

The Unintended Cost of Distance Learning: An Analysis of Child Maltreatment*

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Abstract

Education personnel play a crucial role in identifying and reporting child maltreatment. However, school closures amid COVID-19 pandemic disrupted this vital reporting system. I causally investigate how remote learning influenced trends in child maltreatment reports and risks, leveraging county-level variations in remote learning instructional weeks in the United States during the 2020-21 school year. Utilizing maltreatment report and maltreatment-related fatality data from the National Child Abuse and Neglect Data System (NCANDS), I find that counties with higher exposure to remote instruction experienced fewer screened-in allegations of school-aged children, but a higher substantiated allegations and an increase in maltreatment-related child fatalities. The reduction in allegations was primarily driven by those reported by education personnel, and the impacts varied significantly based on characteristics such as the child's race/ethnicity and the type of maltreatment. These results highlight an unintended cost of distance learning: remote instruction impaired the detection of child maltreatment, leading to fewer reports but more severe cases that could have lasting impacts on children. They also urge prompt policy interventions to safeguard children who remain undetected and to repair the reporting gaps caused by educator-child disconnection.

Keywords: Child Maltreatment, Education Personnel, Mandated Reporter, Remote Learning

JEL Codes: I28, I31, J13

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1 Introduction

Education personnel, as mandated reporters, play a crucial role in identifying and reporting child maltreatment, serving as frontline observers of students' well-being ([Benson et al., 2022](#)). Since 2000, teachers have consistently been either the first or second most common source of maltreatment allegations each year, representing over 20 percent of all maltreatment reports in the United States on average in recent years. ([U.S. Department of Health & Human Services \(HHS\), 2022](#)).

The disruption of in-person schooling during the COVID-19 pandemic significantly impacted this reporting system, impeding the detection and reporting of child abuse and neglect as well as the protective oversight typically provided by schools. Children spent extended periods at home following the initial pandemic-induced school closures, often in conditions of heightened stress and instability. This absence of routine interactions with educators and other school personnel led to an underreporting of maltreatment ([Baron et al., 2020](#); [Cabrera-Hernández and Padilla-Romo, 2020](#); [Prettyman, 2024](#)).

Additionally, emerging evidence reveals a concerning trend: child abuse-related injuries in hospitals and emergency room visits related to child maltreatment increased during the initial school closures ([Bullinger et al., 2021](#); [Kovler et al., 2021](#); [Rebbe et al., 2023](#); [Sidpra et al., 2021](#); [Cappa and Jijon, 2021](#)). Combined with evidence of underreporting, this suggests that a considerable number of maltreatment cases likely occurred but were not promptly reported or addressed. While existing studies provide valuable insights into the early impacts of the pandemic and school closures—focusing primarily on maltreatment reports and child abuse-related injuries—there remains a significant lack of causal evidence on the longer-term effects of the pandemic on maltreatment reporting and, importantly, the risks of maltreatment itself.

This paper provides causal evidence on the impacts of remote learning on child

maltreatment allegations and the risk of maltreatment, calling for prompt policy interventions to address the unintended consequences of distance learning. As school districts implemented various instructional models, ranging from fully remote to fully in-person, the resulting disparities in learning environments provide an opportunity for a quasi-experimental assessment of the impacts of disrupted in-person schooling. We leverage county- and state-level variations in remote learning exposure during the 2020-21 school year (SY) in the United States, employing difference-in-differences and event study methods to compare counties and states with relatively higher and lower exposure to remote learning. Our analyses utilize report- and state-level data on child maltreatment allegations and maltreatment-related child fatalities from the National Child Abuse and Neglect Data System (NCANDS) provided by the National Data Archive on Child Abuse and Neglect (NDACAN).

We demonstrate that remote learning hindered the reporting and detection of maltreatment while exacerbating its severity by analyzing maltreatment-related child fatalities, substantiated allegations, and child maltreatment reporting. Our findings indicate that counties with greater exposure to remote learning during the SY 2020-21 experienced fewer child maltreatment allegations, but rates of substantiated allegations increased. Moreover, states with greater exposure to remote learning experienced an increase in child fatalities linked to maltreatment. These results suggest that the decline in maltreatment allegations did not reflect a reduced risk of maltreatment, but rather an increased risk that went undetected. The reduction in allegations was primarily driven by those reported by education personnel, highlighting the disruption in student-educator interactions. Furthermore, the impacts on allegation rates were particularly pronounced among children from underrepresented groups. Overall, our findings suggest that remote learning may have inadvertently exposed children to a greater risk of maltreatment at home while leading to an underreporting of maltreatment.

These findings carry important policy implications for child welfare systems, par-

ticularly in addressing the heightened risks of maltreatment and underreporting as a result of disruptions in primary maltreatment reporting channels. Child maltreatment has profound and long-lasting impacts on nearly every dimension of children’s lives, with around 1 in 3 children in the United States undergoing a child protective services (CPS) investigation by the age of 18 (Kim et al., 2017).¹ The detrimental effects of child maltreatment, coupled with disruptions in traditional reporting channels, underscore the need for a comprehensive approach that incorporates not only the role of education personnel but also other mandated reporters and support systems.

Policymakers must develop a robust support system to improve the identification and reporting of child maltreatment, recognizing that traditional reporting channels are often disrupted during summer and winter breaks (Puls et al., 2021). Furthermore, these systems are vital as climate change has already led to, and is expected to continue causing school closures due to extreme weather events (World Bank Group, 2024). This initiative includes enhancing training for education personnel, equipping them with the necessary resources to better support children facing greater risks due to disruptions in reporting, prioritizing early intervention, and implementing various prevention programs that engage both other mandated reporters and non-professional reporters (e.g., friends, relatives, and neighbors). Additionally, targeted support systems are necessary to prevent remote learning from exacerbating existing inequalities in the maltreatment reporting landscape, ensuring that underrepresented populations receive the assistance they need during educational disruptions.

This paper contributes to several strands of literature. First, we add to the body of research examining the impacts of modes of learning on children’s outcomes. Prior research, even before the pandemic, explored the effects of virtual schooling and sporadic school closures (Bueno, 2020; Puls et al., 2021). A substantial body of recent re-

¹Studies have shown that child maltreatment is linked to elevated rates of crime and incarceration, greater substance abuse, reduced educational attainment, lower employment and income levels, and poorer behavioral and mental health outcomes (Berger et al., 2016; Currie and Spatz Widom, 2010; Currie and Tekin, 2012; Cicchetti and Handley, 2019; Eckenrode et al., 1993; Raitasalo and Holmila, 2017).

search has focused on investigating how pandemic-induced remote learning and the subsequent return to in-person schooling have influenced students' academic trajectories and health ([Kuhfeld et al., 2022](#); [Aucejo et al., 2020](#); [Copeland et al., 2021](#)). Recent studies have begun to explore high-stakes outcomes associated with different learning modes. For example, studies by [Bacher-Hicks et al. \(2022\)](#) and [Hansen et al. \(2024\)](#) examined the impacts of different learning modes on bullying and suicides. These studies found that distance learning is associated with a lower risk for children compared to in-person learning, primarily due to decreased instances of bullying and cyberbullying, while in-person schooling has been linked to higher suicide rates. Our study adds a new perspective, showing that distance learning is associated with higher maltreatment risks at home. Our findings, along with previous research documenting the high-stakes outcomes of distance learning, highlight the trade-off between shielding students from risks at school and protecting them from risks at home.

Second, our paper builds upon the growing literature on COVID-19 and child maltreatment by broadening three key dimensions highlighted in existing research. First, we examine the persistence of underreporting and the potential increase in undetected child maltreatment risks beyond the pandemic's early stages, spanning up to SY 2021-22. This allows us to build on early findings regarding the pandemic's impact on child maltreatment reporting ([Baron et al., 2020](#); [Cabrera-Hernández and Padilla-Romo, 2020](#); [Cappa and Jijon, 2021](#)). Investigating this later period is crucial, as the accumulated child maltreatment risks over time may reveal more about the ongoing impact of the pandemic on child maltreatment. Second, we incorporate additional variables as indicators of severity, such as child fatalities and substantiated allegations, to provide a more comprehensive evaluation of the potential escalation in undetected maltreatment risks. Lastly, we expand on [Wolf et al. \(2024\)](#)'s examination of the relationship between learning modes and child maltreatment reporting for children aged 0-17 in Virginia by incorporating the latest national data on child maltreatment/fatality reports

and schooling mode data. Moreover, as the majority of child victims are younger children (ages 0-3) who are less affected by school-based learning modes, we focus on school-aged children (ages 4-17) to gain a clearer understanding of the effects of remote learning. We further corroborate this by conducting a sub-analysis of the 0-3 age group, finding no significant effects.

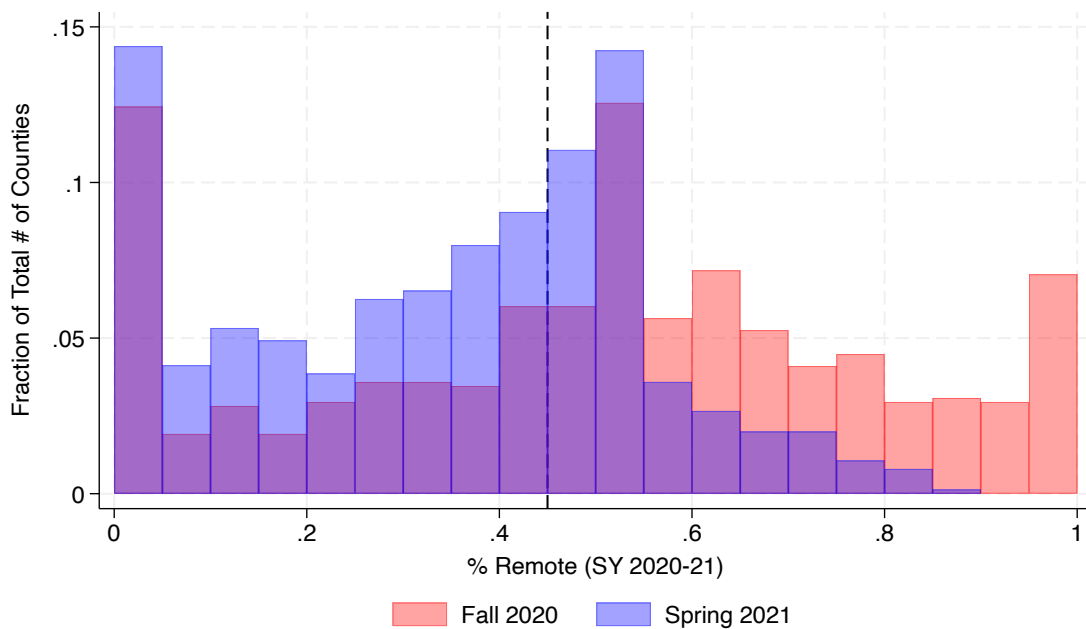
Third, this paper further advances the literature on child maltreatment by reinforcing the crucial role of education personnel in reporting such cases. In particular, we demonstrate that the disrupted connection between children and these personnel decreases the detection of children's exposure to maltreatment risks. Previous research has documented the significant role of school staff in detecting and reporting child maltreatment before and during the early stages of the pandemic when schools transitioned to remote learning ([Baron et al., 2020](#); [Puls et al., 2021](#); [Prettyman, 2024](#)). Our study re-examines the role of education personnel in reporting child maltreatment by focusing on the period after the initial school closures, when exposure to remote learning varied across school districts. Unlike the uniform closures during the early pandemic, this variation allows us to identify the causal impact of disrupted in-person learning on maltreatment reporting. Our findings reaffirm the critical role educators play in identifying and reporting child abuse, emphasizing the importance of maintaining strong connections between students and school personnel even in times of crisis.

2 Background

2.1 Pandemic-Induced School Closure and Return to In-Person Learning in the U.S.

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, began in late 2019 in Wuhan, China and rapidly spread worldwide, leading to a global health crisis. In March

Figure 1: Distribution of Counties by % Remote Learning, SY 2020-21



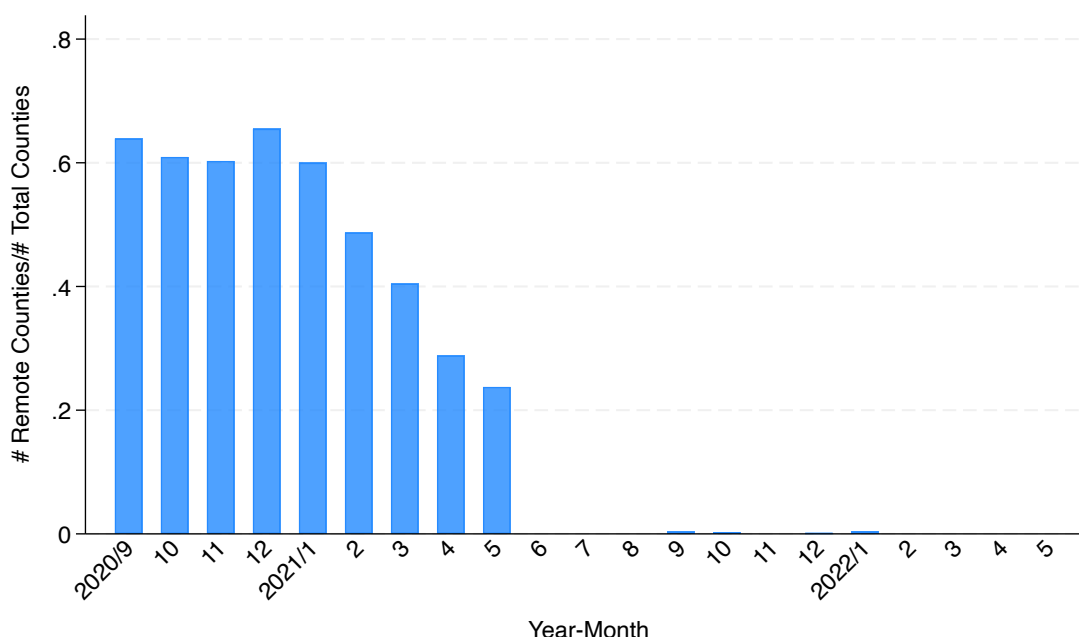
Notes: This figure presents the distribution of counties by the percentage of remote learning during SY 2020-21. The red bars represent the fall semester of calendar year 2020, while the blue bars represent the spring semester of calendar year 2021. Areas where the red and blue bars overlap are colored purple, indicating common percentages of remote learning between the two semesters. The dashed black line indicates the median proportion of remote learning for SY 2020-21 (0.45; mean = 0.42, standard deviation = 0.27).

Source: Authors' analysis of CDC School Learning Modalities (2020-2021) data.

2020, as the pandemic escalated in the United States, most schools across the country suspended in-person instruction to curb the spread of the virus. The duration of these closures varied widely across states, counties, and school districts, with local decisions based on COVID-19 case rates and quarantine measures within each district. The majority of schools – about 77 percent of public schools and 73 percent of private schools – shifted to remote learning in early 2020 and remained closed for the remainder of the SY 2019-20, gradually resuming in-person learning during the SY 2020-21 ([National Center for Education Statistics \(NCES\), 2022](#)). The phased return to in-person instruction also varied considerably across states, counties, and school districts. [Figure 1](#) shows the county-month-level variation in the proportion of remote learning instructional weeks

during the SY 2020-21, with a median of 45% (indicated by the dashed black line).² Most schools had returned to in-person instruction by the beginning of the SY 2021-22, as illustrated in [Figure 2](#).

Figure 2: Proportion of Counties with % Remote above Median, SY 2020-22



Notes: This figure shows the monthly proportion of "remote" counties (those with percentage of remote learning above median) for SY 2020-22, excluding summer months. Each blue bar represents the percentage of counties classified as remote, defined as those exceeding the 0.45 median threshold for SY 2020-21. Further details on county classification are provided in [subsection 3.2](#).

Source: Authors' analysis of CDC School Learning Modalities (2020-2022) data.

Several points should be noted: First, although most public schools were mandated by state decisions to close their physical buildings from mid-March 2020 until the end of the SY 2019-20, the implementation of remote learning varied across districts. Second, summer school in 2020 may have offered some students an opportunity to reconnect with education personnel; however, we lack data to identify which students participated and subsequently reconnected with educators. Moreover, while anecdotal evidence and reports suggest that remote learning exposure varied by local districts

²The corresponding figure for SY 2021-22 is shown in [Figure A1](#). State and county maps of remote learning percentages for the SY 2020-21 can be found in [Figure A2](#) and [Figure A3](#).

during the summer, there is no publicly available data on the primary mode of learning from March to August 2020. Therefore, our analysis focuses on examining the changes in trends of child maltreatment allegations and maltreatment-related fatalities after the initial school closures, utilizing learning mode data from the fall and spring semesters of the SY 2020-21.

2.2 Child Maltreatment Allegation and Fatality Trends

Child abuse and neglect reporting laws are in place across all 50 states, the District of Columbia, and the U.S. Territories, requiring certain professionals and institutions to report suspected maltreatment to a child protective services (CPS) agency. When a CPS agency receives an allegation of maltreatment, it is either screened in for a response by CPS, becoming a report, or screened out. Once screened-in, the case is assigned to a CPS worker for a detailed investigation. If the investigation finds credible evidence that abuse or neglect has occurred, the report is classified as substantiated.

