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Variability in influenza vaccination opportunities and coverage among privately insured children

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Introduction

Influenza-related illnesses are a common cause of visits to medical clinics and emergency rooms as well as hospitalizations. It is estimated that 10% of all U.S. children <18 years seek outpatient care each year for respiratory illness attributable to influenza[1] During the 2017–18 influenza season, 185 lab-confirmed pediatric influenza deaths were reported[2]; most pediatric influenza deaths occur among children who did not received seasonal influenza vaccine.[3] Influenza vaccination is the most effective way to prevent influenza and its complications, and is 65% effective against pediatric influenza deaths.[4] Influenza vaccination for all persons aged 6 months and older has been recommended by the Advisory Committee on Immunization Practices (ACIP) since 2010.[5]

In spite of an increased focus on childhood influenza vaccination, pediatric influenza vaccination coverage remains low. Only 57.9% of U.S. children aged 6 months-17 years received one or more doses of influenza vaccine during the 2017–18 influenza season; coverage was highest among children 6 months-4 years (67.8%) and lowest among adolescents 13–17 years old (47.4%).[6] Even though this was the eighth season since ACIP recommended universal influenza vaccination, fewer than three in five children had received an influenza vaccine and pediatric influenza vaccination coverage has remained flat for the past five seasons.

Influenza vaccination presents unique challenges because the vaccine is administered during only a portion of the year, highlighting the need to identify how missed opportunities for vaccination and healthcare visit patterns during the influenza season affect influenza vaccination coverage. This study seeks to determine influenza vaccination coverage, vaccination opportunities, and missed opportunities among children whose parents were enrolled in private employer-sponsored health insurance plans during the 2016–2017 influenza season. Child, parent, and provider-related variables associated with vaccination opportunities, vaccine receipt, and missed opportunities for vaccination were examined. The findings of this study could help inform development of targeted strategies to improve childhood influenza vaccination coverage in children with private insurance.

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Methods

We analyzed the 2016–2017 MarketScan Commercial Claims and Encounters (CCAE) databases from Truven Health Analytics to conduct this study. CCAE data contain a convenience sample of insurance claims from persons with employer-sponsored insurance and their dependents, including 43.6 million person-years of data in 2016. These data are collected from more than 300 contributing employers and 25 different health plans and cover more than 245 million unique de-identified patients since 1995. Although the database disproportionately draws from the South, it includes claims from many insurers, has very wide overall geographic coverage, and has been frequently used in other health services and policy research.[7] All states and Washington DC were represented in the database during the time of this study. These databases link detailed patient information across provider sites and over time using enrollee identification numbers. Although the MarketScan® CCAE is very large convenience sample, it is not designed to be nationally representative.

Children born in calendar years 1999 – 2015 (aged 1–17 years by the end of 2016) and continuously enrolled in the same insurance plan during the 2016–2017 influenza season were included in the analysis. Influenza season was defined as August 1, 2016 through May 31, 2017. We categorized included children into four age groups: infants (born 2015, 1 year old by the end of 2016), toddlers (born 2012–2014, 2–4 years old), school-aged children (born 2004–2011, 5–12 years old), and teenagers (born 1999–2003, 13–17 years old). Children from 12 states with universal vaccination programs that included influenza vaccine (Alaska, Connecticut, Idaho, Maine, Massachusetts, New Hampshire, New Mexico, Rhode Island, South Dakota, Vermont, Washington, and Wyoming) were excluded from the analyses because vaccinations in these states were not likely to have been billed to third-party payers and thus would probably not be recorded in this database (~9% children were excluded).

All children were enrolled in one of the following types of health insurance plans: basic/major medical, comprehensive, exclusive provider organization (EPO), health maintenance organization (HMO), non-capitated point-of-service (POS), preferred provider organization (PPO), capitated or partially-capitated POS, consumer driven health plan (CDHP), or high deductible health plan (HDHP). Basic/major medical and comprehensive plans are fee-for-service (FFS) plans; EPO, HMO, POS (capitated and non-capitated), and PPO are managed care plans.

