

COVID-19 infections following physical school reopening

The USA closed most of its schools in March–April 2020, which was associated with reduced COVID-19 incidence.¹ In August–September 2020, schools reopened, with many schools teaching remotely until they can safely teach physically.²

We analysed COVID-19 incidence from Florida since its database provides incidence at ages 6–13 years (elementary school) and 14–17 years (high school). We extracted incidence by county and matched it with each county's date of school reopening. We used a 7-day moving average. We aggregated the rates by counties with physical learning and counties with remote learning (the latter were Broward, Miami-Dade and Palm Beach). We calculated time points at which the trends changed in 10 days before reopening and 20 days from reopening, using JoinPoint-Regression. Lastly, we tested if trends were different between counties teaching physically and remotely. Tests were two tailed with a significance level of 0.05.

In counties teaching physically, at ages 6–13 years, the incidence decreased from day –10 to day 4 (–0.5% daily change, 95% CI –0.9% to –0.1%), followed by an increase from day 4 to day 20 (0.8% daily change, 95% CI 0.5% to 1.1%). On day 4, the incidence was 11/100 000 (95% CI 9.9 to 12), and on day 20, it increased to 12.8 (95% CI 11.7 to 13.9, 1.2 fold; figure 1).

In counties teaching physically, at age 14–17 years, the incidence decreased from day –10 to day 1 (–3.2% daily change, 95% CI –3.9% to –2.5%), followed by an increase until day 20 (1.4% daily change, 95% CI 1.1% to 1.8%). On day 1, the incidence was 16.1 (95% CI 14.4 to 17.9), and on day 20, it increased to 20.5 (95% CI 18.5 to 22.5, 1.3 fold).

In counties teaching remotely, at ages 6–13 years, the incidence decreased from day –10 to day 4 (–5.6% daily change, 95% CI –6.7% to –4.5%), followed by no significant trend. The slope from day 0 was significantly different than the slope of counties teaching physically at ages 6–13 years ($T=5.0$, $p<0.05$).

In counties teaching remotely, at age 14–17 years, the incidence decreased from day –10 to day 6 (–4.3% daily change, 95% CI –5.4% to –3.1%), followed by no significant trend. The slope from day 0 was significantly

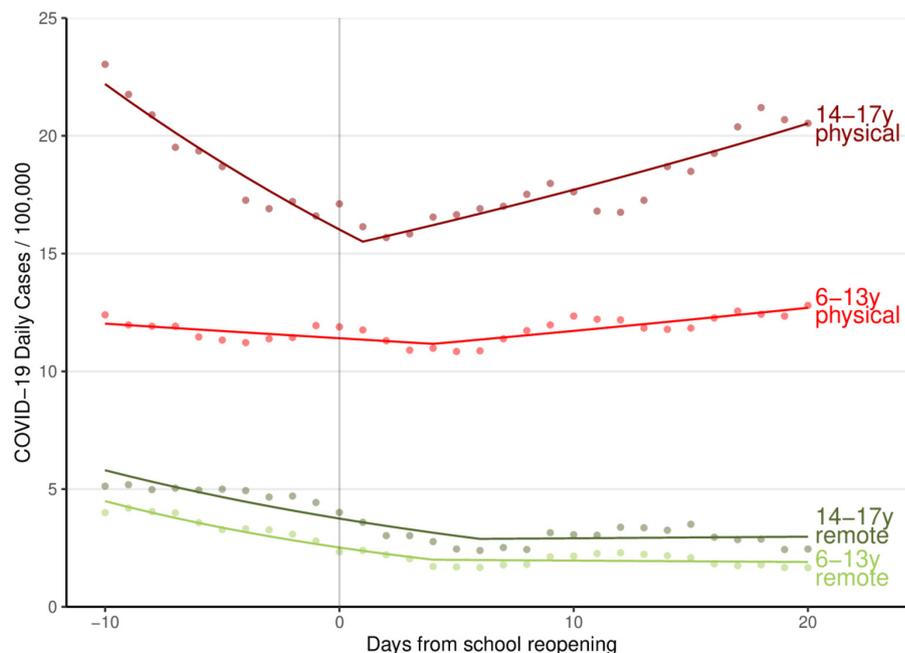


Figure 1 COVID-19 incidence by days from school reopening.

different than the slope of counties teaching physically at ages 6–13 years ($T=7.6$, $p<0.05$).

Our analysis shows that physical reopening of schools was followed by increased COVID-19 incidence at school ages, especially high schools. Counties with remote reopening did not have increased incidence, which may also relate to their lower COVID-19 rates before the reopening, their public mask mandate and gathering limit or their socioeconomic difference, such as in Miami-Dade and Broward.³

A limitation of the study is that some parents opted not to send their children to physical learning. A possible confounder for increased infections with physical learning might be that it allowed parents to go to work, which may increase infections in children. Nonetheless, remote learning can increase inequities and reduce monitoring for the growing risk of suicidality.^{4,5} Counties that reopened physically and had increased COVID-19 incidence could consider remote learning, especially in high schools.

Oren Miron¹,^{*} Kun-Hsing Yu,² Rachel Wilf-Miron,³ Isaac Kohane,² Nadav Davidovitch¹

¹Health Systems Management, Ben-Gurion University of the Negev, Beer Sheva, Israel

²Biomedical Informatics, Harvard Medical School, Boston, Massachusetts, USA

³School of Public Health, Tel Aviv University, Tel Aviv, Israel

Correspondence to Mr Oren Miron, Ben-Gurion University of the Negev, Beer Sheva, Israel; orenmir@post.bgu.ac.il

Contributors OM had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Concept and design: all authors. Acquisition, analysis or interpretation of data: all authors. Drafting of the manuscript: OM. Critical revision of the manuscript for important intellectual content: K-HY, RW-M, IK and ND. Statistical analysis: OM, IK and K-HY. Study supervision: IK and ND.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; internally peer reviewed.

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To cite Miron O, Yu K-H, Wilf-Miron R, et al. *Arch Dis Child* 2021;**106**:e34.

Accepted 23 November 2020
Published Online First 7 December 2020

Arch Dis Child 2021;**106**:e34.
doi:10.1136/archdischild-2020-321018

ORCID iD

Oren Miron <http://orcid.org/0000-0002-7742-478X>

REFERENCES

- 1 Auger KA, Shah SS, Richardson T, *et al*. Association between statewide school closure and COVID-19 incidence and mortality in the US. *JAMA* 2020;324:859.
- 2 Pediatrics AA of. *COVID-19 planning considerations: guidance for school re-entry*. 7, 2020.
- 3 NPR.org. Florida's Governor Lifts All COVID-19 Restrictions On Businesses Statewide. Available: <https://www.npr.org/sections/coronavirus-live-updates/2020/09/25/916969969/floridas-governor-lifts-all-covid-19-restrictions-on-businesses-statewide> [Accessed November 5, 2020].
- 4 Miron O, Yu K-H, Wilf-Miron R, *et al*. Suicide rates among adolescents and young adults in the United States, 2000-2017. *JAMA* 2019;321:2362-4.
- 5 Li A, Harries M, Ross LF. Reopening K-12 schools in the era of coronavirus disease 2019: review of State-Level guidance addressing equity concerns. *J Pediatr* 2020;227:38-44.e7.