

# 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. We causally investigate how remote learning influenced trends in child maltreatment allegations and the severity of these cases, leveraging county- and state-level variations in remote learning instructional weeks in the United States during the 2020-21 school year. We find that in counties and states with higher exposure to remote instruction, fewer allegations were reported, but a higher proportion of allegations were substantiated, and maltreatment-related child fatalities increased. The impacts were primarily driven by a reduction in allegations reported by education personnel. These results highlight an unintended cost of distance learning: remote instruction impaired the detection of child maltreatment, particularly among underrepresented groups, leading to fewer reports but more severe cases. They also urge prompt policy interventions to safeguard children who remain undetected and to prevent the consequences of remote learning from exacerbating existing inequalities in child welfare.

**Keywords:** Child Maltreatment, Remote Learning

**JEL Codes:** I28, I31, J13

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# 1 Introduction

Education personnel play a crucial role in identifying and reporting child maltreatment, serving as frontline observers of students' well-being (Benson et al., 2022). Teachers, school counselors, and administrators are often among the first to notice signs of abuse or neglect, representing over 20 percent of all maltreatment reports in the United States on average in recent years. Since 2000, teachers have consistently been either the first or second most common source of maltreatment allegations each year (U.S. Department of Health & Human Services (HHS), 2022). Therefore, the regular interactions children have at school are essential for identifying and addressing maltreatment, ensuring that children at maltreatment risk receive prompt support and protection.

The disruption of in-person schooling during the COVID-19 pandemic significantly impacted this reporting system, potentially 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. As a result, the absence of routine interactions with educators and other school personnel led to an under-reporting of maltreatment (Baron et al., 2020; Cabrera-Hernández and Padilla-Romo, 2020; Prettyman, 2024). Additionally, emerging evidence from literature reveals a disturbing 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; Cappa and Jijon, 2021; Kovler et al., 2021; Rebbe et al., 2023; Sidpra et al., 2021). This suggests that a considerable number of maltreatment cases likely occurred but were not promptly reported or addressed.

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). Studies

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; Cicchetti and Handley, 2019; Currie and Spatz Widom, 2010; Currie and Tekin, 2012; Eckenrode et al., 1993; Raitasalo and Holmila, 2017). These detrimental effects of child maltreatment underscore the importance of the interactions between students and education personnel. It is particularly problematic as the pandemic compromised the education system's capacity to detect and address maltreatment cases.

This paper causally estimates the impacts of remote learning on child maltreatment allegations and the risk of maltreatment and provides policy implications for addressing the underreporting of child maltreatment. We leverage county- and state-level variations in remote learning exposure during the 2020-21 school year (SY) in the United States. 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.

By analyzing child fatalities, substantiated allegations, and child maltreatment reporting, we offer causal evidence that remote learning hindered the reporting and detection of maltreatment while exacerbating its severity. 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. Additionally, maltreatment-related child fatalities increased in states with higher exposure to remote learning. This suggests that the decline in maltreatment allegations did not reflect a reduced risk of maltreatment, but rather an increased risk that went undetected. The impact was primarily driven by a decline in allegations reported by education personnel, highlighting the disruption in student-educator interactions. Furthermore, the impacts on allegation rates were particularly pronounced among children from under-

represented 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 underscore the need for prompt policy interventions, such as strengthening mandatory reporting laws and providing legislative support for families, to identify and protect children at maltreatment risk when traditional school environments are inaccessible. Furthermore, they call for targeted support systems to prevent remote learning from exacerbating existing inequalities, particularly in the context of child welfare.

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 research has focused on investigating how pandemic-induced remote learning and the subsequent return to in-person schooling have influenced students' academic trajectories and health ([Aucejo et al., 2020](#); [Copeland et al., 2021](#); [Kuhfeld et al., 2022](#)). 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 mal-

treatment 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](#); [Prettyman, 2024](#); [Puls et al., 2021](#)). 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 var-

ied 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

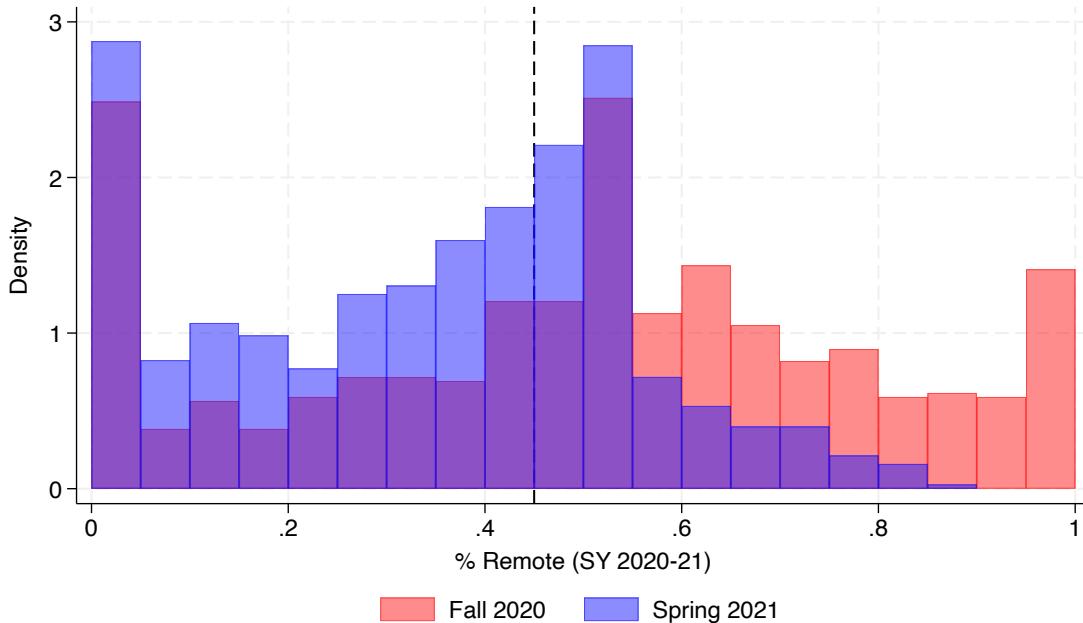
### 2.1 Pandemic-Induced School Closure and Return to In-Person Learning in the U.S.

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 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 an average of 31% (indicated by the dashed black line)<sup>1</sup>. Most schools had returned to in-person instruction by the beginning of the SY 2021-22, as illustrated in [Figure A3](#).

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<sup>1</sup>State and county maps of remote learning percentages for the same school year can be found in [Figure A1](#) and [Figure A2](#).

Figure 1: Proportion of Remote Learning, SY 2020-21



*Notes:* This figure presents a histogram of the proportion of remote learning in counties for each month of the 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 for SY 2020-21 (0.45; mean = 0.42, standard deviation = 0.27).

*Source:* Authors' analysis of CDC School Learning Modalities (2020-2021) 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 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 & 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<sup>2</sup>. 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 2](#) presents the trends in allegations and 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](#))<sup>3</sup>.

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

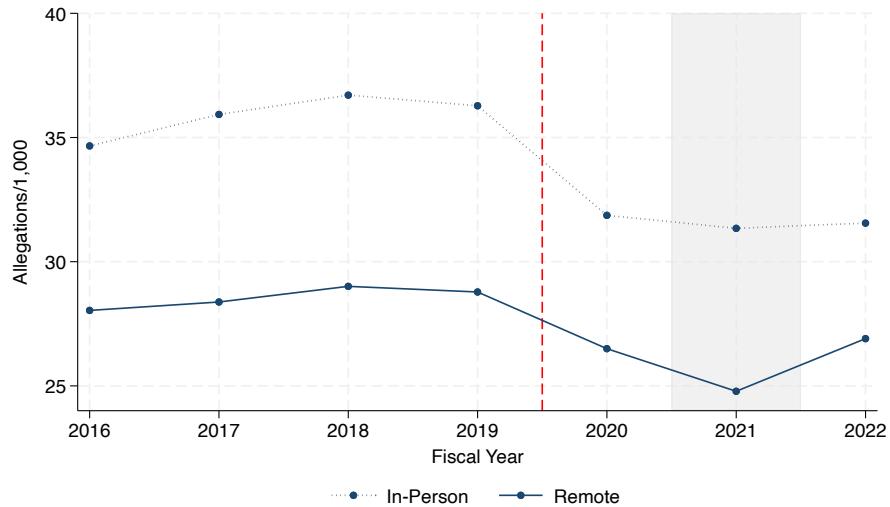
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<sup>2</sup>The federal fiscal year spans from October of the previous year to September of the current year. For example, FFY 2019 covers the period from October 1, 2018 to September 30, 2019.