Current Procedural Terminology (CPT) codes (90630, 90653, 90654, 90655, 90656, 90657, 90658, 90659, 90660, 90661, 90662, 90663, 90664, 90666, 90668, 90672, 90673, 90674, 90685, 90686, 90687, 90688, 90724, and 90756) and the Healthcare Common Procedure Coding System (HCPCS) codes (Q2033, Q2034, Q2035, Q2036, Q2037, Q2038, Q2039 and G0008) from outpatient claims files were used to identify in-plan influenza vaccination. The MarketScan commercial insurance weights were used to calculate in-plan influenza vaccination coverage as the proportion of children receiving at least one influenza vaccine dose between August 1, 2016 - May 31, 2017. These weights were constructed using the Household Component of the Medical Expenditures Panel Survey and American Community Survey,[8] and reflect the distribution of the privately insured U.S. population

by age, sex, geographic region, residence in a metropolitan statistical area, and insurance policy holder status (policy holder or spouse/dependent). Although two doses of influenza vaccine are recommended the first season a child under 9 years is fully vaccinated, we could not assess compliance with this recommendation because children may have received two doses of vaccine prior to enrollment in, or from providers outside of, their current health plan.

To measure opportunities for influenza vaccination, we describe the proportion of eligible children with any health care visit between September 1, 2016 – May 31, 2017. (Our analytic period begins with September as most vaccination providers have some influenza vaccine in stock by then; only ~1% of influenza vaccinations were given in August.) Health visits were classified as influenza vaccination only, preventive, or sick/other visits. No influenza vaccine shortage occurred during the 2016–2017 influenza season; ~145.9 million doses of influenza vaccine were distributed in the United States. ACIP recommends that people get an influenza vaccine by the end of October; however, later vaccination can still be beneficial and influenza vaccine should continue to be offered throughout influenza season, even into February or later.[5] Children with a vaccination opportunity who were not vaccinated by May 31, 2017 were considered to have a missed opportunity for vaccination. We calculated missed opportunities for children with any type of health care visit, including sick visits, because vaccination during sick visits is an important strategy to reduce missed opportunities for vaccination.[9]

We conducted log-binomial regression analyses to identify factors that might be associated with pediatric influenza vaccination. Vaccination coverage, opportunities, and missed opportunities were estimated overall and stratified by age group (infants, toddlers, school-aged children and teenagers), region of child residence (Northeast, North Central, South, and West), residence in a metropolitan statistical area (MSA vs. non-MSA), health plan type (HDHP, CDHP, FFS, or managed care), number of family members insured in the plan (2, 3–5, ≥6), and parents' job classification (salaried vs. hourly wage). In addition, we stratified the analysis by provider type (children who received care at least once from a pediatrician vs. those receiving care at least once from a family physician and never from a pediatrician). We also examined opportunities for influenza vaccination by visit type and the provider and visit types during which influenza vaccination occurred.

Analyses were performed with SAS 9.4 (SAS Institute Inc., Cary, NC). As a secondary analysis of de-identified data, this study did not require Institutional Review Board approval.

Results

Our sample included 2,768,799 eligible children age 1–17 years. Overall in-plan influenza vaccination coverage with at least one dose of influenza vaccine was 34.2%. Vaccination coverage was highest for infants (67.7%) and lowest for teenagers (22.3%, Table 1).

In-plan influenza vaccination coverage varied by policyholder characteristics. A higher proportion of children living in the Northeast were vaccinated than children living in other regions of the United States. A higher proportion of children residing in an MSA were

vaccinated than those living outside an MSA. A higher proportion of children whose parents had salaried jobs were vaccinated than children whose parents had hourly jobs. When examining vaccination coverage by insurance type, coverage was highest among children enrolled in HDHPs. Children enrolled in health plans covering 3–5 family members were more likely to be vaccinated than those in plans covering 2 or ≥6 family members.

Of those children who visited their providers at least once during August 2016 - May 2017 (2,379,636), 65.7% received care at least once from a pediatrician, 13.8% received care at least once from a family physician and never from a pediatrician, and 20.5% received care only from other or unknown provider types. Children in all age groups had higher (>10 percentage points) influenza vaccination coverage if they received care at least once from a pediatrician (Table 2).

Most vaccinated children received influenza vaccine during preventive (44.2%) and influenza vaccination-only visits (47.9%), with 7.9% of influenza vaccinations given during sick visits. Vaccination at influenza vaccine-only visits was more common among older children than among infants (Figure 1). By provider type, most influenza vaccinations were given by pediatricians (72.1%), although this proportion decreased as children aged (Figure 2).

Most children (97.7% of infants, 91.9% of toddlers, 82.6% of school-aged children and 79.3% of teenagers) had at least one vaccination opportunity during the 2016–17 season, although opportunities decreased with age (Table 1). Children living in the Northeast had more opportunities for vaccination in all age groups compared to children living in other regions, as did children living in a MSA and children covered by managed care plans. Children whose parents had hourly jobs had fewer opportunities compared to children whose parents had salaried jobs. Multivariable analysis corroborated these observed associations (Table 3). When examining visit patterns from September 2016 – May 2017, we found that the majority (96.0%) of infants had a preventive visit as compared to 69.2% of toddlers, 50.0% of school-aged children and 42.5% of teenagers. More than half of children in all age groups save teenagers (69.8%, 59.8%, 53.5%, 42.0%) who had at least one preventive visit were vaccinated during this time period (Table 4). Almost two-thirds of missed opportunities for teenagers and 61% of missed opportunities for school-aged children happened during sick visits, whereas most missed opportunities (89%) for infants were during preventive visits. Teenagers were the only group where more than half of children had a sick visit during the study period.

