State Variation in Underinsurance Among Children With Special Health Care Needs in the United States

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WHAT'S KNOWN ON THIS SUBJECT: Many studies have documented the extent to which CSHCN lack insurance. Less attention has been devoted to examining underinsurance for this population and no studies have examined state variability in underinsurance.

WHAT THIS STUDY ADDS: We demonstrate that underinsurance affects far more CSHCN than does lack of insurance. Our results indicate that where a child lives is strongly related to the likelihood that his or her health insurance is adequate.

abstract

OBJECTIVE: National attention has focused on providing health insurance coverage for children. Less awareness has been given to underinsurance, particularly for children with special health care needs (CSHCN). Defined as having inadequate benefits, underinsurance may be a particular problem for CSHCN because of their greater needs for medical care.

METHODS: We used the 2005–2006 National Survey of Children With Special Health Care Needs, a nationally representative study of >40 000 CSHCN, to address state variations in underinsurance. CSHCN with health insurance were considered underinsured when a parent reported that the child's insurance did not usually or always cover needed services and providers or reasonably cover costs. We calculated the unadjusted prevalence of underinsurance for each state. Using logistic regression, we estimated state-specific odds and prevalence for underinsurance after adjusting for poverty level, race/ethnicity, gender, family structure, language use, insurance type, and severity of child's health condition. We also conducted multilevel analyses incorporating state-level contextual data on Medicaid and the State Children's Health Insurance Program.

RESULTS: Bivariate and multivariate analyses indicated that CSHCN's state of residence had a strong association with insurance adequacy. State-level unadjusted underinsurance rates ranged from 24% (Hawaii) to 38% (Illinois). After multivariate adjustments, the range was largely unchanged: 23% (Hawaii) to 38% (New Jersey). Multilevel analyses indicated that Medicaid income eligibility levels were inversely associated with the odds of being underinsured.

CONCLUSIONS: The individual-level and macro-level factors examined only partly explain state variations in underinsurance. Furthermore, the macro-level factors explained only a small portion of the variance; however, other macro-level factors may be relevant for the observed patterns. *Pediatrics* 2010;125:673–680

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Considerable recent national attention has focused on providing health insurance coverage for children. Much less attention has been given to underinsurance, particularly for children with special health care needs (CSHCN), defined as children who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or an amount beyond that required by children generally.[1] Underinsurance, or having insurance that does not sufficiently meet the child's needs, is a particularly critical issue for this population. Although ~14% of children in the United States have special health care needs,[2] this group accounts for 42% of the medical expenditures for children.[3] Moreover, underinsurance among CSHCN has been associated with increased risks for lacking a personal doctor or nurse, having unmet health needs, reporting difficulty in obtaining specialty referrals, and experiencing financial problems.[4]

An estimated one third of CSHCN nationally are underinsured.[5] The risk for being underinsured has been shown to be affected by a number of factors, including race/ethnicity, the child's age, poverty level, and the degree to which the child's activities are affected by the condition.[5] One important area that has not yet been explored is state variations in underinsurance.

There is reason to believe that there may be state-level variation in underinsurance. For example, studies that have examined geographic variations in uninsurance (the total lack of comprehensive insurance) have found wide variations for both children and adults.[6–8] According to the US Census Bureau's 2007 Current Population Survey, the prevalence of uninsured children ranged from 4.1% to 21.2% across states.[8] A similar-sized range across states in the prevalence of underinsured children would not be surprising.

An examination of state variations in underinsurance is important for several reasons. States are being called on to play a larger role in insuring their populations since the inception of the State Children's Health Insurance Program (SCHIP) and the continuing shift away from employer-based health insurance. Gaining additional understanding of the large state variations could lead to more effective interventions aimed at reducing disparities. The best performing states can serve as benchmarks for what might be achieved by others. The information for all states can help guide state health departments and policy makers in targeting resources and assessing the need for the development of effective strategies. In this study, we addressed the following the questions: Does the rate of underinsurance for CSHCN vary across states? Is the rate of underinsurance similar for those with public versus private insurance? Do state-level factors influence the level of underinsurance?

METHODS

With funding and direction from the Health Resources and Services Administration's Maternal and Child Health Bureau, the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) conducted the 2005–2006 National Survey of Children With Special Health Care Needs (NS-CSHCN). This random-digit-dial telephone survey used the State and Local Area Integrated Telephone Survey platform to assess the health care needs and experiences of CSHCN using approximately equal-sized samples of CSHCN from each state and the District of Columbia. From April 2005 to February 2007, all children who were younger than 18 years in 191 640 households were screened for special

health care needs. One child with special health care needs was randomly selected from households with CSHCN to be the target of the detailed interview. A parent or guardian who knew about the child's health and health care was the respondent. Interviews were conducted in English, Spanish, and 4 Asian languages. The overall weighted response rate (AAPOR RR4) was 61.2%; telephone numbers that rang with no answer or were busy on all attempts were assumed to be nonresidential. Additional details about the survey method are available elsewhere.[9] Informed consent was obtained by telephone. The NCHS Research Ethics Review Board approved all data collection procedures.