In federal fiscal year (FFY) 2019, CPS agencies received 4.4 million referrals alleging maltreatment, involving approximately 7.9 million children.³ Of these referrals, 54.5 percent were screened in, representing a rate of 32.2 per 1,000 children in the national population ([U.S. Department of Health & Human Services \(HHS\), 2019](#)).

As documented in [subsection 2.1](#), there was variation in remote learning across local districts. [Figure 3](#) presents the trends in allegations and maltreatment-related child fatalities by learning mode from FFY 2016 to 2022, covering both the pre-pandemic period and the course of the pandemic (a description of how states are classified into each learning mode group can be found in [subsection 3.2](#), and a list of states classified into the remote and in-person learning groups can be found in [Table A1](#)).⁴

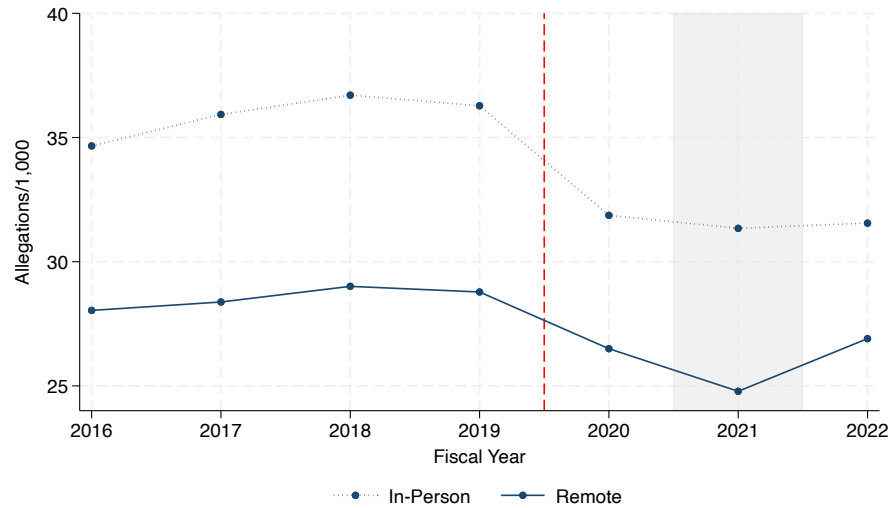
The key takeaway is that there is a substantial difference in these trends between

³The federal fiscal year spans from October of the previous year to September of the current year. For example, FFY 2019 covers the period from October 1, 2018 to September 30, 2019.

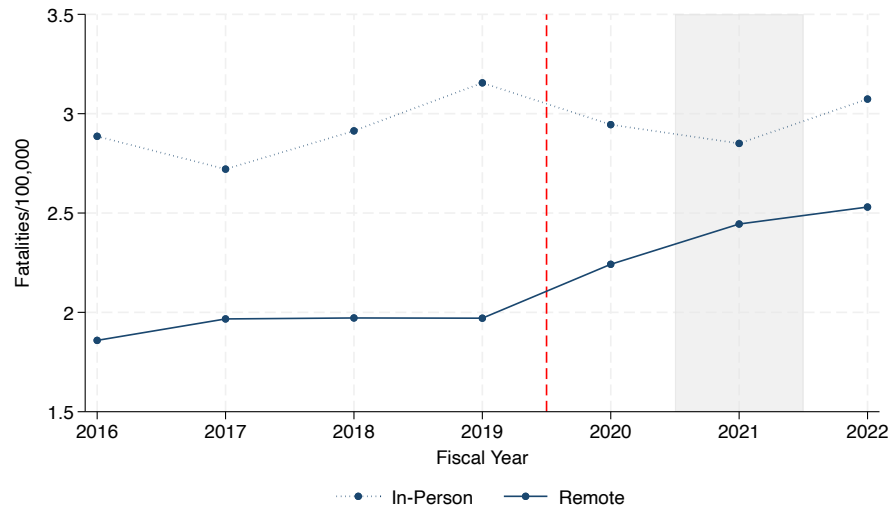
⁴Trends of total screened-in allegations and fatalities are illustrated in [Figure B1](#).

Figure 3: Trend by Learning Mode

(a) Screened-In Allegations



(b) Maltreatment-Related Fatalities



Notes: These figures show trends in (a) screened-in allegations per 1,000 children and (b) maltreatment-related fatalities per 100,000 children. "In-Person" states (dotted navy) refer to those with a proportion of remote learning weeks below the median, and "Remote" states (solid navy) are those with a proportion above the median during the SY 2020-21. These classifications are consistent throughout the analysis period, meaning that counties and states do not switch categories. The shaded grey area represents the "blended" learning period of SY 2020-21. The dashed red vertical line marks March 2020, when schools closed due to the pandemic. *Source:* Authors' analysis of allegation and fatality data from 2016-2022 Child Maltreatment reports.

"remote" states (those with above the median proportion of remote learning instructional weeks in SY 2020-21) and "in-person" states (those with below the median proportion of remote learning instructional weeks). While both in-person and remote states exhibit similar pre-trends in screened-in allegations and maltreatment-related fatalities, in-person states demonstrate higher rates of both. This may be attributed to differences in their policy approaches and responses to child welfare issues, along with the multifaceted nature of child maltreatment reporting. Alternatively, it could indicate an actual higher incidence of maltreatment in these states, as the in-person counties in our analysis sample have a greater proportion of the population living in poverty and lower median household incomes (see [Table 1](#)), which are often associated with increased rates of child maltreatment ([Berger, 2004](#); [Kim and Drake, 2023](#)). While both in-person and remote states experienced a significant drop in allegation rates during FFY 2020, the rates in remote states continued to decline further in FFY 2021. Regarding fatality trends, in-person states saw a slight decrease in fatality rates during the pandemic, followed by a rebound in FFY 2022, whereas fatality rates in remote states gradually increased over the same period. For the analysis results, we anticipate that 1) there will be no significant differences in allegation rates between the remote and in-person groups during the SY 2021-22, as both return to in-person schooling, and 2) the remote group may experience a relative increase in child fatalities and substantiated allegations since the onset of the blended learning (when there was a variation in the proportion of remote learning during SY 2020-21), potentially due to incidents of child maltreatment that went undetected during that period.

3 Data

3.1 Maltreatment Allegations and Fatalities Data

Our primary outcome variables, maltreatment allegations and maltreatment-related child fatalities, are sourced from the Child File of the National Child Abuse and Neglect Data System (NCANDS) and the annual Child Maltreatment reports produced by the Children’s Bureau of the U.S. Department of Health and Human Services for federal fiscal years (FFY) 2016-2022. NCANDS collects report- and state-level data from each state on all children who received a CPS agency response (in the form of an investigation response or an alternative response). This data is recorded in two separate files, the Child File and the Agency File, respectively. The Child File contains information about the characteristics of abuse and neglect reports, such as the age and race/ethnicity of the child and perpetrator, types of maltreatment (e.g., physical abuse, neglect, sexual abuse, etc.), source of the report (e.g., educational personnel, social services personnel), outcomes of the CPS responses, and risk factors associated with the child and their caregivers (e.g., drug abuse, domestic violence). We aggregate the report-level data at the county-month level to calculate the number of screened-in allegations as well as substantiated allegations. [Table 1](#) presents descriptive statistics for key dependent and independent variables (discussed in detail in the subsequent subsections).

Although maltreatment cases involving a child’s death are reported in the Child File, two key challenges complicate their use for child fatality analysis: (1) county FIPS codes are masked in all reports involving a child’s death, preventing county-level analyses, and (2) some child fatalities not identified by CPS are not reported in the Child File but instead recorded in the Agency File as aggregated state-level data. To overcome these issues, we draw state-level child fatality data from the annual Child Maltreatment reports to supplement the fatality data from the Child Files. These reports have the advantage of incorporating cases reported in the Agency File, covering a broader

range of sources, such as hospitals, health departments, and juvenile justice agencies, whereas the Child Files only capture fatality cases identified by the CPS (U.S. Department of Health & Human Services (HHS), 2022). Moreover, to address the issue of masked county FIPS codes for counties with fewer than 1,000 maltreatment cases, we follow the approach of Evans et al. (2022), constructing an aggregated hypothetical county for each state for all county-level analyses.

Table 1: Pre-School-Closure Summary Statistics

	Remote		In-Person		<i>t</i> -test	<i>p</i> -value
	Mean	SD	Mean	SD		
Allegation	6.53	4.05	7.89	4.34	-1.37	0.000
Maltreatment-Related Fatality	1.99	1.17	2.62	1.52	-0.63	0.001
Substantiated Allegation	166.66	102.65	163.04	100.16	3.62	0.062
Unemployment	4.53	2.01	4.13	1.52	0.40	0.000
Labor Force Participation	0.77	0.07	0.77	0.07	0.002	0.076
Percent Poverty	12.88	4.50	13.01	4.30	-0.14	0.105
Median Household Income	65,479	17,890	59,220	12,479	6,258	0.000
Percent White	0.78	0.16	0.84	0.12	-0.07	0.000
Percent Black	0.13	0.14	0.11	0.11	0.02	0.000
Percent Asian	0.04	0.06	0.02	0.02	0.02	0.000
Percent Hispanic	0.14	0.14	0.11	0.13	0.03	0.000
Percent Age 0 to 19	0.25	0.03	0.25	0.03	-0.001	0.198
Percent Age 20 to 24	0.14	0.02	0.13	0.02	0.01	0.000
Percent Age 25 to 34	0.14	0.02	0.13	0.02	0.01	0.000
Percent Age 35 to 44	0.12	0.01	0.12	0.01	0.003	0.000
Percent Age 45 to 54	0.12	0.01	0.12	0.01	0.001	0.017
Percent Age 55 to 64	0.13	0.02	0.13	0.02	-0.003	0.000
Percent Female	0.51	0.01	0.51	0.01	0.001	0.000
Observations	5,449		5,465			

Notes: This table presents county-level summary statistics for the full analysis sample and the periods before the pandemic-induced school closures by learning mode. Counties with remote learning weeks above the median during SY 2020-21 were classified as "Remote," while those below the median were classified as "In-Person." A detailed description of how we classify "Remote" and "In-Person" counties can be found in subsection 3.2. Allegation is measured as allegations per 1,000 children aged 4-17. Fatality if measured as fatalities per 100,000 children aged 0-17. Substantiated Allegation is measured as substantiated allegations per 1,000 allegations involving children aged 4-17. Unemployment (measured by the unemployment rate) and Labor Force Participation (measured by the participation rate) data are sourced from the Bureau of Labor Statistics (BLS). Percent Poverty (the proportion of the population living in poverty) and Median Household Income data are sourced from the Small Area Income and Poverty Estimates (SAIPE) of the Census Bureau. Percentages by race, age, and gender represent the proportion of each group in the population, sourced from the Census Bureau.

3.2 Schooling Mode Data

We obtain school-district-level data on schooling modes from the School Learning Modalities dataset for the SY 2020-21, provided by the Centers for Disease Control and Prevention (CDC).⁵ This dataset offers weekly estimates of school learning modalities (including in-person, hybrid, or remote learning) for K-12 public and independent charter school districts from September 2020 to May 2021. In the final analysis sample, only K-12 public schools are included. We used the Common Core of Data (CCD) of the National Center for Education Statistics (NCES) to identify the type of school district. If a district reports more than one modality within the same week, the modality offered for the majority of those days is represented in the weekly estimate.

To categorize states and counties as either "remote" or "in-person", we used the median of average remote learning weeks during the SY 2020-21. States and counties with an average proportion of remote learning weeks above the median were classified as "remote", while those below the median were classified as "in-person". These classifications remain fixed throughout the analysis period, meaning that counties and states do not switch categories over time, which facilitates a consistent comparison between the two groups. Formal description of how this is formally constructed is detailed in [section 4](#). State and county maps of the remote and in-person groups are presented in [Figure A4](#) and [Figure A5](#).

3.3 State- and County-Level Statistics

To account for time-varying factors, we collect county-level data from multiple sources. For state-level analyses, these datasets are aggregated at the state level. We gather annual labor force statistics from the Bureau of Labor Statistics (BLS), local poverty rates and median household income data from the Small Area Income and Poverty Esti-

⁵Retrieved from https://healthdata.gov/National/School-Learning-Modalities-2020-2021/a8v3-a3m3/about_data.

mates (SAIPE) Program of the U.S. Census Bureau, and demographic data (age, race/ethnicity, and gender) from the U.S. Census Bureau. Lastly, we collect weekly COVID-19 case and death data by county from the Centers for Disease Control and Prevention (CDC) and aggregate them to the county-month level.⁶ We present monthly COVID-19 cases and deaths across remote and in-person learning groups in [Figure A6](#).

4 Empirical Strategy

Our main specification relies on difference-in-differences (DID) and event study methods, grounded in key identifying assumptions – parallel trends and no anticipation – that ensure validity and robustness of the causal estimates. The parallel trends assumption posits that, absent the intervention (remote learning exposure), treated (remote) and comparison (in-person) groups would have exhibited similar trends in child maltreatment allegations, fatalities, and substantiated allegations over time. To empirically support this assumption, we present unadjusted trends for the outcome variables in [Figure 3](#), which show strong evidence of common underlying trends between remote and in-person (comparison) counties and states. Additionally, we present event study plots in the following section, which indicate no statistically significant differences in pre-trends. We also examine pre-trends in control variables, confirming that any baseline differences between groups remained stable prior to the onset of remote learning, as shown in [Figure C1](#) and [Figure C2](#). These results help mitigate concerns that pre-existing disparities, rather than the treatment itself, might drive post-treatment effects. Although COVID-19 was an unforeseen event, making anticipation effects unlikely, we formally test for no-anticipation and find no evidence of pre-treatment impacts. Finally, we conduct a series of robustness checks, including alternative model specifications with continuous treatment measures of remote learning exposure and log-transformed

⁶Retrieved from https://data.cdc.gov/dataset/Weekly-United-States-COVID-19-Cases-and-Deaths-by-yviw-z6j5/about_data.

outcome variables, to further validate our findings. Detailed results are provided in the Robustness Checks section ([subsection 5.3](#)).

To examine the causal effect of remote learning on child maltreatment outcomes and maltreatment-related fatalities, we estimate the following event study and difference-in-difference (DID) models:

$$y_{cm} = \beta_0 + \sum_{\substack{\tau=2018/9 \\ \tau \neq 2020/2}}^{2022/5} \beta_\tau \mathbb{1}[m = \tau] * remote_c + \beta_1 \mathbf{X}_{cm} + \sigma_c + \Omega_m + \epsilon_{cm} \quad (1)$$

$$y_{st} = \gamma_0 + \sum_{\substack{\tau=2016 \\ \tau \neq 2019}}^{2022} \gamma_\tau \mathbb{1}[t = \tau] * remote_s + \gamma_1 \mathbf{X}_{st} + \phi_s + \delta_t + \epsilon_{st} \quad (2)$$

$$y_{cm} = \theta_0 + \theta_1 * remote_c * post_m + \theta_2 \mathbf{X}_{cm} + \sigma_c + \Omega_m + \epsilon_{cm} \quad (3)$$

$$y_{st} = \lambda_0 + \lambda_1 * remote_s * post_t + \lambda_2 \mathbf{X}_{st} + \phi_s + \delta_t + \epsilon_{st} \quad (4)$$

where y_{cm} denotes the outcomes in county c and month m , including the number of child maltreatment allegations per 1,000 school-age children (ages 4 to 17) and the number of substantiated allegations per 1,000 screened-in allegations involving school-age children, and y_{st} denotes the maltreatment-related child fatalities per 1,000 children (ages 0 to 17) in state s and federal fiscal year t . Our key variables of interest, $remote_c$ and $remote_s$, are indicators for "remote" counties and states, respectively, with the construction of these variables detailed in the following paragraph. In Equations 3 and 4, $post_m$ is an indicator for whether month m is in the period following the initial school closures, taking a value of 1 for months in SY 2020-21 (September 2020–May 2021) and 0 for months in SY 2018-19 and 2019-20 (September 2018–May 2019 and September 2019–February 2020), excluding the full-remote months.⁷ $post_t$ is an indicator for whether federal fiscal year t is in the during-the-pandemic period (FFY 2020–2022). \mathbf{X}_{cm} and

⁷For the child fatality and substantiated allegation analyses, the post-period encompasses SY 2021-22 along with SY 2020-21 (the blended learning period), as we are interested in assessing the accumulated risks of maltreatment following the onset of the blended learning.

\mathbf{X}_{st} denote vectors of county and state time-varying covariates including the unemployment rate, labor force participation rate, percent of the population in poverty, median household income, COVID-19 cases and deaths per 100,000 population, percent of the population in six age groups (0–19, 20–24, 25–34, 35–44, 45–54, 55–64), percent female, percent White, percent Black, percent Asian, and percent Hispanic. $\sigma_c (\phi_s)$, $\Omega_m (\delta_t)$, and $\epsilon_{cm} (\epsilon_{st})$ denote county (state) fixed effects, month-year (year) fixed effects, and error terms, respectively. For Equation 1, we use February of 2020 as our reference month, as it was the last month schools were in session before the pandemic. For Equation 2, we omit the year 2019 as our reference period. Our coefficients of interest are β_m , γ_t , θ_1 , and λ_1 which identify the differences in the outcomes between counties and states with higher and lower remote learning ratios in month m , year t and post-remote months, years compared to the reference period, respectively.