Most unvaccinated children in all age groups had missed opportunities for vaccination: 93.1% of infants, 84.1 of toddlers, 73.6% of school-aged children, and 73.6% of teenagers. Patterns of differences in missed opportunities by demographic characteristics were similar to those for vaccination opportunities except that higher rates of missed opportunities were observed for children living in non-MSAs vs. MSAs, despite the fact that children in non-MSAs had fewer opportunities for vaccination overall.

Discussion

This study documented in-plan influenza vaccination coverage, opportunities and missed opportunities for vaccination for children in privately insured health plans. In addition to corroborating the previously observed finding that influenza vaccination coverage is lower among older children, our analysis examined patterns of opportunities for vaccination and how these opportunities affect vaccination coverage. We found notable variation in vaccination opportunities and vaccination coverage among demographic subgroups in our sample, showing that private health insurance is not a sufficient guarantee of access and utilization to influenza vaccination for children. Targeted efforts to bring older children to the doctor during influenza season and delivery of influenza vaccinations outside the traditional provider setting may be needed to optimize pediatric influenza vaccination coverage.

The overall in-plan influenza vaccination rate for children was 34.2%, much lower than the 59.0% estimate for 2016–17 from the National Immunization Survey-Flu (NIS-Flu), which assesses influenza vaccination coverage annually for children aged 6 months-17 years.[10] Two possible explanations for this difference are high frequency of vaccination outside of insurance plans, including vaccination at public clinics or schools, or lower vaccination rate among children in self-insured health plans. Another possibility is that children may have been vaccinated in-plan but no claim was submitted. It is also possible that some claims may be missing due to coordintion of benefits cases. Finally, NIS-Flu estimates may be artificially inflated as the data are subject to non-response and recall bias and are not validated with medical records.[11, 12] A recent study found NIS-Flu vaccination estimates for children 6–23 months using parent-reported data were 12–17 percentage points higher than estimates using provider-reported data.[13] More research is needed to determine which of these possibilities explain the lower-than-expected vaccination rate found in this study.

As noted in previous research,[14] childhood influenza vaccination coverage decreases with increasing age. While infants and toddlers routinely see healthcare providers for well-child visits multiple times annually, older children have fewer scheduled doctor visits and therefore fewer opportunities for influenza vaccination. Efforts need to be placed on encouraging visits to children’s health care providers, including influenza vaccination-only visits, during the influenza season; nearly half of immunized toddlers and school-aged children in our sample were vaccinated at influenza vaccination-only visits. Missed opportunities at eligible sick visits might reflect providers’ reluctance to provide immunization when another chief complaint is the focus of the visit or a conservative or inaccurate understanding of true contraindications to vaccination.[15] Since more teenagers than young children had missed opportunities during sick visits, efforts to increase influenza vaccination coverage among older children need to target vaccination offers during these visits.[9] Pediatric providers could leverage advances in real-time electronic health record (EHR)-immunization information systems (IIS) interoperability to improve influenza vaccination rates.[16–23] Another potential strategy is to administer influenza vaccination during school hours (school-located influenza vaccination), removing the need for a healthcare visit to receive vaccination.[24, 25]

Prior research is conflicting on whether influenza vaccination coverage is higher among privately insured children versus those with public health insurance.[26–29] Our analysis further examines variations in in-plan vaccination coverage by private insurance plan type and finds both vaccination coverage and vaccination opportunities are lower in FFS plans compared to other health plan types. This suggests that FFS plans may include structural barriers that decrease the likelihood of getting vaccinated in-plan. This finding is consistent with a study by Fairbrother et al[30] suggests that compared with enrollees in managed care plans, those in FFS plans were less likely to use preventive services. In our sample, children enrolled in managed care plans had the highest proportions of influenza vaccination opportunities and lowest proportions of missed opportunities within every age group, although this did not always translate to the highest vaccination coverage. Interestingly, our analysis found the highest influenza vaccination coverage in all age groups was among children enrolled in HDHPs, in contrast to the conventional wisdom that cost-sharing like deductibles is a barrier to preventive services use. Most HDHPs have carve-outs to cover preventive services like vaccination with no cost-sharing – a feature that is likely common to most private health plans due to health reform. Even prior to implementation of the Affordable Care Act, most private insurance plans covered recommended childhood vaccines without cost-sharing.[31] A better understanding of how beneficiary care is coordinated in managed care plans and HDHPs may highlight strategies that could be implemented to improve vaccination coverage among children covered by FFS plans. Additional research is needed to determine the reasons for higher observed vaccination coverage in these types of plan.

