ARTICLE

Dimensions of the Local Health Care Environment and Use of Care by Uninsured Children in Rural and Urban Areas

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The authors have indicated they have no financial relationships relevant to this article to disclose.

ABSTRACT

OBJECTIVE. Despite concerted policy efforts, a sizeable percentage of children lack health insurance coverage. This article examines the impact of the health care safety net and health care market structure on the use of health care by uninsured children.

METHODS. We used the Medical Expenditure Panel Survey linked with data from multiple sources to analyze health care utilization among uninsured children. We ran analyses separately for children who lived in rural and urban areas and assessed the effects on utilization of the availability of safety net providers, safety net funding, supply of primary care physicians, health maintenance organization penetration, and the percentage of people who are uninsured, controlling for other factors that influence use.

RESULTS. Fewer than half of uninsured children had office-based visits to health care providers during the year, 8% of rural and 10% of urban children visited the emergency department at least once, and just over half of children had medical expenditures or charges during the year. Among uninsured children in rural areas, living closer to a safety net provider and living in an area with a higher supply of primary care physicians were positively associated with higher use and medical expenditures. In urban areas, the supply of primary care physicians and the level of safety net funding were positively associated with uninsured children's medical expenditures, whereas the percentage of the population that was uninsured was negatively associated with use of the emergency department.

CONCLUSIONS. Uninsured children had low levels of utilization over a range of different health care provider types and settings. The availability of safety net providers in the local area and the safety net's capacity to serve the uninsured influence access to care among children. Possible measures for ensuring access to health care among uninsured children include increasing the density of safety net providers in rural areas, enhancing funding for the safety net, and policies to increase primary care physician supply.

www.pediatrics.org/cgi/doi/10.1542/peds.2005-0733

doi:10.1542/peds.2005-0733

Key Words
uninsured, children, safety net, market, utilization

Abbreviations
MEPS-HC—Medical Expenditure Panel Survey Household Component
BPHC—Bureau of Primary Health Care
AHRQ—Agency for Healthcare Research and Quality
ED— emergency department
HMO— health maintenance organization
PCP—primary care physician

Accepted for publication Aug 16, 2005

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THE INCREASED AVAILABILITY of public health insurance coverage, achieved largely through expansions of Medicaid eligibility in the 1980s and the advent of the State Children's Health Insurance Program in 1997, has been instrumental in reducing the numbers of uninsured children in the United States.[1,2] Nonetheless, an alarming number of children remain without health insurance coverage, with recent estimates placing the number of uninsured children at between 9 and 10 million, or ~12% to 13% of all children.[2,3] That such a substantial number of children remain uninsured reflects restrictions on eligibility for public insurance as well as incomplete uptake of health insurance coverage by children who are eligible for it. By some accounts, as many as two thirds of uninsured children are eligible for but not enrolled in Medicaid or the State Children's Health Insurance Program, despite substantial efforts to strengthen outreach and streamline administrative processes.[2,3] Compared with children who have health insurance coverage, uninsured children are less likely to have a usual source of care, to have any contact with a physician during a given year, to receive care in circumstances in which care seems warranted (eg, for an ear infection), to receive prescription drugs, and to have preventive checkups and immunizations.[4–8] Moreover, researchers have emphasized the importance of health in childhood to individuals' health outcomes over the entire span of their lives.[9]

The ongoing challenge of getting children who are eligible for public health insurance enrolled in a program, combined with the decline in the availability of private insurance coverage and mounting fiscal pressures on state and federal governments, suggests not only that the problem of uninsured children is unlikely to fade but also that the coverage gains of the recent past may erode.[1,10] The likelihood that a sizeable proportion of children will continue to be uninsured and the implications of lacking health insurance coverage for the health and health care of children lend urgency to the need to understand the factors that affect access to care among uninsured children.

