Differences in the Receipt of Low-Value Services Between Publicly and Privately Insured Children

Kao-Ping Chua, MD, PhD,[a] Aaron L. Schwartz, MD, PhD,[b] Anna Volerman, MD,[c,d] Rena M. Conti, PhD,[e] Elbert S. Huang, MD, MPH[c]

abstract

BACKGROUND: Children frequently receive low-value services that do not improve health, but it is unknown whether the receipt of these services differs between publicly and privately insured children.

METHODS: We analyzed 2013–2014 Medicaid Analytic eXtract and IBM MarketScan Commercial Claims and Encounters databases. Using 20 measures of low-value care (6 diagnostic testing measures, 5 imaging measures, and 9 prescription drug measures), we compared the proportion of publicly and privately insured children in 12 states who received low-value services at least once or twice in 2014; the proportion of publicly and privately insured children who received low-value diagnostic tests, imaging tests, and prescription drugs at least once; and the proportion of publicly and privately insured children eligible for each measure who received the service at least once.

RESULTS: Among 6 951 556 publicly insured children and 1 647 946 privately insured children, respectively, 11.0% and 8.9% received low-value services at least once, 3.9% and 2.8% received low-value services at least twice, 3.2% and 3.8% received low-value diagnostic tests at least once, 0.4% and 0.4% received low-value imaging tests at least once, and 8.4% and 5.5% received low-value prescription drug services at least once. Differences in the proportion of eligible children receiving each service were typically small (median difference among 20 measures, public minus private: +0.3 percentage points).

CONCLUSIONS: In 2014, 1 in 11 publicly insured and 1 in 9 privately insured children received low-value services. Differences between populations were modest overall, suggesting that wasteful care is not highly associated with payer type. Efforts to reduce this care should target all populations regardless of payer mix.

[a]*Susan B. Meister Child Health Evaluation and Research Center, Department of Pediatrics, Medical School, University of Michigan, Ann Arbor, Michigan;* [b]*Brigham and Women's Hospital, Boston, Massachusetts;* [c]*Section of General Internal Medicine, Department of Medicine and* [d]*Section of Academic Pediatrics, Department of Pediatrics, University of Chicago, Chicago, Illinois; and* [e]*Institute for Health System Innovation and Policy, Department of Markets, Public Policy, And Law, Questrom School of Business, Boston University, Boston, Massachusetts*

Drs Chua, Schwartz, Volerman, Conti, and Huang conceptualized and designed the study, analyzed and interpreted the data, reviewed and revised the manuscript, approved the final manuscript as submitted, and agree to be accountable for all aspects of the work.

DOI: https://doi.org/10.1542/peds.2019-2325

Accepted for publication Sep 26, 2019

Address correspondence to Kao-Ping Chua, MD, PhD, Susan B. Meister Child Health Evaluation and Research Center, Department of Pediatrics, Medical School, University of Michigan, 300 North Ingalls St, SPC 5456, Room 6E18, Ann Arbor, MI 48109-5456. E-mail: chuak@med.umich.edu

WHAT'S KNOWN ON THIS SUBJECT: Previous studies suggest that children frequently receive low-value services that do not improve health, but whether the receipt of these services differs between privately and publicly insured children is unknown.

WHAT THIS STUDY ADDS: Among publicly and privately insured children in 12 states, 11.0% and 8.9% received 1 of 20 low-value services during 2014, respectively. This small difference suggests that wasteful care is not highly associated with payer type.

To cite: Chua K, Schwartz AL, Volerman A, et al. Differences in the Receipt of Low-Value Services Between Publicly and Privately Insured Children. *Pediatrics.* 2020;145(2):e20192325

Low-value services are health care interventions that are more expensive and equally or less effective than an alternative, including doing nothing.[1] Reducing the provision of low-value services could decrease health care spending while maintaining or even improving outcomes.[2,3] Nationally, major efforts are underway to achieve this goal, including campaigns to increase public and clinician awareness of low-value services (eg, Choosing Wisely) as well as payment and delivery reforms that aim to incentivize the delivery of efficient care (eg, accountable care organizations).[4–6] In children, quality improvement efforts have been focused on low-value services across a broad range of settings, including inappropriate antibiotic prescribing in primary care offices, unnecessary imaging for minor head trauma in emergency departments, and overuse of bronchodilators during hospitalization for bronchoilitis.[7–14]

Little is known about which factors predict the receipt of low-value services in children, a gap that impedes the optimal targeting of limited quality improvement resources. One potentially important factor is patient payer type. Compared with privately insured children, publicly insured children covered by Medicaid or the Children's Health Insurance Program (CHIP) may have different rates of receipt of low-value services for several reasons. First, publicly insured children may face barriers to accessing care regardless of whether it is of low value or high value.[15] Second, families of privately insured children often face cost-sharing that may deter the receipt of low-value services.[1,16] Third, clinicians may have greater financial incentives to order low-value services for privately insured children because of higher reimbursement.[1,17,18] Finally, payer type might serve as a surrogate for other factors that affect the receipt of low-value services, such as systematic bias, patient beliefs regarding health care, and clinician quality.[19–22] Previous research reveals that the quality of care for publicly insured children lags behind that of privately insured children on many dimensions, including access to care, exacerbations of ambulatory care–sensitive conditions such as asthma, and quality of communication with clinicians.[15] If similar disparities exist in the receipt of low-value services, then efforts to reduce wasteful care may be more efficient if they target the design of public insurance programs or the settings in which publicly insured children are frequently seen, such as safety-net facilities.