Two of our findings in particular suggest that logistical barriers to vaccination, rather than attitudinal or financial barriers, are responsible for a notable portion of the deficits in childhood influenza vaccination coverage. First, children who had 2 or ≥6 family members enrolled in the same insurance plan were less likely to receive influenza vaccine than children in plans covering 3–5 family members. Only 2 enrolled family members in the plan suggests a single parent family, while 6 or more is consistent with a larger family, both of which may present logistical barriers to obtaining vaccination and other preventive services. This finding is consistent with a study by Schaffer et al,[32] and suggests that as they have more children, families may find it difficult to travel to physician’s offices or clinics to obtain influenza vaccination. Second, children of employees with hourly wage jobs had fewer vaccination opportunities and correspondingly far lower vaccination coverage (12 percentage points overall) than children of salaried employees. Full-time employees are more likely than part-time employees to have paid vacation or sick days that can be used to take children to doctor visits; while these categories do not correspond precisely to salaried versus hourly wage, it is likely hourly employees in this sample have less access to paid sick time. Children whose parents have paid sick leave are more likely to receive preventive health services, including influenza vaccination.[33, 34] Notably, the difference in vaccination coverage by wage type was lowest in the oldest age group (8 percentage points for teenagers vs. 12–15 for other age groups), some of whom may be able to visit a doctor without parental assistance. Efforts to connect hourly employees with influenza vaccination opportunities for their children outside traditional work hours – for example,

pharmacy-based or school-located vaccination – could decrease this disparity and increase overall vaccination coverage.

Children receiving care from a pediatrician at least once during influenza season had higher influenza vaccination coverage compared to those receiving care from only family physicians or other physician types. This finding is unsurprising given that vaccination is at the heart of pediatric practice due to the high number of vaccines recommended in early childhood. Research consistently shows that family physicians are less likely than pediatricians to recommend or administer childhood vaccines,[35–38] although most family physicians do vaccinate.[39] Family physicians are more likely to work in rural or underserved communities where access to health care is limited, so it is important for these physicians to make every effort to provide influenza vaccination to their pediatric patients[40]. Professional organizations supporting family physicians should consider increasing their educational efforts on best practices related to influenza vaccination and identifying ways to support their members in providing in-office influenza vaccination or establishing effective referral networks.

In general, we found that variations in influenza vaccination coverage followed a similar pattern to variations in vaccination opportunities, highlighting the importance of expanding vaccine availability to increase pediatric influenza vaccination rates. However, it is clear that vaccination opportunities are not the only driver of variations in influenza vaccination coverage. For example, residence in a MSA was associated with slightly greater opportunities for influenza vaccination – about 0–2 percentage points – overall and in each age group. However, differences in influenza vaccination coverage by MSA residency were dramatic, with vaccination of children living in MSAs being 9–15 percentage points higher by age group than those living in non-MSAs. Conversely, vaccination opportunities in the West were 5 percentage points lower than among children living in the South, while there was almost no difference in influenza vaccination coverage. It is important to understand the relative effect of patient demographic factors on vaccination coverage in addition to absolute differences in influenza vaccination.

These findings are subject to limitations. Our study data represented a convenience sample of paid insurance claims reported for reimbursement purposes and might not be representative of U.S. privately insured children. Because of its large sample size, results from the MarketScan® CCAE are likely similar to what would be found in the entire privately insured population. Vaccination opportunities and vaccination coverage might be underestimated – and missed opportunities overestimated – if a claim was not submitted, not successfully submitted using a vaccination-specific code, not reimbursed by the insurance plan, or a child was vaccinated outside of his/her insurance plan; the database may not capture all vaccinations for children in families covered by multiple insurance plans. The data also do not capture vaccinations given outside of the normal clinic setting such as health departments, school clinics or retail pharmacies for which an insurance claim was not submitted; this may disproportionately affect observed coverage in older children. Conversely, because we could not assess influenza vaccination history in children <9 years old (who require two doses of influenza vaccine in the first season they are vaccinated), our findings may overestimate the proportion of these children who are fully vaccinated against

influenza. This study was unable to account for vaccine supply in specific provider offices, so missed opportunities may be overestimated if vaccine was not offered due to lack of availability.

