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Article Summary: This case-controlled study of child care providers is the first to report COVID-19 transmission risk in U.S. child care programs.

What's Known on This Subject: Though often limited by small sample sizes and conducted when child transmission opportunities were limited, studies have suggested that young children are less likely to transmit COVID-19. There are no published studies of COVID-19 transmission in child care.

What This Study Adds: Within the context of considerable infection mitigation efforts in U.S. child care programs, exposure to child care during the early months of the U.S. pandemic was not associated with elevated risk for COVID-19 transmission to providers.

Contributors' Statement Page

Prof Gilliam conceptualized the study, designed the study, conducted the literature search, was involved in aspects of data collection and analysis, and drafted the initial manuscript.

Dr Malik designed the study, conducted the literature search, analyzed data, contributed to data interpretation, and contributed to writing and critical revision of the manuscript.

Ms Mehr analyzed data, contributed to data interpretation, and contributed to critical revision of the manuscript.

Ms Klotz led data acquisition and development of the online survey tool, analyzed data, contributed to data interpretation, and contributed to critical revision of the manuscript.

Dr Reyes designed the study, analyzed the data, contributed to data interpretation, and contributed to critical revision of the manuscript.

Profs Humphries and Murray designed the study and contributed to data interpretation, and contributed to critical revision of the manuscript.

Mr Elharake conducted the literature search, contributed to data interpretation, and contributed to writing and critical revision of the manuscript.

Mr Wilkinson contributed to data interpretation and critical revision of the manuscript.

Prof Omer designed the study, contributed to the analytic approach, contributed to data interpretation, and contributed to critical revision of the manuscript.

All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

Abstract

Objective

Central to the debate over school and child care reopening is whether children are efficient COVID-19 transmitters and likely to increase community spread when programs reopen. We compared COVID-19 outcomes in child care providers who continued to provide direct in-person child care during the first three months of the U.S. COVID-19 pandemic versus those who did not.

Methods

Data were obtained from U.S. child care providers (N=57,335) reporting whether they had ever tested positive or been hospitalized for COVID-19 (N=427 cases), along with their degree of exposure to child care. Background transmission rates were controlled statistically, and other demographic, programmatic, and community variables were explored as potential confounders. Logistic regression analysis was used in both unmatched and propensity score matched case-control analyses.

Results

No association was found between exposure to child care and COVID-19 in both unmatched (odds ratio [OR], 1.06; 95% confidence interval [CI], 0.82 to 1.38) and matched (OR, 0.94; 95% CI, 0.73 to 1.21) analyses. In matched analysis, being a home-based provider (as opposed to center-based) was associated with COVID-19 (OR, 1.59; 95% CI, 1.14 to 2.23), but showed no interaction with exposure.

Conclusion

Within the context of considerable infection mitigation efforts in U.S. child care programs, exposure to child care during the early months of the U.S. pandemic was not associated with elevated risk for COVID-19 transmission to providers. These findings must be interpreted only within the context of background transmission rates and the considerable infection mitigation efforts implemented in child care programs.

The COVID-19 pandemic has had an unprecedented impact on child care and schools. Within one week of the World Health Organization's declaration of a pandemic, 107 countries had implemented national school closures. [1] Within three weeks, the number had grown to 194 countries, impacting 91% of the world's school-age children. [2] When schools closed in the U.S., so did many child care programs, demonstrated by the loss of more than 35% of jobs in the child care industry between February and April 2020. [3] These school and child care closures have been controversial regarding their benefits versus costs. Precautionary closure of child care programs was reasonable, given considerable evidence that these programs may be significant vectors for viral spread. [4] However, several studies have indicated that school and child care closures may have had little impact on slowing the spread of COVID-19. [1,5,6] Furthermore, child care and school closures may result in several negative consequences, such as child care providers' loss of jobs and wages, parents' inability to return to work, and children's diminished educational, social, and nutritional opportunities. [7]