In a previous study, Long and Marquis[11] profiled variation in access to physician services among uninsured children in 10 states. They categorized the states in terms of safety-net capacity, compared access in "high" versus "low" safety-net states, and found a positive association between access to care and greater safety-net capacity. Other research has focused on the relationship between the safety net and access to care among uninsured adults.[12,13] However, uninsured adults' decisions about their own health care may differ from their decisions about health care for their uninsured children. For example, parents may be more inclined to identify a source of care for their children because they anticipate a greater need for care as a result of recommended schedules for well-child visits, immunizations that are necessary for enrollment in school, or the relative susceptibility of children to acute conditions that require care. As a result, they may be more willing and able to overcome barriers to access when they seek care for their children than for themselves.

This article examines how characteristics of the local health care safety net and the structure of the local health care market influence the use of care among uninsured children. To our knowledge, it is the first study to examine the relationship between utilization of care among uninsured children, on the one hand, and the location of safety-net providers, safety-net capacity, and characteristics of the local health care market, on the other. By comparison, the previous Long and Marquis study compared differences across selected states in 1 measure of utilization for uninsured children with differences in safety-net capacity, without controlling for other aspects of the health care market structure in each state that may be related to the capacity of the safety net. Moreover, this study analyzes utilization among a nationally representative sample of children, for a variety of types of health services, and for urban and rural children separately. Previous research has profiled disparities in access to care among rural and urban individuals but has not assessed the relationship between the structure of the health care market and safety in urban and rural areas and utilization.[14,15]

METHODS

Data

We used data from the Medical Expenditure Panel Survey household component (MEPS-HC) linked to data from the American Hospital Association Annual Survey of Hospitals, Area Resource File, InterStudy Regional Market Analysis database, Bureau of Primary Health care (BPHC) Uniform Data System, Current Population Survey, Census of Governments, and the Census Bureau's Annual Survey of State and Local Government Finances. Variables that described the health care market and safety net were linked to MEPS respondents by Social and Scientific Systems, operating through a contract with the Agency for Healthcare Research and Quality (AHRQ). The resulting data file, stripped of geographic identifiers, was available for our use on-site at the AHRQ Data Center.

The MEPS-HC is a nationally representative survey with detailed information on health status and health services utilization. MEPS uses an overlapping panel design in which respondents are interviewed 5 times in person over a 30-month period to collect data spanning a 2-year period.[16] Our analysis pooled MEPS respondents who were children or adolescents aged 2 to 17 and who were uninsured for at least 1 full calendar year during the period from 1996 to 2000. Each observation represents a 1-year period of a child's being uninsured.

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We included 2 separate observations for children who were uninsured during both calendar years in which they were observed. (Children who were uninsured for <1 year were not included in analysis.) The data used in analysis included 3846 person-year observations obtained from 2672 different respondents.

Statistical Analysis

We used multivariate regression models to assess the effects of characteristics of the local safety net and health care market structure on health care utilization among uninsured children. We analyzed 5 measures of utilization: number of office-based physician visits during the year (which includes visits to physicians' private offices, outpatient clinics associated with hospitals, and community health centers but not outpatient department hospital services), number of office-based nonphysician visits (eg, to nurses, nurse practitioners, physician's assistants, physical therapists), number of emergency department (ED) visits, whether the child incurred any medical expenditures or charges during the year (a child may have positive charges but 0 expenditures if free care was received), and total medical expenditures (exclusive of dental or vision care expenditures). These variables were measured for the year period in which the child was uninsured.

The key explanatory variables in the regression models were distance in miles to the nearest safety-net provider of various types, safety-net capacity, supply of primary care doctors, health maintenance organization (HMO) penetration, and the percentage of the population who were uninsured. We included the distance from each uninsured child (based on the population centroid of the zip code of residence) to the nearest provider of each of the following types: hospital ED; public hospital; and federally funded community health center, public housing primary care program, or migrant health center (all of which receive funding through the BPHC). We measured safety-net capacity using the level of local government spending for health and hospitals in the metropolitan area.[11,17] Spending was scaled to the population with income <200% of the federal poverty line and was based on data obtained from the Census of Governments and the Annual Survey of State and Local Government Finances. We measured the primary care physician (PCP) supply in the local area as the sum of family practitioners, pediatricians, and general practitioners per thousand people in the county. Our measure of HMO penetration was the percentage of the population in the metropolitan area who were enrolled in an HMO. Finally, the percentage of the population in the metropolitan area who were uninsured was calculated using a 3-year moving average derived from Current Population Survey data. These variables were measured for the specific year in which the child was uninsured, although the location of BPHC-funded providers was available only for 1997 and 1999 and was imputed for 1996, 1998, and 2000.