Conclusion

In sum, our findings show that even among privately insured children, influenza vaccination coverage is highly variable and well below desired levels. Failure of providers to take advantage of all opportunities for influenza vaccination clearly impacts influenza vaccination coverage, as missed opportunities for influenza vaccination occurred for over half of unvaccinated children. If providers utilize all clinical encounters to screen and, when indicated, vaccinate children, influenza vaccination coverage could be increased significantly and reach the Healthy People 2020 target of 70% level.[41] Evidence-based interventions including EHR-based prompts for providers to recommend the vaccine, assessment and feedback for providers on their vaccination rates, and standing orders should be used to ensure every provider offers influenza vaccine to their pediatric patients during influenza season.[18, 42–46] Continued availability of pediatric influenza vaccination in non-traditional locations like pharmacies and schools can support vaccination opportunities for children whose parents may be unable to schedule in-season healthcare visits. Finally, physician practices should consider utilizing reminder-recall and intensive communications efforts where feasible to bring their pediatric patients in for influenza vaccination-focused visits.

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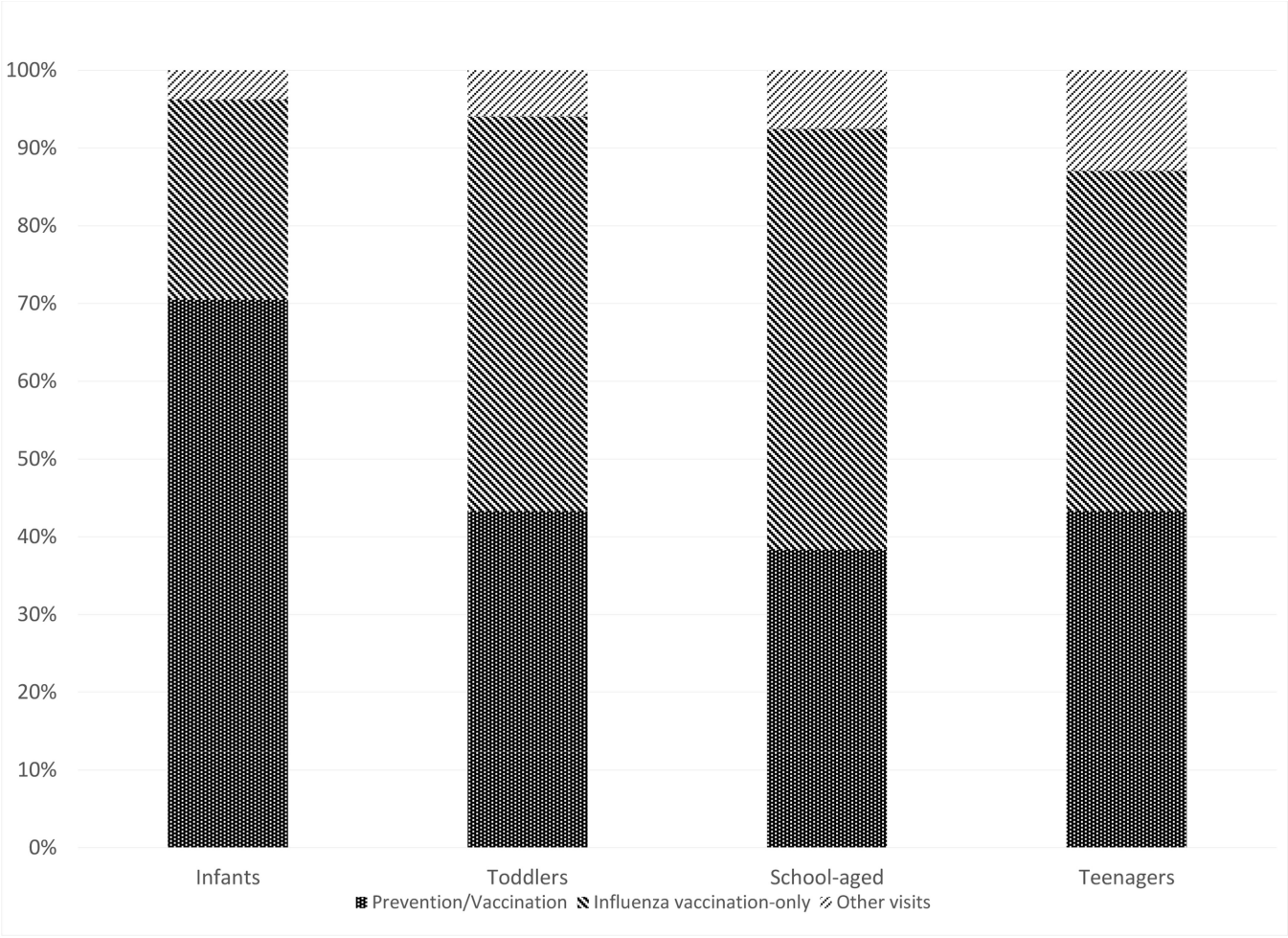

Figure 1.