For purposes of the survey and this report, CSHCN were identified by using the CSHCN Screener.[10] On the basis of parents' answers to 5 stem questions and 2 follow-up questions, this screener classifies children as CSHCN when they have a medical, behavioral, or other health condition that has lasted or is expected to last ≥12 months and that has resulted in functional limitations, elevated needs for medical care or mental health or education services, or needs for specialized therapy or prescription medications. Analyses are based on screening results from 364 481 children aged 0 to 17, yielding 40 840 CSHCN.

For CSHCN with insurance coverage, the level of insurance adequacy was derived from a series of 3 questions: (1) Did the insurance offer benefits or cover services that meet the child's needs? (2) Were the costs that were not covered by insurance reasonable? (3) Did the insurance allow the child to see the health care providers that he or she needed? A summary measure of adequacy was constructed by combining these 3 variables. When a respondent answered "always" or "usually" to all 3 measures of adequacy, the child

was considered to have adequate insurance coverage. When a respondent answered "sometimes" or "never" to any of the 3 questions, the child was considered to have inadequate coverage. CSHCN who had inadequate coverage were considered to be underinsured.

The primary independent variable was state of residence. The sociodemographic variables that were used in the analyses were child's age (0–5, 6–11, or 12–17); child's race/ethnicity (Hispanic, non-Hispanic black, non-Hispanic white, or non-Hispanic multiple or other race); the family's income relative to the federal poverty level (FPL; <100% of the FPL for the calendar year preceding the interview, 100% to <200%, 200% to <400%, or ≥400%); gender; family structure (2-parent family with 2 biological or adoptive parents, 2-parent family with at least 1 step-parent, 1-parent family, or other); and primary language spoken in the home (English or not English). Functional limitation was measured by the frequency and degree to which the child's condition affected his or her ability to do the things done by other children of the same age. Type of health insurance was reported as private only, public only, both private and public, or other comprehensive (type unknown). Children who were uninsured at the time of the interview were excluded from this analysis. Whether the parents had to cut back or stop working because of the child's condition was also examined. Data on family income were missing for ~17% of CSHCN and were imputed by NCHS by using multiple-imputation methods.[11] Household education level was not included because of its high correlation with family poverty level. We also examined public insurance eligibility characteristics in each state and Washington, DC: 2006 maximum income eligibility levels for children who were aged 6 to 17 years of age for regular Medicaid and children's SCHIP-funded Medicaid expansions as a percentage of the FPL (100%; 133%, 140%, or 150%; 175% or 185%; and ≥200%) and 2006 maximum income eligibility levels for children's separate SCHIP programs as a percentage of the FPL (<200%, 200%, 220%–275%, ≥300%, and no separate SCHIP program). These contextual-level data were obtained from the Kaiser Family Foundation.[12]

Analysis

The data analysis was conducted in 4 parts. The first part of the results shows the unadjusted and adjusted estimates by state for underinsurance. The adjusted estimates, calculated according to the Peters-Belson method, are the mean predicted marginals derived by the PREDMARG option in the SUDAAN logistic regression procedure.[13,14] The estimates were adjusted for the demographic, functional ability, type of health insurance, and work situation variables noted already. The adjusted estimates are measures of what the underinsurance rates would be if all states had the same demographics and other measured characteristics. In the second part of the analysis, the unadjusted and adjusted estimates for underinsurance were calculated by state, stratified by whether children were publicly or privately insured. The third part of the analysis used 3 weighted logistic regression models to examine factors that were associated with underinsurance. The first model in Table 1 examines the association between state of residence and underinsurance, adjusting for all of the covariates, whereas the second and third models were stratified by whether children were publicly or privately insured. The results provide adjusted odds ratios for underinsurance by state of residence, overall and by type of insurance. The fourth part of the analysis incorporated the contextual-level state data on eligibility for Medicaid and SCHIP in each state and Washington, DC. We conducted a multilevel analysis that incorporated these variables into random intercept logistic regression models. The first 3 parts of these analyses were performed by using SUDAAN,[13] and the multilevel analysis was conducted by using Stata 10.1.[15] Both software packages account for the complex sample design of the NS-CSHCN.

RESULTS

Nationally, approximately one third of CSHCN were underinsured (Table 2). For the components of underinsurance, 12.7% of parents reported that the insurance did not offer benefits or cover services that meet the child's needs, 28.0% reported that the costs that were not covered by insurance were not reasonable, and 9.3% reported that the insurance did not allow the child to see the health care providers that he or she needed (data available on request). There was substantial state variation in underinsurance. The weighted but unadjusted state estimates for being underinsured ranged from 24% in Hawaii to almost 38% in Illinois. Generally, states in the Midwest had lower estimates of underinsurance, whereas a cluster of states in the Southwest had higher estimates. Adjusting for all of the covariates did not reduce the disparities in underinsurance between the lowest and highest states, although it did change the rank ordering in many cases. For example, the lowest rate of underinsurance was still in Hawaii (22.9%), whereas the highest adjusted estimate was in New Jersey (37.7%).