Pediatricians are key informers to parents about safety issues regarding child care and school attendance during the pandemic. Central to the debate over child care and school reopening is the uncertainty regarding whether children are efficient transmitters of COVID-19. Although there is a relatively infrequent risk for multisystem inflammatory syndrome in children, children appear to be far less likely to be infected and more likely to be asymptomatic or paucisymptomatic. [8] On the other hand, because viral loads may be similar in symptomatic and asymptomatic COVID-19 carriers including children, [9,10] there may be a high risk for transmission to other children and adults through asymptomatic children in settings serving large numbers of children, such as child care and schools. Unfortunately, most studies examining pediatric transmission risk are limited

by small sample sizes of children and were conducted during widespread child care and school closures, when child transmission opportunities were greatly limited. [11]

This study compares COVID-19 rates in child care providers who continued providing child care during the first three months of the COVID-19 pandemic to those who did not, controlling for key individual, programmatic, and community characteristics which may have motivated closure decisions. We conducted a large-scale multi-state canvass of the U.S. child care workforce to identify a sufficient number of cases, given the cumulative incidence of about 0.8% in the U.S. adult population during the first three months of the U.S. outbreak. This is the first known study to estimate directly COVID-19 transmission within child care programs, while addressing current research limitations by focusing on transmission opportunity through children actively participating in out-of-home programs and therefore not shielded from COVID-19. [12]

METHODS

Sample and Procedures

To provide a wide canvassing of child care providers, Qualtrics [13] survey links were emailed to individuals beginning May 22, 2020, with three rounds of reminders until the survey closed on June 8, 2020. Participant recall period for program practices was 8 weeks (from April 1 to the median survey administration date of May 27). Survey links were emailed to potential respondents through a variety of contact lists consisting mostly of individuals associated with the child care industry. These lists are maintained by two large national child care organizations (Child Care Aware of America and National Association for the Education of Young Children), as well as through various state child care workforce registries coordinated by the National Workforce Registry Alliance. Of the 41 state registries coordinated by National Workforce

Registry Alliance, 28 states agreed to participate in this study, 11 were unable to secure permissions quickly enough to participate, and two declined.

Data were included from participants self-identifying as child care providers, consenting to the study, satisfying inclusion criteria (pre-pandemic working as child care providers in direct contact with children), and providing all data necessary to determine both COVID-19 outcome and child care exposure. The research protocol was approved by the Yale University Institutional Review Board, and all participants indicated their informed consent electronically at the beginning of the survey. Participants were offered entry into a raffle to select 20 winners of a $500 gift card. See Table 1.

Variables

Outcome. The key outcome was whether the respondent reported having COVID-19. A value of 1 (case) was assigned if the respondent indicated that they had been either: (a) tested positive for COVID-19 at least once or (b) hospitalized for COVID-19. A value of 0 (non-case) was assigned if neither of these conditions was true.

Exposure. Respondents were asked whether their program closed near the beginning of the pandemic (either as required by government or voluntarily), whether the program reopened, or whether the program closed at any time due to a suspected or confirmed case of COVID-19. Exposure was coded as either 1 (exposed to child care during the pandemic) or 0 (not exposed to child care during the pandemic). A value of 1 was assigned where the respondent indicated that during the pandemic their program remained open, closed but reopened, or closed due to a suspected or confirmed case of COVID-19. A value of 0 was assigned where the respondent indicated that their program was closed during the pandemic or where the respondent indicated

that during the pandemic they either did not report to work or only worked remotely. Child care providers working in open child care programs responded to a series of questions regarding typical group sizes and various infectious disease mitigating strategies their program may have employed during April 2020. See Table 2.

Confounders. All other variables in Table 1 were included as potential confounders. County-level variables were computed for each respondent's county based on their child care program's reported zip code or (if program zip code was not provided) IP address from where the online survey was completed. COVID-19 cumulative death rates were calculated as of May 27, 2020 (the survey median administration date) as a more reliable proxy for community infection rates relative to test-dependent case rates. [15] County-level household median income was obtained from the most recent American Community Survey. [16] County-level variables were trichotomized into proportionally equal thirds.