Visit Type for Influenza Vaccination

Other visits were defined as all clinician visits that were not preventive care or vaccination-only visits.

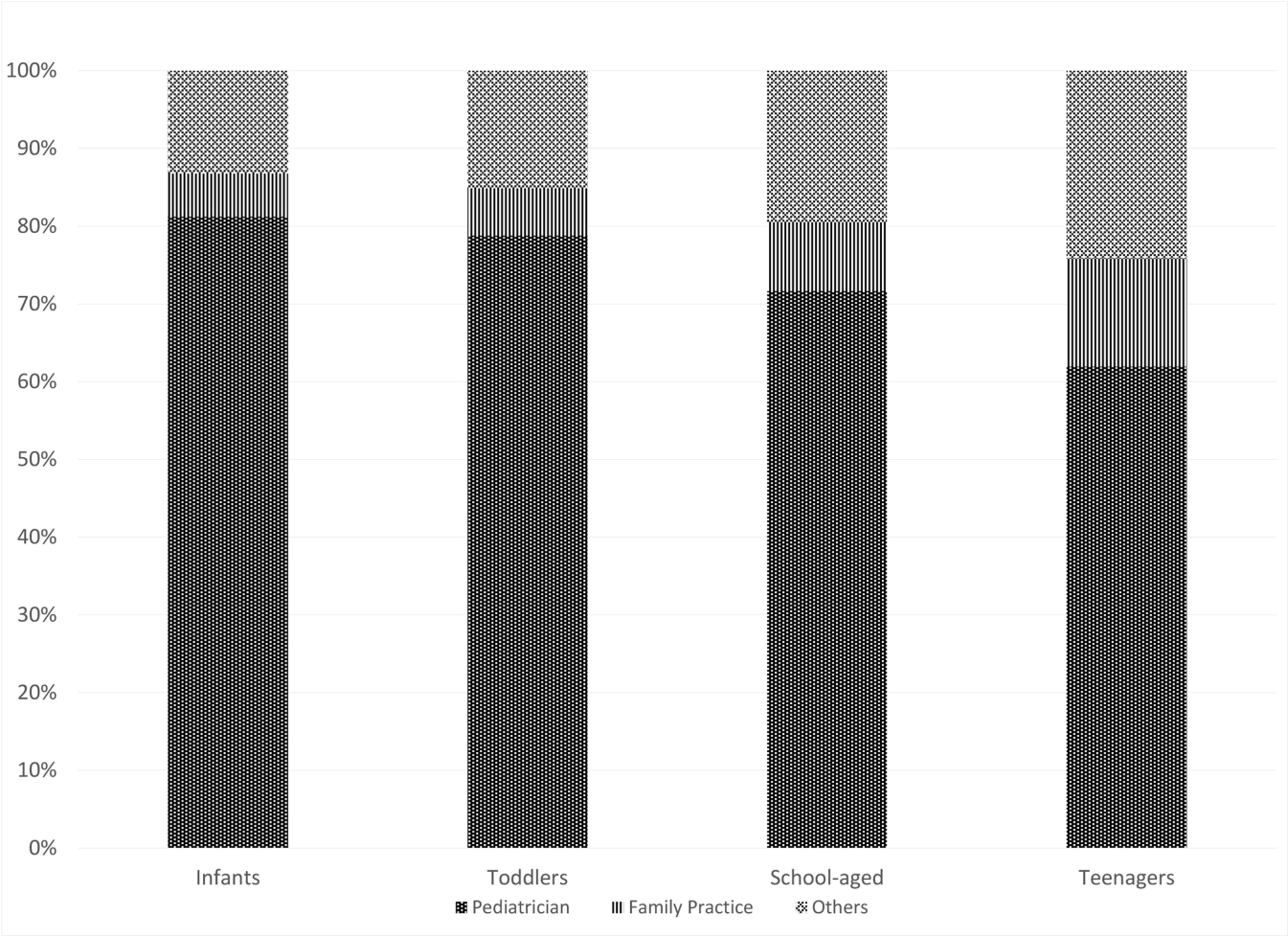

Figure 2.