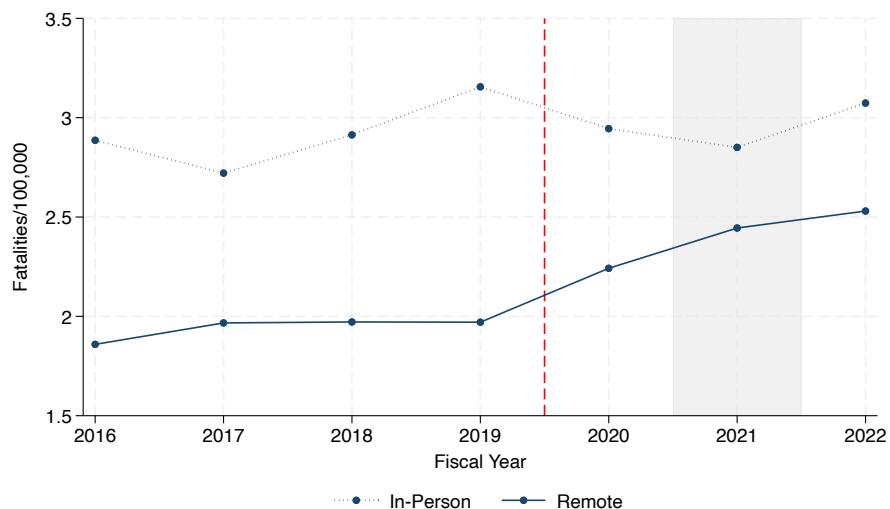
<sup>3</sup>Trends of total screened-in allegations and fatalities are illustrated in [Figure B1](#).

Figure 2: Trend by Learning Mode

(a) Screened-In Allegations



(b) Fatalities



*Notes:* These figures show trends in (a) screened-in allegations per 1,000 children and (b) 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.

ties, 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 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 re-

ceived 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).

While child fatalities are reported in the Child File, two key challenges arise when using this data for the 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 are not reported to the Child File (if not identified by the CPS) but are instead reported in the Agency File. 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

	Full Sample			Pre (2018/9-2020/2)			ttest
	Mean	SD	Mean	SD	Mean	SD	
Allegations	6.90	4.15	6.53	4.05	7.89	4.34	-1.37***
Unemployment	4.98	2.10	4.53	2.01	4.13	1.52	0.40***
Labor Force Participation	0.76	0.07	0.77	0.07	0.77	0.07	0.002*
Percent Poverty	12.90	4.35	12.88	4.50	13.01	4.30	-0.14
Median Household Income	63,553	16,006	65,479	17,890	59,220	12,479	6,258***
Percent White	0.81	0.14	0.78	0.16	0.84	0.12	-0.07***
Percent Black	0.12	0.13	0.13	0.14	0.11	0.11	0.02***
Percent Asian	0.03	0.04	0.04	0.06	0.02	0.02	0.02 ***
Percent Hispanic	0.12	0.14	0.14	0.14	0.11	0.13	0.03***
Percent Age 0 to 19	0.25	0.03	0.25	0.03	0.25	0.03	-0.001
Percent Age 20 to 24	0.13	0.02	0.14	0.02	0.13	0.02	0.01***
Percent Age 25 to 34	0.13	0.02	0.14	0.02	0.13	0.02	0.01***
Percent Age 35 to 44	0.12	0.01	0.12	0.01	0.12	0.01	0.003***
Percent Age 45 to 54	0.12	0.01	0.12	0.01	0.12	0.01	0.001**
Percent Age 55 to 64	0.13	0.02	0.13	0.02	0.13	0.02	-0.003***
Percent Female	0.51	0.01	0.51	0.01	0.51	0.01	0.001***
COVID-19 Case	247.98	524.96	0.00	0.00	0.00	0.00	-
COVID-19 Death	5.36	11.43	0.00	0.00	0.00	0.00	-
Percent Remote	0.15	0.26	0.00	0.00	0.00	0.00	-
Observations	17,402			5,449	5,465	17,402	

*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 [Section 3.2](#). Allegations are measured as allegations per 1,000 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. COVID-19 Case and Death rates (calculated as rates per 100,000 population by the authors) are sourced from the CDC Weekly United States COVID-19 Cases and Deaths by County data. Percent Remote indicates the proportion of weeks spent in remote learning during the 2020-21 school year. COVID-19 Case, Death, and Percent Remote are imputed as zero for the pre-school-closure period.

## 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)<sup>4</sup>. 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<sup>5</sup>. 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. 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 collect 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 Estimates (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 COVID-19 case and death

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<sup>4</sup>Retrieved on May 14, 2024 from  
[https://healthdata.gov/National/School-Learning-Modalities-2020-2021/a8v3-a3m3/about\\_data](https://healthdata.gov/National/School-Learning-Modalities-2020-2021/a8v3-a3m3/about_data).

<sup>5</sup>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.

data from the Centers for Disease Control and Prevention (CDC)<sup>6</sup>.

## 4 Empirical Strategy

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

$$y_{cm} = \beta_0 + \sum_{m=2018/9}^{2022/5} \beta_m \tau_m * remote_c + \beta_1 \mathbf{X}_{cm} + \sigma_c + \tau_m + \epsilon_{cm} \quad (1)$$

$$y_{st} = \gamma_0 + \sum_{t=2016}^{2022} \gamma_t \delta_t * remote_s + \gamma_1 \mathbf{X}_{st} + \phi_s + \delta_t + u_{st} \quad (2)$$

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

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

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, whereas  $y_{st}$  denotes the child fatalities per 1,000 children (ages 0 to 17) in state  $s$  and federal fiscal year  $t$ .  $post_m$  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<sup>7</sup>.  $post_t$  is an indicator for whether federal fiscal year  $t$  is in the during-the-pandemic period (FFY 2020–2022). Using the school-district-level schooling mode data spanning September 2020 to May

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<sup>6</sup>Retrieved from [https://data.cdc.gov/dataset/Weekly-United-States-COVID-19-Cases-and-Deaths-by-yviv-z6j5/about\\_data](https://data.cdc.gov/dataset/Weekly-United-States-COVID-19-Cases-and-Deaths-by-yviv-z6j5/about_data).

<sup>7</sup>For 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.

2021, we construct a variable indicating the primary mode of learning of school district  $d$  in week  $w$  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:

$$mode_c = \frac{\sum_{\{d: \text{district } d \text{ is in county } c\}} \sum_w r_{dw} \cdot s_{dw}}{\sum_{\{d: \text{district } d \text{ is in county } c\}} \sum_w s_{dw}} \quad (5)$$

$$mode_s = \frac{\sum_{\{d: \text{district } d \text{ is in state } s\}} \sum_w r_{dw} \cdot s_{dw}}{\sum_{\{d: \text{district } d \text{ is in state } s\}} \sum_w s_{dw}} \quad (6)$$

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.  $\mathbf{X}_{cm}$  and  $\mathbf{X}_{st}$  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.  $\sigma_c$  and  $\phi_s$  denote county and state fixed effects, and  $\tau_m$  and  $\delta_t$  denote month and year fixed effects, 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. 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

$\beta_m$ ,  $\gamma_t$ ,  $\theta_1$ , and  $\lambda_1$  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.

## 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 C1](#) 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. We do not observe a statistically significant decrease in the screened-in allegation rates for children aged 0-3 across the report characteristics, as presented in [Table C2](#).

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 ( $\theta_1$ ), and [Figure 3](#) shows the event study plot for screened-in maltreatment alle-

Table 2: DID regression results (*Pre* vs. *Post*), ages 4-17

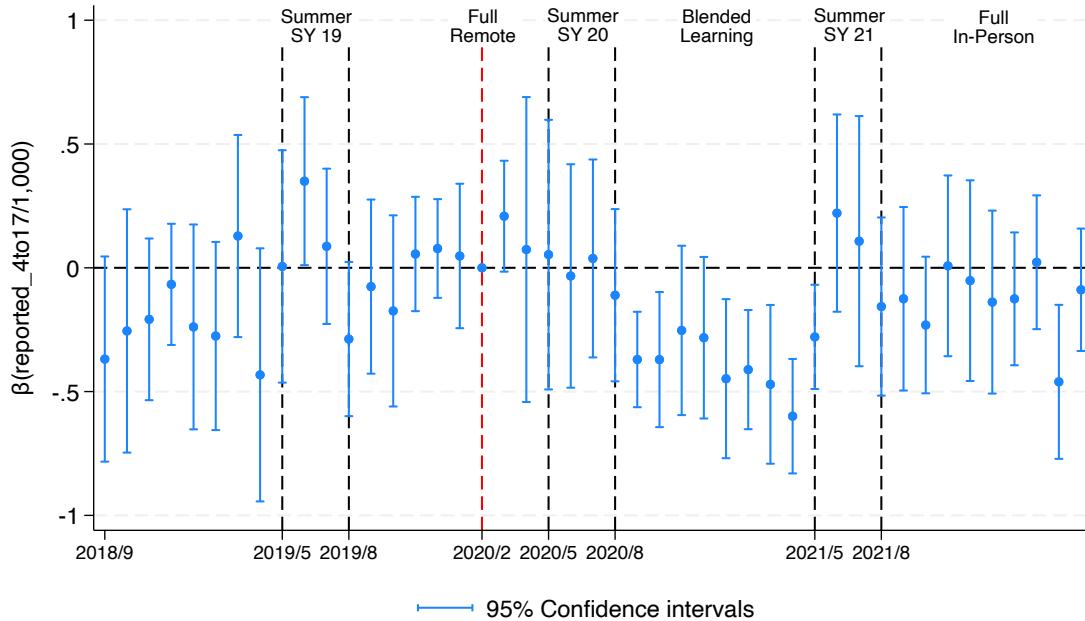
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Total		Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
$\theta_1$	-0.315*	-0.172*	0.014	-0.015	-0.151**	-0.032	-0.017***	-0.139***	-0.122***	-0.183	-0.022*
	(0.178)	(0.091)	(0.031)	(0.011)	(0.069)	(0.110)	(0.005)	(0.067)	(0.042)	(0.123)	(0.013)
	[-4.8%]	[-9.0%]	[2.1%]	[-3.5%]	[-9.3%]	[-0.7%]	[-22.4%]	[-15.0%]	[-8.0%]	[-4.2%]	[-4.8%]
Mean	6.527	1.914	0.674	0.426	1.631	4.480	0.076	0.928	1.517	4.388	0.457
N	17402	17402	17402	17402	17402	17402	17402	17402	17402	17402	17402
r2	0.912	0.808	0.804	0.752	0.924	0.926	0.757	0.926	0.876	0.918	0.802
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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 allegations (column (1)), allegations by report sources (columns (2)-(4)), 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). *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. Percentage changes from the baseline mean are in square brackets.