The individual-level covariates in the models included demographic characteristics and the child's health status. Demographic characteristics included the child's age, gender, and race; the mother's educational level; family structure; and family income as a percentage of the federal poverty line. Measures of the child's health status included self-rated (or parent-rated) general health and mental health, indicators for a sensory or functional limitation or a limitation in age-appropriate activities (play for children who were younger than 5 years and school or other activities for those who were ≥5 years), an index measure of behavioral health problems, and an indicator for the presence of any of 13 childhood conditions (asthma, diabetes, epilepsy, cerebral palsy, mental retardation, cancer, appendicitis, hemolytic anemia, congenital heart disease, renal failure, depression, attention-deficit/hyperactivity disorder, and acne). We include a rich set of health status measures. Uninsured individuals who are in poor health may attempt to locate closer to safety-net providers, or the government may place safety-net providers in areas where health needs are greatest. By capturing health status as completely as possible, we diminish the chances of misattributing a relationship between health and safety-net provider proximity to that between safety-net proximity and utilization.

Additional zip code–level covariates that were based on the 2000 US Census and described each child's zip code of residence included population density, percentage of the population below the poverty line, percentage of the population with at least a high school degree, and percentage of the population who were part of a racial minority. Last, we included indicators for calendar year as covariates as well.

We estimated separate models for children who lived in metropolitan ("urban") areas and nonmetropolitan ("rural") areas. The rural model included a more limited set of covariates because we were unable to measure safety-net capacity, HMO penetration, or percentage of the population who were uninsured for rural areas.

We analyzed the number of office-based physician and nonphysician visits and ED visits using a negative binomial regression model, which is the appropriate model for dependent variables that take on small, nonnegative integer values (ie, 0, 1, 2, 3, …).[18,19] We used a logistic regression model for the variable indicating whether the child incurred any medical expenditures or charges. For total medical expenditures, we used the 2-part model of medical care utilization.[20] We used logistic regression for the first part of the model, which modeled whether the child had any medical expenditures. We used either a generalized linear model with a logarithmic link function or ordinary least-squares regression for the logarithm of expenditures for the second

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part of the model, which modeled the amount of expenditures among those with any expenditures.[21–23] All regressions were weighted and adjusted for the complex design of the MEPS survey using Stata (Stata Corp, College Station, TX).[24] We chose $P \leq .05$ as the criterion for statistical significance.

For 2-part models, such as for total expenditures, there is no way to combine the coefficients from the 2 parts to estimate the net effect of a given independent variable on the dependent variable. Simulations provide a way to observe the combined effect. In addition, simulations for the negative binomial and logistic regression models provide a way to anchor the results to actual utilization levels. We simulated values for each type of utilization using standardized predictions, which provide predicted values of a dependent variable for selected values of an explanatory variable of interest, adjusting for all other explanatory variables in the model. We performed separate simulations for the 25th and 75th percentile values of the distribution (rural or urban specific) of each of the key explanatory variables describing the safety net or health care market structure. For the ordinary least-squares regressions for the logarithm of expenditures, expenditure predictions were calculated using a heteroscedastic smearing retransformation.[25,26] We tested the statistical significance of differences between predicted values from the 2-part model using the delta method.[27] For the negative binomial and logistic regressions, the significance of differences among predictions for a given independent variable is determined by the significance of the coefficient on that variable in the regression.

