

Geographic Variation of Asthma Quality Measures Within and Between Health Plans

Kevin J. Dombkowski, DrPH; Michael D. Cabana, MD, MPH;
Lisa M. Cohn, MS; Achamyeleh Gebremariam, MS; and Sarah J. Clark, MPH

Objective: To contrast health plan performance in treating pediatric asthma within and between different geographic regions.

Study Design: Retrospective analysis of administrative claims data for 18 health plans serving Medicaid enrollees.

Methods: The study population was 3970 children 5-18 years old with persistent asthma who were continuously enrolled in the same Michigan Medicaid health plan for 2002 and 2003, with no other source of health insurance. Outcome measures were assessed based on national guidelines for asthma management: at least 1 asthma controller medication prescription, at least 1 outpatient visit, 1 or more asthma emergency department visits, and an annual influenza vaccination.

Results: Adherence to national guidelines varied significantly ($P \leq .05$) between plans. The proportion of children with at least 1 asthma controller prescription ranged from 66% to 88%; the proportion of children with influenza vaccination ranged from 3% to 46%. Plan ranking varied depending on the guideline measure used. The plan with the lowest aggregate proportion of children who had asthma controller prescriptions (66%) had regional proportions that ranged widely, from 44% to 72%. Some plans were observed to rank highly in performance in 1 region and substantially lower in other regions; similar with-plan regional variation was found for each outcome measure.

Conclusions: Assessments of adherence to Medicaid pediatric asthma management guidelines at the plan level may be insufficient to identify opportunities for improvement. Administrative claims-based profiles of plan performance that are sensitive to regional variations in plan characteristics may be particularly useful in isolating and prioritizing quality-improvement opportunities.

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Since 1991, the National Asthma Education and Prevention Program (NAEPP) has provided recommendations for effective asthma treatment, including guidelines highlighting the components of care that are regarded as essential to asthma management, including asthma assessment and monitoring, control of factors contributing to asthma severity, pharmacotherapy, and patient education. The NAEPP's *Guidelines for the Diagnosis and Management of Asthma*⁸ and the 2002 update⁹ represent the most comprehensive, science-based consensus on asthma diagnosis and management; key clinical activities have been extracted from these guidelines.¹⁰ Following the NAEPP guidelines has the potential to reduce asthma-related deaths, hospitalizations, and school absences among children, which are notably high among minority children.⁴

Despite the longstanding availability of NAEPP guidelines, wide variations in adherence to these asthma management recommendations have been reported.¹¹⁻¹⁹ Prior studies have found ample opportunities for improvement among Medicaid-enrolled children with asthma, with underuse of asthma controller medications, frequent emergency department (ED) utilization, and high rates of hospitalizations being reported.^{13,14,18,20,21} There is evidence suggesting the beneficial effect of managed care on Medicaid enrollees with conditions such as asthma,²² but it is not clear that health plans exhibit consistent performance across geographic areas. Although performance measures can be obtained for health plans operating in a given geographic area, these assessments are based on aggregate, plan-wide data.²³ Understanding the degree to which aggregate plan-level assessments (eg, HEDIS) reflect plan performance in a specific locale is important to purchasers and health plans alike. Medicaid and health plan officials are

Over the past decade, quality of care has become a central consideration in the selection of health plans by employers. Performance measures such as the National Committee on Quality Assurance (NCQA) Health Plan Employer Data and Information Set (HEDIS) measure of appropriate medication use are at the forefront for assessing quality of care among those with persistent asthma.¹⁻³ Purchasers of healthcare services are interested in plan-to-plan performance variation in asthma management, given the potential economic benefits of effectively controlling this common chronic disease.⁴⁻⁷

From the Child Health Evaluation and Research (CHEAR) Unit, Division of General Pediatrics, University of Michigan, Ann Arbor, Mich.

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Address correspondence to: Kevin J. Dombkowski, DrPH, MS, University of Michigan, Division of General Pediatrics, 300 N Ingalls, Ann Arbor, MI 48109-0456. E-mail: kjd@med.umich.edu.

especially interested in comparative data on health plan performance in areas that represent particular challenges, because they can use these data to establish reasonable targets for improvement.