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

gations ( $\beta_m$ ). The results exhibit a pattern similar to those presented in [Table C1](#), 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 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 estimates for the non-school-age children are not statistically significant, as shown in [Table F1](#).

Figure 3: 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.

The event study plot presented in [Figure 3](#) indicates that "remote-learning" 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 E1](#) and [Figure E2](#). As anticipated from the difference-in-differences estimates, the impacts are primarily driven by a decline in maltreatment reports from educational personnel (panel (a) of [Figure E1](#)), with no significant impact observed from reports made by social and medical personnel. Moreover, as illustrated in [Figure E2](#), 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. The corresponding event study plots for children aged 0-3 are presented in [Figure F1](#) through [Figure F3](#), showing no discernible patterns in impacts compared to those for school-aged children.

## 5.2 Child Fatality & 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: child fatalities and allegations that were substantiated<sup>8</sup>.

[Table 3](#) and [Figure 4](#) present difference-in-differences estimates and event study

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<sup>8</sup>As noted previously in [subsection 3.1](#), county-level analysis of child fatality rates is unavailable.

Table 3: DID regression results - Child Fatality

	(1)	(2)
	FFY 2020–2022	FFY 2021–2022
$\lambda_1$	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
$\phi_s$	Y	Y
$\delta_t$	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.

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

plot, respectively. Compared to the period prior to remote learning, the child 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<sup>9</sup>. 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 learning period, we exclude FFY 2020 and re-estimate the difference-in-differences model<sup>10</sup>. The results are consistent, with an increase in the fatality rate by approximately 0.8 per 100,000 children.

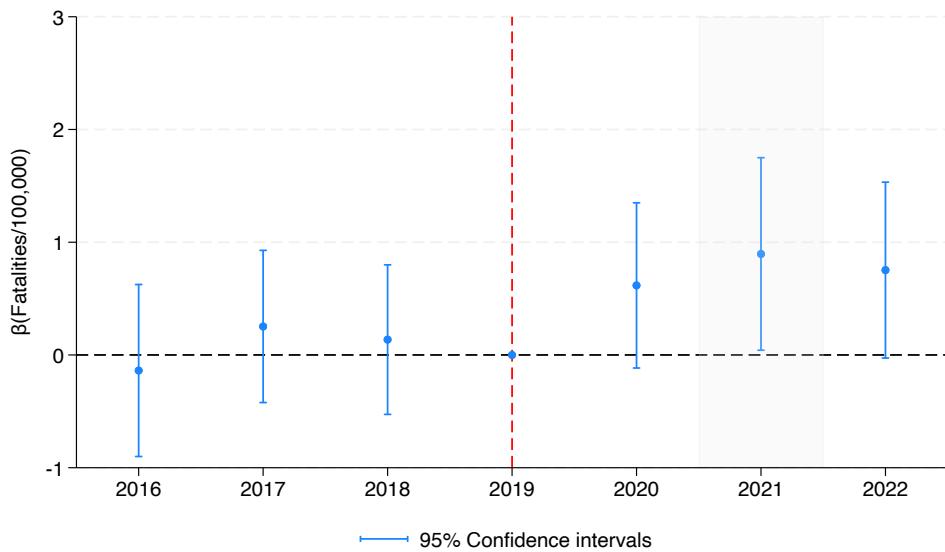
As illustrated in [Figure 4](#), child fatality rates in states with higher exposure to remote learning increased by approximately 1 per 100,000 children following the initial

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<sup>9</sup>We are unable to estimate the effect on the 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.

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

Figure 4: Child Fatality



*Notes:* This figure plots event study estimates for [Equation 2](#). Dependent variable is 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.

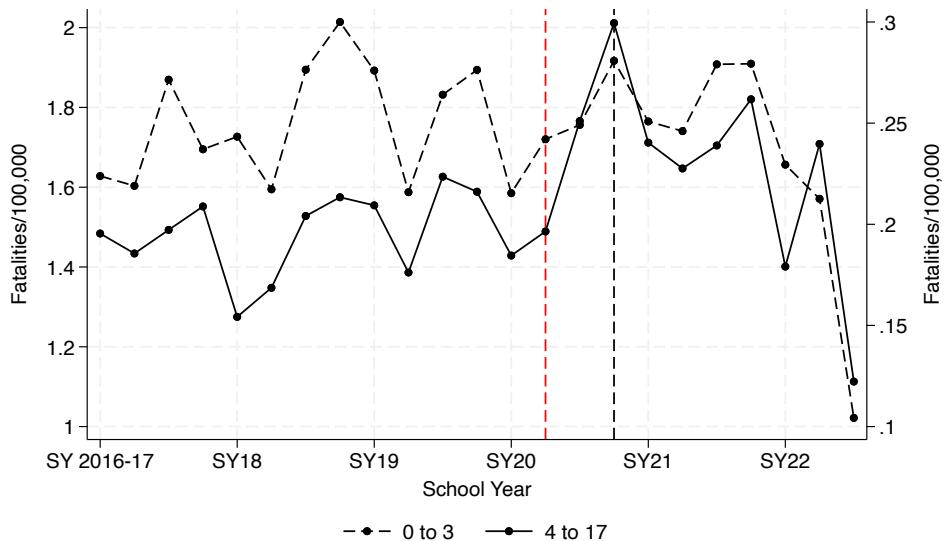
school closures, relative to those with lower exposure to remote instruction. This corresponds to an approximate 50% increase in the child fatality rate from the pre-pandemic average of 2.2 per 100,000 children in 2019 (omitted year). We present suggestive evidence in [Figure 5](#), indicating that the rise in fatalities was primarily driven by school-age children<sup>11</sup>. The figure shows that the trend in fatalities for children aged 0 to 3 remained relatively stable during the sample period, whereas the trend for school-age children surged significantly following the full-remote period, indicated by the dashed red vertical line<sup>12</sup>. Although the fatality rate for school-age children declined from the beginning of the blended learning period (dashed black vertical line), they did not return to the

<sup>11</sup>We analyzed reports resulted in child fatalities using data from the Child File, allowing us to identify the child's age. Although not all child fatalities are captured - only those reported to the CPS are included in the Child File as previously mentioned - the Child File still offers valuable insights, as fatalities recorded there account for over 80 percent of total child fatalities throughout the analysis period.

<sup>12</sup>The 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.

levels observed prior to the initial school closures. While the data do not allow us to estimate event study or difference-in-differences specifications separately for age groups, the differential trends in fatalities by age suggest that schools are the primary mechanism explaining the surge in fatalities illustrated in Figure 4<sup>13</sup>.

Figure 5: 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.

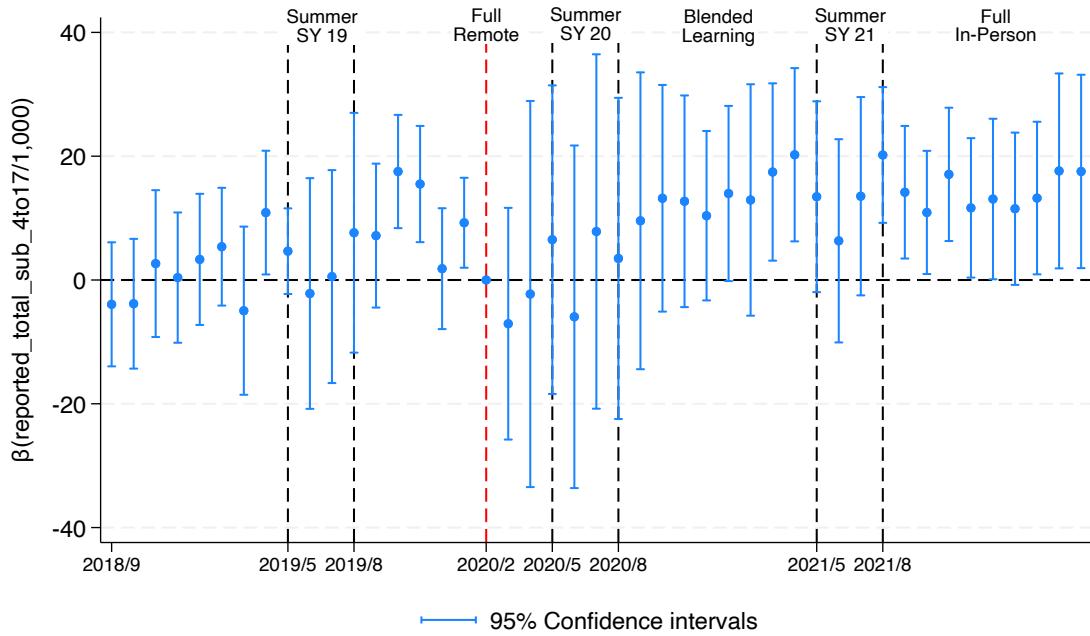
*Source:* Authors' analysis of FFY 2017–2022 NCANDS Child File data.