RESULTS

Descriptive Data

Uninsured children who lived in rural and urban areas averaged <1 office-based physician visit per year (0.79 among the rural uninsured and 0.89 among the urban uninsured), and 60% of children had no physician visit at all (Table 1). Similarly, uninsured children averaged <1 office-based nonphysician visit (0.25 for rural and 0.21 for urban children). Eight percent of rural and 10% of urban uninsured children visited the ED at least once annually. Total medical expenditures averaged $172 among uninsured children in rural areas and $167 among children in urban areas. Notably, 46% of rural and 48% of urban of uninsured children had no medical expenditures or charges during a year. Appendix 1 provides additional descriptive statistics by age.

Table 2 presents descriptive data for the key variables describing the local safety net or health care market structure. The table reports the mean value of each variable as well as the 25th and 75th percentile values, which were used in the simulations. Among uninsured children who lived in rural areas, the average distance to the nearest federally funded community health center, public housing primary care program, or migrant health center was 31.5 miles, compared with an average of 14.7 miles for uninsured children in urban areas. Likewise, the average distances to the nearest ED and public hospital were longer for rural children (7.4 and 22.0 miles, respectively) than for urban children (3.9 and 17.4 miles, respectively). PCP supply was more limited for rural uninsured children, with an average of 0.35 PCPs per thousand people compared with 0.44 for children in urban areas.

Thirty-six percent of rural and 57% of urban uninsured children were minorities, one fourth of uninsured children were poor, ~37% of uninsured children lived with only 1 parent or neither of their parents (eg, in a household with their grandparents), and 26% of rural and 33% of urban uninsured children had mothers with less than a high school education (Table 3). In addition, 53% of rural and 47% of urban children had excellent self-rated or parent-rated health, and 55% of rural and 50% of urban children had excellent self-rated mental health. Functional and social limitations and chronic conditions were rare, but more than half of children had behavioral problems.

TABLE 1 **Utilization Among Full-Year Uninsured Children According to Location**

Type of Utilization	Rural Mean	Urban Mean
No. of office-based physician visits	0.79	0.89
Percentage with any office-based physician visit	40	40
No. of office-based physician visits given >0	1.98	2.22
No. of office-based nonphysician visits	0.25	0.21
Percentage with any office-based nonphysician visits	10	8
No. of office-based nonphysician visits given >0	2.32	2.52
No. of ED visits	0.15	0.10
Percentage with any ED visit	10	8
No. of ED visits given>0	1.36	1.24
Percentage with any medical expenditures or charges	54	52
Total medical expenditures, $	172	167
Percentage with any medical expenditures	52	49
Amount of expenditures given >0, $	319	318

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TABLE 2 **Key Independent Variables: Descriptive Statistics**

Variable	Rural			Urban		
	25th	Mean	75th	25th	Mean	75th
Miles to nearest BPHC provider	14.40	31.54	48.70	2.87	14.73	18.06
Miles to nearest ED	1.37	7.44	12.26	1.51	3.90	4.70
Miles to nearest public hospital	6.44	22.05	29.96	5.36	17.38	22.98
No. of PCPs per 1000 people	0.23	0.35	0.41	0.35	0.44	0.53
Local government spending on health and hospitals per low-income family, $	—	—	—	3.64	7.89	9.22
Uninsured, %	—	—	—	15	20	25
HMO penetration, %	—	—	—	22	29	41

25th and 75th are percentile values of the distribution. These values were used in the simulations, as described in the text.

Regression Results

Rural Children

Table 4 summarizes predicted annual utilization among rural uninsured children for the 25th and 75th percentile values of each of the safety net and health care market variables. As shown, living closer to a BPHC provider (ie, a federally funded community health center, public housing primary care program, or migrant health center) was associated with more physician office visits and higher medical expenditures. For example, if all children lived 14.4 miles from the nearest BPHC provider (the 25th percentile value of distance), then the average total medical expenditure would be $211, which is 57% higher than the average expenditure of $135 if all children lived 48.7 miles from the nearest BPHC provider (the 75th percentile value of distance). Uninsured children who lived closer to an ED had fewer office-based physician visits than those who lived farther away. Finally, a higher supply of PCPs was associated with more physician office visits, a higher probability of incurring any medical expenditures or charges, and higher medical expenditures. For instance, if all rural children lived in counties with 0.41 PCPs per thousand people, then the average total medical expenditure would be $170, which is 16% higher than the average expenditures of $147 if all children lived in counties with 0.23 PCPs per thousand people.

