The effect of COVID-19 and Vaccine rollout on school enrollment in the US

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Abstract

The COVID-19 pandemic outbreaks forced families to decide the safest and most effective learning environments for their children because of the virus's threat to health and life. Hence, because of the nationwide school closure, policymakers have raised concerns about the missing children cases-those who have not enrolled in school at all because of the pandemic. The present study investigates whether there is a difference in the school enrollment during the pre-COVID-19 period, COVID-19 period, and vaccine rollout period. We employed the U.S. Current Population Survey (CPS), covering January 2020 to May 2021, while we use both the logistic and multinomial regression models for the empirical analysis. Our results showed that school enrollment is lower during the COVID-19 pandemic compared to the Pre-COVID-19 period. Other results showed that school enrollment is higher since vaccine rollout compared to the COVID-19 period. A possible explanation for this could be that families consider the vaccine the safe path to enrolling their children in school. We also found that school enrollment varies significantly across race and ethnic groups.

Keywords: COVID-19, Enrollment, High School, College, USA

1. Introduction

The threat to health and life from the COVID-19 virus has caused countries worldwide to implement stay-at-home orders to curb the spread of the disease. This led to a partial or complete shutdown of economic activities and school closures because of health and safety concerns. Because of these unprecedented disruptions, many schools transitioned from traditional face-to-face instruction to distance learning to ensure learning continues during school closures worldwide(OECD, 2020). The nationwide school closure has raised concerns among policymakers about missing children cases- those who have not enrolled in school at all because of the pandemic. This is because families are deciding the safest and most effective learning environments for their children. According to Kamenetz et al. (2020), an average kindergarten enrollment drop by16% in a survey of 60 districts in 20 states, while roughly 30% of all K-12 enrollment declines in another survey of 33 states in the US. Another survey showed that students in the high school class of 2020 were more likely to take a gap year and defer enrollment until the fall of 2021, as students cited remote classes and lack of on-campus amenities during the pandemic as driving these decisions (Howell et al. 2021).

Interestingly, research shows that delayed college enrollment negatively impacts college completion in the future (Witteveen and Attewell 2021). And not only that, enrollment declines could exacerbate the already large socio-economic and race-based achievement gap over time (Bassok and Shapiro 2021). Also, learning loss due to COVID-19 could add up to $10 trillion in labor earnings over their work-life (Azevedo et l., 2020).

Lack of school enrollment could be linked to the family decision to opt for an alternative like homeschooling, delay the start of kindergarten or struggle to access or navigate virtual learning as families fear the health effects of attending school in person during COVID-19. But irrespective of the reason, the important concern is whether the student missing from school rolls are learning. Hence, the present study investigates whether there is a difference in the school enrollment during the pre-COVID-19 period, COVID-19 period, and vaccine rollout period. Therefore, our analysis focuses on high school and college enrollment during these periods.

The rest of the paper is structured as follows. Section 2 focuses on the data sources and description. Then, section 3 describes the data and sources, while section 4 presents the results and discussion. Finally, section 5 contains the concluding remarks.

2. Data Source and Description

The data used for the study was obtained from the U.S. Current Population Survey (CPS), covering January 2020 to May 2021. The CPS covers all 50 US states, the District of Columbia, and US territories. The data is publicly available at https://www.census.gov/data/datasets/time-series/demo/cps/cps-basic.2021.html. Our final sample has 858 569 observations.

Although the CPS is a monthly labor force survey administered to civilians, our focus is on self-reported school enrollment. The respondents in the sample aged 16 and older were asked whether they enrolled in a high school or college last week. The CPS also covers information on the marital status, gender, and educational levels of the respondents. It also includes respondents' race and ethnic groups. However, the CPS offers supplement weights for both the individual and household to represent the sample nationally. But we use a household weight so that the estimate reflects the share of the household.