Provider Type for Influenza Vaccination

Others included Internal Medicine, Pediatric Specialist, Acute Care Hospital, etc.

Table 1.

In-plan Influenza Vaccination Coverage*, Opportunities**, and Missed Opportunities*** by Selected Characteristics for the 2016–2017 Influenza Season, MarketScan

	Born 2015 (1 year) (N=123,820)			Born 2012–2014 (2–4 years) (N=403,276)			Born 2004–2011 (5–12 years) (N=1,296,379)			Born 1999–2003 (13–17 years) (N=945,324)			Born 1999–2015 (1–17 years) (N=2,768,799)		
	Vaccine Uptake (%)	Vax Opp (%)	Missed Opp (%)	Vaccine Uptake (%)	Vax Opp (%)	Missed Opp (%)	Vaccine Uptake (%)	Vax Opp (%)	Missed Opp (%)	Vaccine Uptake (%)	Vax Opp (%)	Missed Opp (%)	Vaccine Uptake (%)	Vax Opp (%)	Missed Opp (%)
Overall (N=2,768,799)	67.7	97.7	93.1	49.5	91.9	84.1	35.0	82.6	73.6	22.3	79.3	73.6	34.2	83.5	75.3
Region															
Northeast (N=444,761)	71.5	98.8	95.8	60.0	95.8	89.6	45.0	90.3	82.6	31.1	87.3	81.7	43.6	90.4	83.3
North Central (N=625,071)	69.2	97.9	93.4	51.1	92.1	84.0	35.4	83.0	73.9	22.4	80.5	75.1	34.6	84.1	76.0
South (N=1,224,182)	65.9	98.1	94.7	46.2	92.5	86.3	32.7	83.4	75.5	19.5	78.5	73.5	31.5	83.6	76.3
West (N=474,785)	66.1	96.2	89.3	46.1	88.6	79.1	31.8	76.8	66.3	20.6	74.0	67.5	31.9	78.6	68.9
Reside in MSA															
Yes (N=2,498,750)	68.8	97.7	92.9	50.8	92.0	83.9	36.0	82.8	73.4	23.1	79.3	73.3	35.3	83.6	75.0
No (N=270,049)	54.4	97.4	94.4	35.4	90.9	85.9	24.3	81.1	75.1	14.2	79.5	76.1	23.1	82.5	77.3
Insurance Type															
HDHP (N=380,798)	71.1	97.2	90.8	53.2	91.2	81.5	37.7	81.2	70.2	23.0	77.1	70.5	37.0	82.2	72.1
CDHP (N=445,745)	67.0	97.9	94.0	48.3	91.9	84.5	34.2	82.3	73.4	21.2	78.6	73.0	32.9	83.0	75.0
FFS (N=85,527)	55.2	95.7	90.7	37.7	88.1	81.0	27.6	79.0	71.2	19.0	77.1	72.0	26.8	80.2	73.2
Managed (N=1,856,729)	67.5	97.8	93.5	49.5	92.2	84.8	34.9	83.2	74.5	22.5	80.0	74.4	34.2	84.1	76.1
Number of Members in the Family															

	Born 2015 (1 year) (N=123,820)			Born 2012–2014 (2–4 years) (N=403,276)			Born 2004–2011 (5–12 years) (N=1,296,379)			Born 1999–2003 (13–17 years) (N=945,324)			Born 1999–2015 (1–17 years) (N=2,768,799)		
	Vaccine Uptake (%)	**Vax Opp (%)**	**Missed Opp (%)**	**Vaccine Uptake (%)**	**Vax Opp (%)**	**Missed Opp (%)**	**Vaccine Uptake (%)**	**Vax Opp (%)**	**Missed Opp (%)**	**Vaccine Uptake (%)**	**Vax Opp (%)**	**Missed Opp (%)**	**Vaccine Uptake (%)**	**Vax Opp (%)**	**Missed Opp (%)**
2 (N=192,541)	68.4	97.5	92.4	42.4	90.6	83.9	27.9	80.5	73.2	19.2	76.9	71.5	31.3	82.6	75.0
3–5 (N=2,230,045)	69.0	98.0	93.9	51.7	92.7	85.1	37.0	84.0	74.9	23.3	80.5	74.8	36.0	84.8	76.5
6+ (N=343,619)	50.4	93.8	88.0	35.6	85.4	77.6	26.3	75.3	66.8	17.8	73.7	68.2	24.4	76.2	68.8
Employee Classification															
Salary (N=1,039,021)	73.0	98.2	93.6	56.0	93.3	85.1	40.1	84.9	75.1	25.6	81.7	75.7	39.4	85.8	76.9
Hourly (N=810,478)	60.1	97.0	92.6	40.9	89.5	82.4	27.7	78.7	70.8	17.8	75.3	70.1	27.3	79.8	72.4

