Value for the Money Spent? Exploring the Relationship Between Expenditures, Insurance Adequacy, and Access to Care for Publicly Insured Children

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Abstract This study examines the relationship between total state Medicaid spending per child and measures of insurance adequacy and access to care for publicly insured children. Using the 2007 National Survey of Children's Health, seven measures of insurance adequacy and health care access were examined for publicly insured children (n = 19,715). Aggregate state-level measures were constructed, adjusting for differences in demographic, health status, and household characteristics. Per member per month (PMPM) state Medicaid spending on children ages 0–17 was calculated from capitated, fee-for-service, and administrative expenses. Adjusted measures were compared with PMPM state Medicaid spending in scatter plots, and multilevel logistic regression models tested how well state-level expenditures predicted individual adequacy and access measures. Medicaid spending PMPM was a significant predictor of both insurance adequacy and receipt of mental health services. An increase of $50 PMPM was associated with a 6–7 % increase in the likelihood that insurance would always cover needed services and allow access to providers ($p = 0.04$) and a 19 % increase in the likelihood of receiving mental health services ($p < 0.01$). For the remaining four measures, PMPM was a consistent (though not statistically significant) positive predictor. States with higher total spending per child appear to assure better access to care for Medicaid children. The policies or incentives used by the few states that get the greatest value—lower-than-median spending and higher-than-median adequacy and access—should be examined for potential best practices that other states could adapt to improve value for their Medicaid spending.

Keywords Medicaid · Health care expenditures · Health care access · Value

Introduction

Improving the health of low-income children has numerous long-term benefits, including increased educational attainment and productivity [1–5]. As one mechanism to promote improved health, states have made substantial investments in Medicaid, the primary public health insurance program for low-income children. In 2009 more than two-thirds of U.S. children in households below the federal poverty line (FPL) were enrolled in Medicaid [6].

Although combined federal and state Medicaid expenditures exceeded $360 billion in fiscal year (FY) 2009 [7], and program expenditures amounted to between 22 and 33 % of total state spending in 2010 [8], little is known about the relationship between states' spending for low-income children and their access to services and quality of care. While higher provider payment fees are assumed to improve access [9], previous research has not indicated a strong and consistent relationship [10–12]. Moreover, while physician visits are an important component of children's health care use, fee-for-service physician payments represent a shrinking proportion of total Medicaid spending on children, dropping from 7.2 % in 1998 to 5.4 % in 2007 due to rising enrollment in managed care

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plans that receive capitated payments for a broad set of benefits [13].[1] Indeed, state Medicaid agencies may view managed care as a strategy for improving access because it commits health plans to contractual access requirements and gives state agencies the ability to monitor compliance with the rules [14, 15].

Exploring the link between spending and outcomes will help federal and state policymakers understand how to obtain the best value when allocating scarce public funds that are further limited during economic downturns [16]. Congress endorsed this course of study in the 2009 Children's Health Insurance Program Reauthorization Act (CHIPRA), which established the Medicaid and CHIP Payment and Access Commission (MACPAC) and charged it with assessing the relationship between Medicaid and CHIP payment policies and access and quality outcomes for beneficiaries [17].

Given heightened interest in assessing the value of Medicaid spending, this paper explores whether those states that spend more per child also have better access outcomes. We compare data on insurance adequacy and access to care for publicly insured children (Medicaid and CHIP) from the 2007 National Survey of Children's Health (NSCH) with 2006 state-level Medicaid expenditure data. While there have been numerous efforts to compare geographic variation in costs and quality within the Medicare program [18–20] and new efforts to compare state spending for cash-assistance Medicaid beneficiaries with disabilities [21], we are not aware of prior work addressing this relationship for Medicaid-enrolled children.

Our approach represents two advances from previous studies that have compared public expenditures or health care access for Medicaid-enrolled children across states or regions [10, 22, 23]. First, we use data from the NSCH, which permits calculation of state-level insurance adequacy and access to care estimates for children in all 51 state programs, whether enrolled in managed care or fee-for-service models. By using individual-level NSCH data, these measures can be adjusted for demographic factors to improve comparability across states. Second, recognizing the large and growing role of managed care for publicly insured children—in 23 states more than 70 % of Medicaid children were enrolled in comprehensive managed care plans in 2006 [24]—we use a global spending measure that includes all capitated, fee-for-service, and administrative expenditures.[2] Doing so more accurately captures total state spending on behalf of enrollees.

