreversible disabilities. In addition, a benefit of preventive services is to reduce the trauma to children caused by hospitalization. Rigorous abstract models of this type of decision problem have been developed by authors such as Kenkel.[7] These models can be adopted when one can actually observe the use of preventive services. Although that was not possible in this study, we still could develop reasonable hypotheses about the main testable factors that affect the relative demand for primary care versus hospital inpatient care.

The out-of-pocket costs of care, as affected by insurance, and the indirect costs of care, such as distance to providers, are likely to reduce the demand for care. Increased family resources and education are likely to increase demand for primary care. These factors, measured in various ways, have been hypothesized to affect demand in previous studies of ACS rates.[2,8] However, the likely effects of insurance are somewhat subtle; it is not just a case of having coverage versus having no coverage. Privately insured patients in health maintenance organizations (HMOs) generally have only a small out-of-pocket cost for primary and preventive services. Other private insurance generally has better coverage for hospital-based services than for office-based physician services. Medicaid beneficiaries theoretically have no out-of-pocket cost for either office-based or inpatient care. However, some children first become enrolled in Medicaid when they are hospitalized, previously having been uninsured[9] and therefore less likely to seek primary care. Also, Medicaid pricing may be substantially below what physicians can charge other patients; hence, Medicaid beneficiaries may have fewer accessible options to obtain primary and preventive services. Finally, areas with a high rate of Medicaid eligibility tend to be areas with low income and education, as well as other housing and family stresses that reduce the value placed on primary and preventive services.

Cultural traditions and other factors may affect the decision to use primary and preventive services by affecting the understanding of medical care and the willingness to spend on health versus other goods and services. A number of these determinants could vary across racial and ethnic groups. Ideally, a statistical analysis could adequately control for family income, education, and job category by direct measures. However, hospital records do not include such information, leaving researchers with only area averages from census data that may not be highly sensitive to differences between ethnic groups. Hence, we hypothesized that nonwhite groups would be observed to have more ACS admissions, even after controlling for insurance coverage.

Hypotheses About Supply

The generally assumed supply factors associated with ACS admissions are locally available primary care physicians in offices or hospitals, local inpatient bed capacity,[10,11] and physician practice patterns.[4,12] More availability of primary care physicians not only makes care more accessible, but also may lead to lower prices. Inpatient capacity may affect the relative cost of inpatient versus primary care to the consumer, but its main practical effect on ACS hospital admissions probably emerges as an effect on professional standards of care. When hospital capacity is relatively scarce, physicians might set higher severity thresholds as a criterion for admission.[1,4]

Some patients with private insurance are enrolled in managed care plans. As measured in hospital data systems, this enrollment will be a captured as an "HMO or alternative delivery system." HMOs have been known to focus more resources than other health plans on preventive care, particularly for children. One way they control costs of providing preventive care and other ambulatory care is by employment of nonphysician personnel. Therefore, we hypothesized that HMOs reduce the use of hospitals for ACS conditions by adding to the supply of primary care providers.

HMO market penetration and the spillover effects on other providers are separate issues. Some authors suggest that because HMOs generate more price competition among hospitals, they reduce the willingness of hospitals to cross-subsidize services to patients with no insurance. Hence, the effect of the market penetration of HMOs on ACS admission rates for a county depends on whether the preventive care outweighs the competitive effect on hospital budgets.

··· DATA AND METHODS ···

The unit of analysis of ACS rates in this study is the county, of which there are 62 in New York. The county is the smallest area for which reliable data on primary care availability and other important demographic and provider data are reported. Health service areas (groups of counties defined by travel patterns) or standard metropolitan areas are often quite diffuse and too large to describe realistically the local availability of primary care and local demographics. Unfortunately, counties also can be too large for some local variables. The most populous counties tend to have distinct neighborhoods, among which the supply and demand for care might vary substantially. For areas smaller than a county (eg, zip code of patient origin), one usually cannot obtain detailed information about availability of local primary care, and many people can routinely leave their home zip code area for primary care without much travel time. The county is a practical compromise when both ambulatory care and hospital care as well as demographics must be measured.