Urban Children

Table 5 summarizes predicted annual utilization for uninsured children who lived in urban areas. The data show that there was no statistically significant association between the distances to the various safety-net providers and either utilization or medical expenditures. However, both the supply of PCPs and the level of local government spending for health and hospitals were positively associated with total medical expenditures. For example, if all urban children lived in counties with 0.53 PCPs per thousand people, then the average total medical expenditure would be $189, which is 16% higher than the average expenditure of $163 if all children lived in counties with 0.35 PCPs per thousand people. Likewise, average medical expenditures were higher in metropolitan areas with higher local government spending on health and hospitals, other things equal. A higher percentage of the population who were uninsured and higher HMO penetration were associated with fewer ED visits among urban uninsured children.

Sensitivity Analyses

To assess further the role of local availability of safety-net providers, we estimated additional regression models in which we replaced the distance to the nearest BPHC provider, nearest ED, and nearest public hospital with, respectively, the number of BPHC providers, EDs, and public hospitals within a specified radius from each uninsured child's residence (10 miles for rural children and 5 miles for urban children). The findings for rural children were consistent with the findings from the models that included distances. However, we also found that a greater number of BPHC providers within a 10-mile radius was associated with more nonphysician office visits. For urban uninsured children, a higher number of BPHC providers within 5 miles was associated with more nonphysician visits. Other findings were unchanged. In addition, we reran the regression for the urban uninsured excluding the health care market and safety-net variables that were available only for urban areas (and unavailable for rural areas). Our results were robust to this sensitivity analysis (see Appendix 2).

DISCUSSION

This study examined the use of health care among uninsured children, focusing in particular on the association between utilization and the local health care environment. Previous research has documented vast differences between the care received by insured and uninsured children, and our descriptive data highlight the low levels of utilization among the uninsured over a range of different health care provider types and settings. Three fifths of uninsured children had no office-based physician visits during a year, more than half had no care from a provider of any type (physician or nonphysician) in an office-based setting, and nearly half had no

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TABLE 3 **Other Independent Variables: Descriptive Statistics**

Characteristic	Rural Mean, %	Urban Mean, %
Age		
2–5 y	22	22
6–11 y	36	39
12–17 y	42	38
Gender		
Female	45	50
Male	55	50
Race/ethnicity		
Black	16	16
Hispanic	17	38
Other (nonwhite)	3	3
White (non-Hispanic)	64	43
Family income		
Less than poverty	25	25
1–2× poverty	38	36
2–4× poverty	29	26
>4× poverty	8	12
Family structure		
No mother in household	12	8
Mother-only household	25	29
2-parent household	63	62
Mother's education		
Mother is not a high school graduate	26	33
Mother is a high school graduate	60	50
Mother is a college graduate	3	9
Perceived health		
Excellent	53	47
Very good	23	29
Good	21	21
Fair or poor	2	4
Perceived mental health		
Excellent	55	50
Very good	23	28
Good	20	20
Fair or poor	2	2
Functional limitations		
Any functional limitation	3	2
No functional limitation	97	98
Social limitations		
Any social limitation	5	5
No social limitation	95	95
Behavioral problem		
None/limited	42/31	43/32
Moderate	15	11
Severe	12	14
Medical conditions		
≥1 (of 13 specified)	2	3
None (of 13 specified)	98	97
Year		
1996	25	21
1997	22	22
1998	20	20
1999	13	18
2000	19	19

medical expenditures or charges in a year. By comparison, other research (using 1999 data) found that nearly three fourths of privately insured children and more than two thirds of publicly insured children had at least 1 office-based visit, and 88% of privately insured and 81% of publicly insured children had at least some medical expenditure.[28] Patterns of utilization were not vastly different between rural and urban uninsured children, which is consistent with previous descriptions of utilization among all children, regardless of insurance status.[28]

More important, however, we found that whether an uninsured child received any medical care and how much care the child received were not completely determined by individual factors such as the child's health status, age, race, family income, and family structure. Rather, the proximity and the availability of the safety net in the local area and its capacity to serve the uninsured played an important role in promoting access to care among uninsured children, and characteristics of the local health care market played a part as well.