To construct $remote_c$ and $remote_s$, we use weekly, school-district-level data on schooling modes for the period spanning September 2020 to May 2021. For each school district d in week w , we construct a variable indicating the district's primary mode of learning as follows:

$$r_{dw} = \begin{cases} 1 & \text{if school district } d \text{ is remote in week } w \\ 0.5 & \text{if school district } d \text{ is hybrid in week } w \\ 0 & \text{if school district } d \text{ is in-person in week } w \end{cases}$$

We then construct a continuous variable $mode_c$ and $mode_s$ by taking the weighted average of r_{dw} for each county c and state s , respectively:

$$mode_c = \frac{\sum_{\{d: \text{district } d \text{ is in county } c\}} \sum_w r_{dw} \cdot s_{dw}}{\sum_{\{d: \text{district } d \text{ is in county } c\}} \sum_w s_{dw}}$$

$$mode_s = \frac{\sum_{\{d: \text{district } d \text{ is in state } s\}} \sum_w r_{dw} \cdot s_{dw}}{\sum_{\{d: \text{district } d \text{ is in state } s\}} \sum_w s_{dw}}$$

where s_{dw} denotes the number of students in district d and week w . We define $remote_c$ and $remote_s$ as indicator variables taking the value of 1 if $mode_c$ and $mode_s$ are above the median and 0 otherwise, respectively. We estimate all equations using weighted least squares, where the weights are the number of school-age children (or children aged 0-3 for the sub-analysis) in each county and month, and in each state and year, respectively.

5 Results

5.1 Allegations

Before presenting the main analysis results, we first report changes in allegation rates from pre-pandemic period (September 2019 to February 2020) to full-remote learning period (March 2020 to August 2020) in [Table D1](#) to assess whether our data is consistent with the findings documented in the existing literature. Our estimates align with the existing literature, showing that total screened-in allegation rates fell by approximately 1.8 per 1,000 school-aged children, representing a 26 percent decrease compared to the pre-period average of 7.1. This decline is primarily driven by a reduction in reports from education personnel (column (2)), approximately a 75 percent decrease from the pre-pandemic baseline mean. Although the largest magnitude of impact is observed in reports involving White children, the percentage decrease is most pronounced for reports involving Black and Hispanic children. Reports related to all three primary types of maltreatment – physical abuse, neglect, and sexual abuse – experienced a decline in allegation rates.

As noted earlier, our main analyses exploit the variation in exposure to remote learning and compare counties and states with higher and lower exposure to remote learning, during the pre-pandemic period and the school year immediately following the initial full-remote learning phase. [Table 2](#) presents the difference-in-differences estimates (θ_1), and [Figure 4](#) shows the event study plot for screened-in maltreatment

Table 2: DID regression results (SY 19-20 vs. SY 21), Allegation, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	-0.315* (0.178) [-4.8%]	-0.172* (0.0912) [-9.0%]	-0.0282 (0.0282) [-2.7%]	0.0140 (0.0310) [2.1%]	-0.0148 (0.0106) [-3.5%]	-0.0480* (0.0280) [-4.8%]	0.0331 (0.0414) [2.3%]
Mean	6.527	1.914	1.034	0.674	0.426	0.435	1.451
N	17402	17402	17402	17402	17402	17402	17402
r2	0.912	0.808	0.829	0.804	0.752	0.712	0.863
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

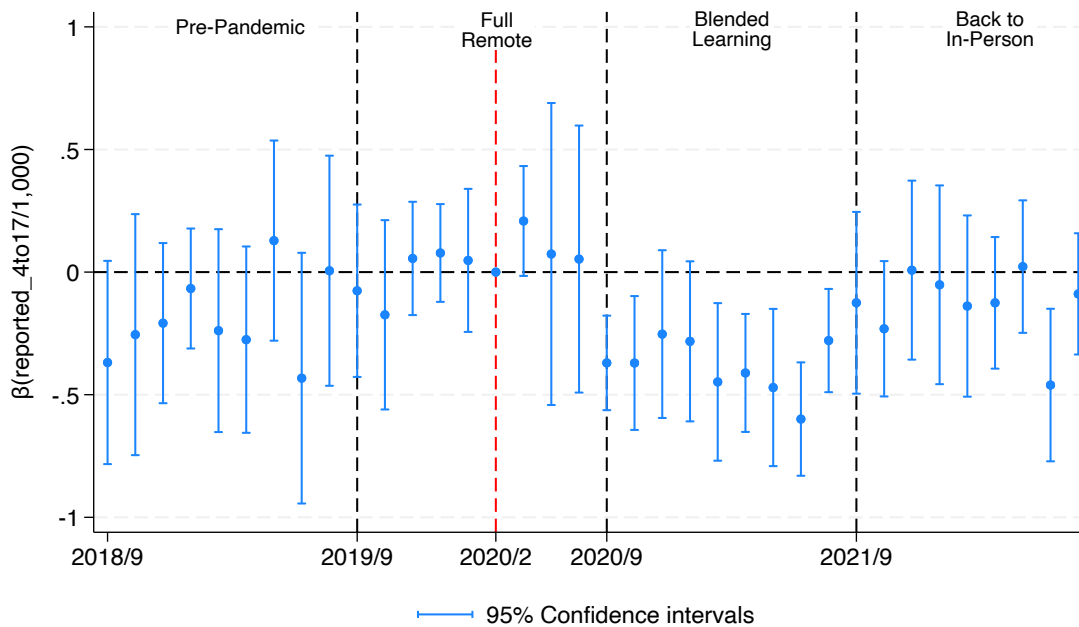
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
θ_1	-0.151** (0.0685) [-9.3%]	-0.0322 (0.110) [-0.7%]	-0.0166*** (0.00540) [-22.4%]	-0.139** (0.0671) [-15.0%]	-0.122*** (0.0422) [-8.0%]	-0.183 (0.123) [-4.2%]	-0.0223* (0.0128) [-4.8%]
Mean	1.631	4.480	0.0756	0.928	1.517	4.388	0.457
N	17402	17402	17402	17402	17402	17402	17402
r2	0.924	0.926	0.757	0.926	0.876	0.918	0.802
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 3. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Post-period includes the blended learning months, following the initial school closures in SY 2020-21 (September 2020–May 2021), while pre-period includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

allegations (β_m). The results presented in the table exhibit a pattern similar to those in Table D1, with a lower total report rate primarily due to a decrease in reports from education personnel. Compared to the counties with a lower proportion of remote instructional weeks, those with a higher proportion experienced a decrease in the total screened-in allegation rate by 0.315 per 1,000 school-aged children, representing an approximate 5 percent decline relative to the pre-period average for counties with higher

Figure 4: Allegations, ages 4-17



Notes: This figure plots event study estimates for Equation 1. Dependent variable is allegations per 1,000 school-age children (ages 4-17). County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in the regression. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

exposure to remote learning. The results are disproportionate by children's race/ethnicity and the type of maltreatment, with notable decreases in allegation rates for Black, Asian, and Hispanic children, ranging from 9 to 22 percents compared to the baseline mean. The most significant decline is observed in reports involving physical maltreatment.

The event study plot presented in Figure 4 indicates that "remote" counties experienced a reduction in screened-in allegations relative to "in-person" counties during the blended learning period (SY 2020-21), with decreases ranging from 0.4 to 0.6 per 1,000 school-aged children. This corresponds to a 6 to 10 percent decrease from an average of 6.3 allegations per 1,000 school-age children in February 2020. The event study results by the source of referrals and child race/ethnicity are provided in Figure F1 and Figure F2. As anticipated from the difference-in-differences estimates, the impacts are pri-

marily driven by a decline in maltreatment reports from educational personnel (panel (a) of [Figure F1](#)), with no significant impact observed from reports made by social and medical personnel. Moreover, as illustrated in [Figure F2](#), significant effects were particularly pronounced in allegations involving Black, Asian, and Hispanic children. The rise in allegation rates among the remote learning group during the summer of SY 2020-21 may be attributed to our classification of the remote learning group, which relies on remote learning data from September 2020 to May 2021 and does not account for the summer period. Exposure to remote learning for both the remote and in-person groups during this period may have varied, which we cannot capture with the available learning modes data.

5.2 Child Fatality and Substantiated Allegations

In addition to the maltreatment allegation analyses, we conduct additional analyses in order to investigate whether greater exposure to remote learning may have contributed to an increase in the severity of child maltreatment. We examine two key outcomes as measures of severity: maltreatment-related child fatalities and allegations that were substantiated.⁸

[Table 3](#) and [Figure 5](#) present difference-in-differences estimates and event study plot for maltreatment-related child fatality, respectively. Compared to the period prior to remote learning, the fatality rate increased by approximately 0.7 per 100,000 children (ages 0 to 17) in states with higher exposure to remote learning relative to those with lower exposure during FFY 2020-2022.⁹ This represents about a 34 percent increase from the pre-period average of 2.032. Given that FFY 2020 includes both the initial full-remote period (mid-March to late-August 2020) and a month-and-a-half of blended

⁸As noted previously in [subsection 3.1](#), county-level analysis of the fatality rates is unavailable.

⁹We are unable to estimate the effect on the maltreatment-related child fatality rate specifically for school-aged children since Child Maltreatment reports only provide aggregated fatality cases across all ages. While age (along with other characteristics) can be identified from the Child Files data, state and county identifiers are masked as aforementioned.

Table 3: DID regression results, Child Fatality

	(1)	(2)
	FFY 2020–2022	FFY 2021–2022
λ_1	0.652*** (0.242) [32.1%]	0.770** (0.300) [37.9%]
Mean	2.032	2.032
N	336	288
r2	0.709	0.718
ϕ_s	Y	Y
δ_t	Y	Y
X_{st}	Y	Y

Notes: This table shows estimates for Equation 4. Dependent variable is child fatalities per 100,000 children (ages 0-17). Column (1) displays results for the specification that includes FFY 2020 through FFY 2022 as the post-period, while column (2) shows results for the specification excluding FFY 2020 (i.e., FFY 2021 through FFY 2022). The pre-period encompasses FFY 2016 through FFY 2019. Robust standard errors are in parentheses. Percentage changes from the baseline mean are in square brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

learning period, we exclude FFY 2020 and re-estimate the difference-in-differences model.¹⁰

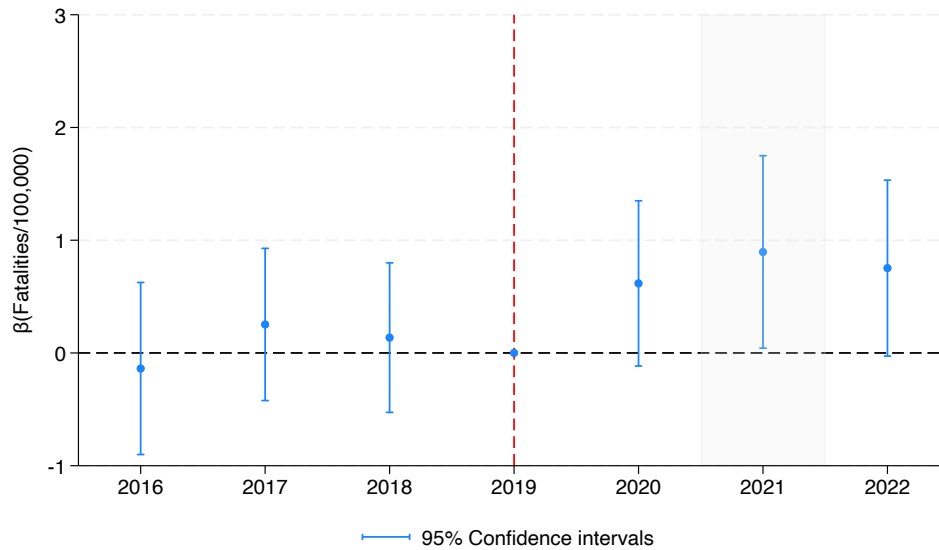
The results are consistent, with an increase in the fatality rate by approximately 0.8 per 100,000 children.

As illustrated in Figure 5, the fatality rates in states with higher exposure to remote learning increased by approximately 1 per 100,000 children following the initial school closures, relative to those with lower exposure to remote instruction. This corresponds to an approximate 50% increase in the fatality rate from the pre-pandemic average of 2.2 per 100,000 children in 2019 (omitted year). In Figure 6, we present suggestive evidence that the rise in fatalities was primarily driven by school-age children.¹¹ The figure shows

¹⁰This also allows us to exclude child fatality cases reported from October 2019 to February 2020.

¹¹We analyzed reports resulted in child fatalities using data from the Child File, allowing us to identify the child's age. While not all maltreatment-related child fatalities are captured—only those reported to CPS are included in the Child File, as previously noted—the Child File provides valuable insights, with recorded fatalities accounting for over 80% of total child fatalities involving children's death across the analysis period. An analogous figure showing the monthly trend is presented in Figure H5.

Figure 5: Maltreatment-Related Child Fatality



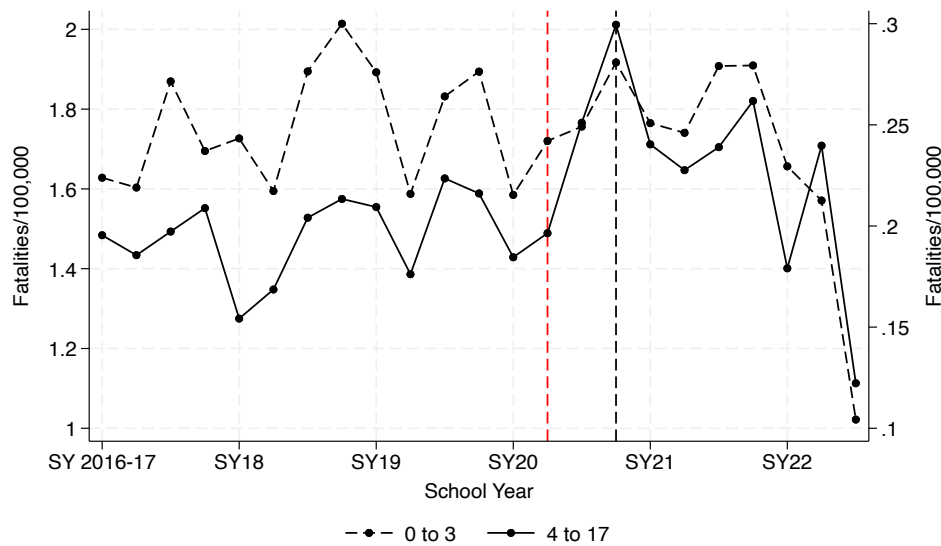
Notes: This figure plots event study estimates for Equation 2. Dependent variable is maltreatment-related child fatalities per 100,000 children (ages 0-17). State fixed effects, year fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in the regression. Blue bars around point estimates represent 95% confidence intervals. The shaded grey area represents the "blended" learning period of SY 2020-21. The dashed red vertical line indicates the year prior to the pandemic and the subsequent school closures.

that the quarterly trend in fatalities for children aged 0 to 3 remained relatively stable, with minor seasonal fluctuations throughout the sample period. In contrast, the trend for school-age children surged significantly following the full-remote period, marked by the dashed red vertical line.¹² Although the fatality rate for school-age children declined following the blended learning period (dashed black vertical line), they did not return to the levels observed prior to the initial school closures. While we cannot conduct a detailed subgroup analysis by age, the differing trends in fatalities across age groups suggest that schools play a central role in explaining the surge in fatalities illustrated in Figure 5.¹³

¹²The decline at the end of the SY 2021-22 could be attributed to the absence of data from June 2022, as our sample period ends in May 2022.

¹³Figure 6 is based on NCANDS Child Files, which include indicators for child deaths, allowing us to create a time series of annual child fatalities. However, state and county identifiers are masked for allegations involving deceased children.

