Social Distancing for COVID-19 and Diagnoses of Other Infectious Diseases in Children

Jonathan Hatoun, MD, MPH, MS,[a,b] Emily Trudell Correa, MPH, MS,[a] Sara Mary Alice Donahue, DrPH, MPH,[c] Louis Vernacchio, MD, MSc[a,b]

Social distancing (SD) during the coronavirus disease 2019 (COVID-19) pandemic has largely removed children from school, day care, and other contact with peers. In addition to reducing transmission of severe acute respiratory syndrome coronavirus 2, these changes would be expected to reduce the transmission of other infectious diseases among children. We sought to determine the effect of SD on 12 infectious diseases commonly diagnosed in pediatric primary care that are contagious to various extents: acute otitis media (AOM), bronchiolitis, common cold, croup, gastroenteritis, influenza, nonstreptococcal pharyngitis, pneumonia, sinusitis, skin and soft tissue infections (SSTIs), streptococcal pharyngitis, and urinary tract infection (UTI).

METHODS

Using electronic health record data from a large Massachusetts pediatric primary care network that cares for ~375 000 children, we analyzed the weekly incidence of each diagnosis from weekday in-person and telemedicine encounters (excluding holidays) for children age 0 to 17 years of age for the same calendar period in 2019 and 2020 starting from January 1. We defined the pre-SD period as calendar weeks 1 to 9 of each respective year; allowed for a 3-week implementation period as SD was enacted in 2020 (statewide state of emergency declared in week 10, school and nonessential businesses closed in week 11, and stay-at-home advisory issued in week 12); and defined the post-SD period as calendar weeks 13 to 18, the most recent data available for analysis. To

TABLE 1 Rates of Diagnosis of Common Pediatric Infectious Diseases in 2019 and 2020 and Difference-in-Differences Between 2019 and 2020

Diagnosis	2019		2020		Difference-in-Differences, 2020 vs 2019 (95% CI)
	Pre-SD	Post-SD	Pre-SD	Post-SD	
AOM	113.4	96.2	113.4	11.5	−85.1 (−86.8 to −83.5)
Bronchiolitis	17.5	8.4	20.1	0.6	−10.4 (−11.0 to −9.8)
Common cold	106.6	79.9	107.1	5.4	−75.4 (−76.9 to −73.8)
Croup	12.0	11.3	11.8	0.4	−10.7 (−11.2 to −10.2)
Gastroenteritis	18.4	15.0	14.9	1.8	−9.8 (−10.5 to −9.2)
Influenza	41.4	19.0	94.4	0.1	−71.7 (−72.8 to −70.6)
Nonstreptococcal pharyngitis	114.7	100.6	126.7	12.4	−100.6 (−102.3 to −98.9)
Pneumonia	22.3	15.0	22.6	1.4	−14.0 (−14.7 to −13.3)
Sinusitis	22.2	15.3	20.6	2.7	−11.1 (−11.8 to −10.4)
SSTI	17.6	17.9	17.8	11.6	−6.6 (−7.4 to −5.9)
Streptococcal pharyngitis	46.4	39.9	41.2	3.8	−31.1 (−32.1 to −30.0)
UTI	3.3	3.7	3.4	2.4	−1.5 (−1.8 to −1.1)

Rates are expressed as diagnoses per 100 000 patients per day. CI, confidence interval.

[a]*Pediatric Physicians' Organization at Children's, Brookline, Massachusetts;* [b]*Department of Pediatrics, Harvard Medical School, Harvard University, Boston, Massachusetts; and* [c]*Department of Accountable Care and Clinical Integration, Boston Children's Hospital, Boston, Massachusetts*

Dr Hatoun drafted the initial manuscript; Ms Correa performed the analysis; and all authors conceptualized and designed the study, reviewed and revised the manuscript, and approved the final manuscript as submitted.

