

COVID-19 and Primary Measles Vaccination Rates in a Large Primary Care Network

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One dose of the measles-mumps-rubella (MMR) vaccine confers $\geq 93\%$ protection against measles.¹ In 2017, nearly 10% of children aged 19 to 35 months in the United States had not received the first dose of the MMR vaccine.² The vaccination rate was lower among those who were uninsured or Medicaid enrolled compared with those with private insurance and among Black children compared with white children.² In May 2020, the Centers for Disease Control and Prevention reported a precipitous drop in vaccination within one state after the severe acute respiratory syndrome coronavirus 2 pandemic began.³ Lower MMR vaccination rates raise serious concerns about a possible measles resurgence³ in the United States because of the high level of herd immunity needed to prevent community transmission.¹ We evaluated changes in measles vaccination rates from the pandemic start when clinic access and attendance decreased to the period in which return for clinical care was encouraged.

METHODS

The Nationwide Children's Hospital pediatric primary care network includes 12 clinic sites in Columbus, Ohio, providing care for >90 000 children and adolescents, most of whom are Medicaid enrolled and belong to a racial or ethnic minority group. The primary study outcome was the proportion with MMR vaccination by age 16 months from March 2017 to

August 2020. We considered the initial pandemic period to be those full months with restricted clinic access (April to May 2020) during which telemedicine was encouraged for many visit types but in-person preventive visits for children ≤ 2 years were still scheduled, and we considered the reopening period to be when access normalized and scheduling outreach by mail, telephone, and text was used to re-engage families (June to August 2020). The χ^2 test or Fisher's exact test was used for bivariate analysis. The confidence interval around the proportion vaccinated was adjusted for clustering by clinic site with sandwich estimators. Because of previously recognized disparities and the differential impact of coronavirus disease 2019 (COVID-19),⁴ we evaluated the association of vaccination with insurance status at the child's most recent visit and race and/or ethnicity using logistic regression with adjustment for clustering by clinic site. Stata 16 (Stata Corp, College Station, TX) was used for all analyses. The Nationwide Children's Hospital Institutional Review Board approved this study.

RESULTS

From March 2017 to March 2020, the average proportion of 16-month-old children with MMR vaccination was 72.0%, which decreased to 66.8% in April to May 2020 ($P < .001$) and then to 62.4% ($P = .02$) from June to August 2020 (Table 1, Fig 1). In Table 1, the

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population demographic characteristics, the proportion who were vaccinated, and the adjusted odds of vaccination are listed. Patients without insurance were less likely to be vaccinated than those with private insurance or enrolled in Medicaid. Compared with patients who were Hispanic or Asian American, white and Black patients were less likely to be vaccinated (Table 1; $P < .001$). Although there was a difference in vaccination between white and Black patients in the unadjusted analyses (Table 1; $P = .001$), there was no difference after adjustment for insurance status and time period ($P = .31$). There was no significant interaction between race and/or ethnicity and insurance status or time period in the likelihood of vaccination.

Regardless of time period, those with a preventive care visit after 12 months of age were more likely to be vaccinated (91.2% vs 8.8%; $P < .001$). The proportion of children with such visits decreased during the postpandemic period (Fig 1; 76.2% vs 70.9%; $P < .001$). For those without any preventive care visits after age 12 months, the proportion vaccinated decreased across the time periods (prepandemic: 9.7%; initial: 6.3%; reopening: 2.5%; $P = .01$).

DISCUSSION

Although preventive visits for children aged ≤ 2 years have always been offered in the clinics, and by June outreach efforts were implemented to have patients return to the clinic for all health care needs, the pandemic-related decline in MMR vaccination has persisted, as has the decline in preventive care visits. The fourfold decrease in vaccination outside of preventive visits is an important contributor to the drop in the MMR vaccination rate. Although it is possible that we did not capture all vaccinations administered to patients elsewhere during the initial pandemic

TABLE 1 Demographic Characteristics, Proportion With MMR Vaccine by 16 Months of Age, and the Adjusted Odds of MMR Vaccination

	Overall Distribution ($N = 23\,534$)	MMR Vaccination	Adjusted Odds of MMR Vaccination (95% CI)
Insurance ^a		$P < .001$	
Any private	8.0%	74.4%	1 (Reference)
Only Medicaid	84.9%	71.2%	0.79 (0.60–1.04)
Self-pay	7.2%	66.6%	0.59 (0.44–0.78)
Race and/or ethnicity ^a		$P < .001$	
White	17.5%	69.2%	1 (Reference)
Black	61.0%	66.5%	0.90 (0.73–1.10)
Hispanic	13.7%	85.3%	2.70 (2.31–3.16)
Asian American	7.0%	89.6%	3.89 (2.60–5.77)
Other ^b	0.2%	67.4%	—
Missing ^b	0.7%	63.6%	—
Pandemic time period		$P < .001$	
Prepandemic	88.3%	72.0%	1 (Reference)
Initial	4.9%	66.8%	0.77 (0.64–0.85)
Reopening	6.8%	62.4%	0.64 (0.57–0.71)

CI, confidence interval; —, not applicable.