The proximity and the availability of safety-net providers were especially influential in rural areas. Thus, we found that in rural areas, longer distances to safety-net providers, in particular, community health centers, public housing primary care programs, or migrant health centers, were associated with fewer physician visits and lower medical expenditures. This finding is consistent with the notion that the monetary costs and convenience (eg, time) associated with travel to the provider can strongly influence the utilization of medical care, especially among low-income families.[29] We also found that a greater supply of PCPs was associated with more physician visits and higher expenditures among rural uninsured children. Greater availability of doctors in the local area is likely to make obtaining care more convenient and possibly also make it easier to find a private physician who provides discounted care to the uninsured.

Our finding that a longer distance to the nearest ED was associated with a higher number of physician visits among rural uninsured children is likely to reflect the substitution of office-based care for hospital-based care in the ED when obtaining ED care is inconvenient. It is interesting that distance to the nearest ED was unassociated with the number of ED visits by rural children. However, the analysis of ED visits may have had low statistical power, because few children had any ED visits.

In urban areas, we found less evidence that the location of safety-net providers relative to uninsured children was an important determinant of utilization. It is likely that distance is a not as good of a proxy for costs and convenience in the case of the urban uninsured than the rural uninsured, given the influence of public transportation and road congestion on travel time in urban areas. However, we found that other factors (safety-net capacity, prevalence of managed care, supply of PCPs, and insurance coverage among the local population) were significantly related to utilization among urban uninsured children.

Specifically, we found that greater safety-net capacity, as measured by local government spending for health and hospitals, and higher PCP supply were asso-

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TABLE 4 **Health Care Utilization Among Uninsured Children in Rural Areas: Predicted Values for Simulated Scenarios**

Simulation Variable	Simulation Value (25th and 75th Percentile Values)	Physician Visits	Nonphysician Visits	ED Visits	Any Expenditures or Charges	Total Expenditures, $
Miles to nearest BPHC provider	14.4	0.85[a]	0.34	0.16	0.55	211[b]
	48.7	0.67[a]	0.26	0.13	0.51	135[b]
Miles to nearest ED	1.37	0.66[a]	0.25	0.16	0.50	153
	4.88	0.85[a]	0.30	0.13	0.55	191
Miles to nearest public hospital	6.44	0.83	0.22	0.17	0.53	184
	29.96	0.73	0.29	0.13	0.53	166
PCPs per 1000 people	0.23	0.72[a]	0.27	0.14	0.51[a]	147[b]
	0.41	0.78[a]	0.28	0.14	0.54[a]	170[b]

All regressions control for the independent variables listed in Table 3.
[a] $P < .05$ for difference between 25th and 75th percentile values.
[b] $P < .01$ for difference between 25th and 75th percentile values.

TABLE 5 **Health Care Utilization Among Uninsured Children in Urban Areas: Predicted Values for Simulated Scenarios**