Summary statistics of the variables are presented in Table 1. We disaggregated this into the Pre-COVID-19 period that covers Jan-Feb. 2020, COVID-19 period covering March -Nov. 2020, and Vaccine Rollout period covering Dec. 2020-May 2021. The study takes March 2020 as the beginning of the COVID-19 period because the stay-at-home-order was implemented in the month (Education Week 2020). For example, most public schools in the United States closed down in March 2020, just as the COVID-19 cases surge. On the other hand, December 2020 was taken as the starting date for the Vaccine rollout, given that the first vaccine was approved and made available to the health workers in the month. Figures 1 and 2 present the distribution of household self-reported school enrollment. Specifically, Figure 1 shows school enrollment by COVID, Pre-COVID, and Vaccine rollout period. Also, Figure 2 shows high school and college enrollments by COVID, Pre-COVID, and Vaccine rollout period.

3. Estimation Strategy

To investigate whether there is a difference in the school enrollment during the pre-COVID-19 period, COVID-19 period, and vaccine rollout period, we employed the model specified below:

$$y_{it} = \emptyset PRE\_COVID_{it} + \delta VACCINE_{it} + \sum_{k=1}^{K} \gamma_k Z_{ikt} + \varphi Time + \varepsilon_{it} \qquad 1$$

where y_{it} is a dummy variable 0-1 indicator of current enrollment in school in time *t*, which we disaggregated into currently *enrolled in school vs. not enrolled* and *enrolled in high school* and *college* vs. not enrolled; PRE_COVID_{it} and $VACCINE_{it}$ represent the Pre-COVID period and Vaccine rollout periods, while the COVID-19 period is the reference period; Z_{ikt} is a vector of the demographic composition of the households which includes gender, marital status and education of household head, and race/ethnic groups; $Time$ is the year-monthly trend; $\emptyset$, δ, γ_k, and φ are parameters to be estimated; ε_{it} is the error term of the regression.

For the estimation of Equation 1, we employ both the logistic and the multinomial regression models. The logistic regression model was used to investigates the probability of school enrollment vs. not enrolled. We also employ the multinomial regression model to examine the likelihood of enrollment in high school and college vs. not enrolled. Subsequently, we estimate the parameters of equation 1 using a household weight provided in the CPS so that the estimate reflects the share of the household. Finally, the logistic and multinomial regression models are estimated with a robust standard error option.

4. Results and Discussion

Table 2 shows that the school enrollment during the pre-COVID-19 period and VACCINE rollout period is higher and significant at the 5% level than during the COVID-19 period. Also, we found high school enrollment during the pre-COVID-19 and VACCINE rollout periods are higher and significant at the 5% level than during COVID-19. Although college enrollment pre-COVID-19 is higher and significant at the 5% level than during COVID-19, there is no significant difference in college enrollment since the VACCINE rollout and COVID-19 periods. The implication of this is that school enrollment decline during the COVID-19 pandemic relative to Pre-COVID-19 and VACCINE rollout periods. This is not surprising because vaccine rollout is critical to global economic recovery (OECD, 2021). Hence, the surge in school enrollment can be attributed to the family's confidence in the vaccine as a safe path to enrolling their children in school.

The decline in school enrollment means young children who are not enrolled in school may be missing opportunities to build the relationships with peers and teachers that make the learning critical. And despite the challenges associated with remote learning, we believe online classes provide opportunities for students to still engage in conversations with their peers and teachers

remotely. Also, enrollment declines could exacerbate the already large socio-economic and race-based achievement gap over time in the U.S (Bassok and Shapiro 2021; Dron et al. 2020). In addition, the declining school enrollment may spell trouble for education funding since most of the money for K-12 education comes from the state budget that is based on the district's prior year enrollment. As such, decline enrollment during COVID-19 may make it difficult to accurately and equitably distribute education funding, which could disproportionately harm low-income students.