Methods

To develop measures of insurance adequacy and access to care for publicly insured children, we identified 2007 NSCH children whose parents reported they were insured by Medicaid or CHIP. We are unable to differentiate between Medicaid and CHIP because respondents were asked about both coverage types in a single question. Excluding respondents with missing data on gender, health status, and/or primary household language (0.2 % of the initial sample) resulted in a final sample size of 19,715. By state, sample sizes ranged from 180 (Utah) to 634 (Louisiana).

State-level Medicaid expenditures were computed for two categories—services and administrative expenses—from the Centers for Medicare & Medicaid Services (CMS) data. For service expenditures, we used 2006 Medicaid Analytic eXtract (MAX) data, which are research-quality data sets containing Medicaid enrollment and claims information from the Medicaid Statistical Information System (MSIS). MAX files contain claims information by service date for each enrollee for the entire calendar year and reflect retroactive claims adjustments, eligibility, and other corrections [24]. For this study, 2006 MAX files were the most current available.[3] For each enrollee age 0-17, we summed all capitation and fee-for-service expenditures during the year and divided the sum by the total number of months the child was enrolled in Medicaid. For example, a child enrolled in Medicaid for 7 months in 2006 would contribute 7 months to the denominator of the measure.

For administrative expenses, we used the Quarterly Medicaid Statement of Expenditures for the Medical Assistance Program, also known as Form CMS-64, used by state Medicaid agencies to report actual program administrative expenses. Many expenses, such as the costs to maintain data management systems, are not attributable to individual beneficiaries. Accordingly, states report administrative expenses in aggregate across all eligibility and age groups. We divided administrative expenses by total member months reported in MAX for all enrollees (no age restrictions). For each state, we then added administrative (per member month) and service (per child member month) expenditures. We compared the result—per member per month (PMPM) total Medicaid expenditures for children—with access measures from the NSCH.

We computed seven regression-adjusted state-level measures of insurance adequacy and access to care: (1) insurance always allows access to needed providers (n = 19,604); (2) insurance always covers needed benefits (n = 19,532); (3) had personal health care provider

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[1] Beginning FY 1998, capitated premiums for Medicaid eligibles enrolled in managed care plans were included in the category "other," so the increase in "other" types of payment from 58.7 % in 1998 to 68.4 % in 2007 could include some services besides capitated payments.

[2] Comprehensive managed care enrollment is authors' calculation using data reported in [24]. See "Methods".

[3] We excluded Maine from the analysis, as only prescription drug expenditures were reported in 2006.

(n = 19,635); (4) received preventive medical visit in the prior year (n = 19,376); (5) received preventive dental visit in the prior year (n = 19,594); (6) received mental health care when needed (ages 2 and above, n = 2,673); and (7) no problems obtaining referrals when needed (n = 4,019).

Measures were computed using logistic regression to adjust for demographic, health status, and household differences that might affect experiences with accessing the health care system and perceptions of insurance adequacy [25–32]. These factors included age, sex, race/ethnicity, health status (child has special needs), mother's education, household income, language (non-English speakers), and number of children in household (only child). Table 1 indicates the categorical levels and reference groups implemented in regression models. There were three control variables with missing data: poverty status, mother's education, and race/ethnicity. For all three variables we addressed missingness by creating a separate category of "unknown value" for the characteristic. For example, household income below 100 % FPL was our reference level, and the regressions included dummy variables for FPL 100–149 %, FPL 150–199 %, FPL 200–299 %, FPL ≥ 300 %, and FPL unknown.

We examined evidence of associations between spending and each measure using descriptive and multivariate approaches. First, we compared adjusted state measures of adequacy and access to total child Medicaid PMPM spending in scatter plots. Then, to assess the statistical significance of potential relationships, we constructed multilevel logistic regression models, including state-level PMPM expenditures as a regressor predicting individual measures.

We also looked for "high-value" states that achieved above-median performance on adequacy and access measures at below-median spending. Median, rather than mean, reference values were used to limit the sensitivity of the analysis to outliers. We examined managed care enrollment levels from MAX 2006 validation tables [24] in identified high-value states to test the hypothesis that higher managed care enrollment may facilitate achieving better insurance adequacy and access to care with lower spending. For each state, the number of children enrolled in health management organizations (HMOs) or health insurance organizations (HIO) at any point in the year was divided by the total number of children. Both the numerator and denominator excluded children receiving less than full Medicaid benefits.