* Influenza vaccination coverage = 1 or more doses of influenza vaccine received between August 1, 2016 – May 31, 2017

** Opportunities include well child, sick and influenza-vaccination-only visits between September 1, 2016 – May 31, 2017

***Missed opportunities include all visits between September 1, 2016 – May 31, 2017 except influenza-vaccination-only visits (N=40,296 for 1 year, 203,966 for 2–4 years, 843,321 for 5–12 years, and 731,877 for 13–17 years

MSA = metropolitan statistical area, HDHP=High Deductible Health Plan, CDHP = Consumer Driven Health Plan, FFS = Fee-for-Service, Managed = Managed Care

Table 2.

In-plan Influenza Vaccination Coverage (%) by Provider Type, 20016–2017 Influenza Season

Age Group	Uptake among children visiting a pediatrician at least once (N=1,563,148, 65.7%)	Uptake among children visiting a family practitioner and no pediatricians (N=327,574, 13.8%)	Uptake among others/ unknown (N=488,914, 20.5%)
Infants	71.7	51.3	59.3
Toddlers	57.7	37.9	39.1
School-aged	48.8	30.0	25.8
Teenagers	38.5	20.5	14.7

Table 3.

Log-Binomial regression analysis of factors associated with coverage and opportunity for influenza vaccination, 2016–2017 influenza season.

Independent variable	Adjusted Risk Ratio with 95% confidence interval for coverage	Adjusted Risk Ratio with 95% confidence interval for opportunity
Age Group		
Young	2.81 (2.81, 2.82)	1.17 (1.17, 1.17)
Toddler	2.16 (2.16, 2.16)	1.14 (1.14, 1.14)
School-aged	1.55 (1.55, 1.56)	1.04 (1.04, 1.04)
Teenager	Referent	Referent
Region		
Northeast	1.31 (1.30, 1.31)	1.10 (1.10, 1.10)
North Central	1.15 (1.15, 1.15)	1.07 (1.07, 1.07)
South	1.05 (1.05, 1.05)	1.07 (1.07, 1.07)
West	Referent	Referent
Reside in MSA		
Yes	1.42 (1.42, 1.42)	1.01 (1.01, 1.01)
No	Referent	Referent
Insurance Type		
HDHP	1.24 (1.23, 1.24)	1.02 (1.02, 1.02)
CDHP	1.15 (1.15, 1.16)	1.02 (1.02, 1.02)
Managed	1.20 (1.20, 1.21)	1.03 (1.03, 1.03)
FFS	Referent	Referent
Number of Members in the Family		
2	0.88 (0.88, 0.89)	0.98 (0.98, 0.98)
3–5	Referent	Referent
6+	0.74 (0.74, 0.74)	0.92 (0.92, 0.92)
Employee Classification		
Salary	Referent	Referent
Hourly	0.76 (0.75, 0.76)	0.95 (0.95, 0.95)

Table 4.

In-plan Influenza Vaccination Coverage and Missed Opportunities by Visit Type, 2016-2017 Influenza Season

	Born 2015 (1 year)			Born 2012–2014 (2–4 years)			Born 2004–2011 (5–12 years)			Born 1999–2003 (13–17 years)		
	Number of Children	Coverage	Missed Opportunity	Number of Children	Coverage	Missed Opportunity	Number of Children	Coverage	Missed Opportunity	Number of Children	Coverage	Missed Opportunity
With any preventive visits	111,134 (96.0%)	77,583 (69.8%)	33,551 (89.0%)	253,283 (69.2%)	151,568 (59.8%)	101,715 (58.8%)	532,950 (50.0%)	285,021 (53.5%)	247,929 (39.5%)	317,815 (42.5%)	133,334 (42.0%)	184,481 (34.1%)
Sick/Other visits, no preventive visit	4,581 (4.0%)	417 (9.1%)	4,164 (11.0%)	105,523 (28.8%)	34,171 (32.4%)	71,352 (41.2%)	499,759 (46.8%)	119,693 (24.0%)	380,066 (60.5%)	416,364 (55.7%)	59,110 (14.2%)	357,254 (65.9%)
Flu vaccination only visits	64 (0.1%)	64 (100.0%)	0 (0%)	7303 (2.0%)	7,303 (100.0%)	0 (0%)	34,241 (3.2%)	34,241 (100.0%)	0 (0%)	13,487 (1.8%)	13,487 (100.0%)	0 (0%)