DOI: https://doi.org/10.1542/peds.2020-006460

Accepted for publication Jun 12, 2020

Address correspondence to Louis Vernacchio, MD, MSc, Pediatric Physicians' Organization at Children's, 77 Pond Ave, Suite 205c, Brookline, MA 02445. E-mail: louis.vernacchio@childrens.harvard.edu

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

FINANCIAL DISCLOSURE: The authors have indicated they have no financial relationships relevant to this article to disclose.

FUNDING: No external funding.

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

To cite: Hatoun J, Correa ET, Donahue SMA, et al. Social Distancing for COVID-19 and Diagnoses of Other Infectious Diseases in Children. *Pediatrics.* 2020;146(3):e2020006460

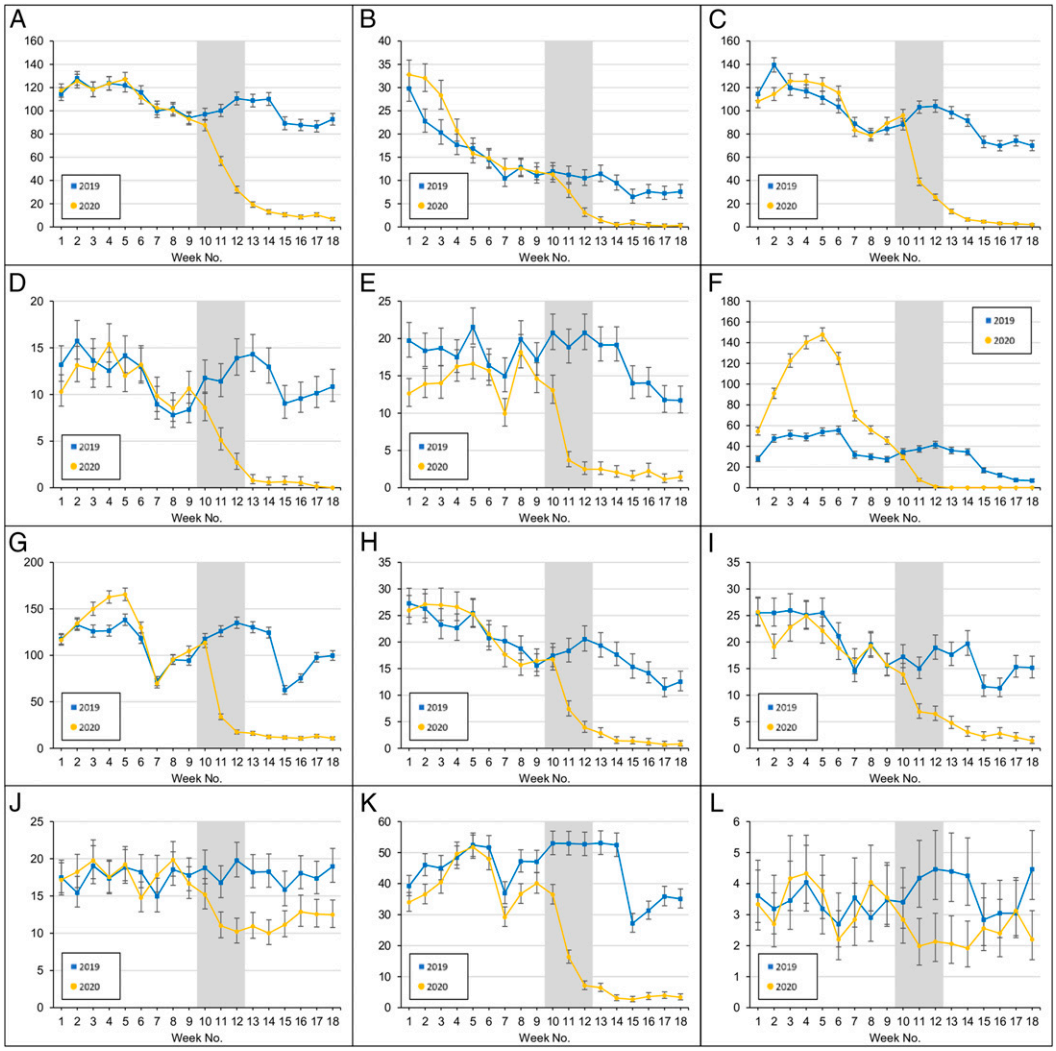

FIGURE 1

Weekly rates with 95% confidence intervals of diagnosis of common pediatric infectious diseases in 2019 and 2020. Rates are expressed as diagnoses per 100 000 patients per day. The shaded area represents period of SD implementation in 2020. A, AOM. B, Bronchiolitis. C, Common cold. D, Croup. E, Gastroenteritis. F, Influenza. G, Nonstreptococcal pharyngitis. H, Pneumonia. I, Sinusitis. J, SSTI. K, Streptococcal pharyngitis. L, UTI.

isolate the effect of SD, we performed a difference-in-differences regression analysis[1] using a multivariable Poisson regression model with diagnosis count as a function of calendar year, time period (pre-SD versus post-SD), and the interaction between the two.

RESULTS

The diagnosis rates per 100 000 patients for each time period and the difference-in-differences analysis for 2020 vs 2019 are displayed in Table 1 and Fig 1. The prevalence of each condition was significantly lower in the 2020 post-SD period than would be expected for all conditions analyzed ($P < .001$ for all diagnoses).

DISCUSSION

SD policies enacted in Massachusetts to mitigate the COVID-19 pandemic resulted in a profound decrease in the diagnosis of common infectious diseases among children. This reduction could be due to 1, or both, of 2 factors: a decline in the prevalence of the conditions or a choice not to seek care when the conditions occurred.[2] The smaller decrease in diagnoses for UTI, an infectious but not generally not contagious disease, suggests that changes in care-seeking behavior had a relatively modest effect on the other observed declines.