The objective of this study was to characterize adherence to guidelines for management of pediatric asthma among health plans serving Medicaid beneficiaries. We examined adherence from 2 perspectives: (1) variation between plans, contrasting the performance of plans operating in similar geographic areas; and (2) variation within plans, comparing outcomes for enrollees within the same plan, but living in different geographic areas. In doing so, we explored the degree to which aggregate measures of health plan quality based on NAEPP guidelines reflected plan performance within a given geographic area.

METHODS

This study is based on a retrospective analysis of administrative claims data for the Michigan Medicaid program and was approved by the University of Michigan institutional review board.

Study Population

A total of 5792 children between 5 and 18 years of age in the Michigan Medicaid program were classified as having persistent asthma by HEDIS criteria during 2 years (2002 and 2003), allowing up to a 1-month enrollment gap each year. The HEDIS criteria for persistent asthma require administrative claims evidence of a child having any of the following within a calendar year: at least 4 asthma medication-dispensing events, at least 1 inpatient or 1 ED claim with a primary diagnosis of asthma, or at least 4 outpatient visits with an asthma diagnosis and at least 2 asthma medication-dispensing events.³ HEDIS classifies an asthma medication-dispensing event as 1 prescription for an asthma medication for an amount lasting 30 days; these medications are identified by a comprehensive list from NCQA.²⁴ Although HEDIS criteria currently require that health plans assess asthma outcomes using administrative claims data for services furnished during 1 year (ie, the "measurement year") to persons identified as having asthma during the prior year, we used a more stringent case definition. We required claims evidence of asthma in both years because there is evidence suggesting that the specificity of the HEDIS criterion for identifying asthma cases can be improved by requiring claims evidence of asthma in the measurement year in addition to the prior year.^{25,26}

We excluded children not enrolled in the same managed care plan throughout the study period ($n = 168$),

children enrolled in fee-for-service Medicaid ($n = 1345$), and children with other health insurance ($n = 309$) to ensure that claims for all services were available in Medicaid administrative data files. Our resulting sample consisted of 3970 children enrolled in 18 plans, representing 69% of Medicaid children with persistent asthma. Demographic characteristics and location of residence were obtained from Medicaid eligibility files. The county of beneficiary residence was classified as being urban or nonurban based on the presence of a metropolitan statistical area, as defined by the US Census Bureau.²⁷

Children were classified a priori into 1 of 4 geographic areas based on general similarities in population and health-services characteristics. Region 1 was comprised of children residing in 3 urban centers that are broadly perceived by Medicaid and health plan officials as areas in which plans consistently have difficulty meeting Medicaid program performance objectives. The largely rural counties in the northern portion of the state, including the Upper Peninsula, were included in region 2. Region 3 included the suburban southeastern counties, and region 4 was comprised of the southwestern counties. Of the 18 plans in our sample, 10 had study subjects in 2 or more of these regions.

Outcomes Measured

We used a variety of performance measures for pediatric asthma management to better understand the degree to which these measures are consistent with the single HEDIS measure for appropriate asthma medication, which is widely used by commercial and Medicaid health plans. Our 4 indicators of asthma management were based on NAEPP recommendations¹⁰: (1) the proportion of children with persistent asthma who had at least 1 asthma controller medication dispensing event in 2003; (2) the proportion of children with persistent asthma who had at least 1 outpatient visit in 2003; (3) the proportion of children with persistent asthma who had 1 or more asthma ED visits in 2003; and (4) the proportion of children with persistent asthma who received an influenza vaccination in 2003. We included an indicator of long-term asthma controller medication use because these medications are essential in the prevention of exacerbations and chronic symptoms among those with persistent asthma.¹⁰ Our outpatient visit measure was based on the recommendation that asthma patients be seen by a physician once every 1-6 months, depending on the severity of the asthma.¹⁰ Because asthma issues can potentially be reviewed by a physician at any office visit, we used a less stringent requirement and determined those children who had at least 1 outpatient visit (acute or routine) for any condition. We included an indicator of ED use because these

visits are an indicator of poorly controlled asthma or inadequate planning for asthma exacerbations.⁸ Our measure for influenza vaccination is based on the recommendation by the Centers for Disease Control and Prevention that all persons with chronic disease, including asthma, receive an influenza vaccination annually.²⁸