Results

Of the sample of publicly insured children in the NSCH, approximately 45 % were white, nearly two-thirds were age 0–10, one-third lived in households with income below

Table 1 Unweighted sample characteristics for publicly insured children, NSCH 2007 (n = 19,715)

Variable	Mean (%)	Lowest value across states (%)	Highest value across states (%)
Gender			
Male[a]	52	47	58
Female	48	42	53
Race/ethnicity			
Non-hispanic white[a]	45	2	88
Hispanic	22	3	72
Non-hispanic black	20	0	78
Non-hispanic other	11	4	69
Race/ethnicity unknown	2	0	4
Age			
0–4 years	31	23	38
5–10 years[a]	32	26	37
11–14 years	21	14	27
15–17 years	16	12	22
Poverty level			
Less than 100 FPL[a]	34	19	50
100-149 FPL	20	14	27
150-199 FPL	13	7	21
200-299 FPL	13	6	25
Greater than or equal to 300 FPL	10	5	18
Poverty level unknown	10	4	16
Mother's education			
8th grade or less[a]	18	8	38
9th to 12th grade	29	19	38
High school or above	39	28	55
Education level unknown	14	9	24
English not primary household language	14	0	50
Child has special health care needs	27	17	36
Only one child in household	38	22	46

[a] Indicates reference category in logistic regression models

the FPL, and nearly half were born to mothers without a high school diploma (Table 1). About one-quarter had special health care needs, and 38 % were the only child in their household. Sample characteristics varied widely by state, highlighting the need to adjust for demographic, health status, and household characteristics that affect the need for and use of health services when comparing measures across states. For example, in one state 17 % of publicly insured children in the NSCH sample had special health care needs, compared to 36 % in another state.

Median total Medicaid PMPM spending for children age 0–17 was $278; most states had spending between $200

and $350 PMPM (Table 2). Overall, the highest-spending state (Alaska, $556 PMPM) had expenditures nearly four times those of the lowest-spending state (Louisiana, $141 PMPM).

Considering unadjusted insurance adequacy and access to care measures, at the national median, 91 % of publicly insured children had a personal health care provider and a preventive medical visit in the prior year (Table 2). More than three-fourths had a preventive dental visit and had no problems obtaining referrals when needed. Roughly 80 % responded that their insurance always covered needed services and allowed access to needed providers. Just over 60 % of children received mental health care when needed.

Adjusted measures are useful for examining the remaining variation across states after accounting for differences in demographics, health status, and household characteristics. Generally, the range in adjusted measures was similar to that observed for the unadjusted measures (Table 2). Variation across states in the adjusted measures ranged from 12 percentage points (has a personal health care provider, 85–97 %) to 57 percentage points (receipt of mental health services when needed, 17–74 %).

Scatter plots arraying state-level adjusted measures with PMPM spending suggested a positive relationship between spending and insurance adequacy measures, as well as with receipt of mental health care and with obtaining referrals (Fig. 1). There does not appear to be a relationship between spending and access to medical or dental care or to having a personal health care provider.

Results from multi-level regression models were consistent with results from the scatter plot analysis. PMPM was a significant predictor of both measures of insurance adequacy as well as receipt of mental health services (Table 3). An increase of $50 PMPM (or roughly, moving from the median to the 75th percentile) was associated with a 6 % increase in the likelihood that insurance would always cover needed services ($p = 0.04$), a 7 % increase that insurance would always allow access to needed providers ($p = 0.04$), and a 19 % increase in receiving mental health care services when needed ($p < 0.01$). For the remaining four access measures, PMPM was a consistent positive predictor and achieved marginal statistical significance ($0.05 < p < 0.10$) in two cases: having a personal health care provider and having no problems obtaining needed referrals.

Few states consistently achieved "high value," defined as a level of insurance adequacy or access above the adjusted national median with lower-than-median PMPM spending. One state—Hawaii—had lower-than-median spending and higher-than-median outcomes for six of the seven measures. An additional five states—Alabama, Georgia, Indiana, South Carolina, and Tennessee—had lower-than-median spending and higher-than-median outcomes for five of the seven measures.

Across all states, the share of Medicaid-enrolled children receiving care through capitated managed care plans in 2006 varied enormously, from 0 to 98 %, with a national median of 55 %. Considering the six potential "high-value" states identified above, there are no clear patterns regarding managed care enrollment. Children's enrollment in comprehensive managed care was especially high in Hawaii and Indiana in 2006—98 and 91 % respectively—and enrollment was above the national median in Georgia (76 %). However, Alabama had no comprehensive managed care enrollment and South Carolina had 20 % enrollment in 2006. While MAX data indicate that Tennessee had no comprehensive managed care enrollment in 2006, this represents an atypical period. The state long operated capitated managed care arrangements, but briefly relied on administrative-service-only relationships with managed care organizations from 2003 to 2006 [33]. It began returning to risk-based contracts in 2007, and by 2009, more than 94 % of Tennessee's Medicaid enrollees were in comprehensive managed care plans [34].