Given research demonstrating the importance of non-pharmaceutical interventions at reducing SARS-CoV-2 transmission, [14] personal COVID-19 health precautions were measured across three factors. Personal COVID-19 health precautions were measured utilizing a 10-item dichotomized (yes/no) checklist of whether the provider followed during their non-work life common health recommendations. Principal component analysis yielded an interpretable 3-factor solution, accounting for 54.21% of the total variance. Factor 1 = Avoiding Social Interactions, Factor 2 = Avoiding High-Risk Situations and Travel, Factor 3 = Masks, Handwashing, and Distancing (scored 0-3, 0-4, and 0-3, respectively). See Table 3 for items and factor loadings.

RESULTS

Participants

A total of 94,390 survey links were accessed by individuals self-identifying as child care providers across all 50 U.S. states, the District of Columbia and Puerto Rico. Of these individuals, 82,741 satisfied inclusion criteria and consented to the study, and 57,335 (69.3%) chose to participate by providing data necessary to determine both COVID-19 outcome and child care exposure. See Table 1 for sample descriptive data. Smallest numbers of respondents were obtained from South Dakota (n = 29), Delaware (n = 67), and Utah (n = 69); and largest numbers were obtained from California (n = 9,189), Florida (n = 5,232), and Ohio (n = 5,076). See Table 4 for a comparison of the analytic sample demographics versus national estimates for child care providers.

Of received surveys, 30.1% of respondents accessed the surveys via an unique link emailed by the researchers, and 69.9% accessed the surveys via an anonymous link emailed by one of the various state child care workforce registries. An indicator for the unique versus anonymous link was not significant when entered as a covariate in the full logistic regression model (point estimate, 0.93; 95% confidence interval [CI], 0.69 to 1.25; P = 0.62). Also, tests of selective participation showed only negligible differences across gender, race, and ethnicity ($|\phi_{(c)}|$ ranging from 0.01 to 0.04), with the exception of age where non-participants (M = 42.07; SD = 12.89) were younger than participants (M = 45.97; SD = 12.31; P < 0.001; d = 0.31).

Child care conditions during the COVID-19 pandemic

Approximately half of respondents (51.4%) reported that their child care program closed near the beginning of the COVID-19 pandemic and remained closed until the time of the survey. Of the

48.6% employed in child care programs that either did not close or reopened during the pandemic, 8.6% reported that their program later closed due to a confirmed or suspected case of COVID-19.

Respondents reported that child care programs that remained open during the early months of the pandemic were operating with smaller than typical group sizes and with considerable degrees of infection mitigation efforts in place. Child group sizes across all open programs were on average smaller than typical for U.S. child care (center-based programs, M = 7.57, SD = 4.94; home-based programs, M = 5.62, SD = 3.20). Most children (81.1%) served in these open programs were under six-years old. See Table 5 for details. Respondents reported very high rates (> 90%) of frequent staff and child handwashing and daily disinfecting of indoor surfaces and fixtures. Most respondents reported surface and fixture disinfecting at least three times daily. Symptom screening, cohorting (not mixing children and items between child groups) and social distancing measures also were frequently employed. Far fewer reported daily mask wearing of staff (35.2%) or children two years and older (11.8%). See Table 2 for details.

Outcome

To assess the robustness of the findings, we analyzed results using binary logistic regression analysis in two different approaches: (a) an unmatched analysis predicting case versus non-case, controlling for covariates and (b) a case-controlled approach using propensity score matching.

In the unmatched analysis, we predicted case (N = 427; 0.7%) versus non-case (N = 56,908; 99.3%), controlling for all variables listed in Table 1 and indicators for the state where the child care program is located. Results indicated no association between COVID-19 outcome and exposure to child care (odds ratio [OR], 1.06; 95% CI, 0.82 to 1.38; P = 0.66). (See Table 6.)