Outcomes were determined using Medicaid administrative claims data reported by health plans for health-services encounters and pharmacy claims. Our outcome measure for asthma controller medication reflects NCQA HEDIS criteria, which include several classes of asthma medications: inhaled corticosteroids, cromolyn/nedocromil, leukotriene modifiers, and methylxanthines.³ Outpatient visits were identified based on Current Procedural Terminology (CPT) procedure or *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* diagnosis codes indicating evaluation and management, preventive, or general medical examination visits. We classified ED visits based on CPT procedure codes (99281-99285) and the Uniform Bill-92 (UB-92) revenue code (0450) for ED services. We determined the proportion of subjects with an influenza vaccination based on CPT procedure codes (90657-90660, 90724) and *ICD-9-CM* diagnosis codes (V048 and V066).

Statistical Analysis

Chi-square tests were performed to assess differences in demographic characteristics between regions. The mean proportion and 95% confidence intervals were estimated for each plan's overall outcomes based on 2003 claims. Regional outcomes were estimated when a plan had ≥ 30 subjects in a region. To aid in comparison, we ranked each plan on each measure (ED visits were ranked in reverse order). Reduction and summarization of claims data were done with SAS version 8 software (SAS Institute Inc, Cary, NC).

RESULTS

Table 1 illustrates the demographic characteristics of the 3970 children

with persistent asthma in our study sample. The asthma health services utilized by the majority of children (65%) during the study period met multiple HEDIS criteria for persistent asthma; 34.5% had only asthma prescription claims, and 0.5% had only asthma ED visits. Most of our subjects were younger than 15 years of age (82%), predominantly male (59%), and black (59%). The majority of subjects (90%) lived in urban areas. Region 1 (urban centers) had a significantly higher proportion of children who were between 10 and 14 years of age and were black, and both region 1 and region 3 were entirely urban or suburban ($P \leq .001$).

Table 2 summarizes each plan's outcome measures and the corresponding rank order relative to other plans. Wide variations were observed for each outcome measure compared with statewide mean values. For example, prescriptions of controller medications ranged between plans from 88% to 66% ($P \leq .05$). Four plans (E, R, M, and A) had controller medication use that was significantly higher than the statewide mean (74.8%), and 1 plan (D) had controller medication use that was significantly lower ($P \leq .05$). Similar variation was observed between plans for each remaining outcome measure. Six plans (R, K, E, M, N, and F) had proportions of children with at least 1 outpatient visit that were significantly higher than the statewide mean (82.6%); however, in 1 plan (B) that proportion was significantly lower ($P \leq .05$). The proportions of children with asthma ED visits were significantly higher than the statewide mean

Table 1. Children 5-18 Years of Age With Asthma, 2002-2003

Characteristic	Geographic Area, %				P
	Region 1 (n = 1765)	Region 2 (n = 605)	Region 3 (n = 856)	Region 4 (n = 744)	
Age, y					.001
5-9	34.7	35.5	38.1	35.9	
10-14	49.4	43.8	46.0	42.6	
15-18	15.9	20.7	15.9	21.5	
Sex					.95
Male	58.8	58.2	57.8	59.1	
Female	41.2	41.8	42.2	40.9	
Race					<.001
White	6.7	76.2	53.0	53.1	
Black	90.7	18.8	41.1	38.3	
All others	2.6	5.0	5.9	8.6	
Residence					<.001
Urban/suburban	100.0	45.8	100.0	88.4	
Rural	0.0	54.2	0.0	11.6	