Table 3 indicates that, overall, families of CSHCN who had private-sector insurance were more likely to be underinsured (33.5% for private compared with 30.9% for public). Furthermore, the state variations were wider within

the publicly and privately insured categories compared with the overall variations. The weighted but unadjusted state estimates for being underinsured among CSHCN who received public insurance ranged from ~17% in Rhode Island to 45% in California. Although there did not seem to be any regional patterns as to higher than average underinsurance, many Midwestern states had lower than average levels of underinsurance for those who received public insurance. Similarly, among CSHCN who had private-sector insurance, underinsurance ranged from a low of 23% in Hawaii to a high of 42% in Wyoming. The predominant regional pattern was that all New England states had lower than average underinsurance among children who were covered by private insurance.

Multivariate analysis indicated that even after controlling for all covariates, where a child lived still had a strong association with whether he or she was underinsured (Table 1). The adjusted odds of being underinsured were >2 times as large for children in many states as for children in the reference state of Hawaii. Other groups that were more likely to be underinsured were CSHCN whose parents had to cut back or stop working as a result of the child's condition and CSHCN who were aged 6 to 17 years, living in households with higher levels of poverty, in non–English-speaking households, most affected by their conditions, or insured by any type other than exclusively public insurance. Stratification by type of insurance indicated greater state variation among those who were privately insured.

An initial multilevel model with no predictors indicated that ~13% of the variation in the odds of insurance adequacy may be attributable to differences among states, as estimated by using the latent variable approach described by Goldstein et al.[16,17] Adjusting

TABLE 1 Underinsurance by Type of Insurance Among Currently Insured CSHCN in the United States, 2005–2006