For residents of New York, about one sixth of hospitalizations of children for ACS conditions occur outside the county of residence. Unlike some previous studies, this study included admissions outside of the local area, extending to 3 adjacent states: New Jersey, Pennsylvania, and Connecticut. Any admissions to Massachusetts or Vermont hospitals were not included (those were expected to be few because of the distance of those borders from population centers in New York). The coverage of out-of-area hospitalization and out-of-state hospitalization is a strong advantage of this study. Generally, such admissions have been ignored or estimated.[1,13] For an explicit study of outflows, see Basu and Friedman.[14]

Information on every hospital discharge during 1994 for New York and the 3 neighboring states is assembled, edited, and standardized as part of the Hospital Cost and Utilization Project database of the Agency for Healthcare Research and Quality. Discharge summaries contain important details about the patient, including age and sex, primary and secondary diagnoses, procedures, whether the patient was admitted through the emergency department or as a transfer from another facility, the primary expected payer, length of stay, and total charges.

The dependent variable was the ACS admission rate for county residents (children) to hospitals anywhere in New York and the 3 neighboring states. It

should be noted that the numerator may include multiple admissions of the same child since there was no way to ascertain whether the same child was admitted multiple times in discharge abstract data. The rate is age adjusted because it tends to be higher for children under age 5 years than over. An expected rate for each county was calculated as the sum of the county proportions of children age 0-4 and 5-19 years multiplied by the statewide ACS admission rate in each age bracket. The ratio of the county observed rate to the expected rate is the age-adjusted rate.

For identifying ACS admissions, we used definitions provided by Billings et al[2] and by Billings (letter to J.B., February 27, 1997). The conditions applicable to children were defined by diagnostic codes (available from the authors) taken from the *International Classification of Diseases, 9th Revision.* The conditions were usually defined by principal diagnoses. In some cases, secondary diagnoses also were used. In several cases, specific exclusion criteria based on age, sex, or procedures were used. In addition to the 10 conditions named by Friedman et al,[6] others used in this study were diabetes, hypertension, selected types of bacterial pneumonia, selected cases of acute bronchitis, urinary tract infection, selected anemias, and angina without a surgical procedure.

Billings et al originally used a modified Delphi approach with a medical advisory panel to select the ACS conditions and also reported on supporting validation tests of these definitions as largely preventable hospitalizations.[2] Other authors have used different methodologies to test the connection between local rates of ACS conditions and the use of primary care services. (For example, Bindman et al used telephone surveys in a number of different zip codes in California and found evidence that less routine ambulatory care was used in areas where rates of ACS hospitalization were higher.[3])

Demand Factors

The Hospital Cost and Utilization Project files provided information on the insurance status of resident children admitted to hospitals within the county or out of area. Insurance status was grouped into 3 categories: Medicaid or self-pay, private HMO, and all other types of insurance (which is principally private insurance plus a small group of other types of public programs). The proportion of children in each category was calculated for all resident children in the county who were hospitalized during the year. Therefore, the proportions of children with various types of insurance refer to all resident children who were hospitalized, not just those with ACS conditions. We could not distinguish which Medicaid beneficiaries were enrolled in HMOs (fewer than 5% of the New York Medicaid population in 1994). In some states and in more recent years that would now be a more important distinction.

Unfortunately, it was not possible to construct a different and credible measure of HMO enrollment for county residents. One such estimate is offered in the Area Resource File, defined as total HMO members divided by the population in a county. This was found to be distorted by the location of plan offices. We considered several strategies to combat this problem: (1) redistributing and adjusting the membership across counties for each health service area, using a health service area average penetration rate; (2) using a dummy variable for counties with high HMO penetration after adjustment (above 25%); or (3) using the proportion of all hospital discharges for children who were covered by private insurance in HMOs. The last option is more precise for patients, but is expected to underestimate HMO enrollment since HMO enrollees generally use less hospital care. However, each of the first 2 options was subject to obvious anomalies for several counties. Therefore, option 3 was adopted.

To calculate the distance traveled by a patient to hospital, we used software that connects latitudes and longitudes of patient zip codes with those of the hospital zip codes. The distance traveled by individual patients was then averaged to obtain mean distance traveled by children with ACS conditions in the county.

Supply Factors

Several county resource variables are used in this study. The total county supply of office-based physicians in primary care is obtained from the Area Resource File. As is customary, primary care physicians outside hospitals include general pediatricians, general practitioners, general internists, and family practice physicians per thousand members of the population. Some primary care is provided in hospitals. Although the number of primary physicians employed in hospitals could not be measured, we did measure the emergency department visits per thousand members of the population in the county. This information was taken from survey files of the American Hospital Association and summed over short-stay community hospitals in a county.