Figure 6: Fatality Trend by Age



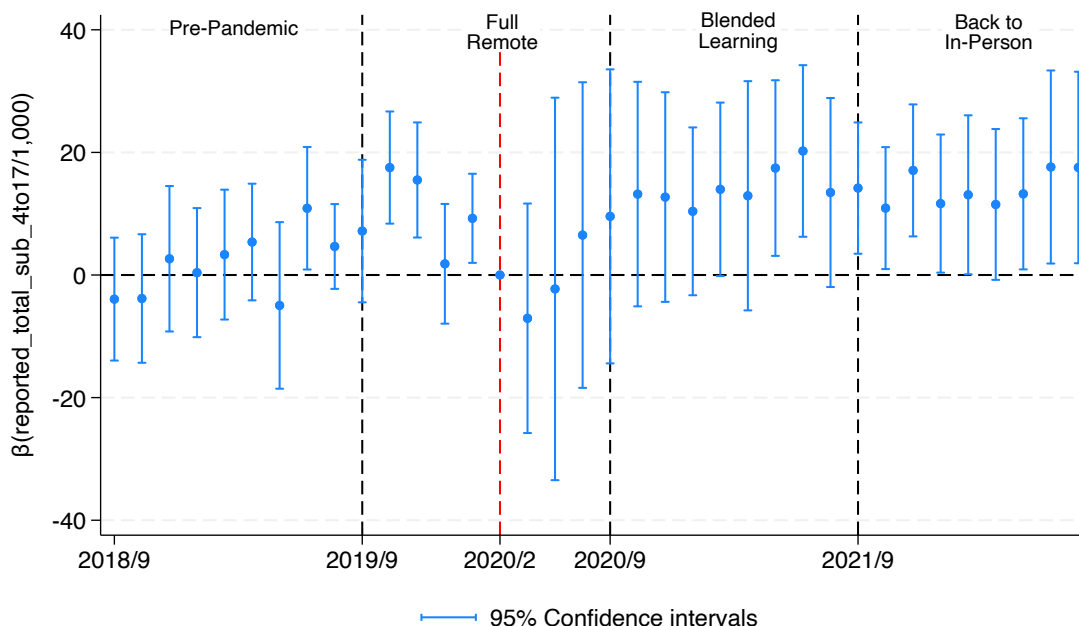
Notes: This figure presents quarterly trends in maltreatment-related fatality rates (per 100,000 children) by age group (0-3 and 4-17). The dashed black line represents the trend for children aged 0-3, while the solid black line represents the trend for children aged 4-17. The dashed red vertical line indicates January–March 2020, the last quarter when schools were mostly in session before the pandemic and subsequent school closures. The dashed black vertical line indicates July–September 2020, around the time when schools began transitioning back to in-person instruction, with variation in the number of weeks that students were served remotely.

Source: Authors' analysis of FFY 2017–2022 NCANDS Child File data.

Analyzing the maltreatment-related fatalities provides important insights into how maltreatment risks evolved during the disruption of in-person learning; however, it offers a limited perspective as we are unable to conduct subgroup analyses by child's age, race/ethnicity, report sources, or types of maltreatment. To supplement the fatality analysis, we conduct an additional analysis of substantiated allegations. [Figure 7](#) presents the event study plot for substantiated allegations per 1,000 screened-in allegations. While there is no significant impact in the beginning of the blended learning period, there is a gradual increase in the substantiated allegation rates toward the end of the blended learning period and the impacts persist throughout the full in-person period in SY 2021-22. These results imply that counties with higher exposure to remote learning during the blended learning period of SY 2020-21 experienced relatively larger

substantiated allegation rates compared to the counties with lower exposure to remote learning following the initial school closures.

Figure 7: Substantiated Allegations, ages 4-17



Notes: This figure plots event study estimates for Equation 1. Dependent variable is substantiated allegations (ages 4-17) per 1,000 screened-in allegations. County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in the regression. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

A subgroup analysis of substantiated allegations for children aged 4-17 is provided in Table G1. Note that the post-period encompasses SY 2021-22 along with SY 2020-21, as we are interested in assessing the accumulated risks of maltreatment following the blended learning phase. Counties with greater exposure to remote learning exhibit a higher rate of substantiated allegations (column (1)). Additionally, substantiated allegations are elevated in reports made by legal, social, and medical personnel and in cases involving Black, White, and Hispanic children, although these findings are not statistically significant. It is important to acknowledge that the analysis of substantiated allegations has its limitations, as reports are substantiated only when they have been reported

to the CPS. Although a higher rate of substantiated allegations may suggest an increase in maltreatment risks, these results should be interpreted with caution.

5.3 Robustness Checks

This subsection outlines several robustness checks performed to validate the results from our main identification.

5.3.1 Age 0-3 Sub-analysis

Figures [H1](#) through [H4](#) and Tables [H1](#) and [H2](#) present the event study plots and difference-in-differences results for non-school-age children (aged 0-3), where the outcome variables include allegations per 1,000 non-school-age children, fatalities per 1,000 children, and substantiated allegations per 1,000 screened-in allegations. These sub-analyses serve as a placebo test, as we do not expect to observe significant impacts on non-school-age children if the effects estimated in the main analysis represent the causal impact of disruptions in in-person learning. None of the estimates are statistically distinguishable from zero, suggesting that the disruption in in-person schooling was the primary channel through which screened-in allegations, substantiated allegations, and fatalities were affected.

5.3.2 Parallel Trends and No Anticipation

As mentioned in the previous section, our main specification relies on difference-in-differences (DID) and event study methods, based on parallel trends and no-anticipation assumptions to ensure robust causal estimates. To empirically support these assumptions, unadjusted trends for outcome variables presented in [Figure 3](#) show consistent underlying trends in those variables between remote and in-person (comparison) groups. While the event study plots in [subsection 5.1](#) and [subsection 5.2](#) show no considerable

or concerning differences in pre-trends, we consider an alternative DID specification for outcome variables of interest and further confirm the absence of notable pre-trend effects as presented in [Table I1](#) through [Table I3](#):

$$y_{cm} = \theta_0 + \theta_1 * remote_c * pre_m + \theta_2 * remote_c * post_m + \theta_3 \mathbf{X}_{cm} + \sigma_c + \Omega_m + \epsilon_{cm} \quad (5)$$

pre_m is an indicator taking the value of 1 for months before the initial school closures (September 2018–May 2019 and September 2019–January 2020, with February 2020 as the reference month). $post_m$ indicates the period after the initial closures, taking a value of 1 for months in SY 2020-22 (September 2020–May 2021 and September 2021–May 2022). All other variables are defined as outlined in [section 4](#). Pre-trends in control variables, shown in [Figure C1](#) and [Figure C2](#), further verify baseline stability across two groups (remote and in-person), mitigating concerns that pre-existing disparities could drive post-treatment effects.

We further test the no anticipation assumption, ensuring that future treatment status has no causal effect prior to implementation. This check aims to confirm that observed changes in allegation and fatality rates stem from variations in remote learning implementation rather than from pre-existing trends or behaviors. To formally test this, we conduct a placebo analysis during the pre-trend period, shifting the reference month to September 2019 (rather than February 2020). The results, presented in [Table I4](#) through [Table I6](#), show no notable trends on total allegation and maltreatment-related fatality.

5.3.3 Alternative Specifications

We validate the robustness of our main results using alternative specifications, including the logarithmic transformation of outcome variables and a continuous treatment variable. The difference-in-differences results for these specifications are reported

in [Table I7](#) through [Table I12](#). All results align with the main specifications, except for logged substantiated allegations, indicating that counties and states with higher exposure to remote instruction reported fewer allegations but more maltreatment-related fatalities.

In summary, the increase in child fatalities and substantiated allegations, alongside the decline in total screened-in allegations in counties with greater remote learning exposure, suggests that remote learning and the resulting disruption in interaction between educators and children heightened children's exposure to maltreatment at home while leaving many cases undetected.

6 Discussion and Conclusion

The COVID-19 pandemic and the resulting school closures have significantly impacted numerous aspects of children's lives, including the reporting and risks of child maltreatment. Beyond the immediate effects of the pandemic, the consequences of pandemic-induced underreporting pose serious threats to children's well-being, potentially resulting in lasting impacts on their development. Traditional maltreatment reporting channels are frequently disrupted during school breaks, as well as on days when schools are closed due to extreme weather, further complicating efforts to identify and support at-risk children ([Puls et al., 2021](#); [World Bank Group, 2024](#)).

Our study provides critical insights into how disruptions to traditional in-person learning have influenced child maltreatment allegations and risks. By leveraging county- and state-level variations in remote learning exposure, we uncover that counties and states with higher proportions of remote learning reported fewer child maltreatment allegations but experienced higher rates of substantiated allegations and maltreatment-related child fatalities. This suggests that remote learning contributed to the underreporting of maltreatment cases, potentially exposing children to greater risks at home

without the protective oversight typically provided by in-person schooling.

Our findings offer important implications for child welfare and education policy, as well as school-based practices, particularly in addressing the enduring consequences of disruptions to primary maltreatment reporting channels. There is a pressing need to develop a comprehensive and robust support system to improve detection and protect children at risk of maltreatment, especially since traditional reporting channels are frequently disrupted. This initiative should focus on enhancing training for education personnel and providing them with the resources needed to support children facing heightened risks due to reporting disruptions, prioritizing early intervention, and implementing a variety of prevention programs. As schools prepare for future disruptions, strategies must be implemented to maintain strong connections between students and educators, fostering a safe and supportive environment. Additionally, strengthening relationships between other mandated reporters and children is crucial to mitigate disruptions in educator-student connections. Targeted support systems are also needed to address the disproportionate impacts of distance learning and to prevent the exacerbation of existing disparities in the maltreatment reporting landscape, ensuring that underrepresented populations receive the necessary assistance during educational disruptions.

We contribute to the literature by extending the temporal scope of analysis beyond the pandemic's initial stages, providing insights into the enduring effects of remote learning on child maltreatment reporting and risks. Our study also adds a new perspective to the existing literature on the effects of learning modes on children's outcomes, revealing that distance learning leads to fewer reports alongside increased maltreatment risks at home. By focusing on school-age children, we provide more precise estimates of remote learning's impact on the population directly influenced by the mode of learning in schools. Importantly, our study underscores the vital role of education personnel in identifying and reporting child maltreatment, particularly in light of disrupted interac-

tions between students and educators.

While our study offers valuable insights for targeted interventions and policy implementation, certain aspects should be approached with caution. Interpreting child fatality and substantiated allegation data as indicators of maltreatment severity may require careful consideration, especially since substantiated allegations are contingent upon children being reported initially as mentioned earlier. Also, the complex nature of data recording and reporting in child protective services means that the timeline between a maltreatment incident to its reporting and final disposition is not always linear or immediate. While child fatality rates contribute to our understanding of the broader impacts of remote instruction on maltreatment risks, it is important to acknowledge the nuances in data collection and reporting processes when drawing conclusions. These factors highlight the ongoing need to refine data collection methods in this critical area of research. Ultimately, deepening our understanding of these complexities will lead to more effective policies and practices aimed at protecting at-risk children.

Disclaimer

The analyses presented in this paper were based on data from the National Child Abuse and Neglect Data System (NCANDS) Child File. These data were provided by the National Data Archive on Child Abuse and Neglect (NDACAN), and have been used with permission. The data were originally collected under the auspices of Duke University. The collector of the original data, the funder, NDACAN, Duke University, Cornell University, and the agents or employees of these institutions bear no responsibility for the analyses or interpretations presented here. The information and opinions expressed reflect solely the opinions of the authors. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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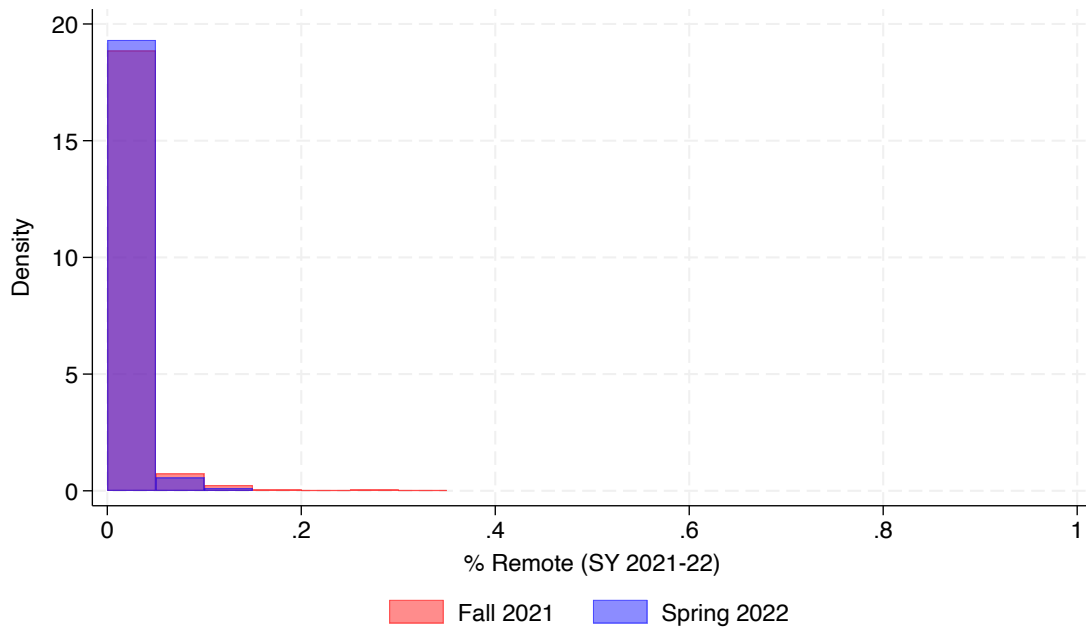
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Appendix

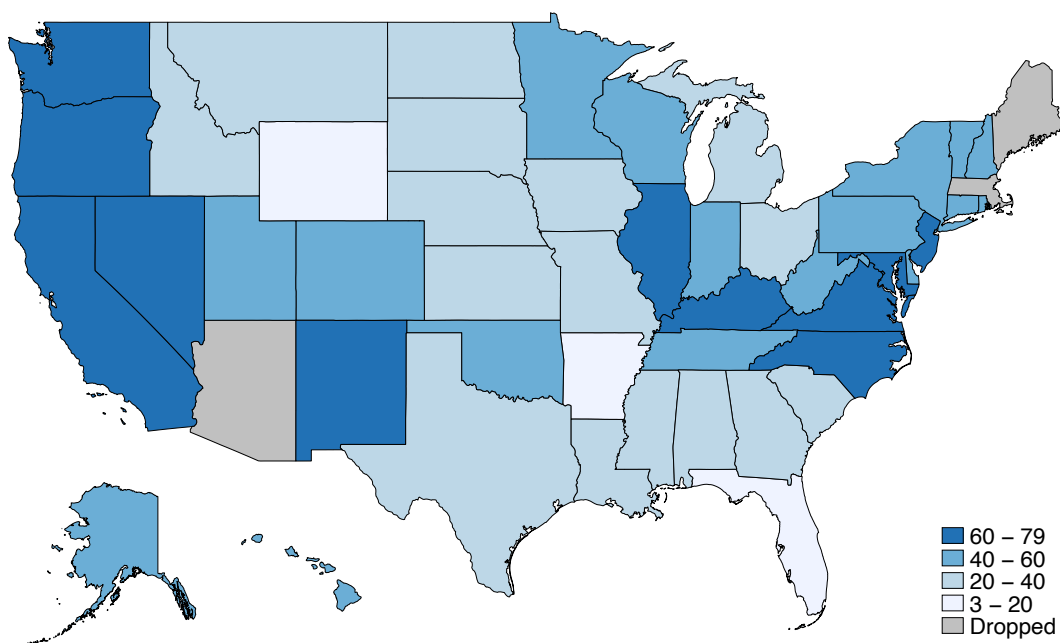
A. Exposure to Remote Learning

Figure A1: Proportion of Remote Learning, SY 2021-22



Notes: This figure presents a histogram of the proportion of remote learning in counties for each month of the SY 2021-22. The red bars represent the fall semester of calendar year 2021, the blue bars represent the spring semester of calendar year 2022. Areas where the red and blue bars overlap are colored purple, indicating common percentages of remote learning between the two semesters. Median = 0, mean = 0.01, standard deviation = 0.02.
Source: Authors' analysis of CDC School Learning Modalities (2021-2022) data.

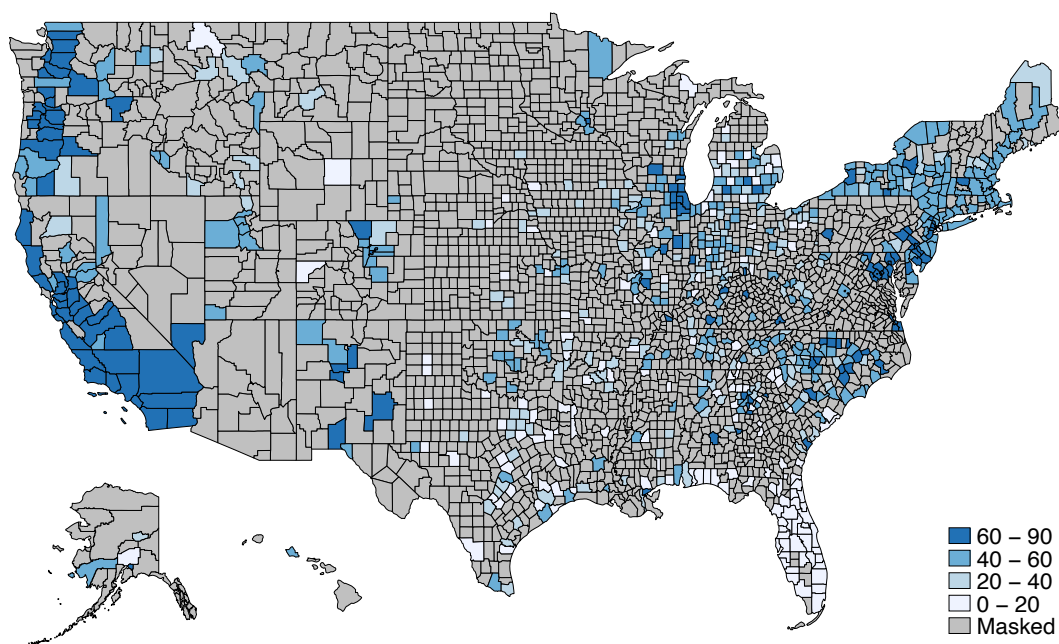
Figure A2: State Map of Remote Learning Percentage, SY 2020-21



Notes: This map illustrates the distribution of remote learning percentages across states during the SY 2020-21. States are color-coded in varying shades of blue, with darker blue indicating a higher percentage of remote learning. States shaded in grey are excluded from the analysis due to missing child maltreatment and/or fatality data in one or more years of the analysis period.