COVID-19 was associated with high levels of county-level cumulative per capita COVID-19 deaths (OR, 1.60; 95% CI, 1.19 to 2.15; P = 0.00). Among covariates, race and ethnicity were associated with COVID-19, specifically being American Indian/Alaskan Native (OR, 2.37; 95% CI, 1.46 to 3.86; P = 0.00), Latinx (OR, 2.13; 95% CI, 1.63 to 2.77; P < 0.001), or African American (OR, 1.97; 95% CI, 1.53 to 2.53; P < 0.001). Personal COVID-19 health precautions also were associated with COVID-19, specifically avoiding high-risk situations and travel was a protective factor (OR, 0.72; 95% CI, 0.62 to 0.84; P < 0.001). Avoiding social interactions, such as family gatherings and restaurants was a risk factor (OR, 1.27; 95% CI, 1.13 to 1.44; P = 0.001), perhaps because opportunities to attend these were dependent on local transmission rates and business closures. To assess whether covariates significantly moderated the relationship between exposure and outcome, interaction terms for each with exposure were entered into the model, and none reached significance (P values ranging from 0.09 to 0.96). A sensitivity analysis was employed to determine whether results differ when directors were removed from the sample. Odds ratios for exposure were similar between the full sample (OR, 1.06; 95% CI, 0.82 to 1.38; P = 0.66) and with directors removed (OR, 1.08; 95% CI, 0.79 to 1.49; P = 0.62).

In the matched case-control analysis, we further tested the association between exposure to child care and COVID-19 outcome using propensity scores for exposure. We matched controls to cases using 1:50 random matching without replacement with caliper width set to 0.2*SD of the logit function. [17] Values used in the propensity score include age, race, ethnicity, gender, director status, county-level COVID-19 death rate, county-level median household income, personal COVID-19 health precaution measures (3 continuous variables), and indicator variables for the state where the child care program is located. Results similarly were not indicative of an association between COVID-19 and exposure to child care (OR, 0.94; 95% CI, 0.73 to 1.21; P =

0.64). As opposed to the non-matched analysis, being a home-based child care provider was associated with COVID-19 outcome (OR, 1.59; 95% CI, 1.14 to 2.23; P < 0.01), but showed no interaction with exposure. See Table 7.

DISCUSSION

This is the first large-scale study of COVID-19 transmission in child care programs. The study utilized a large sample of U.S. child care providers, and results were robust to different analytic approaches and to various tests of exposure interaction effects. Overall, we found no evidence of child care being a significant contributor to COVID-19 transmission to adults. This finding is consistent with previous studies showing a lack of association between school closures and transmission rates. [6,18-20]

COVID-19 outcome rates were higher among those who identified as American Indian/Alaskan Native, African American/Black, or Latinx, as well as those working in counties with high COVID-19 death rates. Conversely, avoiding situations with high risk of infection (e.g., people who are sick, traveling to high infection areas, social events) was a protective factor. None of these covariates, however, interacted with exposure to child care, suggesting a lack of association between child care exposure and COVID-19 outcome regardless of these other factors.

These findings must be interpreted within the context of infection mitigation practices within U.S. child care programs during the early months of the COVID-19 pandemic. Child care providers reported small group sizes, averaging about eight children per group in centers and six children in home-based programs. Also, respondents reported very high rates (> 90%) of both frequent handwashing and daily disinfecting of indoor surfaces and fixtures, and most respondents reported surface and fixture disinfecting at least three times daily. Symptom screening, cohorting and social distancing measures also were frequently employed. Although it

is unclear whether any of these mitigational efforts significantly reduced transmission, there is no way to know whether these findings would hold in the absence of these infection mitigation efforts. Likewise, these results should not be applied to K-12 schools or universities, where students and contexts vary significantly from child care.