Measuring hospital inpatient capacity can present some thorny issues. The number of beds is not

always a reliable measure of the amount of hospital capacity actually staffed, particularly in smaller hospitals. One alternative would be to use the total number of patient days of care produced per capita, taken from the Area Resource File. As it turned out, both beds and patient days had about the same statistical effects, so we adopted the "acute care beds set up" as a measure of hospital capacity.

Severity of illness was calculated using a variable called RDSCALE, which is a development of the Disease Staging system by Medstat, Inc. Disease Staging is a commercial software product that was originally developed to predict mortality and has been recognized in health services research since the mid-1980s.[15,16] RDSCALE is a continuous measure designed to predict resources used in the hospital in conjunction with the diagnosis-related group classification. This measure has been found useful to control for severity in other recent multivariate studies.[17] Using data from Hospital Cost and Utilization Project files, the variable was calculated for each ACS patient, and a mean severity score was calculated for the county by averaging the individual scores of these patients.

Regression Methods

The ordinary least squares regression model in this application raises issues of heteroskedasticity and robustness. There are 2 related problems. One is that the number of children in a county varied dramatically from 1247 to 665,130. The smaller counties were likely to have higher variance in the measured ACS rate due to measurement errors and unexplainable factors in any 1 year. To avoid giving random factors in small counties undue influence on the parameter estimates, one may use a generalized least squares technique to weight observations by an appropriate indicator of county size (we used the number of children).[18] A second potential problem is skewness in ratio variables. The ACS rate is a sum of distinct events for a number of resident children. As a ratio it cannot be negative, but has no presumed distribution that would be better than a normal approximation. The empirical distribution for ACS rate does not have widely extreme values (the maximum is less than twice the state mean), but it is somewhat skewed. Several of the independent variables, although all are ratios, also have a somewhat skewed distribution.

One approach is to arbitrarily transform some or all of the variables (eg, by using logarithms). Unfortunately, several counties have values of 0 for 1 or another independent variable. This leads to an unacceptable loss of degrees of freedom for the analysis. Alternatively, in addition to the weighting, which may reduce the importance of some of the large values in small counties, one may use an accepted general approach to correcting the standard errors of the estimators for heteroskedasticity in the observations. This allows observations with larger errors to be treated as if they come from different approximately normal distributions with larger means and variances. This strategy can leave occasional observations with a relatively high estimated error (as seen in the student t statistic for each observation error) and high influence (measured, eg, by the change in the predicted value for an observation after dropping that observation from the estimation of parameters). For more robust estimates, 1 approach is an iterative method to reduce the weights on cases with particularly high errors and influence. An experimental run of that type suggested only a few indicated changes in the results.

When there are a relatively small number of observations, 62 in this case, and the model for ACS hospitalization rate depends on a number of variables, the degrees of freedom can become relatively small for finding significant effects that may exist. Moreover, the overall explanatory power can appear misleadingly high and should be interpreted with caution. Finally, since a number of variables are imperfectly measured and correlated with each other, some sensitivity testing is warranted. For example, since we found that median family income in the county, percentage of Medicaid patients, percentage of nonwhite ethnic groups, and a location in New York City were highly correlated among each other, we tested the sensitivity and significance of results by excluding 1 variable or another. Consistently, the Medicaid percentage was independently significant with a similar coefficient, regardless of which of the other variables was included. By contrast, the median family income, which may not reflect very well the resources available to parents with young children, did not have independent significance in any test. Hence, the latter variable was dropped from the results presented.

··· RESULTS ···

Table 1 gives descriptive information for the variables, both weighted and unweighted. Since the weights are the number of children in the county, the weighted average of each rate or ratio is the actual state average for all children. **Table 2** gives the

estimated coefficients and test results. In the interest of simplicity and replication, the discussion will pertain to the middle column for the weighted regression. The apparently high explanatory power of this model is interesting, but should be viewed with caution due to the relatively small number of counties. It is more important that a number of the separate influences on the ACS rate were estimated to have statistical significance.

The insurance coverage variables yielded large and significant effects. In counties with a higher proportion of Medicaid and self-pay children, ACS hospitalization rates were significantly higher. In counties with a higher proportion of children with private HMO coverage, ACS hospitalization rates were significantly lower. The sizes of the insurance coefficients were not very sensitive to the method of estimation.