Parameter	All Currently Insured Children, aOR (95% CI)	Public Insurance, aOR (95% CI)	Private Insurance, aOR (95% CI)
State			
Alabama	1.60 (1.18–2.18)	1.31 (0.67–2.55)	1.72 (1.19–2.47)
Alaska	1.59 (1.19–2.12)	1.13 (0.58–2.22)	1.87 (1.31–2.67)
Arizona	1.89 (1.42–2.50)	1.15 (0.60–2.22)	2.57 (1.84–3.60)
Arkansas	1.74 (1.28–2.36)	1.17 (0.61–2.26)	2.53 (1.75–3.66)
California	1.95 (1.45–2.62)	2.80 (1.47–5.34)	1.90 (1.32–2.73)
Colorado	1.96 (1.47–2.62)	2.35 (1.18–4.70)	2.10 (1.50–2.95)
Connecticut	1.80 (1.35–2.40)	1.25 (0.62–2.56)	2.04 (1.47–2.83)
Delaware	1.75 (1.31–2.35)	1.40 (0.71–2.76)	2.22 (1.57–3.13)
District of Columbia	1.79 (1.30–2.48)	1.30 (0.67–2.52)	2.63 (1.79–3.87)
Florida	1.88 (1.40–2.53)	2.22 (1.19–4.15)	1.92 (1.33–2.77)
Georgia	1.78 (1.32–2.41)	1.34 (0.68–2.64)	2.36 (1.66–3.37)
Hawaii	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Idaho	1.91 (1.44–2.55)	1.49 (0.79–2.81)	2.16 (1.52–3.07)
Illinois	2.08 (1.55–2.79)	1.24 (0.63–2.45)	2.42 (1.70–3.43)
Indiana	1.70 (1.26–2.29)	0.98 (0.49–1.97)	2.27 (1.61–3.21)
Iowa	1.37 (1.03–1.83)	0.92 (0.45–1.86)	1.88 (1.34–2.64)
Kansas	1.60 (1.19–2.15)	0.93 (0.46–1.88)	2.07 (1.47–2.92)
Kentucky	1.73 (1.28–2.32)	1.12 (0.57–2.19)	2.59 (1.83–3.68)
Louisiana	1.38 (1.00–1.91)	1.07 (0.56–2.03)	1.66 (1.09–2.51)
Maine	1.17 (0.87–1.57)	0.89 (0.46–1.70)	1.34 (0.93–1.94)
Maryland	1.61 (1.19–2.18)	1.64 (0.80–3.37)	1.71 (1.20–2.42)
Massachusetts	1.71 (1.27–2.30)	1.90 (0.95–3.83)	1.82 (1.28–2.59)
Michigan	1.93 (1.45–2.56)	1.76 (0.94–3.32)	2.29 (1.63–3.23)
Minnesota	1.52 (1.13–2.03)	1.44 (0.66–3.15)	1.73 (1.23–2.44)
Mississippi	2.02 (1.50–2.72)	1.58 (0.86–2.90)	2.45 (1.69–3.55)
Missouri	1.60 (1.20–2.13)	1.67 (0.89–3.13)	1.85 (1.32–2.60)
Montana	1.71 (1.28–2.28)	1.16 (0.58–2.29)	2.33 (1.65–3.29)
Nebraska	1.55 (1.16–2.07)	1.34 (1.04–1.74)	2.03 (1.45–2.85)
Nevada	1.97 (1.47–2.63)	2.05 (1.56–2.69)	2.28 (1.61–3.21)
New Hampshire	1.32 (0.99–1.77)	0.88 (0.43–1.81)	1.63 (1.16–2.30)
New Jersey	2.10 (1.57–2.81)	2.04 (0.98–4.24)	2.35 (1.68–3.30)
New Mexico	1.85 (1.40–2.44)	1.48 (0.83–2.67)	2.16 (1.53–3.07)
New York	1.90 (1.42–2.54)	1.40 (0.75–2.63)	2.31 (1.63–3.27)
North Carolina	1.64 (1.23–2.18)	0.52 (0.26–1.03)	2.74 (1.95–3.85)
North Dakota	1.28 (0.96–1.71)	1.17 (0.58–2.34)	1.44 (1.02–2.03)
Ohio	1.66 (1.25–2.21)	1.13 (0.58–2.19)	2.17 (1.54–3.05)
Oklahoma	1.64 (1.23–2.18)	1.39 (0.76–2.57)	1.84 (1.30–2.61)
Oregon	1.47 (1.10–1.96)	1.17 (0.60–2.29)	1.76 (1.25–2.48)
Pennsylvania	1.54 (1.15–2.07)	1.35 (0.71–2.56)	1.83 (1.26–2.66)
Rhode Island	1.24 (0.93–1.66)	0.68 (0.34–1.35)	1.83 (1.30–2.58)
South Carolina	1.90 (1.43–2.54)	1.00 (0.53–1.88)	2.76 (1.93–3.93)