Even after adjusting for other variables, community-level transmission remained a significant predictor of child care providers testing positive or being hospitalized for COVID-19, highlighting the importance of reopening child care programs only when background transmission rates are low and decreasing (e.g., the World Health Organization threshold of < 5% positivity for at least 14 days).[21] Although this study provides evidence that child care may pose negligible threat to community transmission, communities may pose a considerable threat to child care when background transmission rates are high.[22] Conversely, when background transmission rates are low and managed, transmission within child care programs implementing reasonable infection mitigation efforts may be rare.[23]

Although our study focused only on adults as the COVID-19 transmission end point—potentially from children to adults and adults to adults—it is also important to acknowledge the possible transmissions of COVID-19 from adults to children and children to children, which were not measured in our study. Children represent 9.3% of all COVID-19 cases in the U.S. (as of August 20, 2020),[24] and it is evident that adults are more likely to transmit the virus to children than children are to adults.[12] Due to this likelihood, child care workers should wear face coverings to protect children in child care programs and prevent potential transmission. Furthermore, protective measures against COVID-19 in child care centers are needed as the spread of COVID-19 from child care workers to children may lead to children's family members, including those

most vulnerable to the virus (e.g. the elderly and individuals with underlying medical conditions), contracting COVID-19 from their children or grandchildren. [14,25,26]

As limitations, the sample is not fully representative. Although the odds ratios were very close to one, it is important to acknowledge the relatively large confidence intervals. Variations in state contexts and policies were controlled statistically, but important policy-level variables may not have been adequately controlled. These data were obtained during Spring, and Fall 2020 transmission dynamics may be different. This study depends upon known infection when it is possible that some providers had asymptomatic infection. Therefore, current case counts are probably underestimates, and results could change, if asymptomatic cases were known/counted. Finally, reliance on self-reported test results may bias findings toward null; however, the large sample size should allow detection of even small effects.

In conclusion, exposure to child care during the early months of the U.S. COVID-19 pandemic was not associated with elevated odds for COVID-19 among child care workers. These findings, however, must be interpreted within the context of both community transmission rates and child care infection mitigation efforts.

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Table 1. Descriptive Statistics for All Variables for Cases, Non-Cases in the Logistic Regression Analysis, and Matched Controls in the Case-Control Analysis

	Cases (N=427)	Non-Cases (N=56,908)	Matched Controls (N=21,350)
Exposure [%]			
No	52.2	49.1	51.9
Yes	47.8	50.9	48.1
Race/Ethnicity [%][1]			
American Indian/Alaskan Native	4.6	1.9	2.0
Asian	2.1	3.5	3.7
African American/Black	23.4	14.7	14.8
Native Hawaiian/Other Pacific Islander	0.9	0.5	0.5
White	54.3	72.1	71.7
Prefer to not answer (Race)	18.7	9.6	9.6
Hispanic/Latinx/Spanish Origin	34.2	18.6	18.2
Prefer to not answer (Ethnicity)	2.8	2.1	2.1
Gender [%]			
Female	96.0	97.0	97.0
Male	3.3	2.3	2.3
Non-binary	0.0	0.2	0.2
Prefer not answer	0.7	0.5	0.5
Age (in years) [M (SD)]	45.71 (12.49)	45.97 (12.30)	46.19 (12.31)
Child care Type [%]			
Center-based[2]	65.8	71.4	72.2
Family-based/Home-based	34.2	28.6	27.8
Director/Owner (of center-based) [%]			
No	78.7	73.4	74.2
Yes	21.3	26.6	25.8
Personal COVID-19 Health Precautions [M (SD)]			
Masks/Handwashing/Distancing (0-3)	2.86 (0.40)	2.77 (0.52)	2.80 (0.49)
Avoiding Social Interactions (0-3)	2.34 (0.89)	2.11 (1.04)	2.13 (1.03)
Avoiding High-Risk Situations & Travel (0-4)	2.64 (0.74)	2.71 (0.67)	2.71 (0.66)
County COVID-19 Cumulative Death Rate [%][3]			
Low (0-0.0561 deaths/1,000)	24.6	33.6	31.2
Moderate (0.0564-0.2180 deaths/1,000)	24.1	34.2	33.0
High (0.2184-13.5248 deaths/1,000)	51.3	32.3	35.8
County Household Median Income [%][3]			
Low ($13,242-$54,976)	27.6	33.6	32.4
Moderate ($54,979-$65,010)	36.3	32.3	33.8
High ($65,027-$136,268)	36.1	34.2	33.8

[1] Race/Ethnicity options were "check all that apply;" resulting proportions may not add to 100%.
[2] Center-based child care included (a) for-profit centers (32.5%), (b) non-profit centers (27.4%), (c) school-based (16.7%), (d) Head Start (13.9%), (e) drop-in centers (2.0%), and (f) other (7.4%).
[3] County-level data were trichotomized into proportionally equal thirds.