Analyzing child 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 6 presents the event study plot

<sup>13</sup>Figure 5 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.

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 6: 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 is provided in [??](#). Note that 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 blended learning phase. A higher overall rate of substantiated allegations is observed in counties with greater exposure to remote learning (column (1)), along with higher substantiated allegations involving reports made by social and medical personnel, reports involving White children, and cases related to neglect. 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.

Next, we outline several robustness checks performed to validate the results from our primary identification strategy. The event study plots presented in earlier sections indicate no statistically significant pre-trend, satisfying the parallel trends assumption of our difference-in-differences model. To further strengthen the analysis, we transform the outcome variables into logarithmic form and estimate the same models as an additional robustness check. The results are presented in [Table I1](#) through [Table I3](#). The coefficients are consistent with our main findings, although their magnitudes and statistical significance vary across dependent variables.

In sum, the significant increase in child fatalities and substantiated allegations, along with the decrease in overall allegations in states and counties with higher exposure to remote learning relative to those with lower exposure following the initial school closures, suggest that more children were exposed to maltreatment risk at home when schools closed and that many cases went undetected.

## 6 Discussion & Conclusion

This study provides critical insights into the how disruptions to traditional in-person learning have affected 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, while experiencing higher rates of substantiated allegations and maltreatment-related child fatalities. This suggests that remote learning led to underreporting of maltreatment cases, potentially exposing children to greater risks at home without the protective oversight typically provided by in-person schooling.

Our study offers important implications for child welfare and education policy, as well as school-based practices. Our findings highlight the need for robust support systems, including enhanced training and resources for education personnel and improved mandatory reporting laws, to identify and protect children at risk of maltreatment when traditional school environments are inaccessible. Policymakers should establish strong communication channels between educators and child welfare agencies to ensure timely responses to concerns about student well-being. As schools prepare for future disruptions, strategies should be implemented to maintain strong connections between students and educators, fostering a safe and supportive environment. Additionally, they call for targeted interventions to address the disproportionate impact on underrepresented populations and to prevent educational disruptions from exacerbating existing inequalities in child welfare.

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 interactions 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 children at risk of maltreatment.

## **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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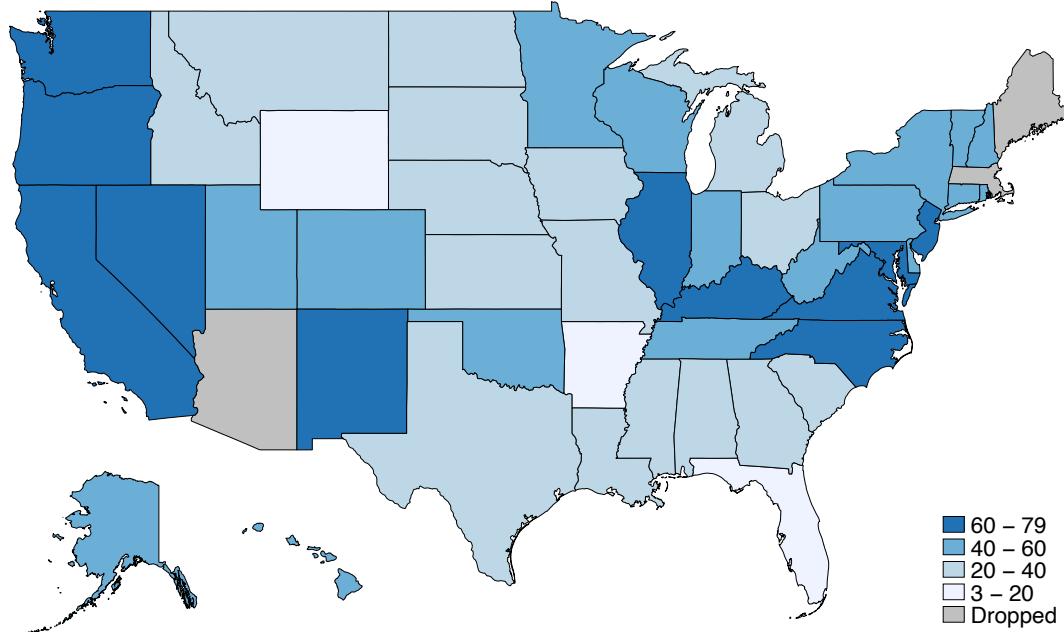
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## Appendix

## A. Exposure to Remote Learning

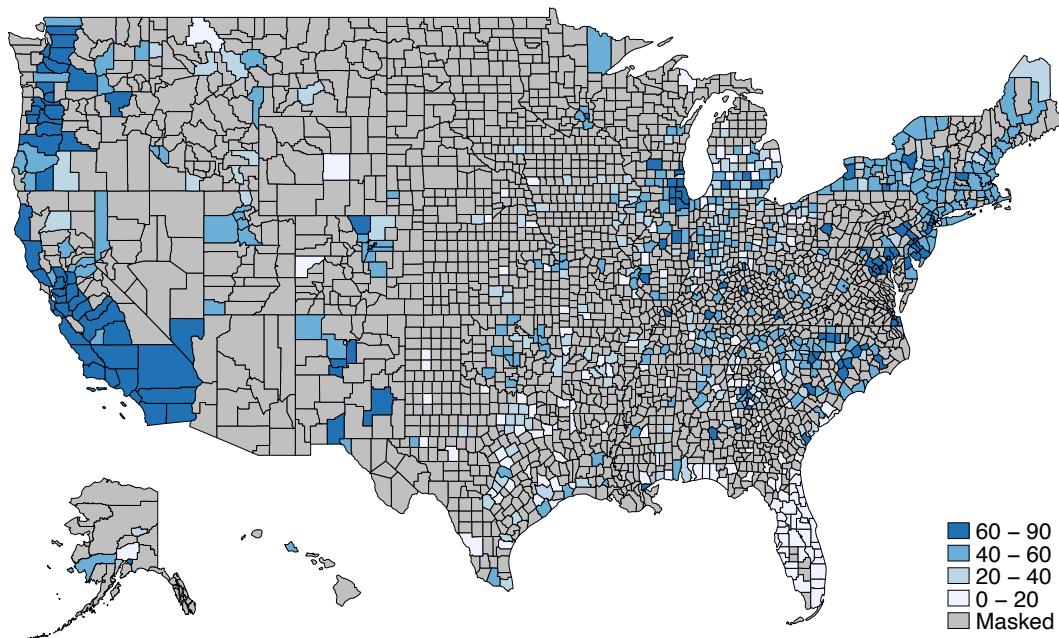
Figure A1: State Map of Remote Learning Percentage, SY 2020-21



**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.

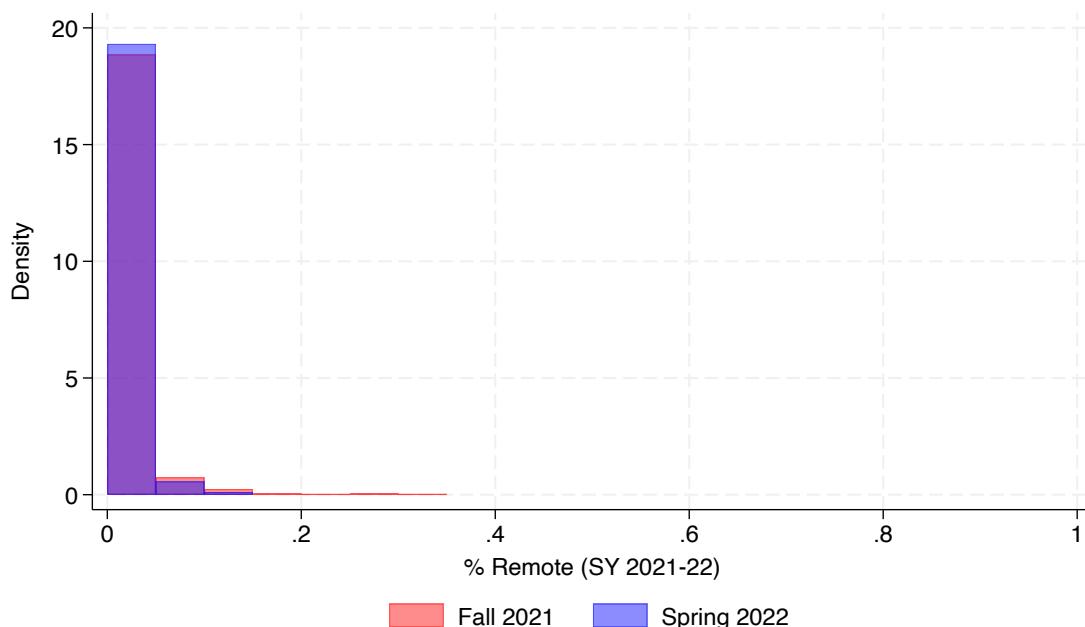
Figure A2: County Map of Remote Learning Percentage, SY 2020-21



*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.