Our objective for this study was to determine the degree to which the receipt of low-value services differs between publicly and privately insured children. To achieve this objective, we used data from 8.6 million children from 12 states and 20 claims-based measures of low-value services that we developed in a previous publication.[16]

METHODS

Data Sources

In spring 2019, we conducted a cross-sectional analysis of the 2013–2014 Medicaid Analytic eXtract (MAX) databases from 12 states. MAX data are research-friendly versions of Medicaid claims submitted by states to the Centers for Medicare and Medicare Services. At the time of writing, 2014 MAX data from only 17 states were available to researchers. Of these states, we excluded 2 because of concerns about the reliability of "encounter data" submitted by comprehensive managed care organizations and 3 because of small sample sizes.[23] MAX data include claims from CHIP enrollees when CHIP funds are used to expand eligibility for Medicaid but not when these funds are used to create a stand-alone CHIP program. We used the MAX Person Summary file to determine demographic characteristics, the MAX Inpatient and Other Therapy files to identify medical claims, and the MAX Prescription Drug file to identify prescription drug claims.

We also conducted a cross-sectional analysis of the 2013–2014 IBM MarketScan Commercial Claims and Encounters database. This database includes claims from >47 million enrollees aged 0 to 64 years who receive private insurance coverage from medium-to-large employers across the United States.[24] We used the MarketScan inpatient, outpatient, and facility files to identify medical claims and the pharmacy file to identify prescription drug claims. To align with available data for publicly insured children, we only examined enrollees who resided in 1 of the 12 states. We used 2014 as the year of analysis and data from 2013 as a "look-back period" for relevant diagnosis codes used in measure inclusion and exclusion criteria.

Because of the use of de-identified data, the Institutional Review Boards of the University of Michigan Medical School and the University of Chicago exempted this study from human subjects review.

Study Population

We included publicly insured children covered by Medicaid or CHIP who were 0 to 18 years old, continuously insured with full benefits throughout 2013 and 2014, and not dually eligible for Medicare at any point during this period. We included privately insured children who were 0 to 18 years old and continuously insured throughout 2013 and 2014.

Low-Value Service Measures

A detailed discussion of the development of the 20 claims-based measures of low-value pediatric service was published previously.[16] Briefly, in the fall of 2015, we compiled a list of >400 low-value

services by reviewing sources such as Choosing Wisely recommendations, and identified 20 that could be classified as low-value using the data elements in the claims. The 20 measures included 6 diagnostic tests, 7 imaging tests, and 9 prescription drugs (Table 1; a full list of codes used in the measures is included in the Supplemental Information).

For each measure, we defined a group of children who were eligible for the service. In some cases, eligibility was age based (eg, group A *Streptococcus* testing for children aged <3 years). In other cases, eligibility was based on the occurrence of a particular diagnosis code in the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM). For example, the denominator for the measure used to assess oral antibiotics for acute upper respiratory infections included all children with a claim containing a diagnosis code for this condition during 2014.

In our previous publication, we created broad and narrow versions of the 20 measures.[16] In this study, we chose only to use the narrow, specific versions to maximize the probability that the measures only captured care that was, in fact, of low value. The specification of measures was similar, except that we added additional ICD-9-CM diagnosis codes that could warrant antibiotics as exclusions in the 5 antibiotic measures. These additional codes were based on a recently published classification scheme of diagnosis codes that was developed to assess the appropriateness of outpatient antibiotic prescribing.[8]

Outcomes

For each patient in the sample, we assessed the receipt of the following in 2014: (1) any of the 20 low-value services at least once, (2) any of the 20 services at least twice, (3) any of the 6 low-value diagnostic tests at least once, (4) any of the 5 low-value imaging tests at least once, and (5) any of the 9 low-value prescription drug services at least once. Among patients eligible for each measure, we assessed the receipt of the low-value service at least once in 2014.

Statistical Analyses

We used descriptive statistics to describe the demographic characteristics of the sample and calculate unadjusted differences in the proportion of publicly and privately insured children with each of the above outcomes. To assess adjusted differences in the receipt of low-value services by payer type, we created an analytic extract derived from data from both publicly and privately insured children and then used logistic regression to model the occurrence of each outcome as a function of payer type (public versus private), controlling for age, sex, and state. To improve interpretability, we calculated average marginal effects (AMEs) of public insurance coverage, which represented the difference in predicted probabilities if children were publicly versus privately insured, holding age, sex, and state at their observed values.[26]

To examine whether differences by payer type may be greater in some states than in others, we calculated the median and range of unadjusted differences in the proportion of publicly and privately insured children in each state who received low-value (1) services, (2) diagnostic tests, (3) imaging tests, and (4) prescription drugs at least once in 2014. Additionally, we fit a multilevel linear probability model for the receipt of at least 1 low-value service in 2014. This model included age, sex, and payer type as level 1 predictors, a random state intercept, and a random slope for payer type. The random state intercept allowed the overall level of receipt of low-value services to vary between states, whereas the random slope allowed the association between payer type and receipt of low-value services to vary between states. We calculated the SDs of the random state intercepts (ie, the variability between states in overall receipt of low-value services) and of the random slopes (ie, the variability between states in the association between payer type and receipt of low-value services).