ACS hospitalization rates were inversely related to the availability of local primary care physicians and positively related to the supply of hospital acute care beds. Hospital emergency visits had the expected negative effect in the weighted model, but it was not large enough to be statistically significant. The coefficients for hospital beds and primary care physician availability were not very sensitive to the weighting.

Counties with a higher nonwhite proportion of the population had higher ACS admission rates, independent of insurance, severity of illness, and distance. This was not affected by inclusion or exclusion of the variable denoting New York City location, but was sensitive to the weighting, as one might expect by the high variance of this variable. Severity of illness was not significantly associated with the county ACS admission rate. However, dis-

Table 1. Selected County Variables, New York State, 1994 (62 Counties)

Variable	Mean	Weighted Mean*	Minimum	Maximum
Age-adjusted hospitalization "anywhere" of children for ACS conditions (per 1000 resident children)†	11.36	15.41	2.62	29.39
No. of children age 0-19 y	78,248	279,920	1247	665,130
Patient insurance				
Proportion of child admissions (all conditions) Medicaid	.32	.41	.06	.73
Proportion of child admissions (all conditions) self-pay	.10	.09	.03	.54
Proportion private HMO‡	.13	.13	0	.43
Severity of illness				
Average severity score of ACS discharges§	59.2	57.8	47.4	96.6
County resources				
Primary care physicians per 1000 population	.34	.53	0	1.11
Hospital acute care beds set up per 1000 population	1.26	2.41	0	6.23
Hospital emergency department visits per 1000 population	23.2	36.1	0	63.6
Other variables				
Proportion of population in nonwhite ethnic categories	.09	.25	.01	.64
Average distance in miles between patient's zip code and hospital zip code	11.80	6.78	1.49	47.30

ACS = ambulatory care sensitive; HMO = health maintenance organization.
*Means were weighted by the proportion of New York children residing in the county.
†The age adjustment is based on state rates for children age 0-4 and 5-19 years separately. "Anywhere" includes any hospital in New York or neighboring states New Jersey, Pennsylvania, or Connecticut. A small number of cases in Massachusetts or Vermont were missed.
‡The proportion of hospital inpatient discharges of patients with private HMO coverage will understate the market penetration of HMO enrollment.
§A predicted charge defined in the text, standardized to 100 across all diagnosis-related groups nationally.

tance from hospitals was a significant deterrent to ACS admissions. We do not know whether children living at farther distances obtained more local non-hospital services, obtained more effective services, or perhaps went without treatment. [AU: IS PREVIOUS SENTENCE ALL RIGHT AS EDITED?]

In order to assess the size of effects and not just the significance, **Table 3** provides a calculation of the effects of a 20% increase or decrease in selected variables on the rate of ACS hospitalization. It is not implied that such a change in each variable is equally meaningful or costly, only that it is within the realm of short-term policy targets or market and demographic trends. A 20% increase in primary care physicians per thousand members of the population (adding about 1 primary care physician for every 10,000 persons) would reduce ACS admissions of children by 2.1%. This impact would not be very dramatic and would be considerably less than the opposite impact of an increase in the proportion of

Table 2. Regression Results, New York State, 1994: Hospitalization for ACS Conditions per 1000 Resident Children in County*

	Unweighted Model		Weighted by Proportion of State Children in County		Weights Modified with Error Diagnostics†	
Variable	Coefficient	*t* Statistic	Coefficient	*t* Statistic	Coefficient	*t* Statistic
Proportion of child admissions Medicaid or self-pay	12.05	2.31‡	11.56	2.36‡	13.00	2.93§
Proportion private HMO‖	-7.98	-1.68	-10.53	-2.95§	-7.37	-2.22‡
Average severity score	-.11	-1.67	-.16	-1.92	-.19	-2.51‡
Primary care physicians per 1000 population	-4.81	-1.55	-4.83	-2.66‡	-5.19	-2.44‡
Hospital inpatient capacity per 1000 population	1.51	1.65	1.56	2.11‡	1.23	1.53
Hospital emergency room visits per 1000 population	-.008	-1.26	-.005	-.65	-.005	-.80
Proportion of population in nonwhite ethnic categories	3.09	.28	16.46	3.00§	8.62	1.19
Average distance in miles from patient zip code to hospital zip code	-.153	-1.78	-.29	-2.08‡	-.29	-2.44‡
New York City (1/0)	7.92	1.58	.69	.33	4.08	1.35
Intercept	16.01					
Adjusted R^2	.65		.93		.86	
df	51		51		51	