Source: Authors' analysis of CDC School Learning Modalities (2020-2021) data.

Figure A3: County Map of Remote Learning Percentage, SY 2020-21



Notes: This map illustrates the distribution of remote learning percentages across counties during the SY 2020-21. Counties are color-coded in varying shades of blue, with darker blue indicating a higher percentage of remote learning. Counties shaded in grey indicate those with masked FIPS codes (NCANDS masks the codes for counties with fewer than 1,000 child maltreatment cases). We adopt the methodology of [Evans et al. \(2022\)](#), constructing an aggregated hypothetical county for each state for all county-level analyses.

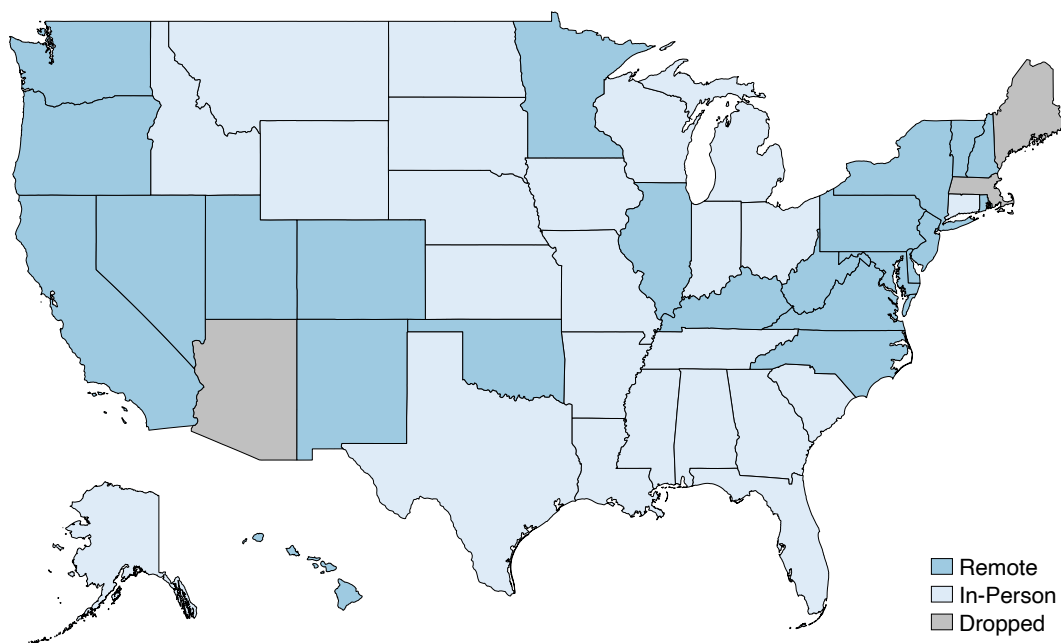
Source: Authors' analysis of CDC School Learning Modalities (2020-2021) data.

Table A1: List of Remote and In-Person States

Remote		In-Person	
California	New Mexico	Alabama	Mississippi
Colorado	New York	Alaska	Montana
Delaware	North Carolina	Arkansas	Nebraska
District of Columbia	Oklahoma	Connecticut	North Dakota
Hawaii	Oregon	Florida	Ohio
Illinois	Pennsylvania	Georgia	South Carolina
Kentucky	Rhode Island	Idaho	South Dakota
Maryland	Utah	Indiana	Tennessee
Minnesota	Vermont	Iowa	Texas
Nevada	Virginia	Kansas	Wisconsin
New Hampshire	Washington	Louisiana	Wyoming
New Jersey	West Virginia	Michigan	

Notes: This table lists states classified as Remote or In-Person based on the median average remote learning weeks during SY 2020-21, with states above the median classified as Remote and those below as In-Person. Further details on the classification are provided in [subsection 3.2](#).

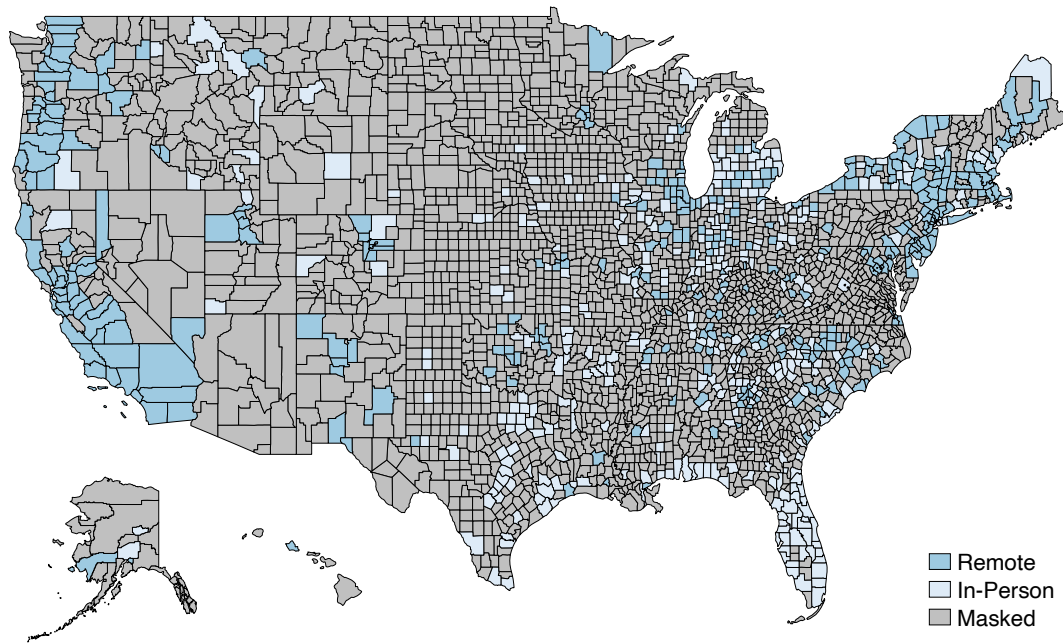
Figure A4: Remote and In-Person States, SY 2020-21



Notes: This map illustrates the distribution of remote and in-person states during the SY 2020-21. States are color-coded based on their classification as either "Remote," indicating those with above-median remote learning percentages, or "In-Person," representing those with below-median remote learning percentages. States shaded in grey are excluded from the analysis due to missing child maltreatment and/or fatality data in one or more years of the analysis period.

Source: Authors' analysis of CDC School Learning Modalities (2020-2021) data.

Figure A5: Remote and In-Person Counties, SY 2020-21

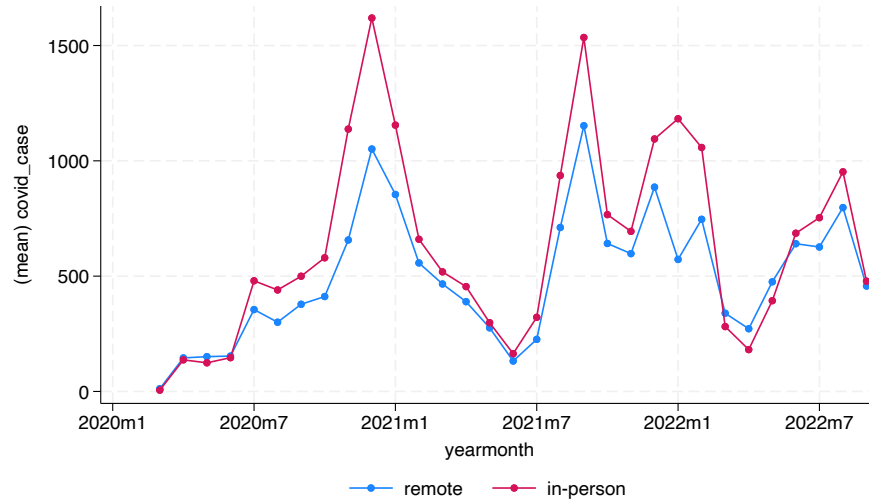


Notes: This map illustrates the distribution of remote and in-person counties during the SY 2020-21. Counties are color-coded based on their classification as either "Remote," indicating those with above-median remote learning percentages, or "In-Person," representing those with below-median remote learning percentages. Counties shaded in grey indicate those with masked FIPS codes (NCANDS masks the codes for counties with fewer than 1,000 child maltreatment cases). We adopt the methodology of [Evans et al. \(2022\)](#), constructing an aggregated hypothetical county for each state for all county-level analyses.

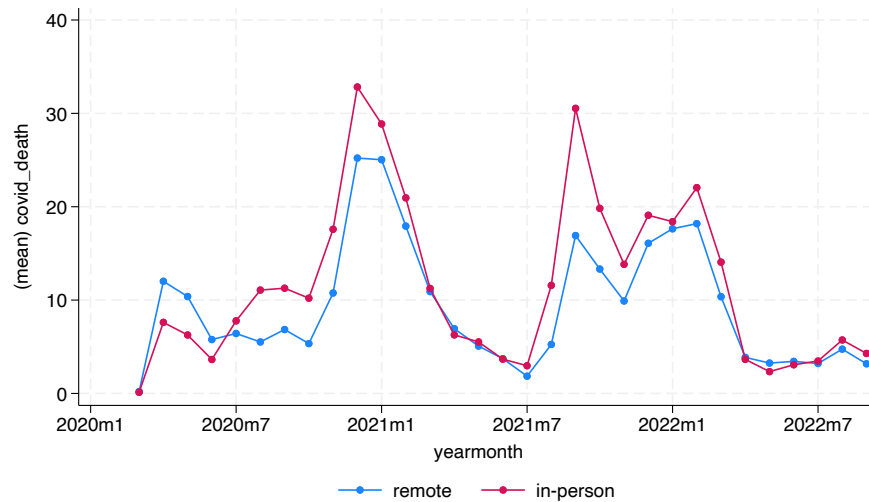
Source: Authors' analysis of CDC School Learning Modalities (2020-2021) data.

Figure A6: COVID-19 Case and Death Trends, 2020–2022

(a) COVID-19 Case



(b) COVID-19 Death

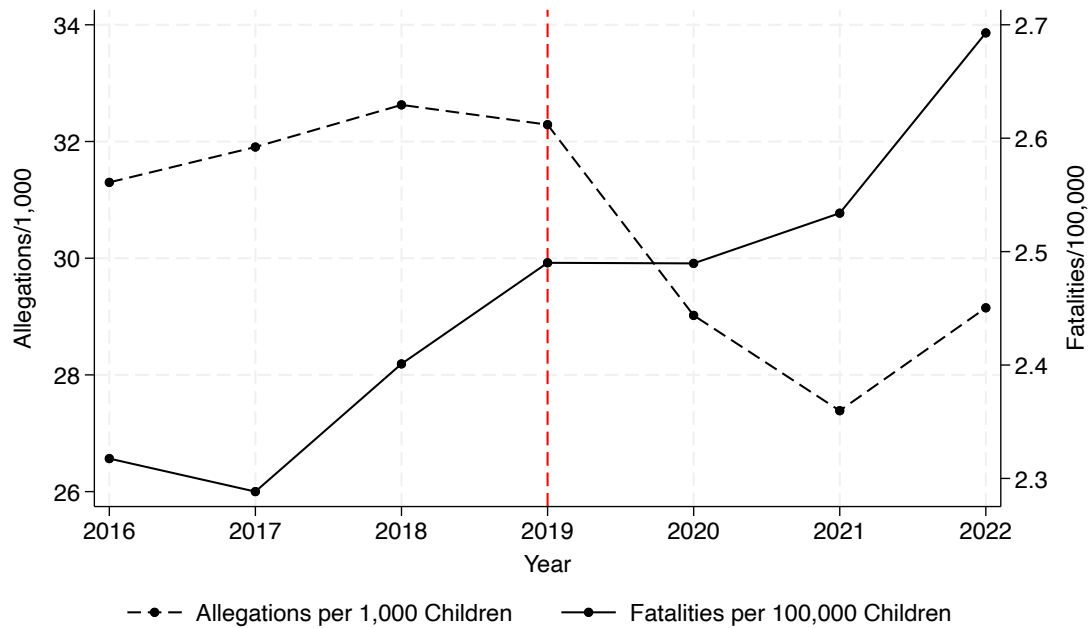


Notes: These figures show trends in (a) COVID-19 case and (b) COVID-19 Death per 100,000 population. "In-Person" counties (solid red) refer to those with a proportion of remote learning weeks below the median, and "Remote" counties (solid blue) are those with a proportion above the median during the SY 2020-21. These classifications are consistent throughout the analysis period, meaning that counties and states do not switch categories.

Source: Authors' analysis of CDC Weekly COVID-19 Case and Death Data. Retrieved from https://data.cdc.gov/dataset/Weekly-United-States-COVID-19-Cases-and-Deaths-by-/yviw-z6j5/about_data.

B. Allegations and Fatalities Trends

Figure B1: Screened-In Allegation and Fatality Trend, FFY 2016-2022

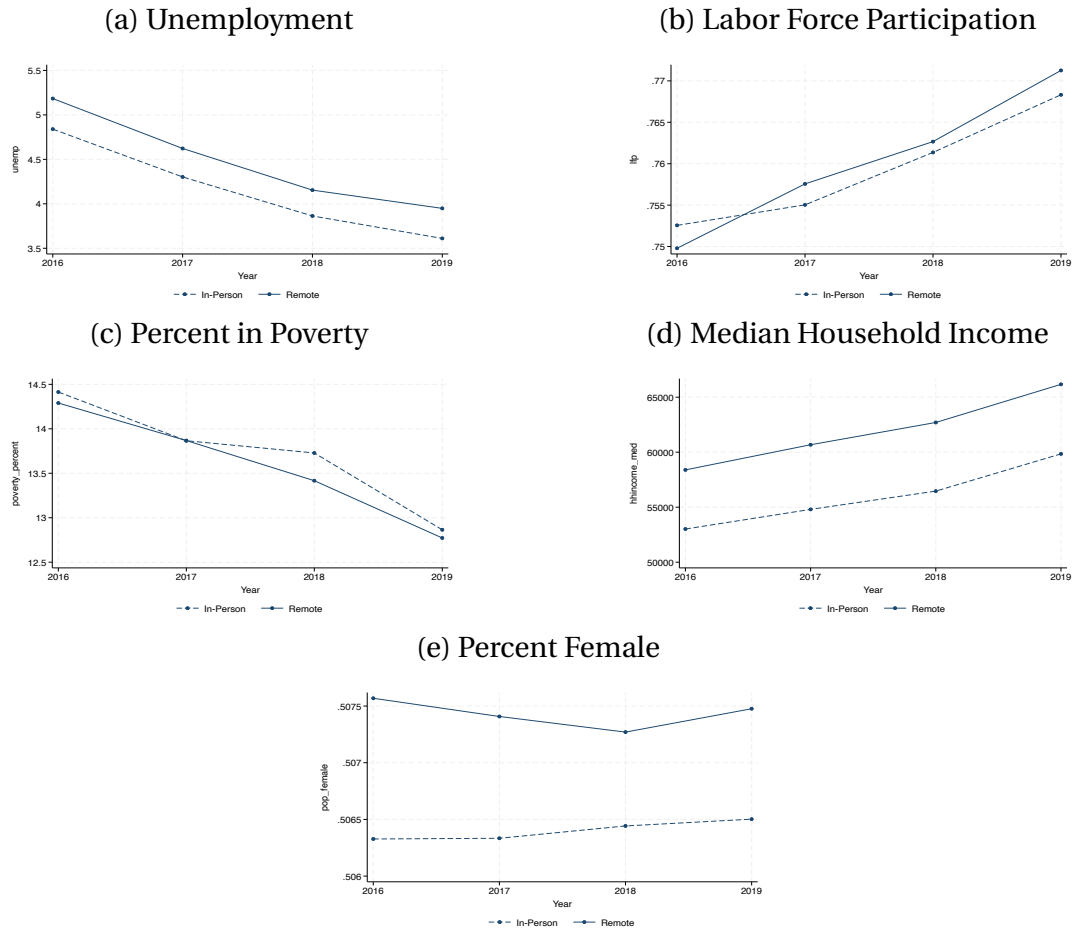


Notes: This figure presents the trends in child maltreatment reports and maltreatment-related child fatalities from FFY 2016 to 2022. The dashed black line represents the number of allegations per 1,000 children aged 0-17, and solid black line represents the number of maltreatment-related child fatalities per 100,000 children. The dashed red vertical line indicates the year before the pandemic.

Source: Authors' analysis of allegation and fatality data from 2016-2022 Child Maltreatment reports.