Analyses were performed by using SAS version 9.4 (SAS Institute Inc, Cary, NC) and Stata version 15.1 SE (Stata Corp, College Station, TX). A 2-sided $P < .05$ was considered statistically significant.

Sensitivity Analyses

The MAX Other Therapy file (outpatient services) only contains 2 diagnosis-code fields, whereas the MarketScan outpatient file contains 4. In a sensitivity analysis, we examined the degree to which results changed when only using data from the first 2 diagnosis-code fields of the MarketScan outpatient file. Additionally, we examined whether results changed when excluding a large state that constituted a disproportionate share of both publicly and privately insured children in the sample.

RESULTS

Sample Characteristics

A total of 6 951 556 publicly insured children and 1 647 946 privately insured children met inclusion criteria, representing a combined sample size of 8 599 502 children. Compared with privately insured children, a higher proportion of publicly insured children in the sample were young children aged 0 to 5 years. The proportion of children who were female was similar between populations (Table 2).

Receipt of Low-Value Services Overall and by Category

Among publicly and privately insured children in the sample, respectively, 11.0% and 8.9% received low-value services at least once in 2014 (AME: 2.8 percentage points; 95% confidence interval [CI]: 2.7 to 2.8), and 3.9% and 2.8% received low-value services at

TABLE 1 Claims-Based Measures of 20 Low-Value Services in Children

No.	Service	Inclusion Criteria	Exclusion Criteria	Denominator
1	Population-based screening for vitamin D deficiency	25-hydroxy vitamin D blood test	No diagnosis potentially warranting testing on day of test or previous claims[a] (osteomalacia, rickets, hyperparathyroidism, osteoporosis, pathologic fracture, obesity, sarcoidosis, hepatic failure, chronic kidney disease, inflammatory bowel disease, cystic fibrosis, celiac disease, failure to thrive, malnutrition, eating disorder, developmental motor delay, long-term glucocorticoid use) No diagnosis of vitamin D deficiency in previous claims[a] No diagnosis indicating pregnancy on day of test Exclude children with complex chronic conditions[b] (eg, children with risk factors for severe vitamin D deficiency, such as malabsorption or poor nutrition)	All children
2	Skin prick test or IgE blood tests in children with atopic dermatitis	Skin prick test or allergen-specific IgE blood test and diagnosis of atopic dermatitis on day of test	No other diagnoses potentially warranting testing on day of test (food allergy, anaphylaxis, asthma, allergic or chronic rhinitis, allergic conjunctivitis, allergic colitis or gastroenteritis, history of penicillin allergy)	Children with a diagnosis of atopic dermatitis during the year
3	Testing for RSV in children with bronchiolitis	Test for RSV (eg, rapid RSV test) or respiratory viral panel and diagnosis of bronchiolitis on day of test	Exclude infants aged <90 d (may be part of a sepsis workup) Exclude testing associated with hospitalization[c] (may be required for grouping patients per hospital policy) Exclude children who received Synagis prophylaxis in the previous 30 d (breakthrough RSV infection may prompt discontinuation of prophylaxis) Exclude children with complex chronic conditions[b] (could influence decision to initiate influenza therapy in these high-risk patients)	Children with a diagnosis of bronchiolitis during the year
4	Blood tests in children with a simple febrile seizure	Blood cell count or electrolytes and diagnosis of simple febrile seizure on day of test	Exclude infants aged <1 y (blood cell count may be part of an evaluation for central nervous system infections in this age group) No diagnosis for complex febrile seizure, vomiting and/or diarrhea, or dehydration on day of test (could warrant blood or electrolyte testing) Exclude testing associated with hospitalization[c] Exclude children with complex chronic conditions[b] (eg, children with epilepsy or congenital neurologic anomalies)	Children with a diagnosis of simple febrile seizure during the year
5	Cervical cancer screening with human papilloma virus test or Papanicolaou test in children	Human papilloma virus test or Papanicolaou test	No diagnosis potentially warranting testing on day of test or previous claim[a] (abnormal Papanicolaou test, dysplasia or malignancy of cervix, vagina, and /or vulva) Exclude children with complex chronic conditions[b] (eg, children with HIV or other immunodeficiency)	Female children aged ≥14 y
6	Testing for Group A *Streptococcus* pharyngitis in children aged <3 y	Test for Group A *Streptococcus* pharyngitis (eg, rapid strep test or throat culture) in children aged <3 y	Exclude testing associated with hospitalization[c] No diagnosis indicating exposure to communicable diseases on day of test (eg, sick contact with strep throat) Exclude children with complex chronic conditions[b] (eg, children with immunodeficiency)	Children aged <3 y

