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Natalie Jordan Date

Prevalence of Pediatric COVID-19 Vaccine Information on Family Medicine Practice Websites in the U.S. Northeast and South

By

Natalie Jordan
Master of Public Health

Epidemiology

Allison T. Chamberlain, PhD, MS
Committee Chair

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By

Natalie Jordan

B.S. in Environmental Science
University of North Carolina at Chapel Hill
2020

Thesis Committee Chair: Allison T. Chamberlain, PhD, MS

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Abstract

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By Natalie Jordan

Purpose: With regional disparities in pediatric COVID-19 vaccine coverage in the U.S.,[1] this study assesses the prevalence of pediatric COVID-19 vaccine related information on family medicine providers' websites in Southern and Northeastern regions of the United States. Due to longstanding public trust in medical providers' professional opinions, their online promotion of COVID-19 vaccines for children 5-11 years old may be useful for further increasing pediatric vaccine uptake.

Methods: Using a dataset of U.S.-based family medicine providers originally collated in Fall 2021, websites of 255 practices located in the U.S. Northeast and South were re-examined for provision of information about pediatric COVID-19 vaccinations. Cross-sectional website content analysis was conducted from January 19, 2022 to February 2, 2022. Modified Poisson regression with robust error variances was used to estimate prevalence ratios for mentioning of pediatric COVID-19 vaccines on website homepages and anywhere on the websites.

Results: Of 255 websites, 28 (11.0%) mentioned pediatric COVID-19 vaccines on the homepage. After adjusting for number of practice locations, conglomerate association, and university affiliation, the prevalence of mentioning pediatric COVID-19 vaccination on the homepage was 0.55 times lower among practices in the South compared to practices in the Northeast (p-value =0.09). While mentioning pediatric COVID-19 vaccines anywhere on practice websites was more prevalent (n=174, 68.2%), it was observed more often on websites from the Northeast than the South (81.1% versus 61.2%, $p < 0.01$). Adjusted prevalence of mentioning pediatric COVID-19 vaccines anywhere on the website was 0.78 lower in the South than in the Northeast (p-value < 0.01).

Conclusions: With only 11% of family medicine practices' websites mentioning pediatric COVID-19 vaccine content on their homepage, routine vaccine providers can improve provision of pediatric COVID-19 vaccine-related information on this existing communication platform. Presence of vaccine content on practice websites varies by geography, suggesting greater emphasis on improving website content may be more impactful in the South than other U.S. regions like the Northeast. With concomitant variations in regional pediatric vaccine coverage, practices and their patient populations may benefit greatly from improving easy access to reputable vaccine information from existing websites already hosted by their trusted family providers.

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Introduction

As of April 18th 2022, American children aged 5-11 years have accounted for 6.7% of all reported COVID-19 cases, with 351 deaths since January 21, 2020.[2] Although mortality is low for this age group, children have substantial risks associated with contracting SARS-CoV-2. These include Multisystem Inflammatory Syndrome of Childhood (MIS-C), neurocognitive sequelae of infection ("long COVID"), and mental health issues.[3] The Pfizer-BioNTech COVID-19 pediatric vaccine was granted Emergency Use Authorization (EUA) by the Food and Drug Administration for use in pediatric populations on October 29, 2021 with an estimated efficacy around 91%.[4] However, the estimated proportion of fully vaccinated children as of April 18, 2022 is just over one-quarter (28.2%);[1] this suboptimal coverage can be attributed in part to parental vaccine hesitancy with concerns of safety, trust, and speed of vaccine production being cited among the top reasons for reluctance.[5-6] As the pandemic has accelerated a shift to telemedicine and online health-seeking behaviors,[7-8] many individuals have turned to the internet for vaccine-related information, thereby increasing their exposure to both evidence-based and non-evidence-based content. Vaccine providers have been urged to engage in vaccine promotion online to reach hesitant audiences and combat misinformation.[9] To target further promotion of pediatric vaccines, vaccine safety, efficacy, and consequences of COVID infection in children are powerful points for providers to convey to audiences moving forward.[10-11]