^a Categories do not add to 100% because of rounding.

^b Not included in the logistic regression analysis because of the small sample size.

and reopening time periods, the likelihood is low because the local health department stopped offering vaccinations at the start of the pandemic. Because we focused on an

urban sample primarily composed of publicly insured minority children in this study, these findings may not generalize to other clinic types and communities.

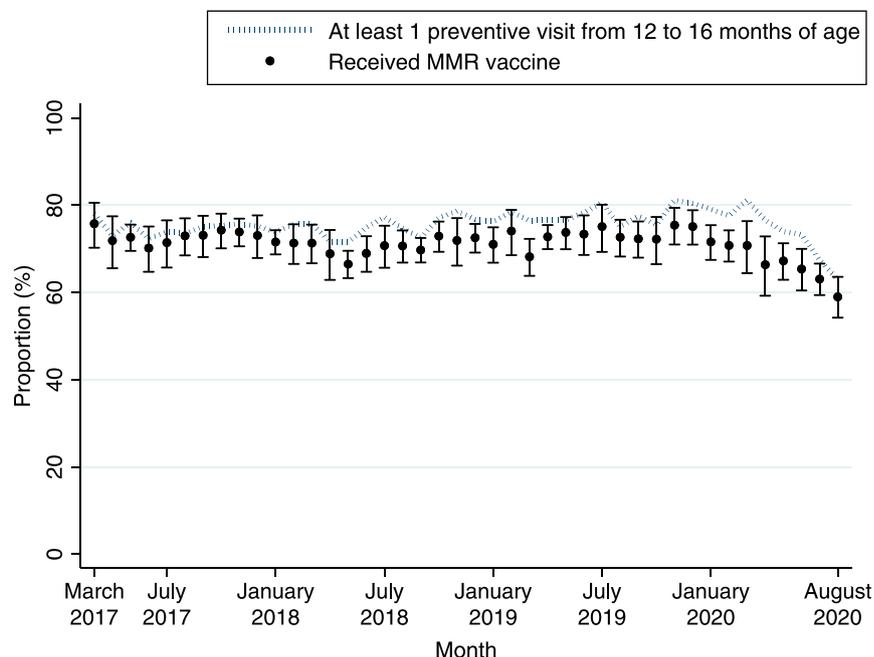


FIGURE 1 Receipt of at least 1 preventive care visit between 12 and 16 months of age and the proportion who received MMR vaccination by 16 months over time. The 95% confidence interval for the proportion vaccinated is adjusted for clustering by clinic.

Given the baseline low vaccination rates even before the pandemic and the subsequent decline, we face a critical need to improve timely vaccination and provide catch-up opportunities in the area with the highest incidence of COVID-19 in Ohio.⁵ To address this, we are implementing new community-based vaccination approaches funded in partnership with our institution (eg, pop-up vaccine clinics, mobile clinics, school-based clinics with increased capacity owing to remote learning), which offer an alternative for families hesitant to visit our clinics because of COVID-19 concerns. However, by separating vaccination from the full range of preventive services, we recognize that opportunities to promote child health and development, which have great importance because of increased family stress and social needs at this time, might be missed. We believe that it is critical to develop innovative approaches to have families return for preventive care.

Although we did not find a disparity between white and Black children in MMR vaccination, it is the falling absolute rate of vaccination that puts everyone at risk. We are now working with community members to understand why Asian American and

Hispanic families were more likely to be vaccinated, which might lead to new vaccine promotion strategies and vaccination coverage overall. The lower rate among uninsured patients emphasizes the importance of our ongoing work to help families enroll in insurance.

Uptake of MMR vaccination is not only critical for protecting the broader community against other infectious outbreaks but also a bellwether of preventive services overall. In this study, we focused on the first MMR vaccination because we hypothesized that any changes in vaccination rates due to pandemic-related closures likely would be identified earliest among young children who require frequent preventive visits. It is too soon to evaluate whether there has been a decrease related to the second MMR vaccination, which is recommended between 4 and 6 years of age. Despite our efforts to have families return for preventive care, we need novel strategies to ensure the delivery of comprehensive preventive services, including catch-up vaccination efforts that might need to extend beyond the end of the pandemic to protect our community from vaccine-preventable outbreaks.

ABBREVIATIONS

COVID-19: coronavirus disease 2019

MMR: measles-mumps-rubella

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