South Dakota	1.52 (1.14–2.02)	0.93 (0.47–1.81)	1.84 (1.30–2.59)
Tennessee	1.39 (1.03–1.87)	1.16 (0.59–2.27)	1.70 (1.19–2.41)
Texas	1.76 (1.31–2.36)	1.64 (0.87–3.12)	1.96 (1.38–2.77)
Utah	1.81 (1.36–2.39)	2.49 (1.23–5.05)	1.93 (1.39–2.68)
Vermont	1.38 (1.02–1.87)	0.94 (0.50–1.77)	1.72 (1.18–2.51)
Virginia	1.66 (1.24–2.22)	1.54 (0.75–3.15)	1.87 (1.34–2.62)
Washington	1.44 (1.07–1.92)	1.27 (0.66–2.44)	1.72 (1.21–2.43)
West Virginia	1.76 (1.31–2.37)	1.63 (0.87–3.06)	2.05 (1.42–2.95)
Wisconsin	1.88 (1.41–2.50)	1.44 (0.70–2.96)	2.44 (1.75–3.41)
Wyoming	2.01 (1.51–2.67)	1.22 (0.64–2.32)	2.85 (2.02–4.02)
Child's age, y			
0–5	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
6–11	1.20 (1.06–1.35)	1.36 (1.05–1.77)	1.12 (0.97–1.30)
12–17	1.13 (1.00–1.27)	1.56 (1.20–2.03)	1.01 (0.87–1.18)
Race/ethnicity			
Hispanic	1.10 (0.93–1.29)	1.31 (0.97–1.76)	1.04 (0.84–1.29)
Non-Hispanic black	0.99 (0.87–1.14)	1.36 (1.09–1.70)	0.85 (0.70–1.04)
Non-Hispanic white	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Non-Hispanic multiple or other race	1.06 (0.90–1.24)	1.19 (0.88–1.59)	1.18 (0.96–1.44)

TABLE 1 Continued

Parameter	All Currently Insured Children, aOR (95% CI)	Public Insurance, aOR (95% CI)	Private Insurance, aOR (95% CI)
FPL[a]			
<100%	1.76 (1.48–2.09)		2.03 (1.45–2.85)
100% to <200%	1.54 (1.35–1.76)		1.82 (1.55–2.13)
200% to <400%	1.35 (1.22–1.50)		1.36 (1.21–1.52)
≥400%	1.00 (Reference)		1.00 (Reference)
Gender			
Male	0.97 (0.90–1.05)	0.97 (0.82–1.15)	0.98 (0.89–1.08)
Female	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Family structure			
2-Parent, step	0.95 (0.82–1.09)	1.12 (0.84–1.48)	0.93 (0.79–1.09)
Single mother	1.05 (0.95–1.17)	1.02 (0.83–1.25)	1.10 (0.97–1.25)
Other	1.20 (1.00–1.43)	1.30 (0.93–1.81)	1.25 (0.99–1.58)
2-Parent, biological or adopted	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Primary language in household			
Non–English speaking	1.22 (0.93–1.61)	1.28 (0.88–1.88)	1.02 (0.66–1.58)
English speaking	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Impact of condition on activities			
Usually/always/great deal	1.60 (1.43–1.79)	1.54 (1.21–1.94)	1.69 (1.47–1.95)
Some/very little	1.46 (1.33–1.60)	1.39 (1.11–1.73)	1.49 (1.34–1.66)
Never	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Type of insurance coverage[b]			
Private only	1.77 (1.55–2.03)		
Both private and public	1.19 (1.01–1.40)		
Other comprehensive	3.01 (2.15–4.22)		
Public only	1.00 (Reference)		
Parents cut back or stopped working as a result of child's condition			
Yes	1.94 (1.76–2.14)	1.63 (1.36–1.95)	2.15 (1.89–2.43)
No	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)