In an effort to explore whether traditional, often trusted, vaccine providers attempt to provide resources to the growing online community, a website content analysis of U.S.-based family medicine practice websites conducted in Fall 2021 revealed that COVID-19 vaccine information was available on the homepages of only 57.1% of the 964 websites examined.[12] Furthermore, substantial differences in the prevalence COVID-19 vaccine information for

different U.S. regions were observed with Northeastern practices being most likely (64.1%) to have COVID-19 vaccine content on their website homepages and the South being the least likely (49.9%). No data were collected about promotion of COVID-19 vaccines for children ages 5 to 11 years old because this study occurred before pediatric COVID-19 vaccines were available. This analysis reports findings of a re-examination of the subset of the same practices from the South and Northeast to understand the extent to which family medicine providers use their existing practice websites for promotion of COVID-19 vaccine information for children aged 5 – 11 years.

Methods

The website sampling methods utilized for this analysis have been previously described in Ackleh-Tingle et. al.[12] In short, the Centers for Medicare and Medicaid Services National Plan and Provider Enumeration System National Provider Identifier (NPI) records were used to create a sampling frame of 136,531 providers who indicated "family medicine" as their primary taxonomy code and were practicing in the U.S. as of September 12, 2021. Providers were randomly sampled proportionally by state, setting the target number of websites selected for each state proportional to the number of family medicine providers listed for that state in the sampling frame. The initial target sample size was 1,000 unique websites; after inclusion and exclusion criteria were applied, 964 practice websites made up the final analytic sample.[12]

For this analysis, only practice websites located in the South and Northeastern regions of the U.S. that had previously mentioned COVID-19 vaccines on their practice websites were included [Figure 1]. Regions were defined based off of Census definitions with the Northeast comprised of Connecticut, Massachusetts, Maine, New Hampshire, New Jersey, New York,

Pennsylvania, Rhode Island, and Vermont; the South contains Alabama, Arkansas, District of Columbia, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia. Websites of the 259 practices from the Northeast and South were revisited from January 19, 2022 to February 2, 2022 to collect data on primary and secondary outcomes of interest. The only practices excluded from this analysis were those affiliated with college student health centers (n=4) due to their lack of pediatric care.

Our primary outcome was mention of COVID-19 vaccines or vaccination for children aged 5-11 years old on the practice's homepage. Secondary outcomes included: 1) mention of COVID-19 vaccines for children aged 5-11 anywhere on the website, 2) presence of a frequently asked question (FAQ) section about COVID-19 vaccines for children aged 5-11, 3) mention of age-appropriate dosage of the pediatric COVID-19 vaccine formulation, and 4) mention of the practice providing pediatric vaccines for 5 – 11 year-olds at their practice. The main covariate of interest was the U.S. Census Bureau-defined geographic region. Data on practice characteristics (i.e. number of practice locations and affiliation with a conglomerate) were retained from the Fall 2021 initial data collection period and were not updated during data collection for this pediatric-focused analysis.

We calculated period prevalences for all outcomes, pooled and stratified by region. Mantel-Haenszel Chi-square tests were used to identify significant differences on outcomes of interest between the Northeast and South. Factors associated with mentioning pediatric COVID-19 vaccines on the website homepage were assessed using modified Poisson regression models with robust error variances. Statistical analyses were performed using SAS version 9.4 (SAS Institute Inc, Cary, NC).

Results

A total of 255 family medicine practices, 90 (62.1%) from the Northeast and 165 (49.5%) from the South, were included in this analysis [Figure 1]. The Northeast had a higher proportion of practices affiliated with a conglomerate than in the South (90% vs. 81.2%) and less practices with only one location (5.6%) compared to the South (13.3%) [Table 1].

Only 28 (11.0%) practices overall mentioned pediatric COVID-19 vaccines for children aged 5-11 on their practice homepage [Table 1]. Differences in this outcome were not significantly significant by region (15.6% in the Northeast vs. 8.5% in the South; p= 0.085). For pediatric COVID-19 vaccines mentioned anywhere on the practice website, 174 practices (68.2%) had at least some content about these vaccines for children somewhere on their website. Practices from the Northeast were significantly more likely to mention the vaccines anywhere on their website than those from the South (81.1% vs. 61.2%; p= 0.0011). Information on vaccine dosage and FAQs for the pediatric vaccines were found on 23.5% and 26.7%, respectively. Over half of all websites (53.3%) mentioned that they provided pediatric vaccines at their practice locations; this metric was significantly more common among Northeastern practices than those in the south (63.3% vs. 47.9%; p= 0.0183) [Table 1].