Table 2 also shows that male-headed households and married households have lower enrollment than female-headed households and unmarried households. Also, the education of the household head seems to be a determining driver of school enrollment decisions in the study. We also found that school enrollment is lower among Black and Other races, as shown in the first column of Table 2 compared to White families. Still, in the first column of Table 2, we found that Hispanics have a lower enrollment probability than Non-Hispanic households. However, the second and third columns of Tables 2 show that high school enrollment declined among the Black and Other races compared to White households and declined among Hispanics compared to non-Hispanic. In contrast, college enrollment increased among Black and other races than white households and dropped among Hispanics compared to non-Hispanic households.

We also found regional variation in enrollment, as households in the Midwest and South have a lower probability of enrollment. Households in the West have a higher likelihood of enrollment than households in the Northeast. This shows that regional differences exist in school enrollment.

We also attempt to investigate whether there is a significant difference in the school enrollment during the pre-COVID-19 period, COVID-19 period, and vaccine rollout period across the races and ethnic groups. The result is presented in Table 3. Our finding shows that among White households, the school enrollment during the pre-COVID-19 period and VACCINE rollout period is higher and significant at the 5% level than during the COVID-19 period. We also found that high school enrollment during the pre-COVID-19 and VACCINE rollout periods are higher and significant at the 5% level than during COVID-19 among White households. In contrast, we found that college enrollment pre-COVID-19 is higher and significant at the 5% level than during COVID-19. At the same time, there is no significant difference in college enrollment since the VACCINE rollout and COVID-19 periods among White households.

Among the Black and Hispanic households, we only found evidence that school enrollment during the pre-COVID-19 period is higher and significant at the 5% level than during the COVID-19. Similarly, high school and college enrollment during the pre-COVID-19 are higher and significant at the 5% level than during the COVID-19 among Black and Hispanic households. Thus, there is no significant differences in school enrollment since the VACCINE rollout and COVID-19 periods among Black and Hispanic families. In addition, we do not find a significant difference in school enrollment during Pre-COVID and VACCINE rollout periods compared to the COVID-19 period among other races. However, we find evidence that high school enrollment is higher and significant during the VACCINE rollout period than the COVID-19 period among other races. College enrollment during Pre-COVOD 19 and VACCINE rollout is not different from the COVID-19 period among other races.

5. Concluding Remarks

Following the COVID-19 outbreak, many countries worldwide closed schools, colleges, and universities to curb the spread of the virus. And families are deciding the safest and most effective learning environments for their children. In addition, because of the nationwide school closure, policymakers have raised concerns about the missing children cases-those who have not enrolled in school at all because of the pandemic. To this end, the present study investigates whether there is a difference in the school enrollment during the pre-COVID-19 period, COVID-19 period, and vaccine rollout period. While the study employs the U.S. Current Population Survey (CPS), covering January 2020 to May 2021, we use both the logistic and multinomial regression models for the empirical analysis.

Our results show that school enrollment is lower during the COVID-19 pandemic compared to the Pre-COVID-19 period. Also, other results show that school enrollment is higher since the VACCINE rollout period than the COVID-19 period. A possible explanation for this could be that families consider the vaccine the safe path to enrolling their children in school. We also found that school enrollment varies across race and ethnic groups because of the COVID-19 pandemic. For instance, school enrollment is lower among Black and Other races compared to White families. Also, Hispanics have a lower probability of enrollment compared to Non-Hispanic households. In addition, high school enrollment is lower among the Black and Other races compared to White families and declined among Hispanics compared to non-Hispanic. In contrast,

college enrollment increased among Black and other races than white households and dropped among Hispanics compared to non-Hispanic households.

We also found regional differences in school enrollment in the study. Specifically, households in the Midwest and South have a lower probability of school enrollment than households in the Northeast. On the other hand, households in the West have a higher likelihood of school enrollment than households in the Northeast. This shows that regional differences exist in school enrollment in the study.