Table 2. Infection Control Efforts Reported in Open Child care Programs during April 2020 (*N* = 20,550)

	Percent Reporting Each Effort Every Day		
	Once Daily	Twice Daily	Thrice Daily
SCREENING			
Child Symptom Screening	78.4	40.7	
Child Temperature Checks	76.1	33.3	
Staff Symptom Screening	73.9	35.4	
Staff Temperature Checks	69.3	28.3	
DISINFECTING			
All Indoor Surfaces	90.2	73.9	56.5
All Doorknobs, Bathroom Fixtures, Handles	90.3	71.1	54.3
All Toys, Books, Classroom Materials	81.7	55.2	39.6
No Child-Accessible Items that Are Hard to Disinfect	75.0		
HAND HYGEINE			
All Children Washed Hands Frequently	92.7		
All Staff Washed Hands Frequently	90.2		
MASKS & PERSONAL PROTECTIVE EQUIPMENT			
All Children (≥2 years old) Wore Facial Masks	11.8		
All Adults Wore Facial Masks	35.2		
All Adults Wore Aprons/Changed Clothes before Work	61.7		
All Adults Wore Gloves when Handling Children	33.2		
COHORTING			
No Mixing of Children between Child Groups	53.6		
No Sharing Items between Child Groups	67.3		
SOCIAL DISTANCING			
Seating/Cots ≥6 Feet Apart	68.0		
Staggered Arrival and Departure Times	51.2		
All Children Curbside Drop-off/Pickup	78.8		
All Child Belongings Separated	85.8		
No Eating “Family Style” or Sharing Food	49.4		

Note. Percentages indicate the proportion of providers reporting that a specific infection control effort was employed either every day or (for some efforts) twice or thrice per day.

Table 3. Personal COVID-19 Health Precautions: Principal Component Analysis with Factor Loadings

	Factor 1	Factor 2	Factor 3
ITEMS			
Asked family and friends not to visit	.79	-	-
Avoided extended family and friends even if not symptomatic	.77	-	-
Avoided eating outside of home	.55	-	-
Avoided close contact with people who were sick	-	.79	-
Avoided traveling to high COVID-19 infection places	-	.71	-
Avoided social events would normally attend	-	.52	-
Canceled business trips, social trips, vacations	-	.47	-
Tried to maintain at least 6 feet from others when outside home	-	-	.75
Facial covering/mask almost always when outside home	-	-	.60
Frequent hand washing/sanitizing when outside home	-	-	.57
FACTOR STATISTICS			
Eigen Value	3.36	1.06	0.99
% Variance Accounted (from rotated sums of squared loadings)	22.0	18.8	13.4
Cronbach Alpha	0.75	0.86	0.82

Note. Factor loadings from Kaiser-normalized varimax rotation, suppressing < .45.

Table 4. Comparison of Total Analytic Sample versus National Estimates of Child Care Provider Demographics and County-Level Descriptions

	Total Analytic Sample	National Estimates
Age [M]	45.97	38.70
Male [%]	2.3	6.5
Race/Ethnicity		
American Indian/Alaskan Native [%]	2.0	0.8
Asian [%]	3.5	3.9
African American/Black [%]	14.7	15.1
White [%]	72.0	69.9
Hispanic/Latinx/Spanish Origin [%]	18.7	22.0
County COVID-19 Deaths per 1,000 [M]	0.34	0.30
County Household Median Income [M$]	64,362	63,179