Using modified Poisson regression with robust error variances, Southern family medicine websites were approximately half as likely than Northeastern practice websites (unadjusted PR= 0.55; p-value = 0.09) to mention pediatric COVID-19 vaccines on the homepage [Table 2]. Similarly, practices in the South were 25% less likely to mention pediatric COVID-19 vaccines anywhere on the website than practices in the Northeast (unadjusted PR= 0.75; p-value < 0.01). After adjusting for number of practice locations, conglomerate status, and university affiliation,

only the prevalence ratio for pediatric COVID-19 vaccine information anywhere on the practice website shifted minimally (PR = 0.78; p-value < 0.01).

Discussion

Exploring whether and how routine vaccine providers – like family medicine physicians – utilize their own practice websites to describe and promote COVID-19 vaccines is useful for understanding and potentially improving online influence of these trusted providers. Promotion of pediatric COVID-19 vaccines may be especially important as parents are known to seek information online to help guide health-related decisions for their children.[13] Given the fact that just over one-quarter (28.2%) of all 5-11 years are fully vaccinated against COVID-19 as of April 18, 2022,[6] vaccine providers should be using all modalities possible – especially before any future COVID-19 surges in fall or winter 2022 - to reach and communicate reputable COVID-19 vaccine information to interested parents.

Only 28 websites out of the 255 in our sample mentioned COVID-19 vaccines for 5-11 year-olds on their practice's homepage. Compared to 57.1% of websites mentioning COVID-19 vaccines for adult populations in Fall 2021,[12] observing only 11% with pediatric vaccine information is far lower than expected. Although vaccines for this age group are relatively new, there has been ample time for practices – especially those which already took time to include general information about COVID-19 vaccines on their websites already - to update their websites with refined content for promotion of pediatric COVID-19 vaccines. Furthermore, the prevalence of our secondary outcome – mentioning pediatric vaccines anywhere on the website - was 68.2%, also lower than the 75.3% prevalence estimate found in Fall 2021 for promotion of COVID-19 vaccines for adults. Although there is less of a difference in these proportions,

pediatric vaccine promotion remains one of the greatest areas for possible improvement due to the suboptimal number of children aged 5-11 years old that are fully vaccinated.

The variations observed in specifically mentioning COVID-19 vaccination on practice homepages and websites may be due to a variety of factors, one being decreasing concern in the COVID-19 pandemic. Due to declines in incidence, hospitalizations, and deaths,[2] vaccination rates for all populations have stalled; primary care practices may not feel the need to promote pediatric vaccination as prominently on their homepages. Stratifying results by region, we further observed that vaccine information on the homepage is not significant while vaccination anywhere on the website is. Lack of statistical significance for the primary analysis likely emanates from the relatively few practices (n=28) mentioning mentioned pediatric vaccines on the homepage at all, resulting in too small of a sample to discern significant differences between the Northeast and South. The reduced presence of pediatric COVID-19 vaccine content on websites in the South compared to the Northeast could be due in part to politicization of vaccination in the U.S. with individuals in the largely Republican South being more vaccine reticent than those in the more Democratic states in the Northeast.[14-15]

Approximately a quarter of websites in this study report pediatric dosage information and FAQs; ideally, these proportions would be much higher in an effort to proactively address parental and patient concerns and questions even before appearance in the clinic. While information about dosage and FAQs did not differ significantly by region, significantly more websites from practices in the Northeast mentioned offering of pediatric COVID-19 vaccines at practice locations than those in the South ($p= 0.0183$). These differences align with higher rates of overall pediatric vaccine uptake in Northeastern states than in Southern states, and it would be

interesting to understand the extent to which presence of COVID-19 vaccine information on trusted vaccine providers' websites might be influencing this greater vaccine uptake.[16-17]

Our study has a few noteworthy limitations. Because this study's sample was a subset of websites originally identified for a previous analysis, the accuracy of some of the practice demographic data elements was dependent upon the quality of initial data collection conducted during Fall 2021 and an assumption that practice demographic data did not change in 5 months' time. Furthermore, because this analysis only re-examined websites that had previously mentioned the COVID-19 vaccine on their homepages back in Fall 2021, this analysis offers signals rather than robust estimates of the proportions of family practice websites in the Northeast and South that provide pediatric COVID-19 vaccine information on their practice website. Moreover, because this study only examined family practice websites and not also pediatric practice websites, a similar exploration into pediatric practice website content might provide more robust information due to their dedicated care to children and adolescents.