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Table 1: Summary statistics of variables

Variables	Full sample	Pre-COVID-19 Period	COVID Period	Vaccine Rollout Period
	Mean or % [SD]	Mean or % [SD]	Mean or % [SD]	Mean or % [SD]
Gender of HH Head				
Male	49.21	49.16	49.1	49.24
Female	50.79	50.84	50.9	50.76
Marital Status				
Married	44.38	44.53	46.9	43.80
Single	55.62	55.47	53.1	56.20
Education Level of HH Head				
Less than High School	13.43	13.91	12.6	13.77
High School/GED	52.42	52.55	52.9	52.15
College/Postgraduate	34.15	33.55	34.5	34.08
Race				
White	91.60	91.84	93.2	91.55
Black	6.57	6.53	5.3	6.59
Hispanic	20.58	20.41	16.2	20.73
Other races	1.83	1.63	1.5	1.87
Region				
Northeast	16.71	16.79	15.7	16.56
Midwest	20.53	20.61	20.3	20.44
South	38.15	38.10	36.0	38.38
West	24.60	24.49	28.0	24.62
# Observation	858,569	111,991	435,192	311,386

Note: Pre-COVID-19 period covers Jan-Feb. 2020; COVID-19 period covers March -Nov. 2020; Vaccine Rollout period covers Dec. 2020-May 2021

Table:2: Estimated Logit and Multinomial logit models

Variables	Logit model	Multinomial logit Model	
	School Enrolled vs. not enrolled	High Sch. Enrolled vs. not enrolled	College Enrolled vs. not enrolled
	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]
PRE-COVID PERIOD	0.1757***[0.0156]	0.2572***[0.0301]	0.1524***[0.0184]
VACCINE ROLLOUT PERIOD	0.0793***[0.0159]	0.3233***[0.0304]	0.0006 [0.0186]
Gender of HH Head			
Male	-0.2579***[0.0078]	-0.1473***[0.0152]	-0.3035***[0.0092]
Marital Status			
Married	-2.2273***[0.0118]	-4.3967***[0.0542]	-1.8611***[0.0120]
Education Levels of HH Head			
High School/GED	-1.3807***[0.0091]	-4.5718***[0.0240]	2.0211***[0.0311]
College/Postgraduate	-1.8899***[0.0121]	-6.6871***[0.0968]	1.5195***[0.0323]
Race			
Black	-0.0889***[0.0182]	-0.2716***[0.0316]	0.0370***[0.0212]
Hispanic	-0.4060***[0.0118]	-0.7257***[0.0204]	-0.1883***[0.0139]
Other races	-0.1869***[0.0335]	-0.5073***[0.0562]	0.0057 [0.0380]
Region			
Midwest	-0.0415***[0.0128]	-0.1314***[0.0257]	-0.0269* [0.0150]
South	-0.0485***[0.0115]	-0.1302***[0.0231]	-0.0313** [0.0135]
West	0.0242***[0.0225]	-0.0943***[0.0249]	0.0571***[0.0141]
Time	0.0016 [0;0018]	-0.0059* [0.0035]	0.0039* [0.0022]
Constant	-1.5719 [0.0018]	3.8546***[2.5378]	-6.6731***[1.5682]
# Observation	858,569	858,569	
Prob > chi2	0.0000	0.0000	

*Note: HH stands for the household; *,**, and *** indicate statistically significant at the 0.1, 0.05, and 0.1 levels, respectively.*

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Table 3: Effect of COVID and vaccine rollout on enrollment by race/ethnicity

	Logit model			
School Enrolled vs. not enrolled	White	Black	Hispanic	Other Races
	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]
PRE-COVID PERIOD	0.1800***[0.0163]	0.1780***[0.0608]	0.1687***[0.0345]	-0.0404 [0.1287]
VACCINE ROLLOUT PERIOD	0.0897***[0.0166]	-0.0376 [0.0614]	0.0420***[0.0348]	-0.0153 [0.1235]
	Multinomial logit Model			
High Sch. Enrolled vs. not enrolled	White	Black	Hispanic	Other Races
	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]
PRE-COVID PERIOD	0.2685***[0.0317]	0.2229** [0.1036]	0.2463***[0.0569]	-0.1415 [0.2265]
VACCINE ROLLOUT PERIOD	0.3433***[0.0319]	0.0951 [0.1026]	0.1699***[0.0568]	0.4406** [0.2169]
College Enrolled vs. not enrolled	White	Black	Hispanic	Other Races
	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]	Coefficient [SE]
PRE-COVID PERIOD	0.1555***[0.0191]	0.1593** [0.0747]	0.1283***[0.0432]	0.0058 [0.1584]
VACCINE ROLLOUT PERIOD	0.0098 [0.0194]	-0.0757 [0.0759]	-0.0109 [0.0421]	-0.1809 [0.1512]