Poverty level was not included as a covariate for the analyses by public insurance because of its strong correlation with the outcome. aOR indicates adjusted odds ratio; CI, confidence interval.

[a] Based on the US Department of Health and Human Services 2005 Poverty Guidelines.

[b] Type of insurance coverage was not included as a covariate for the analyses by public and private insurance.

for all of the child and family covariates except state of residence, only 3.8% of the remaining variance in the odds remained attributable to differences among states.

Table 4 presents the results of multilevel analyses considering whether 1 state-level factor—Medicaid income eligibility—could be contributing to disparities in underinsurance among CSHCN. CSHCN who resided in states where maximum Medicaid eligibility for children who were aged 6 to 19 was less than twice the FPL had at least 11% higher odds of being underinsured, compared with CSHCN in states with maximum Medicaid eligibility set at ≥200% of the FPL. Separate analyses by type of insurance revealed a similar pattern of results, yet the smaller sample sizes for these analyses and the small overall effect size resulted in group comparisons that were not statistically significant. We also considered SCHIP eligibility cutoffs, although they could not be included in the same multilevel model as Medicaid eligibility cutoffs because of strong collinearity. When included in a separate model, no significant relationships between SCHIP eligibility criteria and underinsurance were observed (data available on request).

DISCUSSION

Although there is perennial interest in the Census Bureau's periodic reports on the number of uninsured individuals in the United States, our analysis of the NS-CSHCN suggests that underinsurance affects far more children than does lack of insurance, at least among

TABLE 2 Observed and Adjusted Estimates of Underinsurance Among Currently Insured CSHCN in the United States, 2005–2006

State	Observed Estimates, % (SE)	Adjusted Estimates, % (SE)[a]
United States	33.1 (0.41)	
Alabama	30.5 (2.10)	31.8 (2.22)
Alaska	33.2 (2.06)	31.6 (2.10)
Arizona	35.3 (1.95)	35.4 (2.00)
Arkansas	30.8 (2.05)	33.5 (2.32)
California	35.5 (2.29)	36.1 (2.42)
Colorado	34.6 (2.02)	36.2 (2.14)
Connecticut	34.4 (1.99)	34.3 (2.06)
Delaware	32.2 (1.97)	33.8 (2.10)
District of Columbia	34.7 (2.16)	34.3 (2.55)
Florida	35.8 (2.14)	35.3 (2.23)
Georgia	32.6 (2.10)	34.1 (2.25)
Hawaii	24.3 (1.75)	22.9 (1.89)
Idaho	36.7 (2.02)	35.6 (2.07)
Illinois	37.8 (2.13)	37.5 (2.22)
Indiana	32.7 (2.13)	33.1 (2.17)
Iowa	28.2 (1.77)	28.7 (1.87)
Kansas	30.3 (1.93)	31.8 (2.09)
Kentucky	31.9 (2.04)	33.4 (2.13)
Louisiana	28.2 (2.27)	28.9 (2.37)
Maine	25.4 (1.75)	25.7 (1.81)
Maryland	30.8 (2.12)	32.0 (2.20)
Massachusetts	32.7 (2.04)	33.2 (2.17)
Michigan	35.7 (1.99)	35.8 (2.03)
Minnesota	30.0 (1.94)	30.7 (2.03)
Mississippi	34.7 (2.05)	36.9 (2.22)
Missouri	31.0 (1.84)	31.8 (1.90)
Montana	33.5 (2.00)	33.2 (2.07)
Nebraska	30.2 (1.89)	31.2 (1.99)
Nevada	37.0 (2.16)	36.2 (2.21)
New Hampshire	28.1 (1.80)	28.0 (1.85)
New Jersey	36.6 (2.15)	37.7 (2.21)
New Mexico	35.7 (1.89)	34.9 (2.00)
New York	34.7 (2.05)	35.5 (2.13)
North Carolina	30.8 (1.91)	32.3 (2.00)
North Dakota	26.1 (1.81)	27.3 (1.89)
Ohio	32.0 (1.93)	32.6 (1.99)
Oklahoma	31.5 (1.98)	32.4 (2.06)
Oregon	31.3 (1.89)	30.0 (1.93)
Pennsylvania	30.1 (1.99)	31.1 (2.07)
Rhode Island	26.8 (1.74)	26.8 (1.82)
South Carolina	33.0 (1.91)	35.5 (2.07)
South Dakota	29.7 (1.81)	30.8 (1.93)
Tennessee	28.3 (1.91)	29.0 (2.01)
Texas	33.7 (1.99)	33.8 (2.10)
Utah	34.1 (1.91)	34.4 (1.95)
Vermont	25.8 (1.83)	28.9 (2.05)
Virginia	31.7 (1.95)	32.6 (2.05)
Washington	29.3 (1.84)	29.6 (1.97)
West Virginia	31.7 (1.95)	33.9 (2.17)
Wisconsin	34.4 (1.97)	35.2 (2.07)
Wyoming	34.9 (1.96)	36.7 (2.06)