TABLE 1 Continued

No.	Service	Inclusion Criteria	Exclusion Criteria	Denominator
7	Face or nose radiograph in children with head or face trauma	Radiographs of face or nose and diagnosis of head or face trauma on same day of test	No additional restrictions	Children with a diagnosis of head or face trauma during the year
8	Ultrasound in children with cryptorchidism	Ultrasound of scrotum, pelvis, abdomen, or retroperitoneum and diagnosis of cryptorchidism on day of test	Exclude imaging in neonates aged ≤28 d (ultrasound may be part of an evaluation for a disorder of sex development in neonatal period) No diagnosis potentially warranting imaging on day of test or previous claim[a] (indeterminate sex, adrenogenital disorder, hypospadias, obesity)	Children with a diagnosis of cryptorchidism during the year
9	Sinus imaging in children with acute sinusitis	Paranasal sinus radiograph, maxillofacial CT scan, or face MRI and diagnosis of acute sinusitis on day of test	No diagnosis of acute sinusitis between 180 and 30 d before imaging No diagnosis of chronic sinusitis on day of imaging or previous 180 d No other diagnosis potentially warranting imaging on day of test (orbital cellulitis, cranial nerve palsy, meningismus, seizures, visual disturbances, exophthalmos, altered mental status, nasal polyps) Exclude imaging associated with hospitalization[c] Exclude children with complex chronic conditions[b] (eg, children with cystic fibrosis or immunodeficiency)	Children with a diagnosis of acute sinusitis during the year
10	Neuroimaging in children with a simple febrile seizure	Head CT scan or brain MRI and diagnosis of simple febrile seizure on day of test	No other diagnosis potentially warranting imaging on day of test (complex febrile seizure, focal neurologic examination abnormalities, head or face trauma) Exclude imaging associated with hospitalization[c] Exclude children with complex chronic conditions[b] (eg, children with epilepsy, congenital neurologic anomalies, ventriculoperitoneal shunt)	Children with a diagnosis of simple febrile seizure during the year
11	Neuroimaging in children with headache	Head CT scan or brain MRI and diagnosis of headache on day of test in children	No diagnosis potentially warranting imaging on day of test (convulsions, syncope, head or face trauma, posttraumatic headache, complicated headache syndromes, bleeding disorders, history of stroke, focal neurologic examination abnormalities) Exclude imaging associated with hospitalization[c] Exclude children with complex chronic conditions[b] (eg, children with cancer or hydrocephalus)	Children aged ≥12 y with a diagnosis of headache during the year
12	Cough and cold medications in children aged <6 y	Drug claim for cough or cold medication[d] in children aged <6 y	No additional exclusions	Children aged <6 y
13	Oral antibiotics for acute upper respiratory infections	Drug claim for oral antibiotic within 3 d of a diagnosis of acute upper respiratory infection	No other diagnosis potentially warranting oral antibiotics on the same day of the index diagnosis of acute upper respiratory infection or in the following 3 d[e]	Children with a diagnosis of acute upper respiratory infection during the year
14	Oral antibiotics for acute OME	Drug claim for oral antibiotic within 3 d of a diagnosis of acute OME	No other diagnosis potentially warranting oral antibiotics on the same day of the index diagnosis of acute OME or in the following 3 d[e] No diagnosis of acute OME between 180 and 90 d before the index diagnosis No diagnosis of chronic OME on the day of the index diagnosis or in the previous 180 d	Children with a diagnosis of acute OME during the year
15	Oral antibiotics for acute otitis externa	Drug claim for oral antibiotic within 3 d of a diagnosis of acute otitis externa	No other diagnosis potentially warranting oral antibiotics on the same day of the index diagnosis of acute otitis externa or in the following 3 d[e]	Children with a diagnosis of acute otitis externa during the year

TABLE 1 Continued

No.	Service	Inclusion Criteria	Exclusion Criteria	Denominator
			No diagnosis of acute otitis externa during the 30 d before the index diagnosis No diagnosis of chronic or malignant otitis externa on the same day of the index diagnosis or during the previous 180 d Exclude children with complex chronic conditions[b] (eg, children with immunodeficiency)	
16	Oral antibiotics after tonsillectomy	Drug claim for oral antibiotic within 3 d of tonsillectomy	No other diagnosis potentially warranting oral antibiotics on the same day of the tonsillectomy or in the following 3 d[e] Exclude children with complex chronic conditions[b] (eg, children requiring endocarditis prophylaxis because of heart disease or implants)	Children undergoing tonsillectomy during the year
17	Oral antibiotics for bronchiolitis	Drug claim for oral antibiotic within 3 d of a diagnosis of bronchiolitis	No other diagnosis potentially warranting oral antibiotics on the same day of the index diagnosis of bronchiolitis or in the following 3 d[e]	Children with a diagnosis of bronchiolitis during the year
18	Oral corticosteroids for bronchiolitis	Drug claim for oral corticosteroid within 3 d of a diagnosis of bronchiolitis	Exclude children with complex chronic conditions[b] (eg, children taking steroids for other conditions)	Children with a diagnosis of bronchiolitis during the year
19	Short-acting β-agonists for bronchiolitis	Drug claim for inhaled short-acting β-agonist within 3 d of a diagnosis of bronchiolitis	Limit to first-time wheezing (defined as no diagnosis of wheezing, bronchiolitis, or asthma before the index diagnosis of bronchiolitis) Exclude children with complex chronic conditions[b] (eg, patients with chronic lung disease)	Children with a diagnosis of bronchiolitis during the year
20	Acid blockers for infants with uncomplicated gastroesophageal reflux	Drug claim for oral H2 blocker or oral proton pump inhibitor in infants aged <1 y	No diagnosis potentially warranting acid blockade on the same day of drug claim or in previous claim[a] (failure to thrive, wt loss, underweight, irritability, excessive crying, apnea, apparently life-threatening event, gastritis, peptic ulcer, gastrointestinal bleed) Exclude children with complex chronic conditions[b] (eg, children with risk factors for severe gastroesophageal reflux disease, such as neurologic impairment)	Infants aged <1 y

CT, computed tomography; IgE, immunoglobulin E; OME, otitis media with effusion; RSV, respiratory syncytial virus.