Discussion

States with higher total Medicaid expenditures per child per month appear to perform better on measures of insurance adequacy and access to care for publicly insured children. PMPM spending was a positive predictor of adequacy and access for all seven measures examined and a significant or marginally significant predictor for five measures. Expenditures had the greatest effect on access to mental health; an increase of $50 PMPM increased the likelihood of receiving needed services by 19 %. Though our expenditure measure reflects all fee-for-service, managed care capitation payments, and administrative fees, these results are consistent with previously reported work linking higher provider reimbursement rates to improved access to care [10–12].

While these findings should be heartening to state policymakers seeking to ensure that public funds are well spent, a few states do appear to obtain higher value than others. In six states (Alabama, Georgia, Hawaii, Indiana, South Carolina, and Tennessee), spending was lower than the national median but adjusted insurance adequacy and access to care performance was consistently higher than the median. It is unclear whether these states are anomalous exceptions or if their performance is the result of concerted efforts to assure low-income children access to services while minimizing Medicaid spending.

Nevertheless, the factors responsible for outcomes in these states warrant further study to determine if they offer lessons for other state Medicaid and CHIP programs on ways to improve the value of the money spent. One

Table 2 State Medicaid PMPM cost (2006) and NSCH insurance adequacy and access to care outcomes (2007) for publicly insured children

	PMPM spending	Insurance always covers needed services		Insurance always allows access to needed providers		Has a personal healthcare provider		Preventive medical visit in past year		Preventive dental visit in past year		Received mental health care if needed		No problems obtaining referral, if needed	
		Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)
Alaska	556	74	76	78	80	84	85	87	90	75	78	72	47	77	79
Alabama	226	75	76	83	83	92	94	91	92	76	76	68	49	74	75
Arkansas	253	72	74	82	82	92	92	88	89	75	74	53	34	78	78
Arizona	262	72	72	81	81	88	91	88	89	72	73	74	54	71	72
California	203	73	72	75	75	90	93	92	94	75	71	38	27	61	68
Colorado	248	77	77	80	79	86	88	91	92	69	74	58	39	59	56
Connecticut	282	76	77	76	77	93	94	95	96	78	73	85	74	68	73
D.C.	399	76	76	84	83	90	93	98	98	84	80	61	46	60	66
Delaware	358	84	85	88	88	93	94	93	93	68	63	84	68	76	77
Florida	236	74	74	83	82	91	92	93	93	64	57	47	28	81	83
Georgia	244	81	81	88	88	90	92	95	95	85	83	40	25	87	89
Hawaii	229	77	79	80	83	92	93	90	92	86	88	55	30	81	84
Iowa	287	75	76	83	84	95	94	89	90	86	87	70	51	70	68
Idaho	278	74	74	77	77	88	88	88	89	73	75	68	46	82	81
Illinois	177	74	75	79	80	88	90	90	92	74	73	41	25	78	80
Indiana	231	78	79	78	79	94	95	89	90	77	79	78	62	81	80
Kansas	323	79	80	84	84	90	91	94	95	79	77	81	61	87	86
Kentucky	300	82	83	82	82	95	95	93	94	79	81	57	38	80	79
Louisiana	141	78	79	83	83	89	91	93	94	73	71	56	39	67	69
Massachusetts	432	86	87	90	90	92	93	92	93	75	68	67	46	86	88
Maryland	315	76	77	78	78	91	93	95	95	67	66	73	57	81	83
Maine		76	78	83	84	93	92	94	95	77	77	71	47	76	75
Michigan	176	71	72	83	83	91	91	91	92	76	75	56	38	85	84
Minnesota	395	77	76	79	79	89	89	89	89	66	70	66	43	89	86
Missouri	235	72	73	80	80	92	92	88	90	69	67	86	72	74	74
Mississippi	220	74	75	80	79	87	90	87	87	75	76	41	26	72	74
Montana	368	70	71	76	77	89	89	85	87	72	75	63	41	82	79
North Carolina	310	79	80	84	84	94	95	91	91	80	80	63	39	81	84
North Dakota	310	72	73	83	85	91	91	82	84	73	76	73	48	78	76
Nebraska	313	84	84	89	89	91	92	93	94	75	77	68	39	96	96
New Hampshire	347	76	78	80	81	97	97	94	95	80	75	60	37	90	89