Simulation Variable	Simulation Value	Physician Visits	Nonphysician Visits	ED Visits	Any Expenditures or Charges	Total Expenditures, $
Miles to nearest BPHC provider	2.87	0.94	0.21	0.10	0.53	171
	18.06	0.88	0.23	0.11	0.52	177
Miles to nearest ED	1.51	0.90	0.25	0.11	0.53	182
	4.70	0.89	0.22	0.10	0.53	176
Miles to nearest public hospital	5.36	0.90	0.25	0.11	0.52	180
	22.98	0.89	0.22	0.10	0.53	175
Number of PCPs per 1000 people	0.35	0.85	0.21	0.10	0.53	163[a]
	0.53	0.93	0.24	0.10	0.53	189[a]
Local government spending on health and hospitals per low-income family	3.64	0.92	0.23	0.11	0.52	166[b]
	9.22	0.88	0.23	0.10	0.54	180[b]
Percentage uninsured	0.15	0.87	0.24	0.13[a]	0.52	166
	0.25	0.91	0.21	0.08[a]	0.52	191
HMO penetration	0.22	0.90	0.22	0.12[b]	0.52	178
	0.41	0.87	0.23	0.09[b]	0.51	175

All regressions control for the independent variables listed in Table 3.
[a] $P < .01$ for difference between 25th and 75th percentile values.
[b] $P < .05$ for difference between 25th and 75th percentile values.

ciated with higher medical expenditures. The result for safety-net capacity corroborates published findings for physician visits[12] but also extends these findings to a national sample and to medical expenditures as a measure of use. In addition, the percentage of the local population that was uninsured was inversely associated with use of the ED among uninsured children in urban areas. This finding suggests that uninsured individuals who live in areas with many uninsured may compete for limited resources; in particular, ED crowding may be a severe problem in areas with many uninsured.[30–33]

Managed care presence was also associated with utilization of the ED by urban uninsured children, who had fewer ED visits in areas with higher HMO penetration. From one perspective, this finding seems counterintuitive. Managed care is thought to limit the ability of physicians to subsidize care for the uninsured by reducing the fees that they receive for insured patients in managed care plans. It would be reasonable to assume that uninsured children may be less able to find charity care from physicians in areas where managed care penetration is high and may in turn substitute ED care for office-based care.[32] Consistent with this hypothesis, our results suggested a negative association between HMO penetration and physician office visits, although this finding did not reach statistical significance. Conversely, high HMO penetration in an area may lead to reduced ED capacity, making it harder for all patients, including the uninsured, to be seen in the ED. In addition, physicians in areas where HMO penetration is high may focus on preventive care for both their insured and uninsured patients, decreasing the need for ED care.

A limitation of our study is that only children who were uninsured for a full year were included. Some children are uninsured for shorter periods of time or may cycle between being insured and uninsured.[34,35] Another limitation is that we did not have data on travel time and costs in urban areas or on factors that affect travel time and costs such as public transportation and road congestion. Having this information would have enabled us to test the role of costs and convenience among urban uninsured children directly, rather than rely on distance as a proxy measure. We also lacked data on potentially important features of safety-net providers

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such as hours of operation, ease of making appointments, and the like, although our measure of safety-net capacity may capture variation in these features to some degree. Finally, we had no information on whether health care services were medically appropriate or necessary. Because uninsured children represent an underserved population, however, we view more care, whether it is more office-based visits or higher medical expenditures, as a preferred outcome and as indicative of better access to care. Clearly, for a population that faces fewer access barriers, such as an insured population, the same interpretation may be unreasonable.

The strong likelihood that a substantial number of uninsured children will be with us for some time to come suggests that measures to ensure access to health care among children who lack health insurance must become an important focus for health care policy. The findings of this study suggest that appropriate policies should differ between rural and urban areas. In rural areas, potentially beneficial policies include increasing the density of safety-net providers as well as enhancing the supply of PCPs. Initiatives in urban areas should focus on increasing funding for the safety net, although measures to increase the supply of PCPs also have a role. Of course, none of these efforts can overcome the negative impact on access to care of being uninsured.

ACKNOWLEDGMENTS

This study was supported by AHRQ grant P01-HS10770.

We are grateful to Jessie Riposo for able and efficient assistance with the analyses; Elaine Quiter for management of the AHRQ-funded Center on Healthcare Markets and Vulnerable Populations; Sue Polich for expertise in working with the MEPS-HC data; Randy Hirscher and Jill Gurvey for building the file that described the health care market and safety-net structure; Susan Marquis for providing the measure of safety-net capacity; Kanika Kapur for programming assistance; and the AHRQ for willingness to clean and add individuals' zip codes to the MEPS restricted-use files. Special thanks go to Bill Carroll and Ray Kuntz.