As routine vaccine providers, family medicine providers continue to serve as trusted sources of health information and behaviors. Ensuring their timely shift to providing online content to reflect society's growing consumption of online health information is of utmost importance. During the COVID-19 pandemic, people have been restricted and limited in their traditional in-person engagement in health care, so health seeking behaviors and the demand for online health information has grown exponentially.[8] To keep up with this trend, family medicine providers should continue to update their websites accordingly on health outcomes and concerns that are prevalent now and in the future. Although COVID-19 numbers have declined over the past couple months, the disease is still circulating and the potential for new variants and outbreaks remains high. In order to reduce the chance of more severe disease and death – as well

as strain to the healthcare industry overall - vaccination against COVID-19 remains the best preventative option available. With vaccination rates slowing, a boost to help parents find confidence in a decision to vaccinate their children against COVID-19 could be especially helpful during this period of declining transmission of the disease. Children are often at the fore of safety concerns, so having ample resources from trusted voices to help parents make the decision to vaccinate are increasingly important.

Conclusion

During public health emergencies, health providers should prioritize dissemination and amplification of important health-related information online so the public can easily find clear, reliable information from the health providers they trust most. This is especially important during a public health emergency like the COVID-19 pandemic. As prevalence of pediatric COVID-19 vaccine information among family medicine provider websites remains low especially among Southern practices, the need for updated, tailored vaccine promotion content on practice websites may be a resource-light way to increase pediatric vaccine promotion.

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Figure 1. Selection of analytic sub-sample from initial sample of family medicine practice websites curated in Fall 2021