Figure A3: Proportion of Remote Learning, SY 2021-22



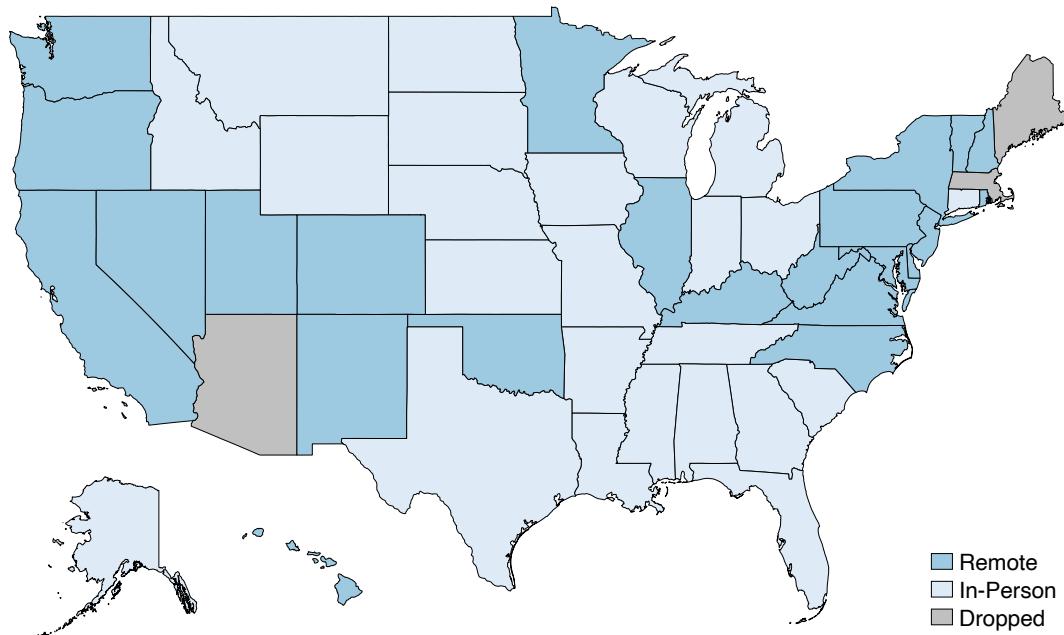
*Notes:* This figure presents a histogram of the proportion of remote learning in counties for each month of the SY 2021-22. The red bars represent the fall semester of calendar year 2021, the blue bars represent the spring semester of calendar year 2022. Areas where the red and blue bars overlap are 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.

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](#).

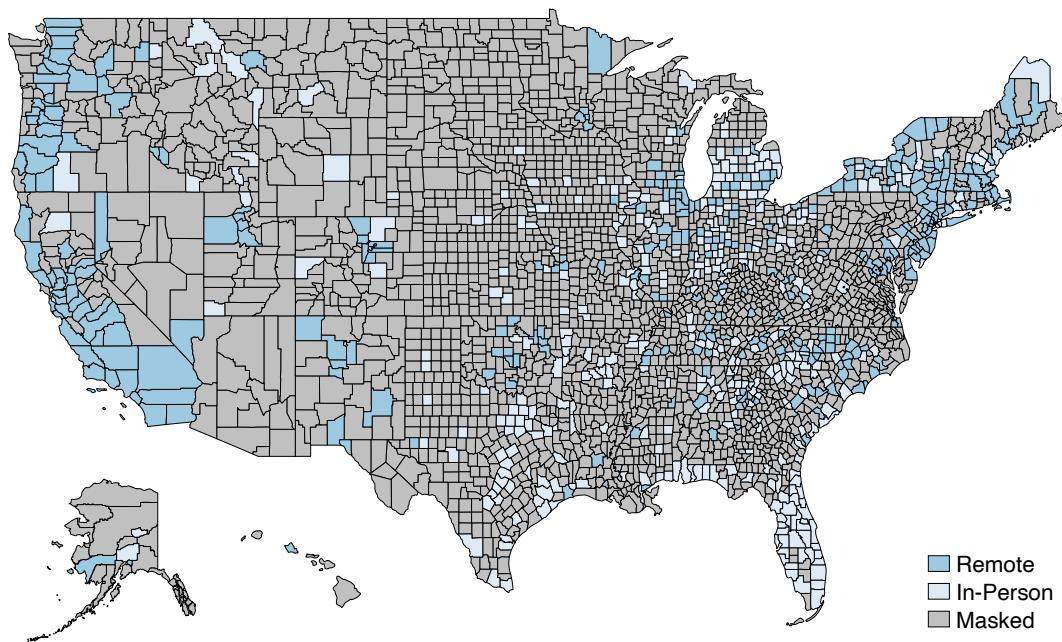
Figure A4: Remote and In-Person States, SY 2020-21



*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

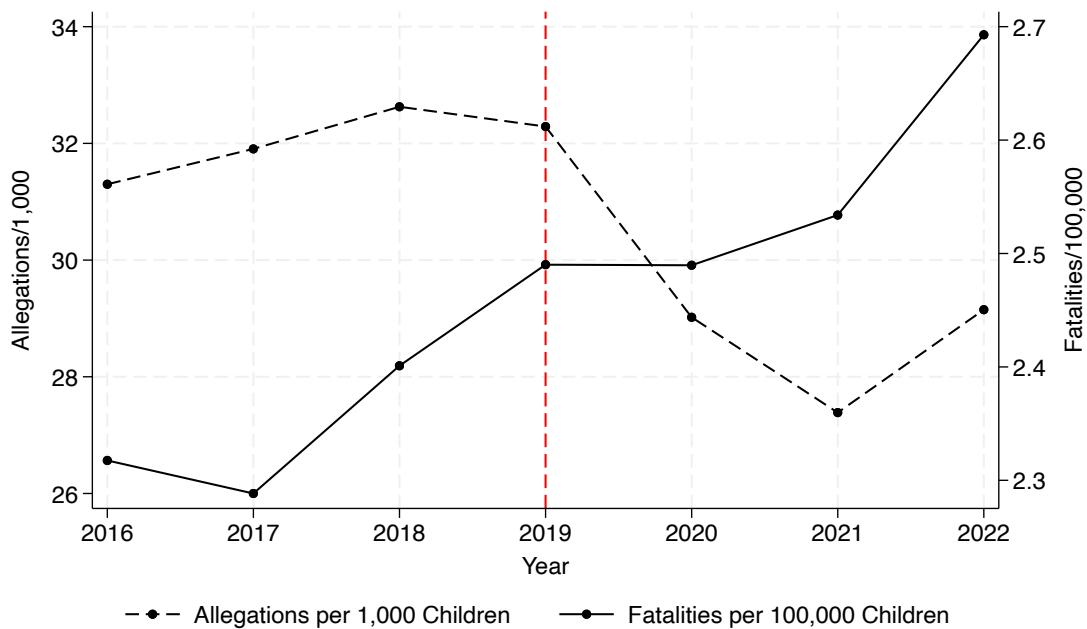


*Notes:* This map illustrates the distribution of remote and in-person counties during the SY 2020-21. Counties are color-coded based on their classification as either "Remote," indicating those with above-median remote learning percentages, or "In-Person," representing those with below-median remote 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.

## B. Allegations & Fatalities Trends

Figure B1: Screened-In Allegation & 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. DID Regression Results - Pre-Pandemic vs. Full-Remote

Table C1 and Table C2 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:

$$y_{cm} = \pi_0 + \pi_1 * post_m + \pi_2 * \mathbf{X}_{cm} + \sigma_c + \tau_m + \kappa_{cm} \quad (7)$$

where the variables are as defined in Equation 3.