[a] Adjusted for child's age, race/ethnicity, poverty level, gender, family structure, primary language in household, type of insurance, whether a parent had to cut back or stop working because of the child's condition, and severity of condition.

TABLE 3 Observed and Adjusted Estimates of Underinsurance by Type of Insurance Among Currently Insured CSHCN in the United States, 2005–2006

State	Public Insurance			Private Insurance		
	Weighted, N	Observed Estimates, % (SE)	Adjusted Estimates, % (SE)[a]	Weighted, N	Observed Estimates, % (SE)	Adjusted Estimates, % (SE)[a]
United States	2 849 102	30.9 (0.82)		6 017 435	33.5 (0.50)	
Alabama	65 754	26.5 (3.83)	29.5 (4.33)	95 327	29.0 (2.46)	29.7 (2.54)
Alaska	5894	26.5 (4.10)	26.6 (4.45)	12 378	34.7 (2.61)	32.1 (2.56)
Arizona	55 232	26.7 (3.72)	26.9 (4.06)	119 142	39.8 (2.41)	38.5 (2.40)
Arkansas	51 992	24.5 (3.35)	27.1 (3.99)	49 861	36.6 (2.84)	37.5 (2.95)
California	245 978	45.0 (4.54)	47.3 (5.14)	597 393	31.8 (2.76)	31.5 (2.88)
Colorado	29 387	38.0 (5.20)	42.4 (5.82)	99 210	32.7 (2.25)	33.8 (2.32)
Connecticut	26 270	30.7 (4.89)	28.6 (5.06)	92 060	32.8 (2.10)	33.8 (2.14)
Delaware	7979	28.9 (4.03)	31.9 (4.76)	21 569	32.7 (2.32)	35.0 (2.46)
District of Columbia	7292	33.8 (3.72)	30.4 (4.18)	6016	37.6 (2.68)	39.7 (3.14)
Florida	183 758	39.1 (4.03)	42.0 (4.33)	294 438	34.1 (2.67)	33.0 (2.75)
Georgia	121 964	28.8 (3.92)	29.6 (4.49)	158 975	35.8 (2.53)	37.3 (2.63)
Hawaii	7163	25.7 (4.13)	25.1 (4.75)	24 852	22.9 (2.01)	20.5 (2.10)
Idaho	11 274	33.0 (3.94)	31.8 (4.11)	22 773	36.3 (2.56)	34.8 (2.60)
Illinois	95 686	29.6 (4.19)	27.8 (4.22)	297 212	38.4 (2.54)	37.1 (2.57)
Indiana	74 397	24.4 (4.05)	25.0 (4.38)	154 538	35.6 (2.52)	35.8 (2.54)
Iowa	20 743	17.7 (3.47)	22.4 (4.18)	59 257	31.6 (2.20)	31.3 (2.23)
Kansas	26 851	19.1 (3.67)	22.9 (4.21)	68 418	32.8 (2.27)	33.5 (2.39)
Kentucky	65 807	24.3 (3.59)	26.5 (4.21)	95 169	38.8 (2.61)	38.1 (2.61)
Louisiana	70 104	25.2 (3.38)	26.2 (3.71)	66 171	28.3 (3.07)	29.9 (3.29)
Maine	16 006	21.4 (3.18)	23.0 (3.54)	24 649	25.3 (2.30)	25.4 (2.34)
Maryland	49 378	33.9 (5.24)	34.7 (5.61)	150 187	28.4 (2.30)	30.5 (2.45)
Massachusetts	50 586	36.4 (4.84)	38.1 (5.34)	163 394	31.7 (2.34)	31.5 (2.50)
Michigan	101 407	35.3 (3.90)	37.0 (4.32)	226 459	35.2 (2.43)	35.8 (2.43)
Minnesota	27 304	29.0 (5.46)	31.5 (6.35)	130 254	29.1 (2.18)	30.0 (2.27)
Mississippi	53 610	32.8 (3.10)	33.4 (3.45)	41 287	36.1 (2.89)	37.4 (3.02)
Missouri	63 320	33.1 (3.82)	34.9 (4.13)	134 179	31.3 (2.21)	31.1 (2.22)
Montana	7449	26.2 (4.10)	27.5 (4.63)	14 305	36.4 (2.43)	35.4 (2.50)
Nebraska	14 132	24.3 (4.13)	23.1 (4.59)	42 751	31.5 (2.22)	32.6 (2.27)
Nevada	11 916	36.0 (4.76)	39.3 (5.35)	41 583	37.0 (2.53)	36.2 (2.51)
New Hampshire	9846	21.5 (3.75)	23.1 (4.43)	34 819	29.5 (2.14)	29.4 (2.19)
New Jersey	49 957	37.6 (5.86)	39.4 (6.01)	209 548	35.7 (2.39)	37.1 (2.45)
New Mexico	21 381	33.0 (3.15)	31.8 (3.46)	28 748	35.5 (2.51)	34.8 (2.62)
New York	173 390	31.1 (3.82)	31.2 (4.03)	333 855	35.9 (2.56)	36.6 (2.63)
North Carolina	113 921	17.1 (3.09)	15.0 (3.04)	179 950	37.8 (2.45)	39.6 (2.51)
North Dakota	3259	24.4 (4.34)	27.3 (4.94)	10 608	25.8 (2.05)	26.1 (2.07)
Ohio	120 851	26.0 (3.81)	27.1 (4.30)	270 321	34.9 (2.36)	34.4 (2.35)
Oklahoma	49 637	30.4 (3.49)	30.7 (3.79)	72 047	30.3 (2.52)	30.3 (2.49)
Oregon	29 398	26.2 (3.73)	28.4 (4.37)	69 376	31.7 (2.31)	30.5 (2.30)
Pennsylvania	134 213	29.0 (3.80)	30.5 (4.12)	224 335	30.0 (2.62)	31.0 (2.72)
Rhode Island	12 531	16.8 (3.10)	18.7 (3.54)	22 381	31.5 (2.26)	31.2 (2.32)
South Carolina	50 716	23.3 (3.09)	24.7 (3.53)	79 403	38.9 (2.58)	40.0 (2.73)
South Dakota	6344	21.3 (3.33)	22.9 (4.12)	13 617	31.0 (2.26)	31.0 (2.30)
Tennessee	69 633	25.0 (3.73)	27.5 (4.37)	133 174	29.7 (2.32)	29.4 (2.33)
Texas	223 677	35.8 (3.99)	35.0 (4.36)	469 080	32.1 (2.37)	33.2 (2.44)
Utah	11 140	35.3 (5.15)	42.9 (5.91)	61 967	33.1 (2.15)	31.6 (2.11)
Vermont	7198	19.3 (2.63)	23.5 (3.26)	9373	26.9 (2.53)	30.3 (2.78)
Virginia	63 843	31.3 (4.90)	33.4 (5.39)	196 137	31.9 (2.13)	32.1 (2.20)
Washington State	54 582	23.8 (3.47)	28.9 (4.14)	123 765	30.6 (2.36)	29.5 (2.35)
West Virginia	26 902	27.9 (3.22)	34.0 (3.97)	31 838	34.2 (2.68)	33.5 (2.76)
Wisconsin	42 940	28.4 (4.51)	32.1 (5.24)	130 208	36.5 (2.31)	37.2 (2.34)
Wyoming	5111	23.4 (3.24)	27.9 (3.88)	9078	42.1 (2.60)	40.7 (2.60)

[a] Adjusted for child's age, race/ethnicity, poverty level, gender, family structure, primary language in household, whether a parent had to cut back or stop working because of the child's condition, and severity of condition.

CSHCN. Data from the 2005–2006 survey indicate that only ~2% of CSHCN were uninsured at the time of the interview and another 7% had intermittent coverage during the course of the past year, but one third were underinsured as indicated by family reports of coverage that only sometimes or never covers the services or providers

TABLE 4 Association Between Medicaid Eligibility Level and Underinsurance Among Currently Insured CSHCN, 2005–2006

Maximum Income Level (Relative to the FPL) for Medicaid Eligibility for Children Aged 6 to 19 y	All Currently Insured CSHCN, aOR (95% CI)	CSHCN With Public Insurance, aOR (95% CI)	CSHCN With Private Insurance, aOR (95% CI)
100%	1.12 (1.02–1.23)	1.24 (0.95–1.62)	1.07 (0.93–1.23)
133%, 140%, or 150%	1.15 (1.03–1.27)	1.12 (0.93–1.36)	1.15 (0.99–1.32)
175% or 185%	1.11 (1.00–1.22)	1.12 (0.96–1.31)	1.08 (0.91–1.28)
≥200%	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)