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APPENDIX 1 Utilization Among Full-Year Uninsured Children by Age and Location

	Ages 2–5 y		Ages 6–11 y		Ages 12–17 y	
Type of Utilization	Rural Mean	Urban Mean	Rural Mean	Urban Mean	Rural Mean	Urban Mean
No. of office-based physician visits	1.19	1.04	0.66	0.87	0.70	0.83
Percentage with any office-based physician visit	0.47	0.52	0.35	0.36	0.42	0.38
No. of office-based physician visits given >0	2.52	2.00	1.90	2.44	1.69	2.18
No. of office-based nonphysician visits	0.09	0.11	0.39	0.33	0.17	0.16
Percentage with any office-based nonphysician visits	0.47	0.52	0.35	0.36	0.42	0.38
No. of office-based nonphysician visits given >0	1.19	1.54	3.29	3.43	1.58	1.94
No. of ED visits	0.19	0.13	0.13	0.09	0.14	0.10
Percentage with any ED visit	0.13	0.09	0.11	0.08	0.09	0.08
No. of ED visits given >0	1.43	1.47	1.18	1.11	1.58	1.23
Percentage with any medical expenditures or charges	0.65	0.64	0.49	0.48	0.53	0.50
Total medical expenditures	186.27	138.74	215.26	179.08	112.77	171.46
Percentage with any medical expenditures	0.63	0.60	0.47	0.45	0.52	0.48
Amount of expenditures given >0	294.47	230.84	461.31	402.03	218.23	355.36

APPENDIX 2 Urban Regressions With Only Rural Market Variables Compared With Urban Regressions With All Market Variables (Comparison of Safety Net and Health Care Market Variables)

	Rural Market Variables Only			All Market Variables		
	Coefficient	SE	Significance	Coefficient	SE	Significance
Physician visits						
Miles to nearest ED	−0.005	0.01	NS	−0.006	0.01	NS
Miles to nearest public hospital	−0.001	0.00	NS	−0.001	0.00	NS
Miles to nearest BPHC provider	−0.003	0.00	NS	−0.004	0.00	NS
PCPs per 1000	0.489	0.35	NS	0.517	0.35	NS
Nonphysician visits						
Miles to nearest ED	−0.034	0.03	NS	−0.033	0.03	NS
Miles to nearest public hospital	−0.004	0.01	NS	−0.006	0.01	NS
Miles to nearest BPHC provider	0.006	0.00	NS	0.007	0.01	NS
PCPs per 1000	0.738	0.65	NS	0.665	0.66	NS
ED visits						
Miles to nearest ED	−0.004	0.02	NS	−0.009	0.03	NS
Miles to nearest public hospital	0.003	0.01	NS	−0.002	0.01	NS
Miles to nearest BPHC provider	0.003	0.00	NS	0.003	0.00	NS
PCPs per 1000	0.045	0.68	NS	−0.036	0.67	NS
Any expenditures						
Miles to nearest ED	0.990	0.02	NS	0.989	0.02	NS
Miles to nearest public hospital	1.000	0.00	NS	1.001	0.00	NS
Miles to nearest BPHC provider	0.999	0.00	NS	0.998	0.00	NS
PCPs per 1000	1.717	0.65	NS	1.895	0.72	NS
Log expenditures, given >0						
Miles to nearest ED	−0.007	0.02	NS	−0.007	0.02	NS
Miles to nearest public hospital	−0.005	0.00	NS	−0.002	0.00	NS
Miles to nearest BPHC provider	0.003	0.00	NS	0.003	0.00	NS
PCPs per 1000	0.517	0.37	NS	0.576	0.38	NS

NS indicates not significant at the 5% or 1% level.

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Pediatrics 2006;117;e509
DOI: 10.1542/peds.2005-0733

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