Although it is not surprising that the transmission of infectious diseases decreased with SD, these data demonstrate the extent to which transmission of common pediatric infections can be altered when close contact with other children is eliminated. Notably, 3 of the studied diseases, namely, influenza, croup, and bronchiolitis, essentially disappeared with SD.

The trajectory of influenza is especially interesting. Diagnoses in 2020 exceeded those in 2019 as expected from national surveillance data,[3] but the spread of influenza appears to have ended abruptly with SD. This finding differs somewhat from a recent report from Japan revealing a significant but not as dramatic decline in influenza cases coincident with SD in that country.[4] The differing results may relate to the timing of SD within the influenza season, different approaches to SD in the 2 locations, or the fact that the Japanese study included patients of all ages, whereas ours is focused only on children.

The infectious disease risks of contact with others have always been implicitly weighed against the benefits of social interaction. The current natural experiment of abrupt, widespread SD during the COVID-19 pandemic has allowed for a more explicit appreciation of the magnitude of these risks in children and may inform strategies for infectious disease risk mitigation as social interaction increases in the future.

ABBREVIATIONS

AOM: acute otitis media
COVID-19: coronavirus disease 2019
SD: social distancing
SSTI: skin and soft tissue infections
UTI: urinary tract infection

REFERENCES

1. Wing C, Simon K, Bello-Gomez RA. Designing difference in difference studies: best practices for public health policy research. *Annu Rev Public Health*. 2018;39:453–469
2. Isba R, Edge R, Jenner R, Broughton E, Francis N, Butler J. Where have all the children gone? Decreases in paediatric emergency department attendances at the start of the COVID-19 pandemic of 2020. *Arch Dis Child*. 2020;105(7):704
3. Centers for Disease Control and Prevention. Weekly US influenza surveillance report. Available at: https://www.cdc.gov/flu/weekly/#ILINet. Accessed May 7, 2020
4. Sakamoto H, Ishikane M, Ueda P. Seasonal influenza activity during the SARS-CoV-2 outbreak in Japan. *JAMA*. 2020;323(19):1969–1971