ACS = ambulatory care sensitive; HMO = health maintenance organization.
*Test statistics are corrected for heteroskedasticity using White's method.
†Weights for 4 counties with residuals having significant *t* statistics and relatively high influence (Cook's D, produced by the SAS software) were reduced. In the final run, 2 counties had residuals with significant *t* statistics but only small influence.
‡$P < .05$.
§$P < .01$.
‖The proportion of hospital inpatient discharges of patients with private HMO coverage among all county residents hospitalized will understate the market penetration of HMO enrollment.

nonwhite ethnic groups from 25% to 30%. It appears that a 20% increase in the proportion of children in private HMOs (from 13% to 16%) would have a relatively small effect, but the market penetration of HMOs has been growing rapidly over time, and larger increases are quite possible. If hospital inpatient capacity continues to decline as it has in the past decade, this could reduce ACS admissions noticeably. It is important to monitor whether this decline means that some children go without essential hospital care.

··· DISCUSSION ···

The findings about insurance coverage are qualitatively similar to those of Weissman et al, who studied Massachusetts and found significantly higher rates of avoidable admission (based on the diagnosis groups) for Medicaid and uninsured patients compared with privately insured patients.[8] The evidence about HMO market penetration is consistent with earlier smaller-scale and random assignment studies.[19,20]

Table 3. Effects of Selected Changes on Rate per 1000 Children of Hospital Admissions for ACS Conditions*

Variable	Change	Percent Difference in Rate of Admission for ACS Conditions
Primary care physicians per 1000 population	Increase 20%	-2.1%
Inpatient acute care beds per 1000 population	Decrease 20%	-2.6%
Proportion of all child admissions from private HMOs†	Increase 20%	-1.8%
Proportion of population in nonwhite ethnic groups	Increase 20%	5.4%

ACS = ambulatory care sensitive; HMO = health maintenance organization.
*Changes are from the weighted mean values of the variables, using the regression results shown in Table 2.
†This figure does not include Medicaid enrollees in HMOs, who represented fewer than 5% of the Medicaid hospital cases in 1994.

Higher hospital admission rates for nonwhite groups, separate from the effects of insurance or primary care availability, might be determined by factors such as poverty, cultural attitudes, education, and language barriers. However, we have no information to separate out such influences that might be of interest to other researchers.

One resource variable not used in the analysis because of lack of sufficiently detailed county data in 1994 is the number of primary care practitioners in community health centers (CHCs) that serve local areas that are classified as "underserved." It appears that CHCs added the equivalent of about 237 full-time-equivalent primary care practitioners (physicians and others) to New York in the mid-1990s, spread around the rural counties and the poorer neighborhoods of big cities. There were about 9535 practicing primary care physicians in New York at that time. Some counties had just a few, while others had more than 1000. From a check of map locations in a later year, it appears that the impact of CHCs might be particularly important in a handful of small counties that are designated in their entirety as underserved areas and have at least 1 CHC site. The absence of this detailed information would tend to result in observing fewer ACS admissions for residents of small counties with few physicians in primary care practices than would otherwise be expected.

··· CONCLUSION ···

The finding of a negative association of ACS rates with coverage by private HMOs offers encouragement to states in contracting for Medicaid enrollment in managed care plans. Nevertheless, because of incentives to avoid hospitalization in capitated plans, states should be concerned about monitoring patterns of potential undertreatment, perhaps including 1 or more sentinel ACS conditions and requiring direct contact with families of enrolled children to assess health status.

Finally, the supply of primary care physicians and physician substitutes will remain important for ACS hospitalization rates, even as insurance coverage is extended. In this decade there has been a noticeable increase in the overall availability of primary care professionals and services (an increase of more than 20% in primary care physicians between 1990 and 1996). One interesting area for more research would be the effects of the actual overall increasing supply of physicians on healthcare for children, including effects on ACS admissions, and how the trends are

affecting different geographic areas and subpopulations. If the supply of physicians per capita continues to increase, this might permit a more powerful effect of improved insurance for children.

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