Table 2. Utilization of Asthma Health Services by Health Plan, 2003

Plan	No.	Asthma Controller Medication Prescription		Office Visits		Asthma Emergency Department Visit		Influenza Vaccination	
		Percentage	Rank	Percentage	Rank	Percentage	Rank	Percentage	Rank
A	806	79.2	4	82.9	9	30.5	15	19.6	9
B	565	71.3	15	72.9	18	41.4	17	2.5	18
C	312	70.5	16	75.0	17	28.5	14	8.3	17
D	349	66.2	18	82.5	11	21.8	7	15.5	12
E	132	87.9	1	93.2	3	22.7	8	28.8	3
F	367	74.7	9	88.6	6	26.2	12	19.9	8
G	193	73.6	12	86.5	7	28.0	13	9.3	16
H	100	78.0	6	78.0	15	25.0	11	46.0	1
I	164	67.1	17	80.5	14	25.0	10	12.2	14
J	34	76.5	8	85.3	8	23.5	9	11.8	15
K	174	77.6	7	94.3	2	16.7	4	31.6	2
L	133	78.2	5	81.2	13	14.3	3	24.1	6
M	128	82.8	3	93.0	4	11.7	2	18.8	10
N	84	73.8	10	90.5	5	10.7	1	26.2	5
O	164	73.8	11	82.3	12	19.5	6	22.6	7
P	86	73.3	13	76.7	16	18.6	5	16.3	11
Q	115	73.0	14	82.6	10	53.0	18	13.0	13
R	64	87.5	2	95.3	1	32.8	16	28.1	4
Overall	3970	74.8		82.6		27.7		16.8	

(27.7%) for 4 plans (N, M, L, and K), but were significantly lower for plans B and Q ($P \leq .05$). Plans H, K, and E had influenza vaccination rates significantly higher than the statewide average (16.8%), whereas plans G, C, and B each had vaccination rates that were significantly lower ($P \leq .05$).

Taking each of the 4 outcome measures into account, 1 plan (E) had consistently favorable rankings and 2 (B and C) had consistently unfavorable rankings. However, plan performance often was inconsistent across the 4 outcome measures. For example, plan A was ranked 4th based on use of long-term controller medications, but had a less favorable ranking for outpatient visits (9th), ED visits (15th), and influenza vaccinations (9th). Similarly, plan D was ranked last (18th) for use of long-term controller medications, but had more favorable rankings for outpatient visits (11th), ED visits (7th), and influenza vaccinations (12th).

Plan enrollees were stratified into the 4 geographic regions; in total, there were 30 combinations of plans by region, yielding a subsample of 3780 children (95%) of our initial sample. Table 3 presents the 4 asthma outcome measures by plan for each of the 4 regions. Plans

in urban centers were observed to have outcomes that varied significantly between plans. For example, the table illustrates that among the 9 plans in region 1, plan A had significantly higher rates of asthma controller medication use, office visits, and influenza vaccinations compared with most other plans in the region ($P \leq .05$). Rates varied widely across measures in each region; for example, use of long-term asthma controller medication varied by as little as 12% in region 2 and as much as 44% in region 4. Figure 1 shows an example of regional variation, using asthma controller medications. Plan A, where the aggregate use of these medications was 79%, had outcomes ranging from 82% in region 1 to 67% in region 4 ($P \leq .05$). Similarly, plan G had regional results that varied substantially from its aggregate outcome of 74%, ranging from 80% (region 1) to 66% (region 4).

Plans with a relatively favorable performance ranking in 1 region did not necessarily have a comparable ranking in another region. In addition, plans with favorable rankings based on 1 outcome did not necessarily have concordant rankings using another measure. Figure 2 illustrates these results for plan D, showing regional differences for each of the 4 outcomes measured. The fig-

ure shows that asthma controller medication use in regions 2 and 3 was significantly higher ($P \leq .05$) than use in region 4. The proportion of children with at least 1 outpatient visit was significantly higher in region 2 than region 1 ($P \leq .05$), and also was higher than that in region 3. Asthma ED use in plan D varied significantly between regions, ranging from 16% in region 3 to 39% in region 1 ($P \leq .05$). Influenza vaccination rates ranged from a low of none reported (region 4) to 20% (region 3).