All models adjusted for child's age, gender, race/ethnicity, family structure, primary language in the home, impact of the child's condition on activities, and whether the parents cut back or stopped working because of the child's condition. The models for all currently insured CSHCN and for privately insured CSHCN were adjusted for family poverty level. The model for all currently insured CSHCN was also adjusted for type of health insurance. aOR indicates adjusted odds ratio; CI, confidence interval.

needed by their child or a reasonable share of the costs of care. Although the proportion of CSHCN with no insurance has declined since the first NS-CSHCN was conducted in 2001,[2] the proportion who are underinsured remains essentially unchanged.[5] The high prevalence of underinsurance, combined with its adverse impact on access to care and family financial burden,[4] calls for additional study of its determinants. This study was designed to document variation in underinsurance rates for CSHCN across the states and to examine the factors that might account for that variation. To our knowledge, this is the first study to attempt such an analysis.

We found evidence of substantial variation across the states in underinsurance rates. Differences were even more pronounced when we analyzed children with private and public insurance separately. We hypothesized that a substantial portion of the state variation in underinsurance could be explained by differences in sociodemographic, health, and health care factors across states. Past studies have demonstrated that many of these factors or variables are statistically significant predictors of underinsurance,[4] and there is substantial variation in the prevalence of these variables across states.[18] Like previous studies, our analysis of the current data showed that underinsurance is more prevalent among vulnerable populations, including children with more significant functional limitations, those who live in poverty, and those in non–English-speaking households; however, our multivariate adjustment for these variables and others operating at the level of the child and family did not appreciably diminish state disparities in underinsurance.

A relatively small amount of the state variation in underinsurance can be explained by state-level covariates. Correlational statistics derived from our multilevel model indicate that no more than 13% of the variation in underinsurance across states can be accounted for by factors that operate at the state level. Our multilevel analyses added state discretionary policies related to the provision of public insurance to the child and family variables that were included in the individual-level model. We did find that Medicaid eligibility levels were associated with rates of underinsurance; however, the addition of this state-level variable explained only a very small amount of the total variation across states.

It is surprising that so little of the variation in underinsurance rates can be explained by child-, family-, and state-level factors. There are a number of possible explanations for the high degree of unexplained variation across states. First, some variables were not included in our models. We were able to include a fairly comprehensive set of child- and family-level demographic factors, but additional variables that describe the individualized health care needs of CSHCN may also predict underinsurance rates. Future research might investigate the contribution of additional state-level variables, such as provider payment levels and the range of covered services under public insurance, private employer insurance practices, and state mandates concerning services provided under private plans; however, as noted, only a small proportion of the variation in underinsurance across states can be accounted for by such factors. Second, systematic state variation in insurance practices may exist in the same way that geographic variation exists in frequency of medical procedures. Third, error in the measurement of underinsurance may contribute to the variance in underinsurance rates across states. Finally, there is likely to be a random component to state variation in underinsurance.

The strengths of our study include its large, nationally representative sample composed of independent representative state samples, its broad representation of CSHCN, and the inclusion of survey questions on adequacy of insurance; however, the study design is also subject to limitations. Because the insurance adequacy questions require the respondent to assess his or her child's global experiences in the health care system, recall bias is a possibility. In addition, children who were homeless or living in institutions as well as migrants were not interviewed and therefore not represented in the survey. Also, because the focus of this study was underinsurance, states that provide less comprehensive public coverage to more children will seem to be "lower performing" than states that provide more compre-

hensive public coverage to fewer children, because uninsured children were not considered "underinsured" and were excluded from the analyses.

Furthermore, there is no single agreed-on definition of "underinsurance." Alternative conceptions of underinsurance might yield different results from those presented here. The survey also lacked information on certain important covariates, such as parental health insurance status.[19] Finally, we could not compare parent report with actual evaluations of insurance policies. Readers should also keep in mind that questions about the adequacy of insurance were asked only for children who were reported to have coverage at the time of the interview. A more inclusive estimate of the proportion of CSHCN with insurance problems would also include those with no insurance coverage.

CONCLUSIONS

The presence of substantial state disparities in underinsurance among CSHCN is cause for concern. Our results indicate that where a child lives is strongly related to the likelihood that his or her health insurance is adequate. Moreover, only a small part of that association is explained by the underlying demographic and health characteristics of children. These findings suggest that current efforts to add coverage incrementally for the uninsured, although important, will do little to address the problems of the underinsured or the state disparities demonstrated here. If policy makers are interested in ensuring equitable treatment in the health care system for CSHCN, then policy initiatives aimed at reducing underinsurance and increasing uniformity of coverage across states are also needed. A recent report[18] showed that the sources of underinsurance vary by type of coverage, with inadequate coverage of needed services and providers being the primary source of underinsurance for publicly insured CSHCN and inadequate coverage of a reasonable amount of costs being the primary source of underinsurance for privately insured CSHCN. Hence, different approaches to addressing underinsurance in public and private plans may be needed.

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