Supplementary Material for “Revisiting Pediatric Covid-19 cases in Counties With and Without School Mask Requirements—United States, July 1—October 20 2021”

Ambarish Chandra* University of Toronto

Tracy Beth Høeg† University of California, Davis

July 14, 2022

*Department of Management, UTSC; Rotman School of Management; and Department of Economics, University of Toronto, 105 St. George Street, Toronto, Ontario, M5S 3E6, Canada; Email: ambarish.chandra@utoronto.ca

†University of California-Davis 4680 Y St 1700 Sacramento, CA 95817, and Sierra Nevada Memorial Hospital 155 Glasson Way, Grass Valley, CA 95945.

1 Overview

This document presents supplementary information for the main manuscript. Some or all of this information can be included in the manuscript, at the editor's request, or else this file can be made available as an online appendix.

Section 2 contains additional information on the construction of the sample. Section 3 provides details on the correlation of the CCVI and SVI variables, discussed in the main text. Section 4 considers the possibility that testing rates may vary across jurisdictions in a manner that could bias the results. Section 5 presents additional regression results.

2 Notes on Sample Construction and Replication

Two factors make it impossible to exactly replicate the CDC study by Budzyn et al. First, it is unclear how that study treated school districts that cross county lines, as well as those counties which contain multiple school districts. This is important because mask policies are set at the district level while case data are only available at the county level, and the two levels of geography do not map clearly to one another. This paper assigns each such district to each county of which it is a part, thereby duplicating some school districts.

Second, Budzyn et al obtain school masking rules, and other school district variables, from MCH, which in turn obtains these from phone surveys of school districts. MCH updates school district information frequently. This study uses MCH data that were current as of October 15, 2021. The CDC study used information from much earlier, which was likely to have been different as school district information changes regularly and the MCH information also sometimes conflicts with other sources.

Our study finds 565 counties that satisfy the selection criteria used by Budzyn et al, in contrast to the 520 counties used in that study. The difference is likely due to the reasons provided above.[1] This is why the results of our replication cannot line up exactly with those in Budzyn et al although, as we show below, the results are very similar.

Note that, of the 565 counties that fit the criteria in Budzyn et al, 270 imposed mask requirements in schools and 295 did not. In comparison, in our full sample of 1832 counties, 776 had school mask requirements and 1056 did not.

3 Inclusion of the CCVI variable

Budzyn et al control for a number of covariates in their analysis, including the Social Vulnerability Index (SVI) and the Community Covid-19 Vulnerability Index (CCVI). The CCVI was developed by a private company, Surgo Ventures, who state that it is based on the SVI.[2] These variables

[1] When contacted, the corresponding author of the CDC study did not clarify this issue and declined to share the code used to construct the sample.

[2] See https://precisionforcovid.org/ccvi and https://www.atsdr.cdc.gov/placeandhealth/svi/index.html

are indeed very similar with a correlation between them of 0.85. It is this unclear why both were included as covariates, in addition to multiple other variables associated with social vulnerability including poverty, population density and percent uninsured.

Including all these variables as regression controls is an unusual choice, because it increases the standard error of the estimated coefficients. In the case of the Budzyn et al study, it turns out that the resulting estimates are highly sensitive to the choice of controls. As we show in the next section, it appears likely that the main regression coefficient in the Budzyn et al regression is only statistically significant when all these variables are included, and not if the CCVI variable is dropped. Upon dropping the largely redundant CCVI covariate, the significant result in the specification that attempts to replicate the Budzyn et al analysis ($p = 0.019$) is no longer significant ($p = 0.076$). In terms of our analysis, dropping the CCVI resulted in significantly higher case numbers in the masked counties, as described in the main manuscript text.

4 Potential variation in testing rates across jurisdictions

One potential concern with our analysis may be that rates of testing for Covid-19 could vary across jurisdictions in a manner correlated with school mask requirements. For example, if states or counties that mandate masks in school are also more likely to test students, or the wider community, then these jurisdictions will also mechanically report higher case rates than other areas. We note that the Budzyn et al study also did not account for the possibility that testing rates may have been a confounding variable. Nevertheless, our analysis is robust to the possibility of testing differences, as we describe in this section.

Testing rates can vary across states as well as within states. At an aggregate level, there is no clear relationship between testing rates and school mask requirements. For example, Florida and New York have very similar per-capita rates of PCR testing, as reported by the CDC, but while New York maintained a state-wide mask mandate for schools through most of the 2021-22 school year, Florida had no such requirement.