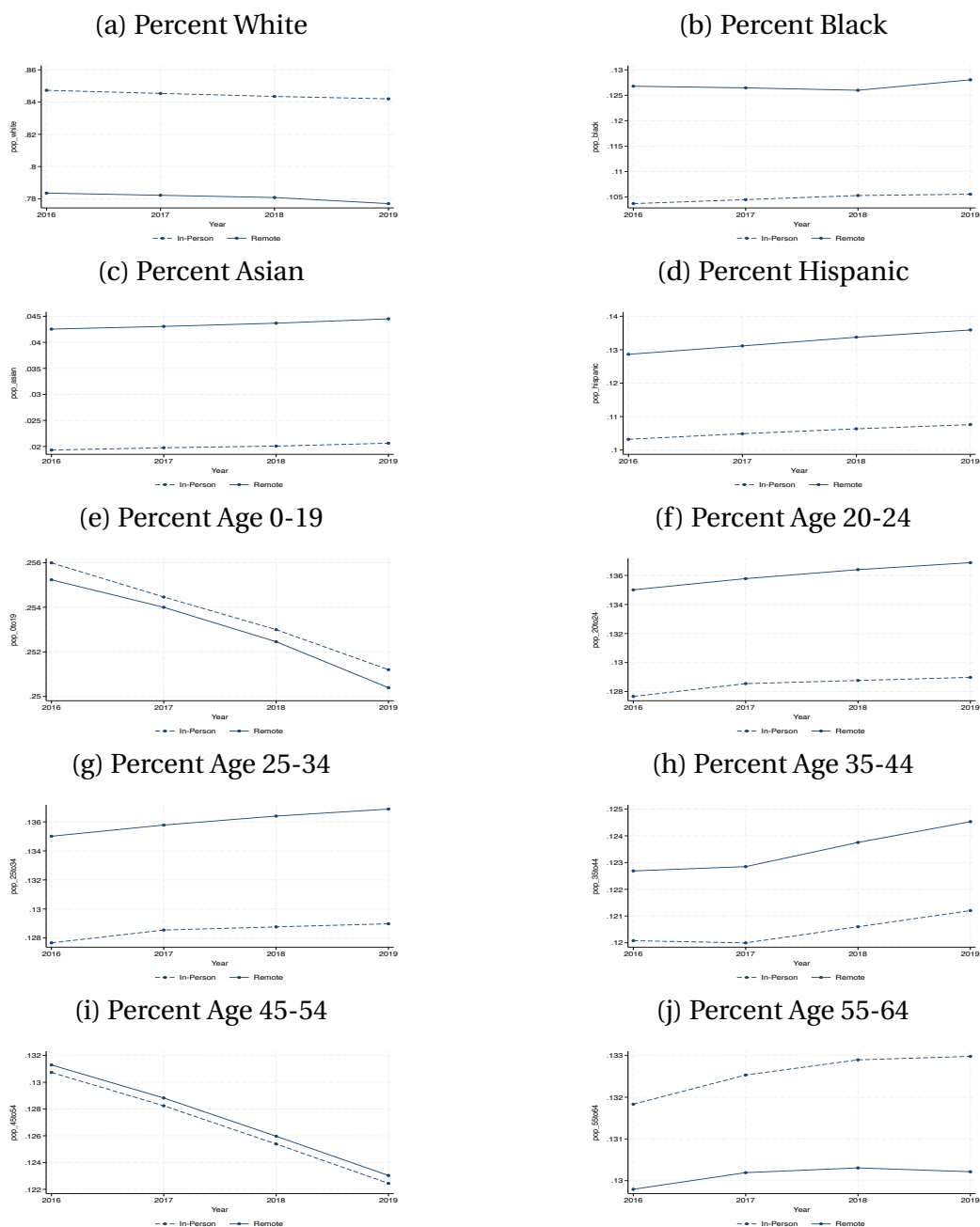
C. Pre-Trends in Control Variables

Figure C1: Pre-Trends



Notes: These figures present unadjusted pre-trends for unemployment (panel (a)), labor force participation (panel (b)), percent in poverty (panel (c)), median household income (panel (d)), and percent female (panel (e)) from 2016 to 2019. "In-Person" counties (dashed navy) refer to those with a proportion of remote learning weeks below the median, and "Remote" counties (solid navy) are those with a proportion above the median during the SY 2020-21. These classifications are consistent throughout the analysis period, meaning that counties do not switch categories.

Figure C2: Pre-Trends (cont.)



Notes: These figures present unadjusted pre-trends for percent White, Black, Asian, Hispanic (panels (a)-(d)) and percent aged 0-19, 20-24, 25-34, 35-44, 45-54, 55-64 (panels (e)-(j)) from 2016 to 2019. "In-Person" counties (dashed navy) refer to those with a proportion of remote learning weeks below the median, and "Remote" counties (solid navy) are those with a proportion above the median during the SY 2020-21. These classifications are consistent throughout the analysis period, meaning that counties do not switch categories.

D. DID Regression Results - Pre-Pandemic vs. Full-Remote

Table D1 present the estimates for maltreatment allegations per 1,000 school-age children (ages 4 to 17), by referral source, child race/ethnicity, and maltreatment type. We estimate the following equation:

$$y_{cm} = \pi_0 + \pi_1 * post_m + \pi_2 * \mathbf{X}_{cm} + \sigma_c + \tau_m + \kappa_{cm} \quad (6)$$

where the variables are as defined in Equation 3.

Table D1: Pre-Pandemic vs. Full-Remote Allegation, Ages 4-17

	(1) Total	(2) Edu	(3) Legal	(4) Social	(5) Medical	(6) Other Pro	(7) Non-Pro
π_1	-1.807*** (0.448) [-25.6%]	-1.643*** (0.272) [-77.0%]	0.0872 (0.0597) [7.6%]	-0.133** (0.0532) [-20.1%]	-0.0283 (0.0246) [-6.2%]	-0.0674 (0.0507) [-15.0%]	0.0945 (0.1000) [5.9%]
Mean	7.055	2.133	1.145	0.662	0.459	0.450	1.606
N	8682	8682	8682	8682	8682	8682	8682
r2	0.912	0.758	0.844	0.770	0.764	0.719	0.869
σ_c	Y	Y	Y	Y	Y	Y	Y
τ_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

	(8) Black	(9) White	(10) Asian	(11) Hisp.	(12) Physical	(13) Neglect	(14) Sexual Abuse
π_1	-0.650*** (0.194) [-42.4%]	-1.045*** (0.255) [-19.8%]	-0.0203 (0.0180) [-32.5%]	-0.279*** (0.103) [-33.1%]	-0.583*** (0.109) [-36.1%]	-0.652** (0.243) [-14.8%]	-0.0832*** (0.0295) [-15.9%]
Mean	1.532	5.272	0.0624	0.844	1.613	4.396	0.524
N	8682	8682	8682	8682	8682	8682	8682
r2	0.905	0.921	0.762	0.916	0.889	0.918	0.799
σ_c	Y	Y	Y	Y	Y	Y	Y
τ_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 6. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

E. DID Regression Results - SY 2021-22

Table E1: DID regression results (SY 19-20 vs. SY 22), Allegation, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	-0.0312 (0.202)	0.0257 (0.0843)	-0.0263 (0.0307)	0.0167 (0.0260)	-0.0174 (0.0113)	-0.0376* (0.0211)	0.0856 (0.0688)
Mean	6.527	1.914	1.034	0.674	0.426	0.435	1.451
N	17085	17085	17085	17085	17085	17085	17085
r2	0.903	0.809	0.820	0.801	0.745	0.719	0.858
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
X_{cm}	Y	Y	Y	Y	Y	Y	Y

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
θ_1	-0.0719 (0.0723)	0.133 (0.139)	-0.00606 (0.00478)	-0.0438 (0.0539)	-0.00786 (0.0480)	-0.0648 (0.142)	-0.00980 (0.0199)
Mean	1.631	4.480	0.0756	0.928	1.517	4.388	0.457
N	17085	17085	17085	17085	17085	17085	17085
r2	0.922	0.920	0.770	0.933	0.872	0.907	0.799
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
X_{cm}	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for [Equation 3](#). Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Post-period includes SY 2021-22 (September 2021–May 2022), while pre-period includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table E2: DID regression results (SY 19-20 vs. SY 22), Allegation, Ages 0-3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	0.0876 (0.134)	0.0284 (0.0294)	-0.0107 (0.0357)	0.0328 (0.0222)	-0.0206 (0.0269)	-0.0121 (0.00849)	0.112 (0.0685)
Mean	5.759	0.570	1.182	0.679	1.014	0.224	1.518
N	17085	17085	17085	17085	17085	17085	17085
r2	0.900	0.710	0.791	0.715	0.803	0.427	0.809
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

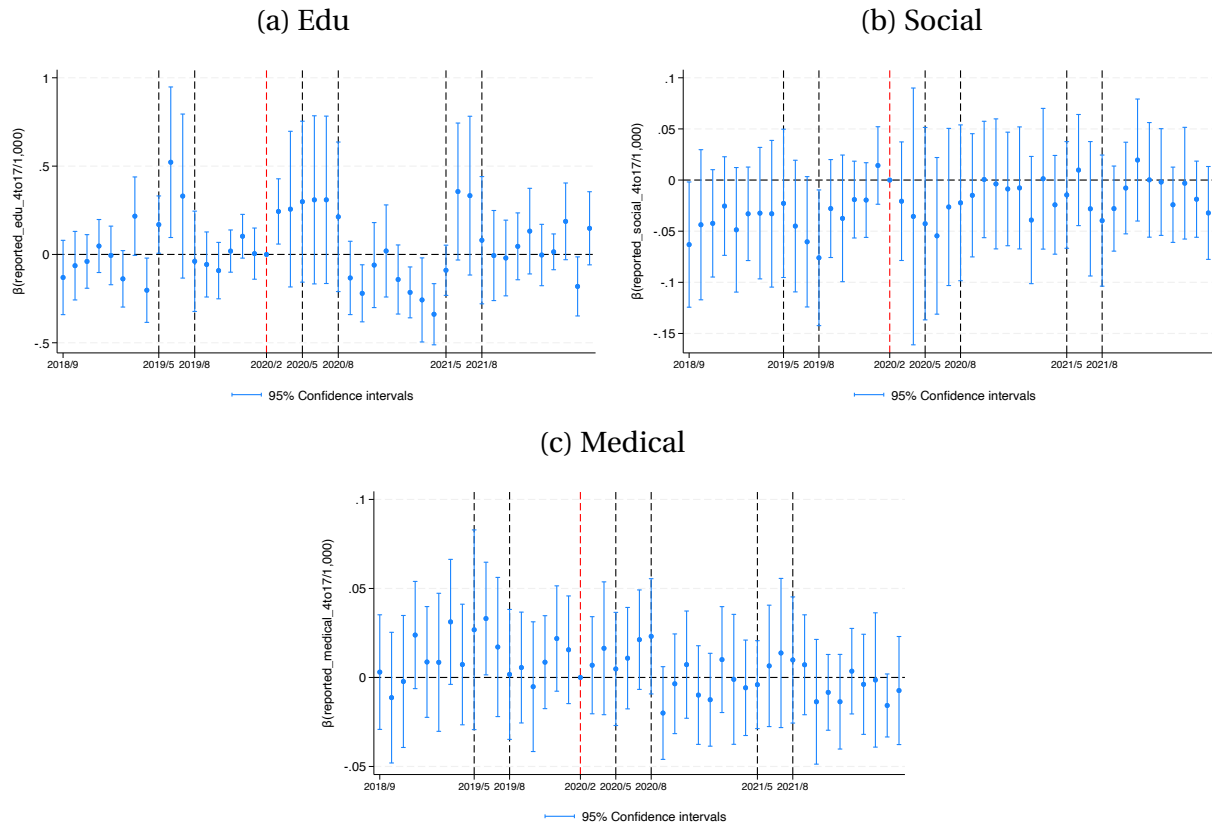
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
θ_1	-0.0242 (0.0511)	0.162 (0.0969)	-0.000767 (0.00290)	0.00654 (0.0208)	0.0193 (0.0215)	0.0221 (0.112)	-0.00494 (0.00792)
Mean	1.550	3.795	0.0494	0.703	1.073	4.270	0.151
N	17085	17085	17085	17085	17085	17085	17085
r2	0.908	0.901	0.548	0.906	0.879	0.891	0.523
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 3. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 children aged 0-3. Post-period includes SY 2021-22 (September 2021–May 2022), while pre-period includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

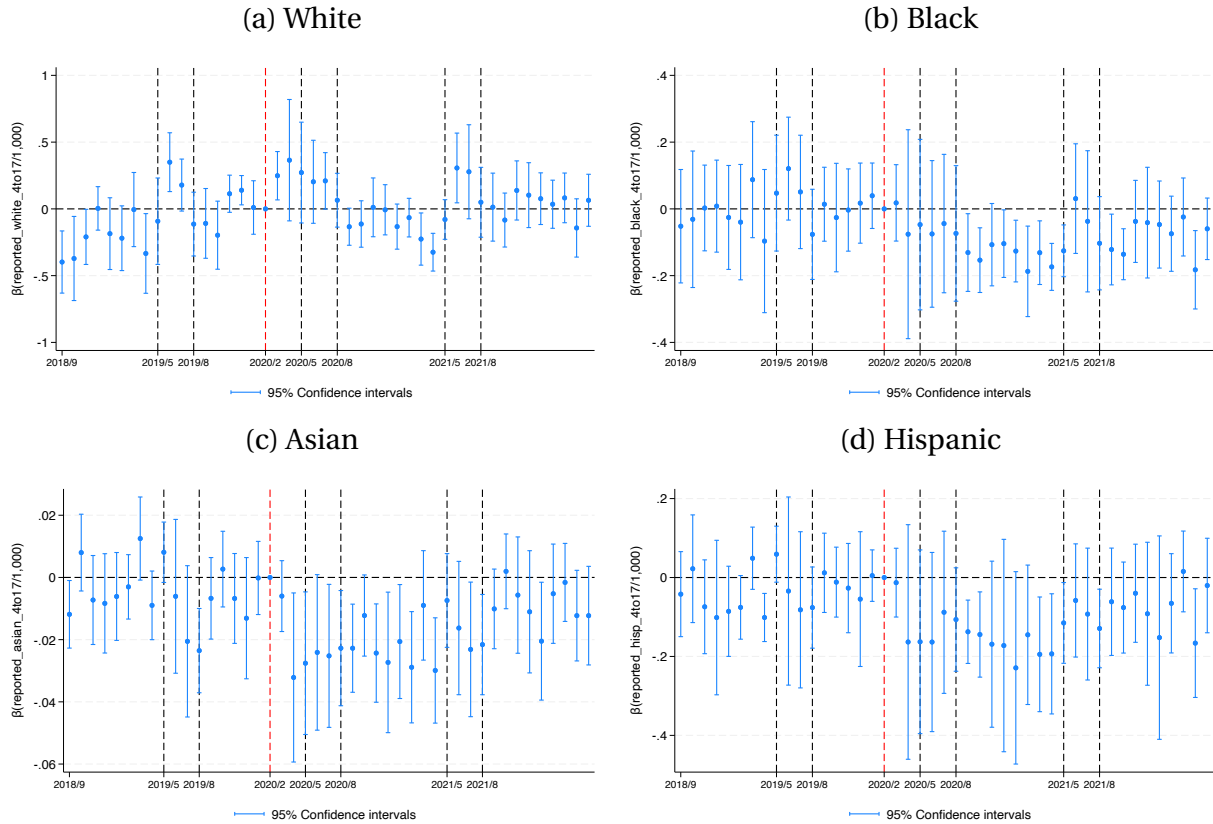
F. Allegation Event Study - by Referral Source and Child Race/Ethnicity

Figure F1: Referral Sources



Notes: These figures plot event study estimates for Equation 1. Dependent variable is allegations by education personnel (panel (a)), social personnel (panel (b)), and medical personnel (panel (c)) per 1,000 school-age children (ages 4-17). County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in all regressions. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

Figure F2: Child Race/Ethnicity



Notes: These figures present event study estimates plots for Equation 1. Dependent variable is allegations involving White children (panel (a)), Black children (panel (b)), and Hispanic children (panel (c)) per 1,000 school-age children (ages 4-17). County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in all regressions. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

G. Substantiated Allegations

Table G1: DID Substantiated Allegation, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	8.929* (4.457) [5.4%]	-5.529 (5.764) [-4.7%]	7.777 (6.563) [2.4%]	8.466 (6.185) [4.3%]	9.624 (6.720) [4.7%]	-5.717 (5.504) [-4.4%]	-2.077 (7.524) [-1.7%]
Mean	166.7	118.6	328.1	196.8	203.1	129.2	121.3
N	23560	23398	23351	22566	22756	21867	23036
r2	0.774	0.512	0.640	0.337	0.327	0.275	0.421
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