[a] "Previous claim" refers to all claims from January 1, 2013, to the day before the service.

[b] Defined as children with an ICD-9-CM diagnosis or procedure code indicating a complex chronic condition on any claim from January 1, 2013, to the day of the service; codes were based on a widely used algorithm.[25]

[c] Defined as a test occurring on or between the admission and discharge dates for a hospitalization.

[d] Defined as medications containing pseudoephedrine, phenylephrine, guaifenesin, dextromethorphan, brompheniramine, chlorpheniramine, homatropine and hydrocodone, codeine and promethazine, and codeine and pyrilamine. Diphenhydramine was excluded because it is commonly used for indications other than cough and cold.

[e] Bacterial infections such as acute suppurative otitis media, urinary tract infection, pneumonia, and cellulitis.

least twice (AME: 2.3 percentage points; 95% CI: 2.2 to 2.3). Furthermore, 3.2% and 3.8% received any of the 6 low-value diagnostic tests at least once in 2014 (AME: 0.2 percentage points; 95% CI: −0.009 to 0.5), 0.4% and 0.4% received any of the 5 low-value imaging tests at least once in 2014 (AME: 0.02 percentage points; 95% CI: 0.01 to 0.03), and 8.4% and 5.5% received any of the 9 low-value prescription drug services at least once in 2014 (AME: 3.6 percentage points; 95% CI: 3.6 to 3.6) (Fig 1).

Receipt of Individual Low-Value Services

For each of the 20 measures, Table 3 reveals the proportion of eligible patients who received the service at least once during 2014. Unadjusted differences in these proportions by payer type were typically small (median difference among 20 measures, public minus private: −0.3 percentage points), as were AMEs (median: +0.1 percentage points) (Fig 1). Publicly insured children were significantly more likely to receive 6 of the 9 low-value prescription drug services; of these 6 services, 5 were related to antibiotic overuse. No consistent association with payer type was observed among the 6 low-value diagnostic testing measures or among the 5 imaging measures.

State-Level Variation in Differences by Payer Type

For each state, Table 4 reveals differences in the proportion of publicly and privately insured

TABLE 2 Demographic Characteristics of Sample

Characteristic	Publicly Insured (n = 6 951 556), n (%)	Privately Insured (n = 1 835 680), n (%)
Age group, y		
0–5	2 492 541 (35.9)	482 798 (29.3)
6–11	2 365 804 (34.0)	499 904 (30.3)
12–18	2 093 211 (30.1)	665 244 (40.4)
Female sex	3 394 563 (48.8)	805 346 (48.9)
State[a]		
1	2 923 214 (42.1)	427 867 (26.0)
2	574 448 (8.3)	262 433 (15.9)
3	170 916 (2.5)	36 184 (2.2)
4	118 283 (1.7)	58 846 (3.6)
5	585 713 (8.4)	109 748 (6.7)
6	588 391 (8.5)	243 395 (14.8)
7	282 710 (4.1)	52 165 (3.2)
8	330 911 (4.8)	102 221 (6.2)
9	258 079 (3.7)	44 081 (2.7)
10	456 207 (6.6)	124 237 (7.5)
11	579 006 (8.3)	124 467 (7.6)
12	83 678 (1.2)	62 302 (3.8)
Race and/or ethnicity[b]		
White, non-Hispanic	2 299 060 (33.1)	Not reported
Black or African American, non-Hispanic	1 654 323 (23.8)	Not reported
American Indian or Alaskan native, non-Hispanic	36 622 (0.5)	Not reported
Asian, native Hawaiian, or Pacific Islander, non-Hispanic	269 428 (3.9)	Not reported
Hispanic or Latino	2 182 700 (31.4)	Not reported
>1 race	50 728 (0.7)	Not reported
Unknown	458 695 (6.7)	Not reported

[a] States are not identified to protect confidentiality of data contributors.

[b] Race and/or ethnicity data are only available in MAX data. Data represent race and/or ethnicity as recorded by state Medicaid programs in the MAX Person Summary (enrollment) file.

children who received any of the 20 low-value services at least once in 2014. Differences ranged from −2.1 to 11.7 percentage points but were typically small (median difference, public minus private: 2.6 percentage points). Similarly, differences in the proportion of publicly and privately insured patients who received low-value diagnostic tests, imaging tests, and prescription drug services at least once in 2014 varied among the 12 states but were also typically small (median differences each: ≤2.5 percentage points).

Some states had higher-than-average levels of receipt of low-value service regardless of payer type. Among publicly and privately insured children, respectively, the median proportions receiving low-value services at least once in 2014 were 11.6% and 8.8% among the 12 states, but in 1 state, these proportions were 26.6% and 14.9%. In the multilevel model, there was variation across states in differences by payer type (SD of random slopes: 2.8 percentage points), but this variation was smaller than the variation across states in overall receipt of low-value services (SD of random intercepts: 3.7 percentage points).

Sensitivity Analyses

When searching only the first 2 diagnosis-code fields of the MarketScan outpatient file, the proportion of privately insured children receiving any of the 20 low-value services at least once increased from 8.9% to 9.0%. The AME of public insurance coverage for this outcome decreased from 2.8 to 2.7 percentage points (95% CI: 2.6 to 2.7).