Table C1: Pre-Pandemic vs. Full-Remote Allegations, ages 4-17

	(1) Total	(2) Edu	(3) Social	(4) Medical	(5) Black	(6) White	(7) Asian	(8) Hispanic	(9) Physical	(10) Neglect	(11) Sexual Abuse
$\pi_1$	-1.829*** (0.447) [-25.7%]	-1.622*** (0.261) [-75.2%]	-0.129** (0.053) [-19.1%]	-0.018 (0.029) [-3.8%]	-0.690*** (0.188) [-45.8%]	-1.071*** (0.257) [-20.2%]	-0.018 (0.017) [-28.6%]	-0.290** (0.119) [-33.6%]	-0.592*** (0.103) [-36.7%]	-0.650** (0.244) [-14.8%]	-0.088*** (0.028) [-16.9%]
Mean	7.109	2.156	0.677	0.471	1.507	5.295	0.063	0.863	1.612	4.397	0.521
N	9018	9018	9018	9018	9018	9018	9018	9018	9018	9018	9018
r2	0.911	0.759	0.783	0.772	0.906	0.920	0.758	0.913	0.889	0.917	0.803
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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 7. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(4)), 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). Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

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

Table C2: Pre-Pandemic vs. Full-Remote Allegations, ages 0-3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Total		Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
$\pi_1$	-0.319 (0.324) [-5.0%]	-0.465*** (0.119) [-68.3%]	-0.010 (0.047) [-1.5%]	0.059 (0.070) [5.0%]	-0.133 (0.120) [-8.9%]	-0.163 (0.184) [-3.6%]	-0.004 (0.010) [-9.5%]	-0.044 (0.104) [-6.5%]	-0.098 (0.066) [-8.4%]	0.071 (0.198) [1.6%]	0.020 (0.019) [12.0%]
Mean	6.351	0.681	0.678	1.182	1.497	4.541	0.042	0.681	1.166	4.473	0.166
N	9018	9018	9018	9018	9018	9018	9018	9018	9018	9018	9018
r2	0.914	0.620	0.744	0.835	0.915	0.917	0.559	0.905	0.905	0.916	0.568
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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 7. Dependent variables are total allegations (column (1)), allegations by report sources (columns (2)-(4)), by child's race/ethnicity (columns (5)-(8)), and allegations involving physical abuse, neglect, and sexual abuse (columns (9)-(11)) per 1,000 children aged 0-3. Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

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

## **D. DID Regression Results - SY 2021-22**

Table D1: DID regression results (SY19-20 vs. SY22), ages 4-17

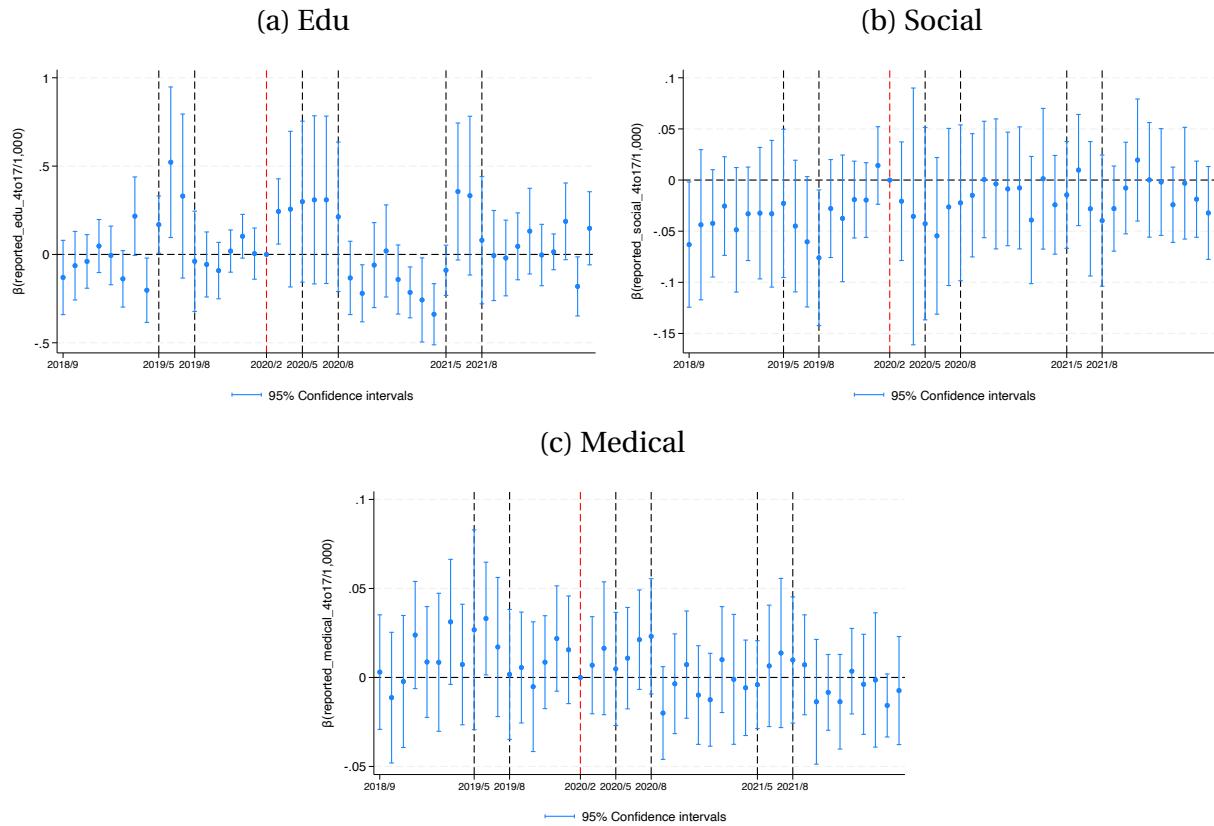
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total	Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
$\theta_1$	-0.031 (0.202) [-0.5%]	0.026 (0.084) [1.4%]	0.017 (0.026) [2.5%]	-0.017 (0.011) [-4.0%]	-0.072 (0.072) [-4.4%]	0.133 (0.139) [3.0%]	-0.006 (0.005) [-7.9%]	-0.044 (0.054) [-4.7%]	-0.008 (0.048) [-0.5%]	-0.065 (0.142) [-1.5%]	-0.010 (0.020) [-2.2%]
Mean	6.527	1.914	0.674	0.426	1.631	4.480	0.076	0.928	1.517	4.388	0.457
N	17085	17085	17085	17085	17085	17085	17085	17085	17085	17085	17085
r2	0.903	0.809	0.801	0.745	0.922	0.920	0.770	0.933	0.872	0.907	0.799
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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)) 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). Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

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

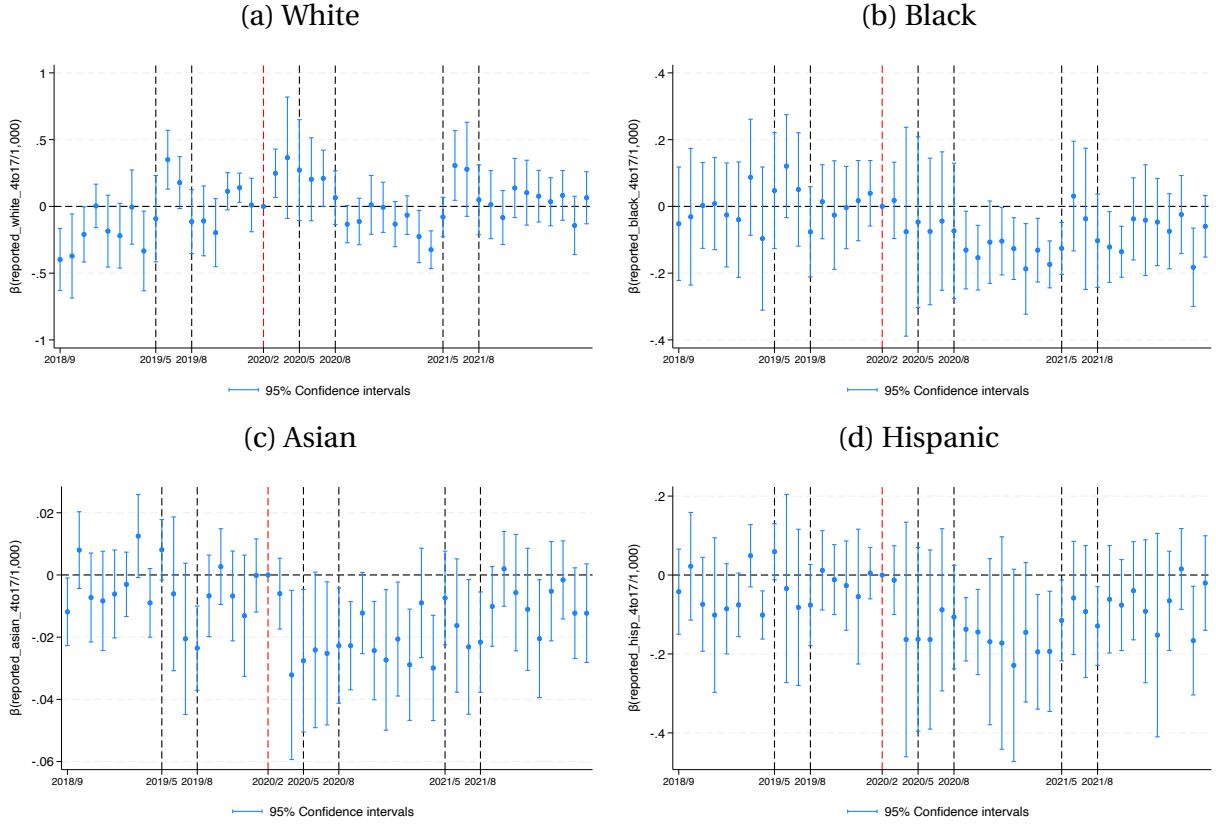
## E. Allegation Event Study - by Referral Source and Child Race/Ethnicity

Figure E1: Referral Sources



*Notes:* These figures plots 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.

