

COVID-19 Pandemic Exacerbates Childhood Immunization Disparities

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ABSTRACT

Background: The objective of this study was to measure the recovery of routine pediatric immunizations after a period of reduced vaccine administrations in the early weeks of the COVID-19 pandemic.

Methods: We recorded data on vaccines administered in Children's Wisconsin primary care or urgent care clinics from January 2019 through December 2020 and aggregated data by date and insurance type.

Results: During the gradual reopening period after week 21 in 2020, vaccine administration returned to prepandemic levels for children with commercial insurance but remained below baseline rates until the end of 2020 for children with Medicaid insurance.

Discussion: The decline in pediatric vaccination in 2020 disproportionately affected children with Medicaid insurance.

INTRODUCTION

Preventive measures implemented to minimize spread of coronavirus disease 2019 (COVID-19) caused a national decline in pediatric vaccine administration.^{1,2} Decreased vaccine coverage persisted with initial reopening in 2020.^{3,4} Prior to the COVID-19 pandemic, health insurance status correlated with vaccination coverage, with lower vaccine coverage in children with Medicaid or no health insurance compared to children with commercial insurance.⁵ We evaluated changes in routine immunizations after health care clinics reopened in southeastern Wisconsin in May 2020 and

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identified disparities in catch-up vaccination by insurance type.

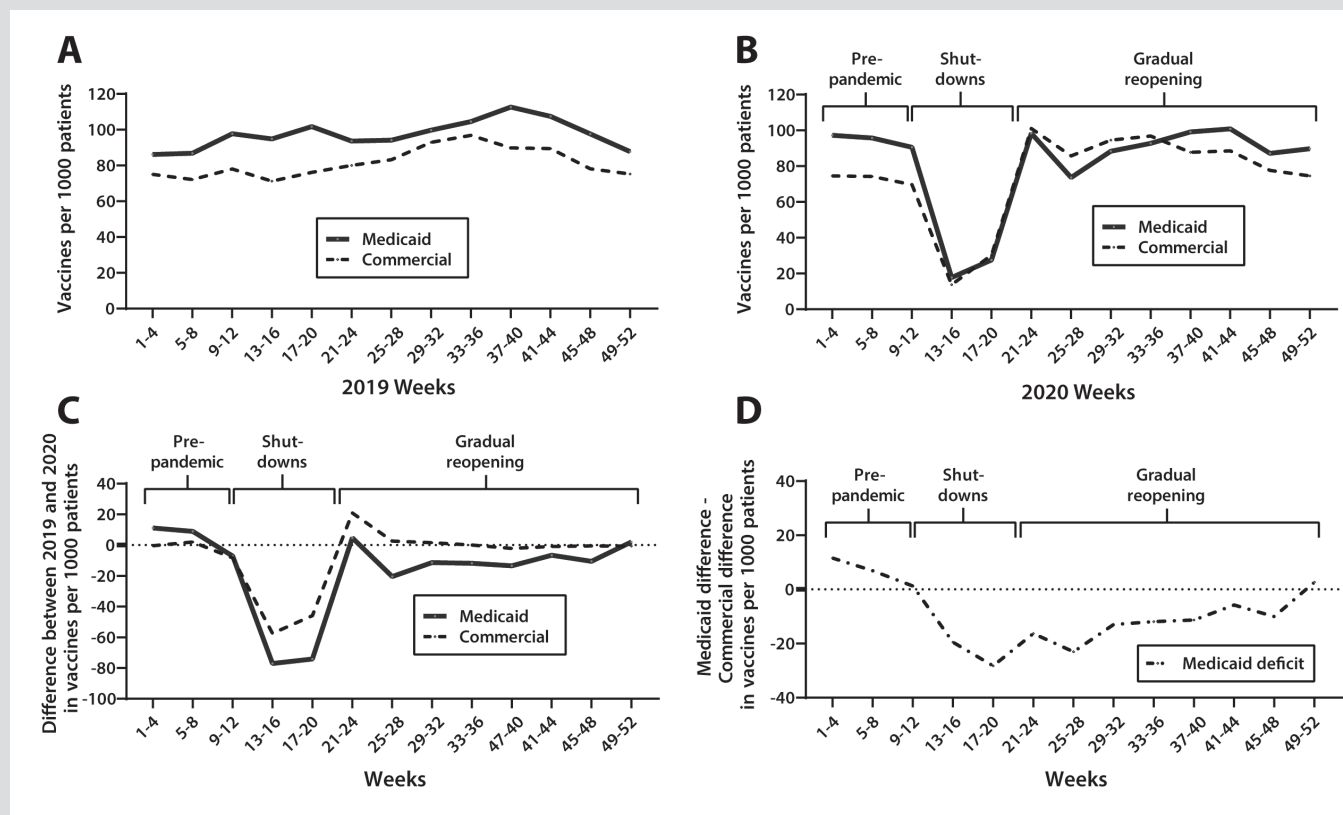
METHODS

We analyzed vaccination data from Children's Wisconsin, a health care system including 24 general pediatric and 7 urgent care clinics. The Institutional Review Board was aware of the project and determined it was a quality improvement activity. We recorded vaccines administered to patients aged 0 to 18 years, with commercial or Medicaid insurance, during primary pediatric or urgent care visits from 2019 week 1 through 2020 week 52, using epidemiologic weeks defined by the

Centers for Disease Control and Prevention. Exclusions included seasonal influenza vaccine administration, vaccines administered to uninsured patients, and vaccines administered in other locations. Data were categorized by vaccine type, week administered, and insurance type.