When excluding the large populous state from the analysis, the proportion of publicly insured children receiving any of the 20 low-value services at least once increased from 11.0% to 13.5%, and it increased from 8.9% to 9.9% in privately insured children. The AME of public insurance coverage for this outcome increased from 2.8 to 2.9 percentage points (95% CI: 2.8 to 2.9).

DISCUSSION

Using 20 claims-based measures and data from 8.6 million children in 12 states, we found that 11.0% of publicly insured children and 8.9% of privately insured children received low-value services at least once in 2014. Adjusted analyses that accounted for age, sex, and state, public insurance were associated with a 2.8-percentage-point higher probability of receiving any of the 20 low-value services at least once in 2014. The largest difference was observed in the receipt of low-value prescription drug services, whereas no substantial differences were observed in the probability of receiving low-value diagnostic or

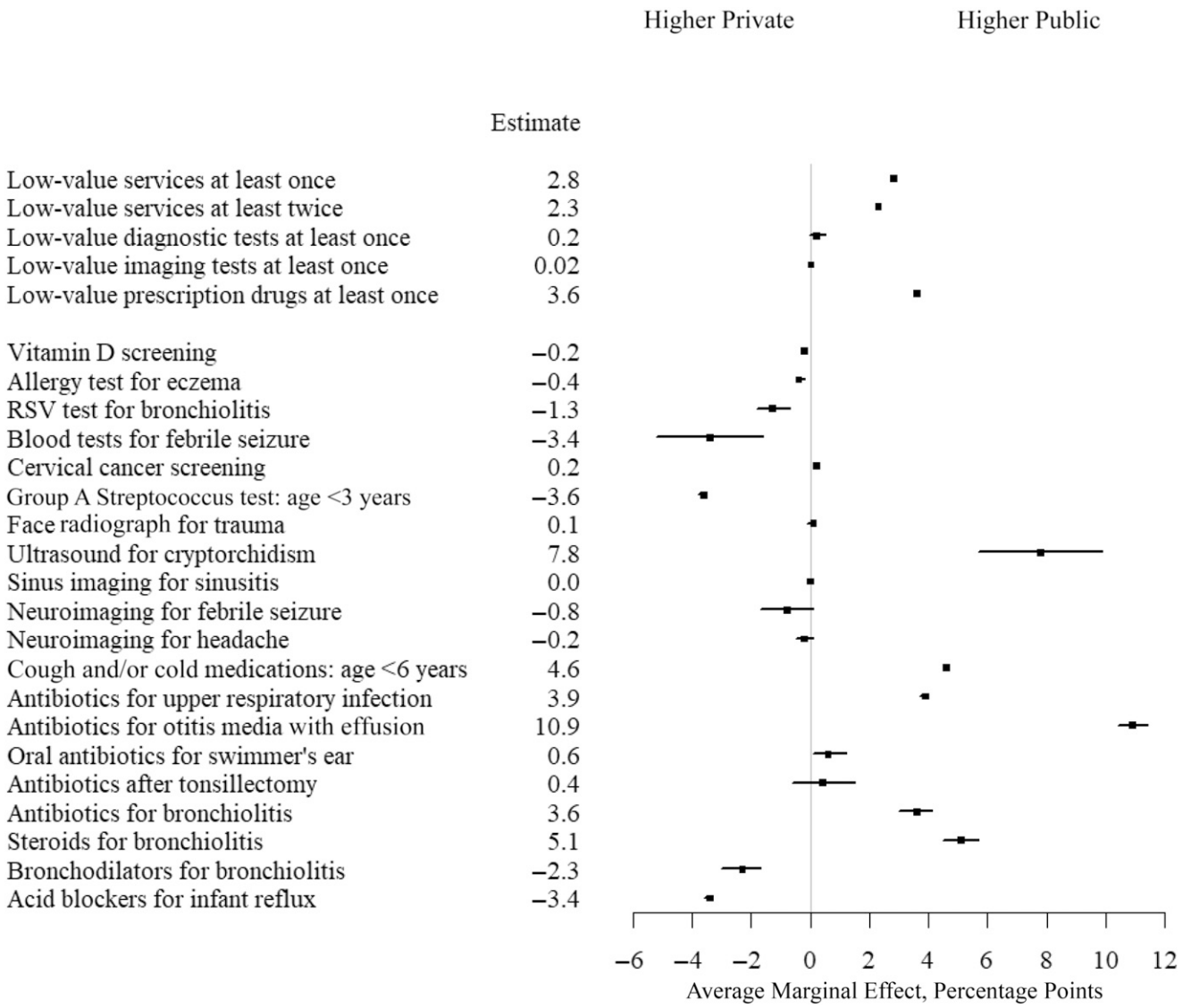

FIGURE 1

AMEs of public insurance coverage on the receipt of low-value services. Boxes represent point estimates, whereas horizontal lines represent 95% CIs. RSV, respiratory syncytial virus.

imaging tests. Among the 20 measures, the magnitude of differences by payer type was generally small, and the direction of differences was not uniform. Taken as a whole, our findings suggest that all children frequently receive low-value services and that payer type is not associated with large differences in wasteful care. Consequently, efforts to reduce such care should target all populations regardless of payer mix.