We obtained state level testing data from the U.S. Department of Health and Human Services.[3] We calculated tests per capita for the period August 1 to November 30, 2021, which most closely coincides with our sample period of pediatric case rates in schools. We included this variable as a control in our regression specification and found no effect on the main relationship between school mask requirements and per capita pediatric cases; see Regression 5 in the table below.

The other possibility is that testing rates vary across counties within a state. There is no source for county-level testing across the United States, implying that testing data must be obtained on a state-by-state basis, but not all states provide this information. As a case study we examined the state of Georgia, for two reasons. First: weekly county-level data on testing is easily available from the state's Covid-19 data hub website.[4] Second, school mask policies varied widely across the

[3] The data are available at:
https://beta.healthdata.gov/dataset/COVID-19-Diagnostic-Laboratory-Testing-PCR-Testing/j8mb-icvb

[4] See https://covid-hub.gio.georgia.gov/

state between August and November 2021. Of the 159 counties in Georgia, we classified districts in 37 counties as requiring masks in school, and those in 48 counties as not requiring masks, based on information from MCH. The remaining 74 counties did not meet the criteria laid out in our study for classification, due either to insufficient data from MCH or conflicting policies across districts within those counties. States such as New York and Florida would not have been useful for this analysis because they lack variation in masking rules across counties, as described above.

We calculated that the Georgia counties with mask requirements in schools had average testing rates of 13.12 per 100 residents during September and October of 2021, while those without such requirements had a testing rate of 11.95 per 100 residents. The difference was not statistically significant ($p = 0.4463$).

Overall, both across-state and within-state data suggest no clear relationship between school mask policies and testing rates, suggesting that variation in testing rates is unlikely to be a confounding variable in our analysis.

5 Addittional Regression Specifications

Table 1 presents six regression specifications. The specifications in Column 1 regresses pediatric cases per capita on the control variables used by Budzyn et al, but using the sample of 1832 counties for the first 7 weeks that schools were open. Column 2 adds week fixed-effects to the specification of Column 1.[5]

Columns 3 and 4 omit the CCVI variable that was employed by Budzyn et al, with Column 4 adding week fixed-effects again. Finally, Columns 5 and 6 estimate the regression for the 565 counties that fit the Budzyn et al specification. The result of Column 5 shows the only case where there is a statistically significant association between school mask requirements and pediatric cases, though this is no longer the case when the CCVI variable is dropped in the specification of Column 6.

[5]Budzyn et al do not state that they use week fixed-effects, but these seem natural to control for, as we see a regular pattern, across the entire country, of high case rates around the time of school opening that then subsided as the term continued.

Table 1: Regression of Pediatric Cases per 100,000

	1832 counties					565 counties	
Regression Number:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
School Mask Requirement	1.339	1.279	3.564	3.507	2.903	-4.892	-3.692
	(0.051)	(0.058)	(0.000)	(0.000)	(0.000)	(0.019)	(0.076)
Adult Cases per 100K	1.213	1.194	1.215	1.196	1.200	1.492	1.501
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Percent Uninsured	-0.538	-0.558	-0.334	-0.353	-0.348	-0.338	-0.094
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.173)	(0.702)
Percent in Poverty	0.536	0.531	0.317	0.312	0.437	0.859	0.702
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Population Density	-0.001	-0.001	0.001	0.001	0.001	0.003	0.015
	(0.191)	(0.162)	(0.310)	(0.329)	(0.295)	(0.709)	(0.025)
Social Vulnerability Index	-14.062	-13.558	8.371	8.911	7.156	-26.470	-2.338
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.648)
Community Vulnerability Index	27.109	27.154				30.886	
	(0.000)	(0.000)				(0.000)	
Percent Non-Hispanic White	-1.508	-0.892	-2.449	-1.836	-0.181	0.703	3.262
	(0.476)	(0.667)	(0.251)	(0.380)	(0.932)	(0.906)	(0.584)
Median Age	0.772	0.768	0.742	0.738	0.708	1.240	1.186
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Pediatric Vaccination Rate	1.411	1.320	-1.256	-1.352	-0.958	-2.128	-7.528
	(0.528)	(0.546)	(0.576)	(0.540)	(0.664)	(0.755)	(0.268)
State Tests Per Million					0.267		
					(0.000)		
Constant	-37.165	-40.113	-33.032	-35.973	-38.096	-61.641	-57.191
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R^2	0.659	0.673	0.652	0.666	0.667	0.709	0.705
Obs	12824	12824	12824	12824	12824	2260	2260

Note: p-values in parentheses.