We calculated the number of vaccines administered for active patient population size, defined as the number of patients who had a visit in the previous 3 years by insurance type. Periods in 2020 were categorized as "prepandemic" (weeks 1-11), "shutdowns" (weeks 12-20), and "gradual reopening" (weeks 21-53). The difference in vaccines administered in 2020 compared to 2019 was calculated as vaccines administered per 1000 patients per 4-week period in 2020 minus those administered in 2019 for each payer type, termed "commercial difference" and "Medicaid difference." The commercial difference minus the Medicaid difference defined the "Medicaid deficit." Data were analyzed using GraphPad Prism 8 (La Jolla, California), and statistical significance of differences was identified by Wilcoxon matched-pairs signed rank test.

Figure. Vaccine Administrations by Insurance Type, 2019 and 2020



A and B. Vaccinations in each 4-week period per 1000 patients with the indicated insurance type in 2019 (A) and 2020 (B).
 C. Difference in vaccinations between 2019 and 2020 by insurance type.
 D. Deficit in vaccinations in Medicaid-insured patients over the course of 2020 vs commercial-insured patients over the same period.

RESULTS

In 2019, the average 4-week vaccine administration rate per 1,000 patients was 16% higher for 51,000 Medicaid-insured patients compared to 96,000 commercially insured patients (Figure 1A, $P < 0.005$). During shutdowns, all patients had a sharp decline in vaccines administered (Figure 1B), but Medicaid-insured patients had a larger decline than commercially insured patients (Figure 1C). During the period of gradual reopening, the vaccination rates for commercially insured patients rebounded to 2019 levels, resulting in no difference between 2019 and 2020 vaccines per 1,000 commercially insured patients (Figure 1C). However, vaccination rates for Medicaid enrollees stayed below 2019 levels until weeks 49 to 53, with 11 fewer vaccines administered per 1,000 Medicaid patients per 4 weeks in 2020 compared to 2019

Table. Vaccines Administered, Excluding Influenza, 2019 and 2020

Vaccine	Commercial		Commercial Difference in 2020 vs 2019 (%)	Medicaid		Medicaid Difference in 2020 vs 2019 (%)	Medicaid Deficit ^a
	2019	2020		2019	2020		
All vaccines	1058	969	-89 (-8)	1265	1059	-206 (-16)	117
Hepatitis B	123	115	-8 (-7)	170	143	-27 (-16)	19
Rotavirus	114	108	-6 (-5)	140	116	-24 (-17)	18
DTaP	206	192	-14 (-7)	270	226	-44 (-16)	30
HIB	118	113	-5 (-4)	159	138	-21 (-13)	16
Pneumococcal	160	152	-8 (-5)	210	183	-27 (-13)	19
IPV	165	154	-11 (-7)	222	184	-38 (-17)	27
Hepatitis A	88	76	-12 (-14)	112	86	-26 (-23)	14
MMR	91	80	-11 (-12)	114	92	-22 (-19)	11
Varicella	91	80	-11 (-12)	116	93	-23 (-20)	12
HPV	84	70	-14 (-17)	73	58	-15 (-21)	1
Meningococcal	99	95	-4 (-4)	71	62	-9 (-13)	5

Abbreviations: DTaP, diphtheria, tetanus, and pertussis; HIB, *Haemophilus influenzae* type b; IPV, inactivated poliovirus; MMR, measles, mumps, and rubella; HPV, human papillomavirus.

All vaccine numbers are per 1000 active patients in each payer type.

^aThe difference between the Medicaid and commercial differences in 2020 vs 2019.

(Figure 1C, $P=0.03$). The magnitude of the year-over-year vaccine deficit in patients with Medicaid compared to commercial insurance was as great as 28 per 1,000 patients in weeks 17 to 20 but recovered slowly and reached parity by the end of 2020 (Figure 1D).

Both commercial- and Medicaid-insured patients received fewer vaccine doses in 2020 than 2019 (8% and 16% fewer, respectively) (Table). Approximately 8,700 and 10,900 vaccines were missed in 2020 for 97,600 commercial- and 53,000 Medicaid-insured children, respectively. Vaccines primarily administered to young infants, such as *Haemophilus influenzae* type B (HIB), were relatively preserved in the commercial population, showing a 4% decline in 2020 compared to 2019, while the Medicaid population had a 13% decline in 2020 compared to 2019 (Table).

DISCUSSION

A dramatic decline in routine vaccinations was an unintended consequence of shutdowns in early 2020.^{1,2} Our data show that commercially insured children in Southeastern Wisconsin initially received more vaccines during gradual reopening compared to the prior year, with a partial but incomplete catch-up in missed doses. In contrast, Medicaid-insured children continued receiving fewer vaccinations compared to 2019, prolonging the pandemic's effect on vaccination status in that group. This difference could be from delays in reopening of clinics with a high proportion of Medicaid patients, difficulty contacting families to reschedule canceled appointments, lack of transportation, or other complexities of daily living disproportionately affecting the Medicaid-insured patients.

By using data from this project externally to lobby for governmental support of outreach programs and grouping aligned health disparity projects internally for greater momentum, our health system aims to improve capacity to target vaccine-vulnerable populations. The availability of statistically robust data to uncover disparities and drive efforts to identify root causes of disparities is important in the quest for health equity. Once root causes are identified specific to the disparity, appropriate interventions can be implemented and the data mining tools can again be used to confirm improvement. Accurate data ensure that our efforts are efficient and effective.

Project limitations are inclusion of a single health care system, exclusion of vaccinations outside of primary care encounters, and no measurement of barriers to vaccination. The disparity we identified in Southeastern Wisconsin may be exacerbated by the highly segregated status of our most populous city, Milwaukee.

CONCLUSION

This study identified a prolonged lapse in routine pediatric vaccinations during the COVID-19 pandemic, primarily in Medicaid-insured patients. Our data suggest that the Medicaid

population may be vulnerable to a resurgence of vaccine-preventable diseases.⁶

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