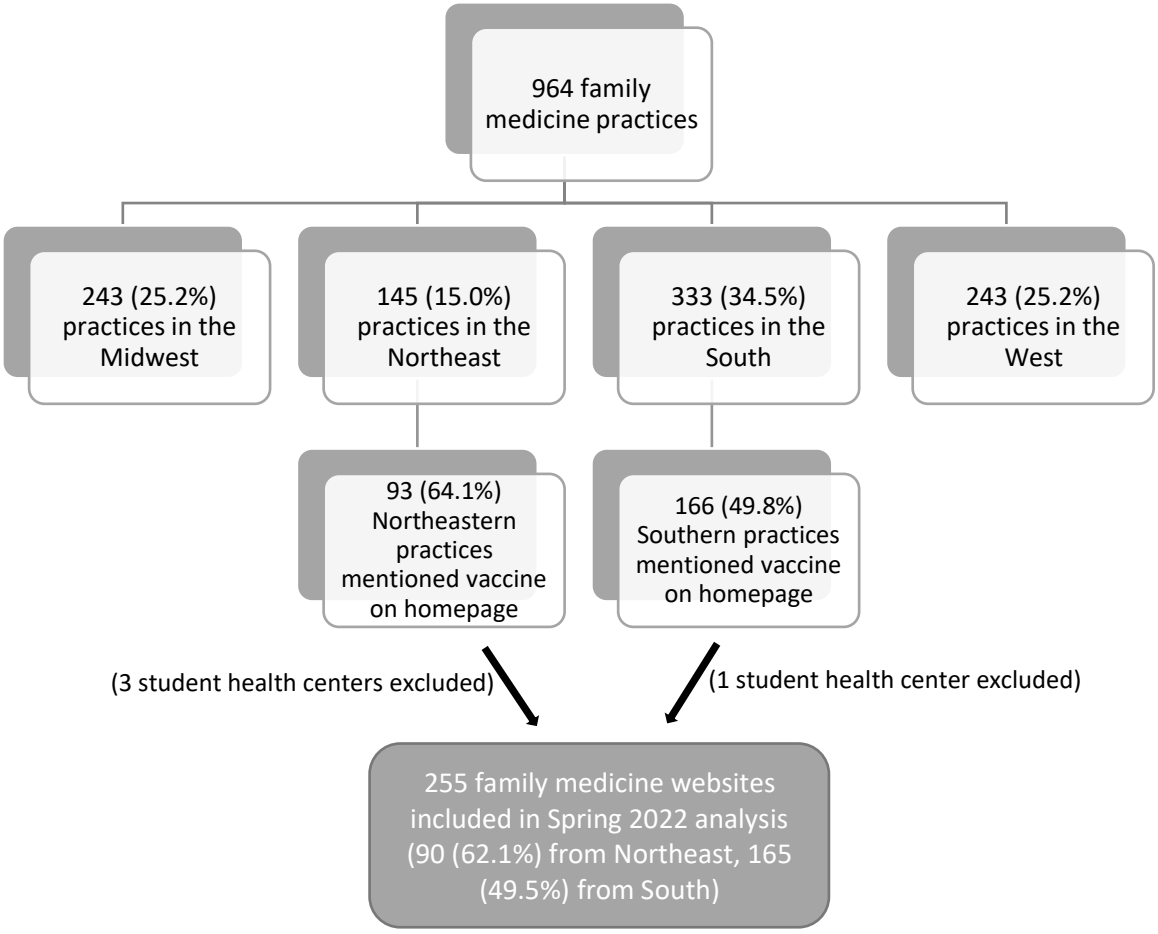

Table 1. Characteristics and pediatric COVID-19 vaccine information on family medicine practice websites in the United States

	Total	Northeast	South	p-value*
A. Practice Characteristics[a]	n (%)[b]	n (%)	n (%)	
Number of locations				
1	27 (10.6)	5 (5.6)	22 (13.3)	0.16
2-9	49 (19.2)	16 (17.8)	33 (20.0)	
10-19	32 (12.6)	16 (17.8)	16 (9.7)	
20+	147 (57.7)	53 (58.9)	94 (57.0)	
Part of conglomerate/ managed healthcare system				
Yes	215 (84.3)	81 (90.0)	134 (81.2)	0.07
No	40 (15.7)	9 (10.0)	31 (18.8)	
Affiliated with University Health Network				
Yes	46 (18.0)	13 (14.4)	33 (20.0)	0.27
No	209 (82.0)	77 (85.6)	132 (80.0)	
B. Pediatric Vaccine Data				
Mentions COVID-19 vaccine for 5-11 year-olds on website homepage				
Yes	28 (11.0)	14 (15.6)	14 (8.5)	0.09
No	227 (89.0)	76 (84.4)	151 (91.5)	
Mentions COVID-19 vaccine for 5-11 year-olds anywhere on website				
Yes	174 (68.2)	73 (81.1)	101 (61.2)	<0.01
No	81 (31.8)	17(18.9)	64 (38.8)	
Mentions different dosage amount for pediatric population on website				
Yes	60 (23.5)	24 (26.7)	36 (21.8)	0.38
No	195 (76.5)	66 (73.3)	129 (78.2)	
Has FAQ section on COVID-19 vaccines for pediatrics				
Yes	68 (26.7)	29 (32.2)	39 (23.6)	0.14
No	187 (73.3)	61 (67.8)	126 (76.4)	

Provides COVID-19 vaccine to 5-11 year-olds				
Yes	136 (53.3)	57 (63.3)	79 (47.9)	0.02
No/Not stated	119 (46.7)	33 (36.7)	86 (52.1)	

*Mantel-Haenszel Chi-Square test
[a]Collected in Ackleh-Tingle et. al. paper
[b]Percentages may not add up to 100 due to rounding

Table 2. Unadjusted and adjusted prevalence ratios of mentioning pediatric COVID-19 vaccine on family medicine websites in the United States

	Mentions Pediatric COVID-19 Vaccine on Homepage				**Mentions Pediatric COVID-19 Vaccine Anywhere on Website**			
	Unadjusted PR (95% CI)	p-value	Adjusted PR (95% CI)	p-value	Unadjusted PR (95% CI)	p-value	Adjusted PR (95% CI)	p-value
NORTHEAST	reference				reference			
SOUTH	0.55 (0.27-1.09)	0.09	0.55 (0.28-1.10)	0.09	0.75 (0.64-0.88)	<0.01	0.78 (0.67-0.90)	<0.01

Abbreviations: PR, prevalence ratio; CI, confidence interval

*Adjusted for conglomerate status, number of locations and university affiliation