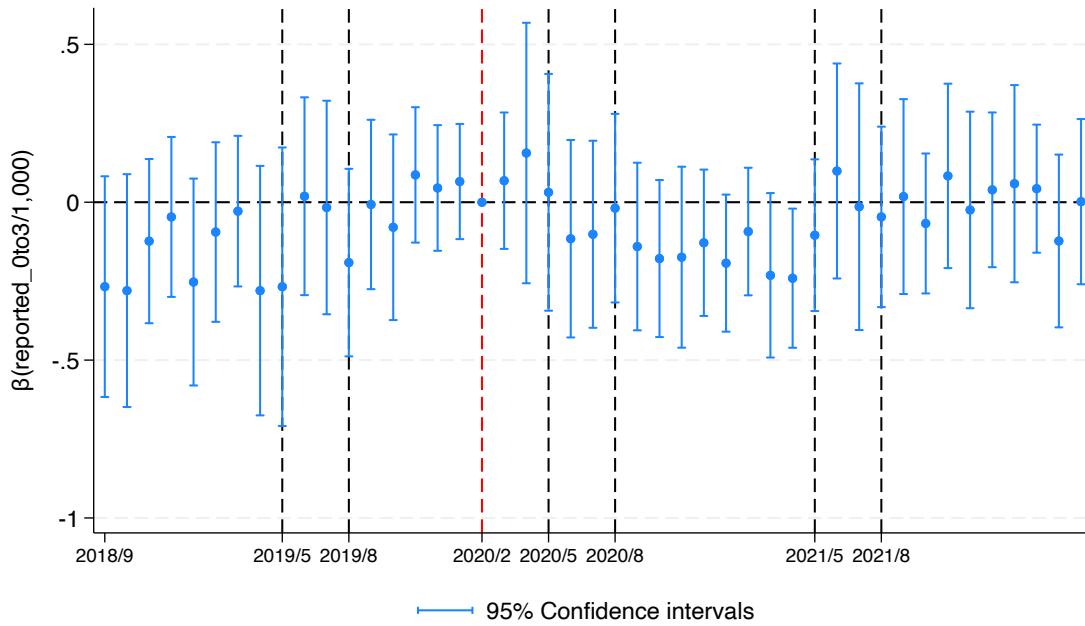
Figure E2: Child Race/Ethnicity



*Notes:* These figures plots event study estimates 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.

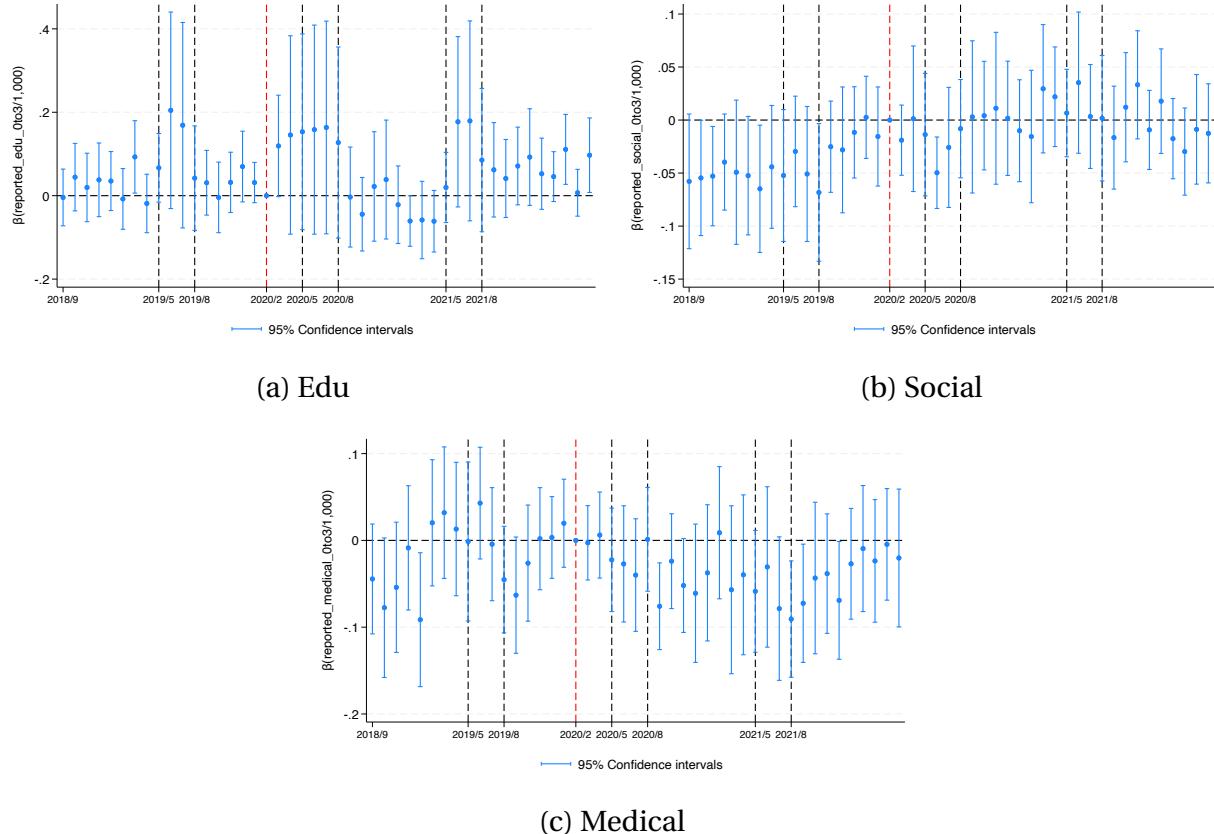
## F. Sub-Analysis for Allegations (aged 0-3)

Figure F1: Allegations, ages 0-3



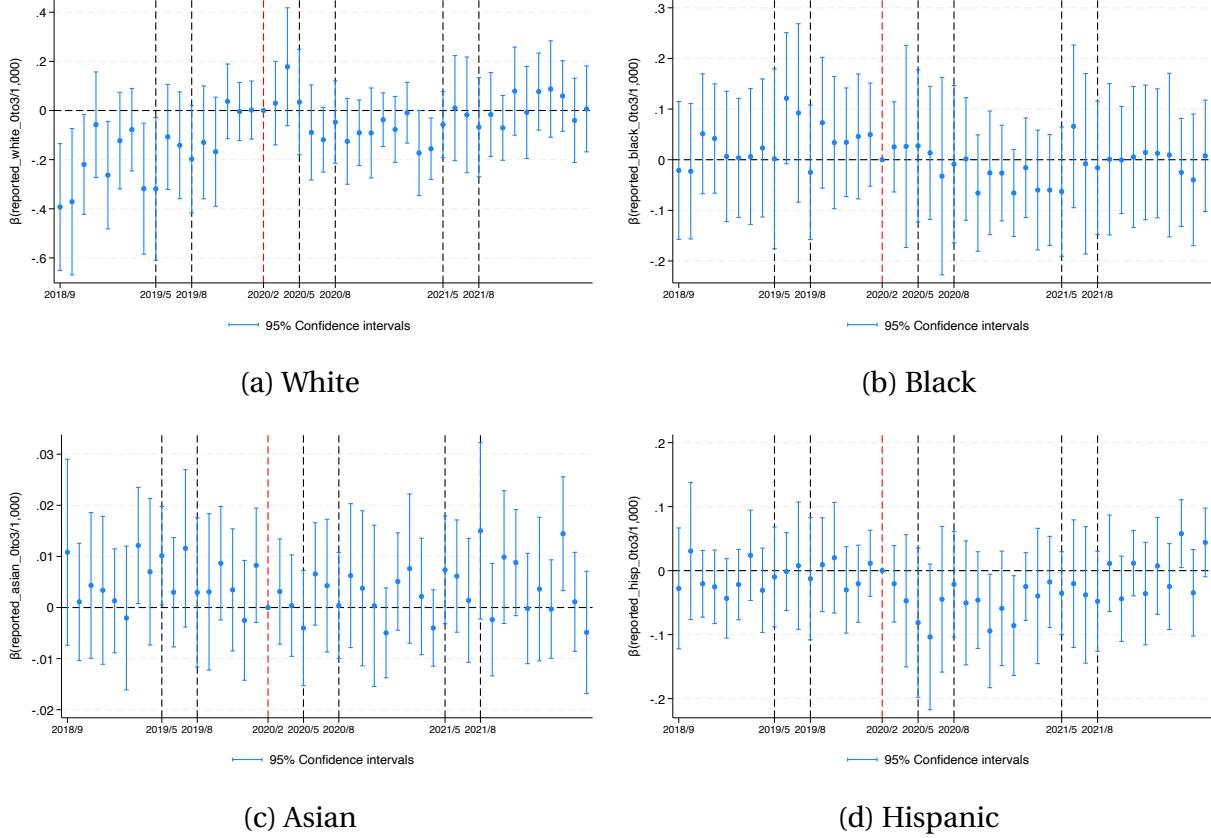
*Notes:* This figure plots event study estimates for [Equation 1](#). Dependent variable is allegations per 1,000 children aged 0-3. County fixed effects, year-month fixed effects, and other controls (% poverty, median household income, % population by race, age, sex, COVID-19 cases and deaths) are included 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 F2: Referral Sources



*Notes:* These figures plots 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 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 F3: Child Race/Ethnicity



*Notes:* These figures plots event study estimates 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 F1: DID regression results (*Pre* vs. *Post*), ages 0-3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Total		Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
$\theta_1$	-0.092 (0.111) [-1.6%]	-0.059 (0.038) [-10.4%]	0.036 (0.027) [5.3%]	-0.026 (0.023) [-2.6%]	-0.074* (0.035) [-4.8%]	0.049 (0.082) [1.3%]	-0.003 (0.002) [-6.1%]	-0.045 (0.027) [-6.4%]	-0.008 (0.021) [-0.7%]	-0.072 (0.093) [-1.7%]	-0.007 (0.009) [-4.6%]
Mean	5.759	0.570	0.679	1.014	1.550	3.795	0.049	0.703	1.073	4.270	0.151
N	17402	17402	17402	17402	17402	17402	17402	17402	17402	17402	17402
r2	0.904	0.695	0.721	0.809	0.913	0.906	0.553	0.905	0.888	0.899	0.530
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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)), by child's race/ethnicity (columns (5)-(8)), and allegations involving physical abuse, neglect, and sexual abuse (columns (9)-(11)) per 1,000 children aged 0-3. *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. Percentage changes from the baseline mean are in square brackets.