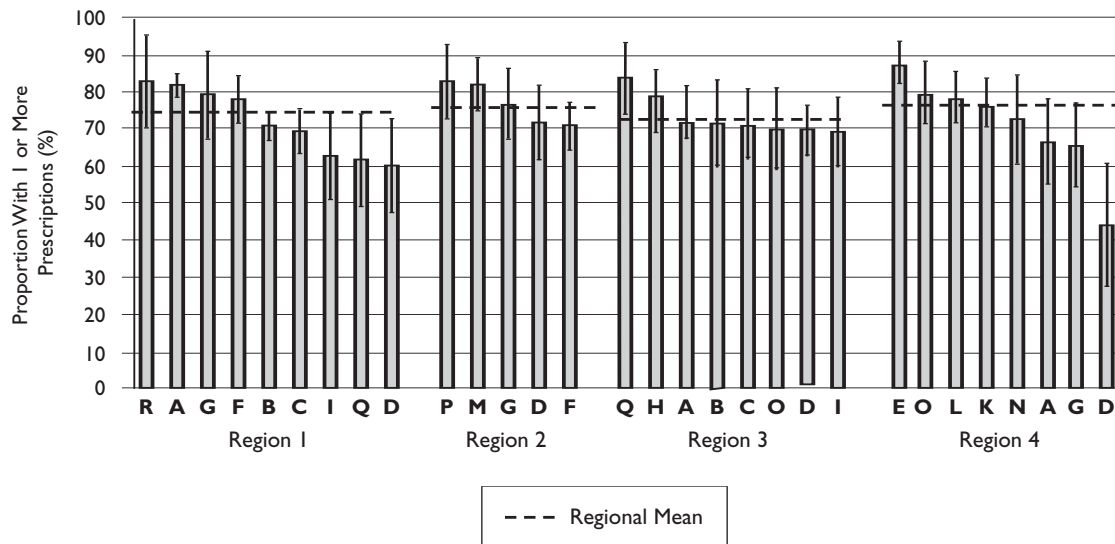
DISCUSSION

Quality-improvement (QI) initiatives are commonplace among health plans, and the resources devoted to these efforts continues to increase.²⁹⁻³¹ Our findings suggest the importance of recognizing that individual health plans may have a diverse profile for performance in pediatric asthma management by geographic region; thus, aggregate quality indicators may not adequately describe plan experiences. We also found that plan performance often is inconsistent across multiple measures of quality of asthma care based on NAEPP guidelines. Some plans had notably low proportions of annual outpatient visits—a fundamental indicator of access to care—yet also had relatively low rates of asthma

ED visits. Our findings also indicate that relying on a single HEDIS-type aggregate measure of asthma care will fail to capture within-plan variations that may reflect differences in (1) the underlying severity of illness among