Note. Age, Gender, and Race/Ethnicity comparisons are between the total analytic sample (N = 57,335) versus national child care provider estimates based on the 2018 American Community Survey (ACS). ACS data are weighted national averages for individuals with an occupation of "childcare workers" (occupation code 4600) between the ages of 18 and 65. For the ACS, Asian = "Chinese" + "Japanese" + "Other Asian or Pacific Islander;" Hispanic/Latinx/Spanish Origin = "Mexican" + "Puerto Rican" + "Cuban" + "Other (Hispanic)." County COVID-19 Deaths per 1,000 are the mean deaths per 1,000 individuals for the counties of survey respondents versus the U.S. national average. County Household Median Income for survey respondents is the mean of the median annual household income of the counties of the survey respondents constructed using the 2018 five-year ACS data. County Household Median Income for the national child care provider estimate is the mean median income for the county in 2018 reported by U.S. Census.

Table 5. Percentage of Children by Age Served by Respondents Open during the Pandemic

	All Providers	Center-Based Providers	Home-Based Providers
Infants (under 1 year)	8.3	8.2	8.3
Toddlers (1-2 years)	29.7	30.6	29.4
Preschoolers (3-5 years)	43.1	50.5	40.0
School-Age (6 years and older)	18.9	10.8	22.3

Table 6. Adjusted Logistic Regression Unmatched Analysis Predicting Case (N=427) Versus Non-case (N=56,908)

	OR	95% Wald CI		P Value
Exposure to Child care				
No		*Reference*		
Yes	1.06	0.82	1.38	0.66
Race/Ethnicity				
White		*Reference*		
American Indian/Alaskan Native	2.37	1.46	3.86	0.001
Asian	0.83	0.42	1.64	0.60
African American/Black	1.97	1.53	2.53	<0.001
Native Hawaiian/Other Pacific Islander	1.86	0.65	5.29	0.25
Prefer not to answer (Race)	1.59	1.17	2.16	0.003
Hispanic/Latinx/Spanish Origin	2.13	1.63	2.77	<0.001
Prefer not to answer (Ethnicity)	1.31	0.69	2.50	0.41
Gender[1]				
Female		*Reference*		
Male	1.60	0.93	2.75	0.09
Prefer not to answer	0.97	0.29	3.23	0.98
Age	1.00	0.99	1.01	0.78
Child care Type				
Center-based		*Reference*		
Family-based/Home-based	1.25	0.87	1.80	0.22
Director/Owner (of center-based)				
No				
Yes	0.95	0.72	1.25	0.73
Personal COVID-19 Health Precautions				
Masks/Handwashing/Distancing	1.16	0.90	1.50	0.24
Avoiding Social Interactions	1.27	1.13	1.44	0.001
Avoiding High-Risk Situations & Travel	0.72	0.62	0.84	<0.001
County COVID-19 Cumulative Deaths				
Low		*Reference*		
Moderate	1.13	0.83	1.54	0.45
High	1.60	1.19	2.15	0.002
County Median Household Income				
Low		*Reference*		
Moderate	1.26	0.96	1.65	0.10
High	1.03	0.76	1.41	0.84
Interaction Effects				
Exposure * Child Care Type	0.85	0.54	1.34	0.49

Note. State where child care program is located (all 50 states, plus District of Columbia and Puerto Rico) was entered in the logistic regression analysis, but not reflected in the table.

[1] No cases self-identified as non-binary gender, dropping this value from analysis.

Table 7. Adjusted Case-Controlled Conditional Logistic Regression Analysis Predicting Case (N=427) Versus Matched Controls (N=21,350)

	OR	95% CI		P Value
Exposure to Child care	0.94	0.73	1.21	0.64
Child care Type (Family/Home-based)	1.59	1.14	2.23	<0.01
Interaction (Child care Type * Exposure)	0.82	0.53	1.26	0.37

Note. Cases propensity score matched to controls using 1:50 random matching without replacement using caliper width 0.2*SD of the logit function. Values used in the propensity score include age, race, ethnicity, gender, director status, county-level COVID-19 death rate, county-level median household income, personal COVID-19 health precaution measures (3 continuous variables), and state where child care program is located (indicator variables).

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