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

Table F2: DID regression results (SY 19-20 vs. SY 22), ages 0-3

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Total	Edu	Social	Medical	Black	White	Asian	Hispanic	Physical	Neglect	Sexual Abuse
$\theta_1$	0.088 (0.134) [1.5%]	0.028 (0.029) [4.9%]	0.033 (0.022) [-2.1%]	-0.021 (0.027) [4.9%]	-0.024 (0.051) [-1.5%]	0.162 (0.097) [4.3%]	-0.001 (0.003) [-2.0%]	0.007 (0.021) [1.0%]	0.019 (0.022) [1.8%]	0.022 (0.112) [0.5%]	-0.005 (0.008) [-3.3%]
Mean	5.759	0.570	0.679	1.014	1.550	3.795	0.049	0.703	1.073	4.270	0.151
N	17085	17085	17085	17085	17085	17085	17085	17085	17085	17085	17085
r2	0.900	0.710	0.715	0.803	0.908	0.901	0.548	0.906	0.879	0.891	0.523
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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)), by child's race/ethnicity (columns (5)-(8)), and allegations involving physical abuse, neglect, and sexual abuse (columns (9)-(11)) per 1,000 children aged 0-3. Robust standard errors are in parentheses, clustered at the state level. Percentage changes from the baseline mean are in square brackets.

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

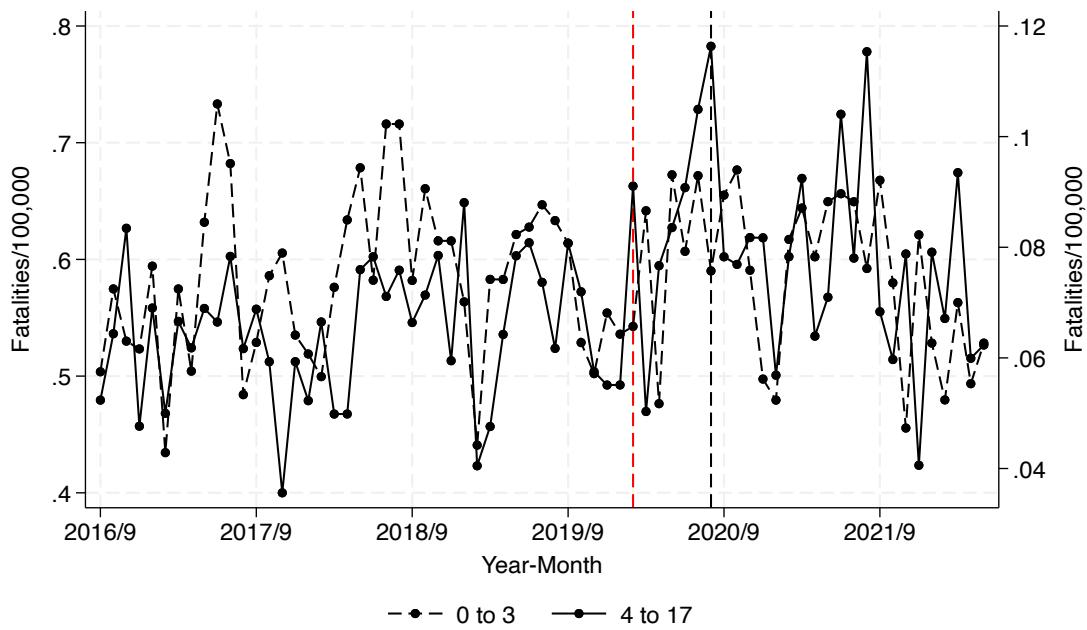
Table F3: DID Substantiated Allegations (*Pre* vs. *Post*), ages 0-3

	(1)
	Total Substantiated Allegations
$\theta_1$	7.094 (5.359) [3.0%]
Mean	235.4
N	23508
r2	0.752
$\sigma_c$	Y
$\tau_m$	Y
$X_{cm}$	Y

*Notes:* This table shows estimates for [Equation 3](#). Dependent variable is substantiated allegations (ages 0-3) per 1,000 screened-in allegations. *Post* includes the months following the initial school closures in SY 2020-21 (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. Percentage changes from the baseline mean are in square brackets.

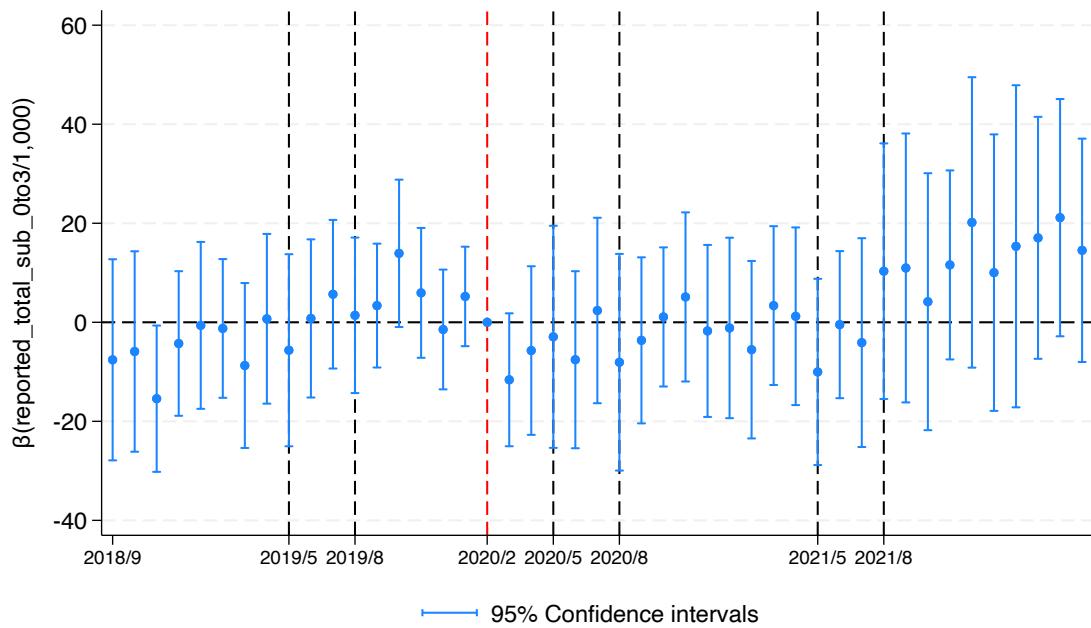
\*  $p < 0.10$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$

Figure F4: 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.

Figure F5: 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.

## **H. Substantiated Allegations**

Table H1: DID Substantiated Allegations (*Pre* vs. *Post*), ages 4-17

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Total	8.929*	-1.170	2.374**	1.257*	1.855	5.958*	-0.260	2.629	-0.255	5.989**	2.274
$\theta_1$	(4.457)	(1.657)	(0.913)	(0.723)	(1.648)	(3.035)	(0.238)	(1.659)	(1.038)	(2.828)	(1.931)
[5.4%]	[-3.6%]	[11.8%]	[9.0%]	[4.3%]	[5.2%]	[-9.5%]	[8.1%]	[-0.8%]	[5.1%]	[10.6%]	
Mean	166.7	32.33	20.15	13.89	43.26	113.8	2.731	32.28	33.30	117.8	21.47
N	23560	23560	23560	23560	23560	23560	23560	23560	23560	23560	23560
r2	0.774	0.493	0.510	0.405	0.782	0.776	0.695	0.864	0.696	0.805	0.611
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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). *Post* includes the months following the initial school closures in SY 2020-21 (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. Percentage changes from the baseline mean are in square brackets.

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

## **I. Robustness Check**

Table II: DID regression results (*Pre* vs. *Post*), 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
$\theta_1$	-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
r2	0.924	0.847	0.831	0.775	0.943	0.943	0.758	0.935	0.885	0.935	0.824
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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 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. Percentage changes from the baseline mean are in square brackets.

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

Table I2: DID regression results - Child Fatality

	(1)	(2)
	FFY 2020–2022	FFY 2021–2022
$\lambda_1$	0.170** (0.0684)	0.218** (0.0866)
Mean	1.031	1.031
N	336	288
r2	0.723	0.733
$\phi_s$	Y	Y
$\delta_t$	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) 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. Percentage changes from the baseline mean are in square brackets.

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

Table I3: DID Substantiated Allegations (*Pre* vs. *Post*), 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
$\theta_1$	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
$\sigma_c$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
$\tau_m$	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 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 2020-21 (September 2020–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. Percentage changes from the baseline mean are in square brackets.

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