Table 3. Asthma Management Measures by Region and Plan, 2003

Region	Plan	No.	Percentage			
			Asthma Controller Medication Prescription	Office Visits	Asthma Emergency Department Visit	Influenza Vaccination
Region 1	A	568	82.0	83.6	32.2	21.8
	B	508	71.3	71.5	41.3	2.4
	C	219	69.9	76.3	32.0	8.2
	D	56	60.7	75.0	39.3	8.9
	F	162	78.4	89.5	30.2	20.4
	G	44	79.5	93.2	38.6	9.1
	I	65	63.1	78.5	29.2	3.1
	Q	58	62.1	81.0	60.3	6.9
	R	35	82.9	91.4	37.1	17.1
	All plans	1715	74.8	79.5	36.0	12.1
Region 2	D	78	71.8	92.3	19.2	17.9
	F	195	71.3	87.7	23.6	19.5
	G	47	74.5	95.7	8.5	8.5
	M	128	82.8	93.0	11.7	18.8
	P	54	83.3	81.5	16.7	16.7
	All plans	534	76.2	89.7	18.2	17.0
Region 3	A	154	74.7	78.6	24.7	11.0
	B	57	71.9	86.0	42.1	3.5
	C	92	71.7	71.7	20.7	8.7
	D	179	69.8	81.0	16.2	19.6
	H	100	78.0	78.0	25.0	46.0
	I	98	69.4	81.6	22.4	18.4
	O	71	70.4	87.3	21.1	26.8
	Q	57	84.2	84.2	45.6	19.3
	All plans	808	73.1	80.3	24.5	19.3
Region 4	A	66	66.7	87.9	31.8	19.7
	D	34	44.1	79.4	26.5	0.0
	E	132	87.9	93.2	22.7	28.8
	G	67	65.7	76.1	35.8	11.9
	K	153	77.1	94.8	17.0	32.0
	L	131	78.6	80.9	14.5	24.4
	N	55	72.7	87.3	12.7	25.5
	O	85	80.0	81.2	15.3	21.2
	All plans	723	75.8	86.7	20.6	23.8
All regions		3780	74.8	82.5	28.1	16.6

Figure 1. Long-term Asthma Controller Medication Prescriptions by Plan and Region*

*Dashed horizontal lines indicate the regional mean. Error bars illustrate the 95% confidence interval for each observed value.

enrollees, (2) characteristics of the physician network in specific locales, (3) access to local and regional health-care services (eg, EDs, public health services), and (4) community norms.

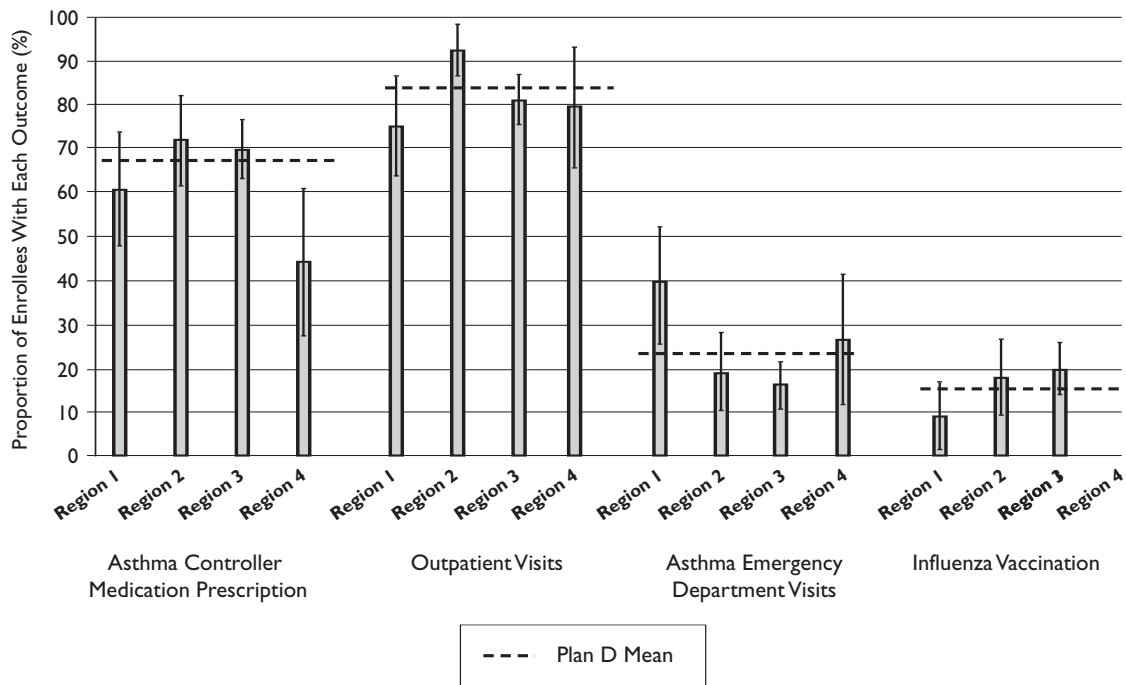
In addition, the observed within-plan variation may reflect underlying differences by region with respect to the demographic composition of enrollees, which prior studies have found to influence patient compliance with recommended asthma management strategies and related outcome measures.^{13,32-34} Other findings from a prior study of Michigan Medicaid plans illustrate that pediatric asthma QI programs varied substantially between plans in terms of comprehensiveness, use of provider incentives, and the inclusion of allied health professionals.³⁵ However, we also observed in that study that few plans used QI programs with interventions that are known to be effective in changing physician practices or outcomes for asthma patients. The findings from this study suggest that plans can use regional stratification of asthma outcomes to identify and prioritize QI initiatives toward the areas in greatest need.