We compared the receipt of low-value services between publicly and privately insured children across a broad range of treatments, conditions, and settings. In adjusted analyses, having public insurance was associated with a 2.8-percentage-point higher probability of receiving any of the 20 low-value services at least once during the year. Furthermore, we found that the direction of differences among the 20 services did not vary in a consistent manner. For example, for the 9 low-value prescription drug measures, having public insurance was associated with a higher probability of receiving inappropriate antibiotics, a lower probability of receiving acid blockers for uncomplicated infant reflux, and a lower probability of receiving steroids and short-acting β-agonists for bronchiolitis. Although a 2.8-percentage-point difference is not negligible at the population level given the sheer number of publicly insured children in the United States, its magnitude does not justify preferentially focusing efforts to reduce waste on publicly insured children over privately insured children, particularly because the direction of differences by

TABLE 3 Differences in the Receipt of Low-Value Services in Children by Payer Type, 2014 MAX and MarketScan

Measure	Publicly Insured, n = 6 951 556			Privately Insured, n = 1 835 680			Difference in % of Eligible Children Affected (Public Minus Private)[a]	AME of Public Insurance Coverage (95% CI)
	No. Eligible Children	% of Eligible Children Affected	% of Publicly Insured Children Affected	No. Eligible Children	% of Eligible Children Affected	% of Privately Insured Children Affected		
Screening for vitamin D deficiency	6 951 556	0.8	0.8	1 647 946	1.3	1.3	−0.4	−0.2[b] (−0.2 to −0.2)
Allergy tests for eczema	164 881	2.1	0.0	36 768	2.6	0.1	−0.6	−0.4[b] (−0.5 to −0.2)
RSV testing for bronchiolitis	130 526	11.8	0.2	21 973	17.4	0.2	−5.7	−1.3[b] (−1.8 to −0.7)
Blood tests for simple febrile seizures	15 979	13.5	0.0	1871	16.3	0.0	−2.8	−3.4[b] (−5.2 to −1.6)
Cervical cancer screening	690 563	1.6	0.2	235 911	1.9	0.3	−0.3	0.2[b] (1.6 to 2.7)
Group A *Streptococcus* test in young children	1 244 621	11.1	2.0	273 566	12.3	2.0	−1.2	0.2[b] (0.2 to 0.3)
Face or nose radiograph for head or face trauma	319 535	3.4	0.2	69 959	3.7	0.2	−0.3	0.1 (−0.1 to 0.2)
Ultrasound for cryptorchidism	11 067	29.2	0.0	1946	20.0	0.0	9.2	7.8[b] (5.7 to 9.9)
Sinus imaging for acute sinusitis	316 479	0.6	0.0	119 860	0.6	0.0	0.0	0.0 (−0.1 to 0.04)
Neuroimaging for simple febrile seizures	15 979	2.8	0.0	1871	3.6	0.0	−0.9	−0.8 (−1.7 to 0.1)
Neuroimaging for headache	141 119	7.5	0.2	39 535	8.1	0.2	−0.5	−0.2 (−0.5 to 0.1)
Cough and cold medications in young children	2 492 541	8.5	3.0	482 798	3.2	0.9	5.3	4.6[b] (4.5 to 4.7)
Oral antibiotics for acute URI	1 517 072	18.8	4.1	280 128	15.0	2.5	3.8	3.9[b] (3.7 to 4.0)
Oral antibiotics for acute otitis media with effusion	158 054	45.4	1.0	44 987	34.1	0.9	11.3	10.9[b] (10.4 to 11.4)
Oral antibiotics for acute otitis externa	96 323	25.3	0.3	29 374	24.3	0.4	1.0	0.6[b] (0.1 to 1.2)
Oral antibiotics after tonsillectomy	36 342	29.0	0.2	8326	27.5	0.1	1.5	0.4 (−0.6 to 1.5)
Oral antibiotics for bronchiolitis	130 526	21.4	0.4	21 973	15.3	0.2	6.1	3.6[b] (3.0 to 4.1)
Oral corticosteroids for bronchiolitis	130 526	24.0	0.5	21 973	18.1	0.2	6.0	5.1[b] (4.5 to 5.7)
Short-acting β-agonists for bronchiolitis	130 526	24.4	0.5	21 973	28.5	0.4	−4.2	−2.3[b] (−3.0 to −1.7)
Acid blockers for reflux in infants	436 878	2.8	0.2	151 552	6.3	0.6	−3.5	−3.4[b] (−3.6 to −3.3)

RSV, respiratory syncytial virus; URI, upper respiratory infection.

[a] May not exactly equal the difference in the numbers in the third and sixth columns because of rounding.

[b] Statistically significant (95% CI does not contain 0).

payer type varies between services. Our findings are consistent with those of previous studies of receipt of low-value services in adults. For example, the authors of 1 study found that 14.9% of publicly insured adults and 11.4% of privately insured adults in Oregon received 1 of 15 low-value services in 2013. The authors of this study also failed to find a consistent pattern in the direction of differences by payer type among the 15 services.[17]

The absence of a large disparity by payer type is reassuring given that publicly insured children frequently receive lower-quality care in other domains compared with privately insured children.[15] However, any reassurance should be tempered by the high prevalence of wasteful care in both populations. Using just 20 measures, we found that ~1 in 9 publicly insured children and 1 in 11

TABLE 4 State-Level Unadjusted Differences in Receipt of Low-Value Services by Payer Type