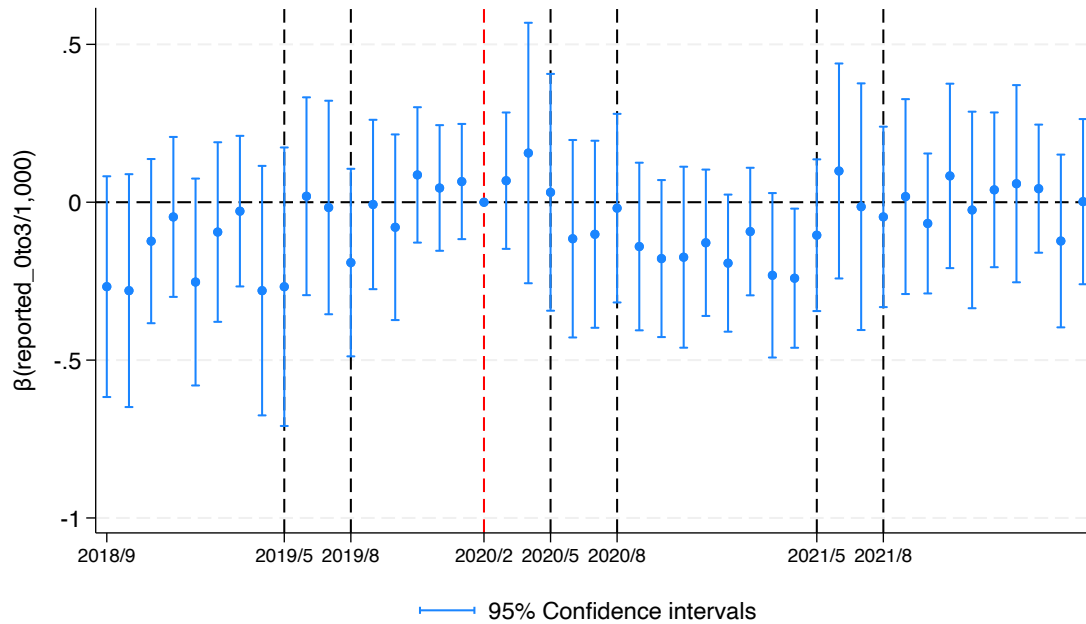
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
θ_1	8.919 (5.405) [5.2%]	7.513* (4.391) [4.4%]	-1.029 (12.18) [-0.7%]	6.373 (6.093) [3.6%]	8.808 (5.697) [5.6%]	5.745 (4.301) [2.9%]	6.001 (8.797) [2.0%]
Mean	171.7	169.4	147.7	179.3	156.0	195.4	297.7
N	22878	23532	12714	22310	23344	23404	22984
r2	0.423	0.713	0.178	0.355	0.767	0.800	0.548
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 3. Dependent variables are total substantiated allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 children aged 0-3. Post-period includes SY 2020-22 (September 2020–May 2021 and September 2021–May 2022), while pre-period includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

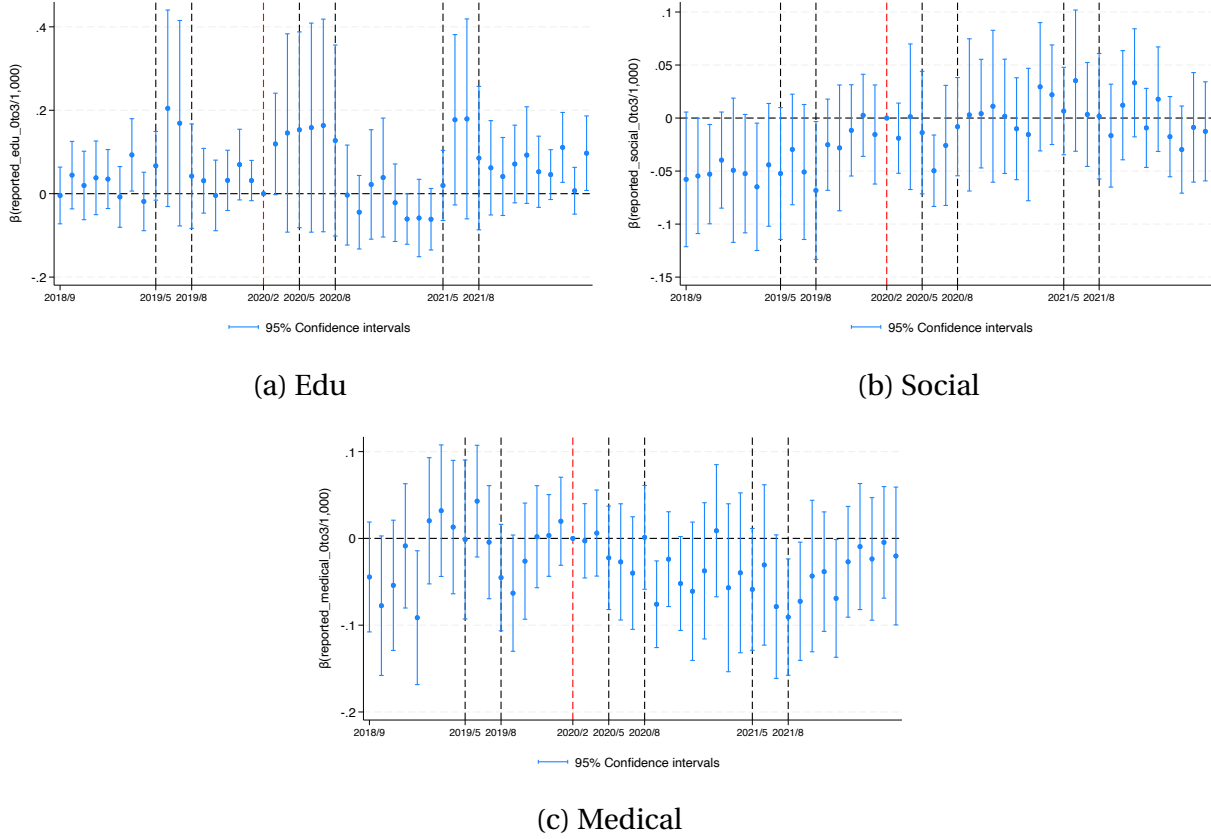
H. Sub-Analysis for Allegations (aged 0-3)

Figure H1: Allegations, ages 0-3



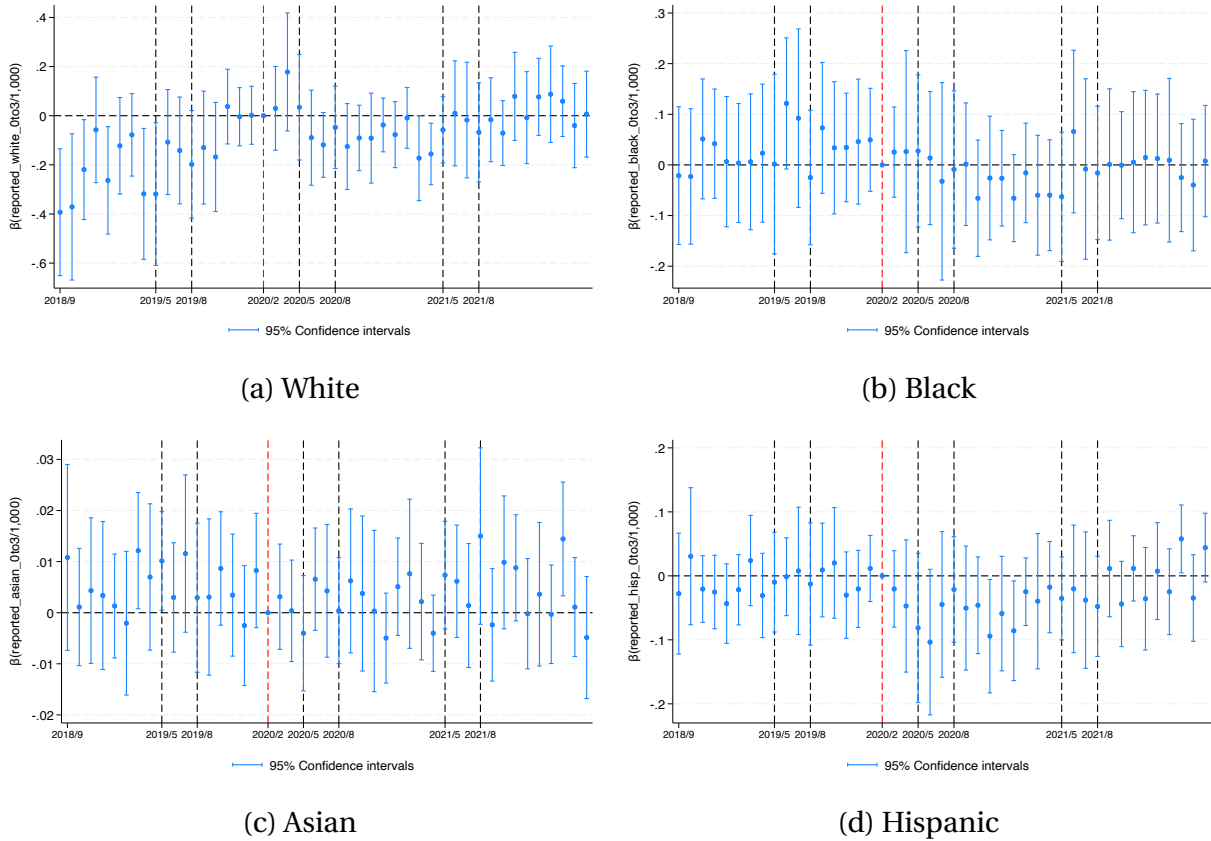
Notes: These figures present event study estimates plots for Equation 1. Dependent variable is allegations per 1,000 children aged 0-3. County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in the regression. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

Figure H2: Referral Sources



Notes: These figures present event study estimates plots for Equation 1. Dependent variable is allegations by education personnel (panel (a)), social personnel (panel (b)), and medical personnel (panel (c)) per 1,000 children aged 0-3. County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in all regressions. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

Figure H3: Child Race/Ethnicity



Notes: These figures present event study estimates plots for Equation 1. Dependent variable is allegations involving White children (panel (a)), Black children (panel (b)), and Hispanic children (panel (c)) per 1,000 children aged 0-3. County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in all regressions. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

Table H1: DID regression results (SY 19-20 vs. SY 21), Allegation, Ages 0-3

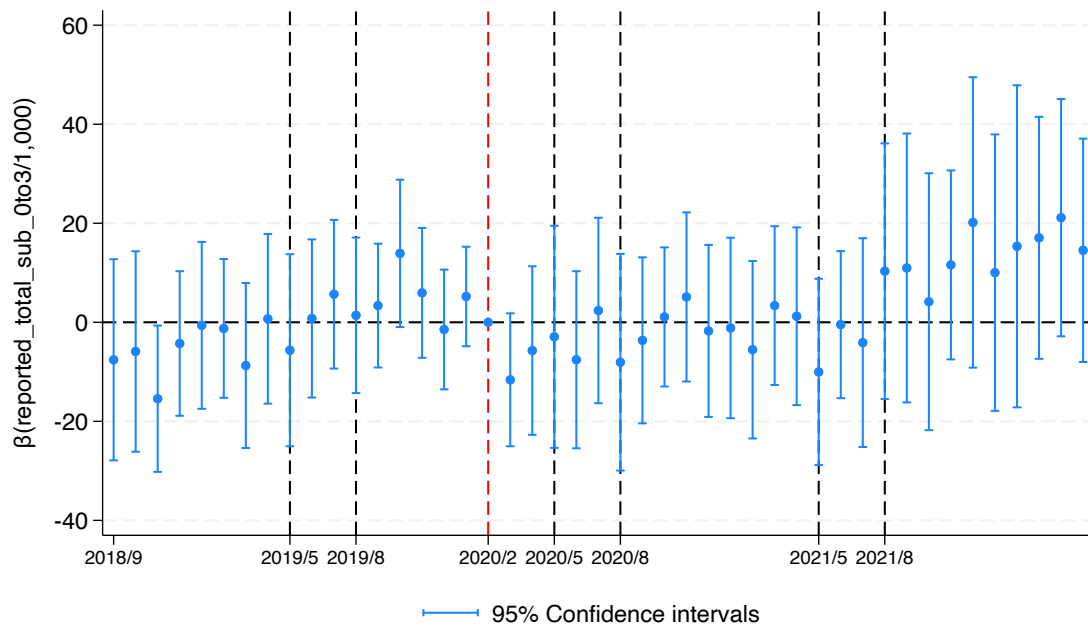
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	-0.0917 (0.111)	-0.0591 (0.0376)	-0.0159 (0.0296)	0.0363 (0.0269)	-0.0261 (0.0229)	-0.0132 (0.00966)	0.0552 (0.0441)
Mean	5.759	0.570	1.182	0.679	1.014	0.224	1.518
N	17402	17402	17402	17402	17402	17402	17402
r2	0.904	0.695	0.798	0.721	0.809	0.416	0.819
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
θ_1	-0.0741** (0.0349)	0.0485 (0.0815)	-0.00287 (0.00196)	-0.0454 (0.0274)	-0.00797 (0.0205)	-0.0724 (0.0932)	-0.00731 (0.00879)
Mean	1.550	3.795	0.0494	0.703	1.073	4.270	0.151
N	17402	17402	17402	17402	17402	17402	17402
r2	0.913	0.906	0.553	0.905	0.888	0.899	0.530
σ_c	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 3. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 children aged 0-3. Post-period includes the blended learning months, following the initial school closures in SY 2020-21 (September 2020–May 2021), while pre-period includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure H4: Substantiated Allegations, ages 0-3



Notes: This figure plots event study estimates for Equation 1. Dependent variable is substantiated allegations (ages 0-3) per 1,000 screened-in allegations. County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included in the regression. Standard errors are clustered at the state level. Blue bars around point estimates represent 95% confidence intervals. The dashed red vertical line indicates February 2020, the last month schools were in session prior to the pandemic and the subsequent school closures.

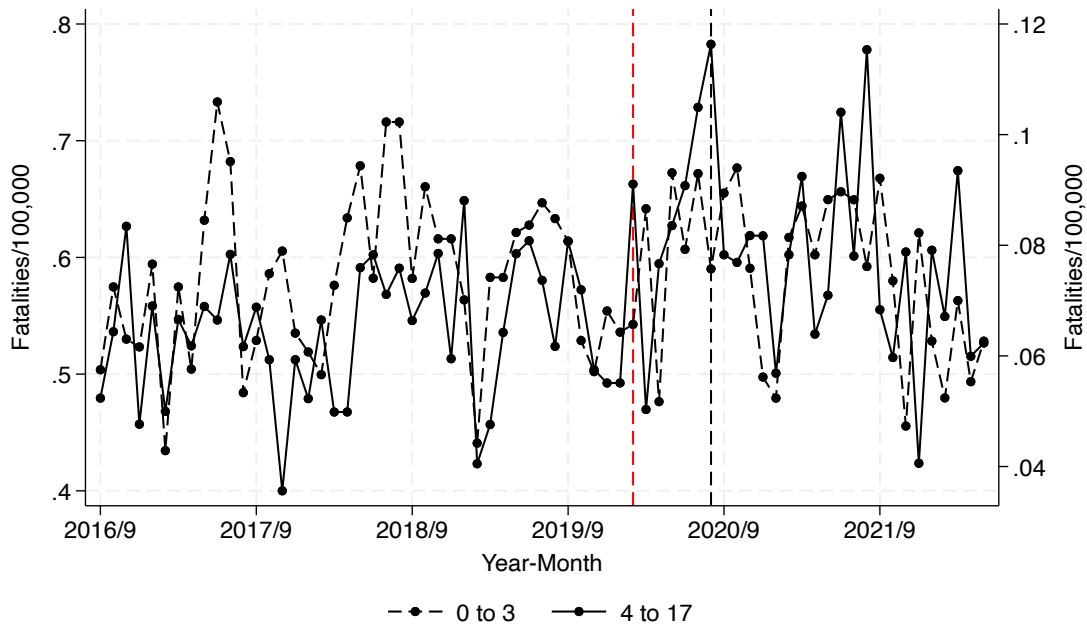
Table H2: DID Substantiated Allegation, Ages 0-3

(1)	
Total Substantiated Allegations	
θ_1	7.094 (5.359)
Mean	235.4
N	23508
r2	0.752
σ_c	Y
Ω_m	Y
\mathbf{X}_{cm}	Y

Notes: This table shows estimates for [Equation 3](#). Dependent variable is substantiated allegations (ages 0-3) per 1,000 screened-in allegations. Post-period includes SY 2020-22 (September 2020–May 2021 and September 2021–May 2022), while pre-period includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Figure H5: Fatality Trend by Age-Month



Notes: This figure presents monthly trends in maltreatment-related fatality rates (per 100,000 children) by age group (0-3 and 4-17). The dashed black line represents the trend for children aged 0-3, while the solid black line represents the trend for children aged 4-17. The dashed red vertical line indicates January–March 2020, the last quarter when schools were mostly in session before the pandemic and subsequent school closures. The dashed black vertical line indicates July–September 2020, around the time when schools began transitioning back to in-person instruction, with variation in the number of weeks that students were served remotely.