The finding that asthma outcomes varied within plans is consistent with other studies, both for asthma outcomes measures¹⁷ and other measures of quality.³⁶ Though some have argued for HEDIS-type measures at the physician-practice level,³⁷ the feasibility of this approach is limited due to small sample sizes.³⁸ Moreover, variability in individual physician performance exists from 1 patient to another,³⁹ as well as across different aspects of quality measures.⁴⁰ In addition, our

assessment of pediatric asthma management outcomes suggests that despite the many challenges, some plans operating in urban centers are able to perform at substantially higher levels than other plans.

This study has several limitations. We used a HEDIS-based approach with administrative claims data, because this methodology is used widely in the United States and is familiar to Medicaid and health plan officials. Although the completeness of the data reported by Michigan Medicaid plans is generally good, some incompleteness may be present (eg, influenza vaccinations obtained through health fairs or free clinics). Despite variations in the timeliness, accuracy, and completeness of plans' claims data, findings from a recent study suggest that pediatric asthma outcome measures are robust to data loss and accurately reflect plan quality even when data may be incomplete.⁴¹ We used 2 years of eligibility data to establish our study population. Plans considering the application of this approach to asthma and other conditions may improve their specificity by applying HEDIS eligibility criteria to 2 years as the basis for identifying cases.^{25,26} Another limitation is that our findings are based on administrative claims data and severity of asthma could not be determined; consequently, potential differences in severity of asthma between and within plans are not reflected in these results.

Our findings have several implications for health plans and Medicaid program managers. We found that many plans had quality-of-care measures indicating that improvements focused on care practices for asthma

Figure 2. 2003 Asthma Management Indicators, Plan D*

*Dashed horizontal lines indicate the Plan D mean. Error bars illustrate the 95% confidence interval for each observed value.

patients are warranted. Several indicators of asthma management based on national guidelines illustrate a generally high reliance on ED care and notably low influenza vaccination rates among children with persistent asthma. Results from several recent studies offer perspectives on potential interventions that focus on reducing ED use^{15,42-45} and improving rates of influenza vaccination⁴⁶ among children with asthma.

Our findings also suggest that aggregate assessments of Medicaid pediatric asthma management practices at the overall plan level are not sufficient to identify targeted opportunities for improvement. Profiles of plan performance that are sensitive to regional variations in plan characteristics may be particularly useful in isolating and prioritizing QI opportunities. Medicaid plans can use this information to gauge the adequacy of existing provider networks in selected geographic areas and to target areas that would benefit most from more intensive intervention.

Although our approach to establishing geographic regions was based on county (or city) of residence, application of this approach in other states requires an understanding of the geographic distribution of plan enrollees, health plan participation, and health-services availability. Consequently, Medicaid and health plan

officials may wish to characterize geographic areas that do not necessarily follow existing boundaries established for local health departments or health-planning purposes.

CONCLUSION

Although there is some additional administrative burden, these findings demonstrate that claims data can be used to expand the scope of performance measurement beyond what is currently considered by the HEDIS program. The method described here offers a more broad-based assessment of plan quality, with a more diverse selection of outcome measures that may more accurately portray asthma management among health plan enrollees. Health plans may find this approach particularly valuable when assessing the effects of asthma QI efforts in selected areas of operation; it also may be useful for evaluating other outcomes and health plan performance criteria.

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