Table 2 continued

	PMPM spending	Insurance always covers needed services		Insurance always allows access to needed providers		Has a personal healthcare provider		Preventive medical visit in past year		Preventive dental visit in past year		Received mental health care if needed		No problems obtaining referral, if needed	
		Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)	Unadj. (%)	Adj. (%)
New Jersey	293	75	75	81	82	90	93	93	94	73	68	57	41	79	84
New Mexico	283	72	73	77	78	87	90	90	92	76	74	57	35	67	73
Nevada	281	71	70	74	73	85	88	88	90	68	61	34	17	52	53
New York	328	74	74	81	82	94	95	96	96	78	78	59	35	78	80
Ohio	213	82	83	85	85	91	92	93	94	76	74	58	39	91	90
Oklahoma	244	74	75	76	77	87	88	89	91	80	81	54	30	68	69
Oregon	295	66	65	72	71	91	92	85	87	75	77	40	19	70	72
Pennsylvania	377	76	78	80	81	94	94	96	96	77	73	81	67	85	84
Rhode Island	396	83	84	87	88	93	94	96	97	82	77	82	66	73	72
South Carolina	214	78	79	84	84	89	91	93	93	83	81	59	38	90	90
South Dakota	267	72	74	81	83	90	91	87	90	81	82	56	30	88	87
Tennessee	218	76	77	76	76	88	89	92	93	77	77	69	53	79	80
Texas	250	79	78	82	81	90	92	90	91	82	83	60	43	66	63
Utah	258	74	74	81	81	93	94	86	88	84	86	60	42	84	82
Virginia	255	84	84	81	81	95	95	87	87	75	77	70	50	65	66
Vermont	359	80	81	87	88	95	94	94	95	83	84	69	53	89	88
Washington	233	72	72	75	75	94	94	84	86	83	82	48	25	57	55
Wisconsin	195	70	71	74	75	88	89	88	90	71	71	65	46	75	76
West Virginia	278	78	79	83	83	94	94	96	97	77	80	78	60	86	84
Wyoming	313	76	77	83	85	90	89	90	91	78	75	76	55	75	75
Maximum	556	86	87	90	90	97	97	98	98	86	88	86	74	96	96
75th Percentile	315	78	79	83	84	93	94	93	94	80	80	72	52	84	84
Median	278	76	76	81	82	91	92	91	92	76	76	63	42	78	79
25th Percentile	234	74	74	78	79	89	90	88	90	73	73	56	35	70	72
Minimum	141	66	65	72	71	84	85	82	84	64	57	34	17	52	53

Adjusted measures were computed using logistic regression to control for age, sex, race/ethnicity, health status (child has special needs), mother's education, household income, language (non-English speakers), and number of children in household (only child)
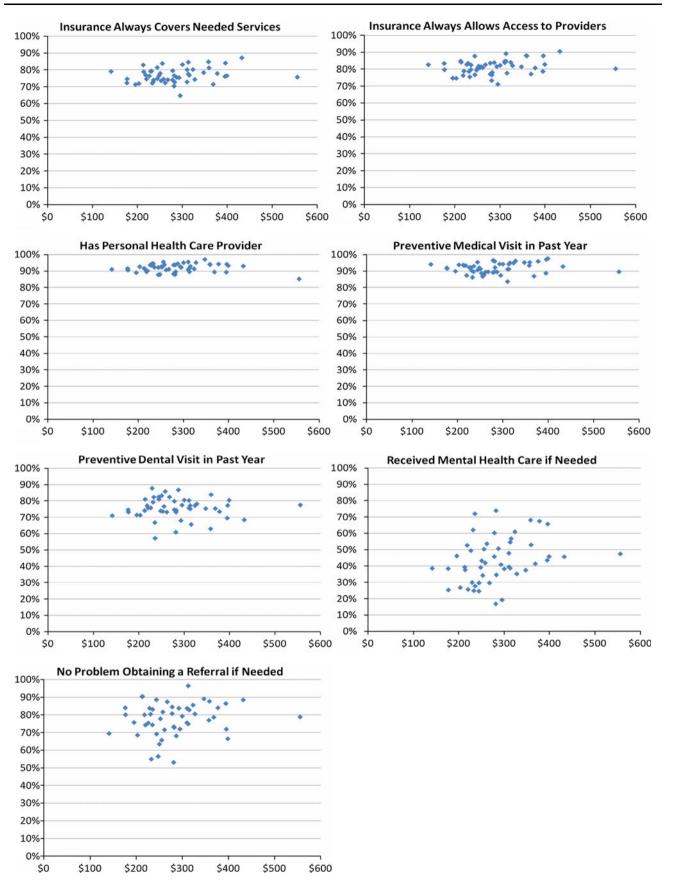
Fig. 1 Adjusted state-level quality measures (NSCH 2007) and PMPM expenditures (2006)