State	% of Children in State Receiving Any Low-Value Service At Least Once in 2014			% of Children in State Receiving Any Low-Value Diagnostic Test At Least Once in 2014			% of Children in State Receiving Any Low-Value Imaging Test At Least Once in 2014			% of Children in State Receiving Any Low-Value Prescription Drug Service At Least Once in 2014		
	Public	Private	Difference	Public	Private	Difference	Public	Private	Difference	Public	Private	Difference
1	7.6	6.0	1.7	1.2	2.5	−1.4	0.3	0.3	−0.1	6.4	3.3	3.1
2	15.0	10.2	4.8	4.4	4.2	0.3	0.4	0.4	0.0	11.8	6.6	5.2
3	12.0	9.2	2.8	4.0	3.1	0.8	0.4	0.4	0.0	9.0	6.5	2.5
4	7.4	5.2	2.3	2.5	1.7	0.8	0.3	0.3	0.1	5.2	3.4	1.7
5	13.5	15.5	−2.1	3.7	5.1	−1.4	0.6	0.7	−0.1	10.6	11.9	−1.4
6	9.0	7.3	1.7	3.8	3.5	0.3	0.4	0.5	0.0	5.5	3.8	1.7
7	9.1	7.4	1.7	5.5	4.7	0.9	0.3	0.3	0.0	4.2	3.0	1.1
8	26.6	14.9	11.7	5.7	4.4	1.3	0.5	0.5	0.1	23.7	11.8	11.9
9	11.2	8.4	2.8	3.5	3.5	0.1	0.4	0.5	0.0	8.4	5.2	3.3
10	17.4	13.3	4.1	7.2	7.0	0.2	0.4	0.5	−0.1	11.4	7.1	4.3
11	13.3	10.9	2.3	4.8	4.6	0.2	0.6	0.5	0.1	9.5	6.9	2.5
12	9.3	5.8	3.5	3.8	2.4	1.4	0.3	0.3	0.1	5.9	3.4	2.5
Median	11.6	8.8	2.6	3.9	3.9	0.3	0.4	0.5	0.0	8.7	5.9	2.5
Minimum	7.4	5.2	−2.1	1.2	1.7	−1.4	0.3	0.3	−0.1	4.2	3.0	−1.4
Maximum	26.6	15.5	11.7	7.2	7.0	1.4	0.6	0.7	0.1	23.7	11.9	11.9
Range	19.2	10.3	13.8	6.0	5.3	2.8	0.3	0.4	0.2	19.5	8.9	13.3

Unadjusted differences may not exactly equal the difference in the numbers from the "Public" and "Private" columns because of rounding.

privately insured children received low-value services in 2014. The true proportion of children who receive low-value services is undoubtedly much higher. Indeed, although our measures captured a broad range of services, they still only captured a subset of the small number of services that can be identified as being of low value in claims data.

At the state level, the median difference by payer type in the proportion of children receiving low-value services was small, consistent with the main analysis. Furthermore, there was substantial variability between states in the overall level of receipt of low-value services. Although exploring geographic variation was beyond the scope of this study, we note that low-value antibiotic prescriptions were highly prevalent services and that the proportion of children receiving low-value prescription drug services varied between states. Collectively, these findings suggest that inappropriate antibiotic prescribing may be an important driver of between-state variation in the receipt of low-value services, consistent with previous studies revealing variation in inappropriate antibiotic prescribing between US Census regions.[27] The substantial between-state variation suggests that efforts to reduce low-value services may lead to greater improvements in certain geographic areas (ie, those with higher prevalence of wasteful care).

This study has a number of limitations. First, we relied on older data because MAX data beyond 2014 are currently unavailable because of the ongoing transition to a new Centers for Medicare and Medicare Services system for Medicaid claim submission (Transformed Medicaid Statistical Information System).[28] Quality improvement efforts since 2014 may have reduced some of the services we examined, although a recent study revealed that 1 of 11 privately insured children received inappropriate antibiotics during 2016.[8,13,14] Second, differences in coding practices for publicly and privately insured children may have affected results. Finally, because of the lack of clinical details in claims data, our measures may misclassify appropriate services as being of low value or may fail to capture all low-value services.[16,29,30] Misclassification would affect estimates of the absolute level of low-value service receipt, but estimates of differences may be less impacted because any bias is unlikely to be differential between publicly and privately insured children.

CONCLUSIONS

Both privately and publicly insured children frequently receive low-value services. Publicly insured children were more likely to receive low-value services, but the overall modest magnitude of this difference, coupled with the inconsistent direction of differences by payer type among services, suggests that wasteful care in children is not highly associated with payer type. Future research to identify factors that do drive wasteful care could facilitate the optimal targeting of quality improvement resources.

ABBREVIATIONS

AME: average marginal effect
CHIP: Children's Health Insurance Program
CI: confidence interval
ICD-9-CM: *International Classification of Diseases, Ninth Revision, Clinical Modification*
MAX: Medicaid Analytic eXtract

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

FINANCIAL DISCLOSURE: Dr Schwartz has been compensated as a consultant by the Medicare Payment Advisory Commission to aid in their efforts to measure low-value care in Medicare for research purposes; the other authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: Supported by a grant to Dr Chua (Academic Pediatric Association Young Investigator Award). Dr Chua is also supported by a career development award from the National Institute on Drug Abuse (grant 1K08DA048110-01). Funded by the National Institutes of Health (NIH).

POTENTIAL CONFLICT OF INTEREST: The authors have indicated they have no potential conflicts of interest to disclose.

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Pediatrics originally published online January 7, 2020;

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