I. Robustness Check

Table I1: Parallel Trends Test (SY 19-20 vs. SY 21), Allegation, Ages 4-17

	(1) Total	(2) Edu	(3) Legal	(4) Social	(5) Medical	(6) Other Pro	(7) Non-Pro
<i>Pre</i>	-0.127 (0.157)	-0.0306 (0.0635)	-0.0347 (0.0430)	-0.0316 (0.0204)	0.0106 (0.0135)	-0.00490 (0.0179)	-0.0616 (0.0483)
<i>Post</i>	-0.431*** (0.104)	-0.200** (0.0811)	-0.0600 (0.0507)	-0.0150 (0.0231)	-0.00515 (0.0116)	-0.0525 (0.0346)	-0.0235 (0.0343)
N	17402	17402	17402	17402	17402	17402	17402

	(8) Black	(9) White	(10) Asian	(11) Hisp.	(12) Physical	(13) Neglect	(14) Sexual Abuse
<i>Pre</i>	0.0104 (0.0642)	-0.143 (0.103)	-0.0034 (0.0046)	-0.0216 (0.0275)	-0.0403 (0.0383)	-0.0620 (0.108)	0.0009 (0.0129)
<i>Post</i>	-0.142*** (0.0394)	-0.163*** (0.0550)	-0.0197*** (0.0069)	-0.158** (0.0661)	-0.159*** (0.0330)	-0.240*** (0.0811)	-0.0215* (0.0126)
N	17402	17402	17402	17402	17402	17402	17402

Notes: This table shows parallel trends test analysis estimates for [Equation 5](#). Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). *Pre* includes months before the initial school closures (September 2018–May 2019 and September 2019–January 2020, with February 2020 as the reference month) and *Post* indicates the period after the initial closures, including months in SY 2020-22 (September 2020–May 2021 and September 2021–May 2022). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I2: Parallel Trends Test, Child Fatality

	(1)	(2)
	FFY 2020-2022	FFY 2021-2022
<i>Pre</i>	0.118 (0.313)	0.103 (0.308)
<i>Post</i>	0.723** (0.327)	0.828** (0.367)
N	336	288

Notes: This table shows parallel trends test analysis estimates for [Equation 5](#). Dependent variable is child fatalities per 100,000 children (ages 0-17). Column (1) displays results for the specification that includes FFY 2020 through FFY 2022 as the post-period, while column (2) shows results for the specification excluding FFY 2020 (i.e., FFY 2021 through FFY 2022). The pre-period encompasses FFY 2016 through FFY 2019. Robust standard errors are in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I3: Parallel Trends Test (SY 19-20 vs. SY 21-22), Substantiation, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
<i>Pre</i>	5.243 (3.944)	2.349 (7.780)	14.33 (10.11)	-4.575 (8.021)	5.429 (9.117)	16.00* (8.253)	13.81 (8.769)
<i>Post</i>	13.78*** (4.541)	-3.355 (5.297)	21.04* (11.71)	4.233 (7.527)	14.65 (10.37)	9.082 (8.249)	10.70 (7.388)
N	23560	23398	23351	22566	22756	21867	23036

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
<i>Pre</i>	-8.052 (9.005)	7.712* (4.073)	55.82*** (18.24)	9.098 (14.71)	-2.129 (5.388)	13.21** (5.027)	-3.125 (11.05)
<i>Post</i>	1.469 (8.105)	14.65*** (4.765)	50.52** (23.77)	14.79 (13.90)	6.838 (7.168)	17.97*** (4.270)	3.109 (10.25)
N	22878	23532	12714	22310	23344	23404	22984

Notes: This table shows parallel trends test analysis estimates for [Equation 5](#). Dependent variables are total substantiated allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). *Pre* includes months before the initial school closures (September 2018–May 2019 and September 2019–January 2020, with February 2020 as the reference month) and *Post* indicates the period after the initial closures, including months in SY 2020-22 (September 2020–May 2021 and September 2021–May 2022). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I4: No Anticipation Test, Allegation, Ages 4-17

	(1) Total	(2) Edu	(3) Legal	(4) Social	(5) Medical	(6) Other Pro	(7) Non-Pro
$\beta_{2019/5}$ (<i>reference month</i>)							
$\beta_{2019/9}$	-0.114 (0.130)	-0.302** (0.123)	0.0237 (0.0204)	0.0232 (0.0181)	-0.0140 (0.0107)	0.0244 (0.0348)	0.0586* (0.0321)
$\beta_{2019/10}$	-0.217 (0.150)	-0.339** (0.162)	0.00142 (0.0158)	0.0138 (0.0224)	-0.0245** (0.0101)	0.0162 (0.0411)	0.0371 (0.0315)
$\beta_{2019/11}$	0.00943 (0.0554)	-0.229* (0.128)	0.0497 (0.0309)	0.0320 (0.0200)	-0.0109 (0.0151)	0.00435 (0.0136)	0.0958 (0.0675)
$\beta_{2019/12}$	0.0368 (0.0722)	-0.143 (0.0914)	0.0378 (0.0314)	0.0319 (0.0235)	0.00267 (0.0115)	-0.00538 (0.00821)	0.0747 (0.0576)
$\beta_{2020/1}$	0.0464 (0.153)	-0.212 (0.172)	0.0527** (0.0255)	0.0645* (0.0322)	-0.000342 (0.0119)	0.00808 (0.0268)	0.0882 (0.0551)
$\beta_{2020/2}$	-0.00335 (0.120)	-0.218 (0.134)	0.0421 (0.0465)	0.0502** (0.0248)	-0.0160 (0.0177)	0.00794 (0.0279)	0.0986 (0.0729)
N	13127	13127	13127	13127	13127	13127	13127

	(8) Black	(9) White	(10) Asian	(11) Hisp.	(12) Physical	(13) Neglect	(14) Sexual Abuse
$\beta_{2019/5}$ (<i>reference month</i>)							
$\beta_{2019/9}$	-0.0219 (0.0408)	-0.188** (0.0912)	0.00384 (0.00848)	0.0452 (0.0899)	-0.0925*** (0.0256)	0.0730 (0.0682)	-0.0023 (0.0166)
$\beta_{2019/10}$	-0.0626 (0.0794)	-0.280*** (0.0933)	0.0132 (0.0097)	0.0210 (0.0947)	-0.0706** (0.0304)	0.0552 (0.0812)	-0.0206 (0.0184)
$\beta_{2019/11}$	-0.0402 (0.0254)	0.0278 (0.0446)	0.0038 (0.0035)	0.0047 (0.0153)	-0.0481* (0.0270)	0.0944* (0.0557)	-0.0089 (0.001)
$\beta_{2019/12}$	-0.0190 (0.0248)	0.0586 (0.0549)	-0.0026 (0.0044)	-0.0218 (0.0351)	-0.0039 (0.0307)	0.0645 (0.0597)	0.0137 (0.0099)
$\beta_{2020/1}$	0.0195 (0.0657)	-0.0254 (0.119)	0.0079* (0.0039)	0.0053 (0.0337)	-0.0123 (0.0491)	0.132 (0.108)	-0.0163 (0.0109)
$\beta_{2020/2}$	-0.0201 (0.0431)	-0.0372 (0.0827)	0.0080 (0.0060)	-0.0001 (0.0454)	-0.0199 (0.0399)	0.0922 (0.0951)	-0.0191 (0.0175)
N	13127	13127	13127	13127	13127	13127	13127

Notes: This table shows estimates from no-anticipation test analysis, based on adjustments to the analysis period and reference month in Equation 1. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I5: No Anticipation Test, Child Fatality

	(1)	(2)
	FFY 2016-2019	FFY 2016-2020
β_{2016} (<i>reference year</i>)		
β_{2017}	-0.0947 (0.243)	-0.0766 (0.261)
β_{2018}	-0.271 (0.259)	-0.250 (0.281)
β_{2019}	-0.502 (0.313)	-0.481 (0.336)
β_{2020}		0.0750 (0.324)
N	192	240

Notes: This table shows estimates from no-anticipation test analysis, based on adjustments to the analysis period and reference year in [Equation 2](#). Dependent variable is child fatalities per 100,000 children (ages 0-17). Column (1) displays results for the specification that includes FFY 2016 through FFY 2019 as the analysis period (with year 2016 as reference year), while column (2) shows results for the specification including FFY 2020 (i.e., FFY 2016 through FFY 2020). Robust standard errors are in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I6: No Anticipation Test, Substantiation, Ages 4-17

	(1) Total	(2) Edu	(3) Legal	(4) Social	(5) Medical	(6) Other Pro	(7) Non-Pro
$\beta_{2019/5}$ (<i>reference month</i>)							
$\beta_{2019/9}$	4.492 (4.376)	-7.775 (9.657)	5.616 (10.07)	-10.14 (11.74)	12.38 (16.91)	-9.110 (13.65)	6.790 (10.04)
$\beta_{2019/10}$	15.11** (6.225)	7.709 (6.139)	18.24* (10.35)	35.07*** (11.36)	35.85** (13.37)	3.663 (10.57)	2.338 (6.311)
$\beta_{2019/11}$	12.91*** (3.695)	9.857* (5.706)	12.62 (11.29)	9.568 (10.47)	9.809 (12.40)	14.19 (10.38)	11.25 (8.239)
$\beta_{2019/12}$	-0.564 (5.029)	3.220 (6.602)	-28.33*** (10.27)	41.23** (18.21)	23.20* (12.15)	-1.003 (11.14)	4.168 (7.550)
$\beta_{2020/1}$	6.437 (5.523)	6.401 (8.982)	-2.236 (10.72)	27.31** (12.38)	13.84 (14.42)	-9.781 (11.01)	3.320 (9.984)
$\beta_{2020/2}$	-2.395 (6.737)	2.805 (6.063)	-13.05 (10.55)	14.72 (9.614)	1.806 (8.976)	-16.81* (9.641)	-6.223 (9.753)
N	13122	12517	12980	12571	12661	12141	12830

	(8) Black	(9) White	(10) Asian	(11) Hispanic	(12) Physical	(13) Neglect	(14) Sexual Abuse
$\beta_{2019/5}$ (<i>reference month</i>)							
$\beta_{2019/9}$	8.031 (11.62)	2.877 (4.234)	3.480 (22.43)	-3.797 (7.809)	2.434 (8.539)	-1.378 (5.909)	16.01 (18.05)
$\beta_{2019/10}$	18.68 (12.50)	9.728 (6.064)	36.17 (23.77)	18.53 (13.46)	6.586 (10.41)	11.29 (7.402)	37.78*** (11.80)
$\beta_{2019/11}$	16.61 (10.38)	9.117** (3.834)	11.90 (22.45)	24.22** (10.37)	5.406 (9.209)	17.46** (8.548)	19.48 (13.36)
$\beta_{2019/12}$	-3.917 (8.223)	-1.759 (6.274)	-24.31 (33.02)	7.623 (8.865)	0.807 (6.618)	-3.457 (7.057)	40.44** (16.12)
$\beta_{2020/1}$	7.380 (8.807)	7.941* (4.110)	-14.89 (29.57)	18.34 (11.67)	12.94 (10.43)	12.51 (9.577)	5.749 (11.14)
$\beta_{2020/2}$	8.400 (11.43)	-5.660 (6.177)	-64.21** (31.58)	-7.860 (16.41)	4.375 (11.49)	-10.57** (5.143)	14.12 (13.09)
N	12714	13105	6915	12357	13001	13033	12766

Notes: This table shows estimates from no-anticipation test analysis, based on adjustments to the analysis period and reference month in Equation 1. Dependent variables are total substantiated allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I7: DID regression results (SY 19-20 vs. SY 21), Allegations with Continuous Treatment, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	-0.443*** (0.150)	-0.235** (0.0962)	-0.0442 (0.0276)	0.0137 (0.0254)	-0.0167* (0.00917)	-0.0727** (0.0328)	0.0358 (0.0362)
N	17402	17402	17402	17402	17402	17402	17402

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
θ_1	-0.160** (0.0772)	-0.0786 (0.0951)	-0.0213*** (0.00488)	-0.214** (0.0828)	-0.175*** (0.0396)	-0.247** (0.116)	-0.0227* (0.0116)
N	17402	17402	17402	17402	17402	17402	17402

Notes: This table shows estimates for Equation 3, with continuous measures of exposure to remote learning. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Pre-period includes months before the initial school closures (September 2018–May 2019 and September 2019–January 2020, with February 2020 as the reference month) and post-period indicates the period after the initial closures, including months in SY 2020-21 (September 2020–May 2021). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I8: DID regression results - Child Fatality with Continuous Treatment

	(1)	(2)
	FFY 2020-2022	FFY 2021-2022
λ_1	0.460** (0.208)	0.532** (0.268)
N	336	288

Notes: This table shows estimates for [Equation 4](#), with continuous measures of exposure to remote learning. Dependent variable is child fatalities per 100,000 children (ages 0-17). Column (1) displays results for the specification that includes FFY 2020 through FFY 2022 as the post-period, while column (2) shows results for the specification excluding FFY 2020 (i.e., FFY 2021 through FFY 2022). The pre-period encompasses FFY 2016 through FFY 2019. Robust standard errors are in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I9: DID regression results (SY 19-20 vs. SY 21-22), Substantiated Allegations with Continuous Treatment, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Total	Edu	Legal	Social	Medical	Other Pro	Non-Pro
θ_1	11.03*	-18.87	-6.658	1.780	5.546	-6.786	-14.14
	(6.193)	(13.27)	(14.02)	(7.148)	(8.195)	(8.835)	(13.49)
Mean	118.0	74.10	226.9	158.4	164.4	82.23	75.42
N	17391	17242	17208	16634	16789	16087	16982

	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Black	White	Asian	Hisp.	Physical	Neglect	Sexual Abuse
θ_1	12.74	10.63*	21.35	14.00	19.11**	2.997	11.10
	(8.286)	(5.879)	(19.04)	(9.570)	(7.423)	(4.888)	(8.759)
Mean	122.9	123.4	116.8	125.0	101.8	157.8	257.2
N	16858	17366	9242	16418	17220	17272	16943

Notes: This table shows estimates for Equation 3, with continuous measures of exposure to remote learning. Dependent variables are total substantiated allegations (column (1)), allegations by report sources (columns (2)-(7)), allegations by child's race/ethnicity (columns (8)-(11)), and allegations involving physical abuse, neglect, and sexual abuse (columns (12)-(14)) per 1,000 school-age children (ages 4-17). Pre-period includes months before the initial school closures (September 2018–May 2019 and September 2019–January 2020, with February 2020 as the reference month) and post-period indicates the period after the initial closures, including months in SY 2020-21 (September 2020–May 2021 and September 2021–May 2022). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I10: DID regression results (*Pre* vs. *Post*), Logged Allegations, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Total		Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
θ_1	-0.079** (0.030)	-0.099*** (0.030)	0.003 (0.018)	-0.011 (0.007)	-0.053** (0.020)	-0.041* (0.024)	-0.014*** (0.004)	-0.049** (0.021)	-0.067*** (0.019)	-0.051 (0.033)	-0.014* (0.008)
Mean	1.884	0.968	0.446	0.324	0.808	1.512	0.069	0.565	0.828	1.491	0.343
N	17402	17402	17402	17402	17402	17402	17402	17402	17402	17402	17402
r ²	0.924	0.847	0.831	0.775	0.943	0.943	0.758	0.935	0.885	0.935	0.824
σ_c	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
\mathbf{X}_{cm}	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 3. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(4)), and allegations by child's race/ethnicity (columns (5)-(8)), and allegations involving physical abuse, neglect, and sexual abuse (columns (9)-(11)) per 1,000 school-age children (ages 4-17), all in logarithmic form. *Post* includes the blended learning months, following the initial school closures in SY 2020-21 (September 2020–May 2021), while *Pre* includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I11: DID regression results, Logged Child Fatality

	(1)	(2)
	FFY 2020–2022	FFY 2021–2022
λ_1	0.170** (0.0684)	0.218** (0.0866)
Mean	1.031	1.031
N	336	288
r2	0.723	0.733
ϕ_s	Y	Y
δ_t	Y	Y
\mathbf{X}_{st}	Y	Y

Notes: This table shows estimates for [Equation 4](#). Dependent variable is child fatalities per 100,000 children (ages 0-17) in logarithmic form. Column (1) displays results for the specification that includes FFY 2020 through FFY 2022 as the post-period, while column (2) shows results for the specification excluding FFY 2020 (i.e., FFY 2021 through FFY 2022). The pre-period encompasses FFY 2016 through FFY 2019. Robust standard errors are in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table I12: DID Substantiated Allegations (*Pre* vs. *Post*), Logged, Ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total	Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
θ_1	0.039 (0.033)	-0.132* (0.074)	0.148** (0.069)	0.091 (0.058)	0.020 (0.043)	0.048 (0.038)	-0.058 (0.054)	0.003 (0.042)	0.007 (0.040)	0.031 (0.037)	0.068 (0.043)
Mean	4.873	2.860	2.139	1.889	2.908	4.345	0.555	2.470	2.987	4.292	2.503
N	23560	23560	23560	23560	23560	23560	23560	23560	23560	23560	23560
r2	0.717	0.448	0.466	0.446	0.708	0.724	0.550	0.739	0.545	0.768	0.543
σ_c	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ω_m	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
X_{cm}	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Notes: This table shows estimates for Equation 3. Dependent variables are total substantiated allegations (column (1)), substantiated allegations by report sources (columns (2)-(4)), by child's race/ethnicity (columns (5)-(8)), and substantiated allegations involving physical abuse, neglect, and sexual abuse (columns (9)-(11)) per 1,000 screened-in allegations (ages 4-17), all in logarithmic form. *Post* includes the months following the initial school closures in SY 2020-22 (September 2020–May 2021 and September 2021–May 2022), while *Pre* includes the months in SY 2018-19 and 2019-20, excluding the full-remote months (September 2018–May 2019 and September 2019–February 2020). Robust standard errors are in parentheses, clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$