Table 3 Estimated odds of positive access outcome in states with PMPM spending $50 higher than median

	Odds ratio	P-value
Insurance adequacy		
Insurance always covers needed benefits	1.060	0.042
Insurance always allows access to providers	1.067	0.041
Access to care		
Has personal health care provider	1.081	0.067
Preventive medical visit in prior year	1.058	0.155
Preventive dental visit in prior year	1.025	0.414
Obtained mental health services, if needed	1.189	0.006
No problems receiving referrals, if needed	1.116	0.059

hypothesis that we explored was that high-value states enrolled greater proportions of children in comprehensive managed care plans, as these delivery models may give states greater ability to hold plans accountable for their performance [14, 15]. We found that two states with consistently high-value results—Hawaii and Indiana—had unusually high enrollment in capitated managed care. Interviews with program managers in these states conducted for another study [35] indicated that managed care was a key strategy for achieving value in the Medicaid program. In Indiana's case, the state has long required plans to collect and, since 2005, publicly report quality measures. In 2006, Indiana incorporated pay-for-performance incentives in its contracts. In Hawaii, the state has enrolled children in capitated managed care since the mid 1990s; contracted plans also serve the privately insured and have earned some of the highest quality scores nationwide.

While these findings suggest the promise of Medicaid managed care, such a delivery approach does not appear to be required for achieving high value. South Carolina, another of the "high-value" states identified in this study, enrolled only about 20 % of all children in capitated managed care in 2006. The state has earned high marks for policies that increase access to dental care for low-income children, and may use similar strategies to assure access to other types of care [36].

There are several limitations that should be considered in interpreting these results. First, all data from the NSCH are parent-reported. Second, although state-level data presented in this study are the most complete available, measures for insurance adequacy and access to care (Medicaid and CHIP) and expenditures (Medicaid alone) reflect slightly different populations. Nevertheless, comparing these two measures to explore the relationship between spending and access for publicly insured children is still likely to yield meaningful results. While the NSCH sample includes both Medicaid and CHIP enrollees, sample members predominantly represent Medicaid enrollees,

though the balance of Medicaid versus CHIP respondents likely varied across states. Nationwide, Medicaid enrollees accounted for approximately 83 % of publicly insured children in 2007; in no state were fewer than 70 % of publicly insured children enrolled in Medicaid at some time during the year (authors' calculation based on data in [37, 38]). Considering expenditures, MAX data do not contain information on payments for CHIP enrollees, and no data sets of comparable quality on CHIP expenditures are available. However, our Medicaid-only PMPM cost measure is likely to be similar to a combined Medicaid and CHIP PMPM measure, because the greater proportion of enrollees are in Medicaid and in FY 2006, 32 states operated Medicaid-expansion or combination Medicaid/CHIP programs, which use the same administrative and service contracting approaches for both populations [39].

Though this study expands the body of evidence on the positive relationship between public spending and insurance adequacy and access to care outcomes for children, available data to address this question are limited. The NSCH provided many useful indicators of children's health care access but lacks other measures that would be useful in assessing the value of Medicaid spending. For example, how are providers delivering care to chronically ill children? How often are acutely ill children treated appropriately for common conditions like ear infections? Are mental health care services—both screening and treatment—well coordinated with medical care?

Provisions in the CHIPRA will help to expand the number of available measures and improve comparability across states by developing a core set of quality and access measures for Medicaid and CHIP enrollees. Twenty-four measures covering areas such as prenatal care, immunizations, well child visits, emergency room use, and appropriate acute care treatment were included in the initial set for voluntary reporting. CMS is investing significant resources in helping states measure and report on quality in the CHIP and Medicaid programs, viewing this measurement effort as the first step in improving the quality of care for publicly insured children [40]. Future research comparing the value of spending to a broader set of quality indicators for children's health care by source of insurance coverage will benefit from these efforts.

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