Note: We did not report the result of other control variables; **,**, and *** indicate statistically significant at the 0.1, 0.05, and 0.1 level respective*

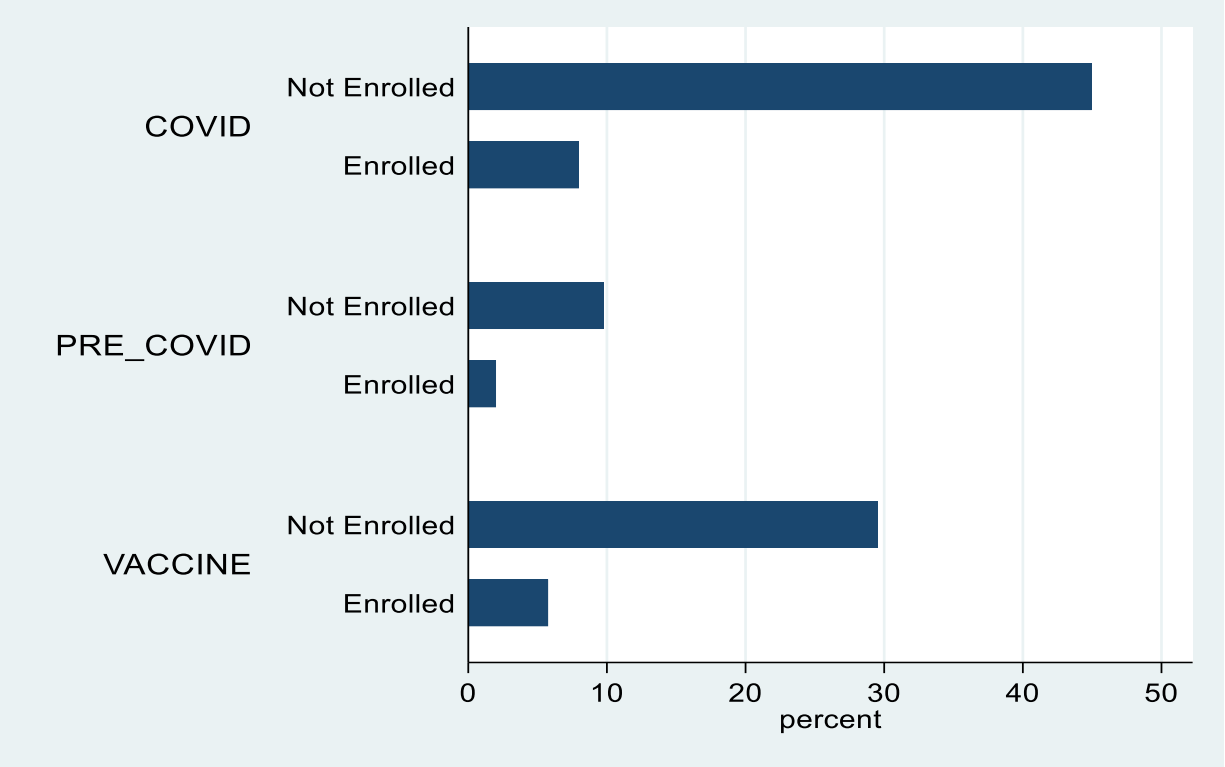

Figure 1: Distribution of HH decision to enroll in high school and college combined response

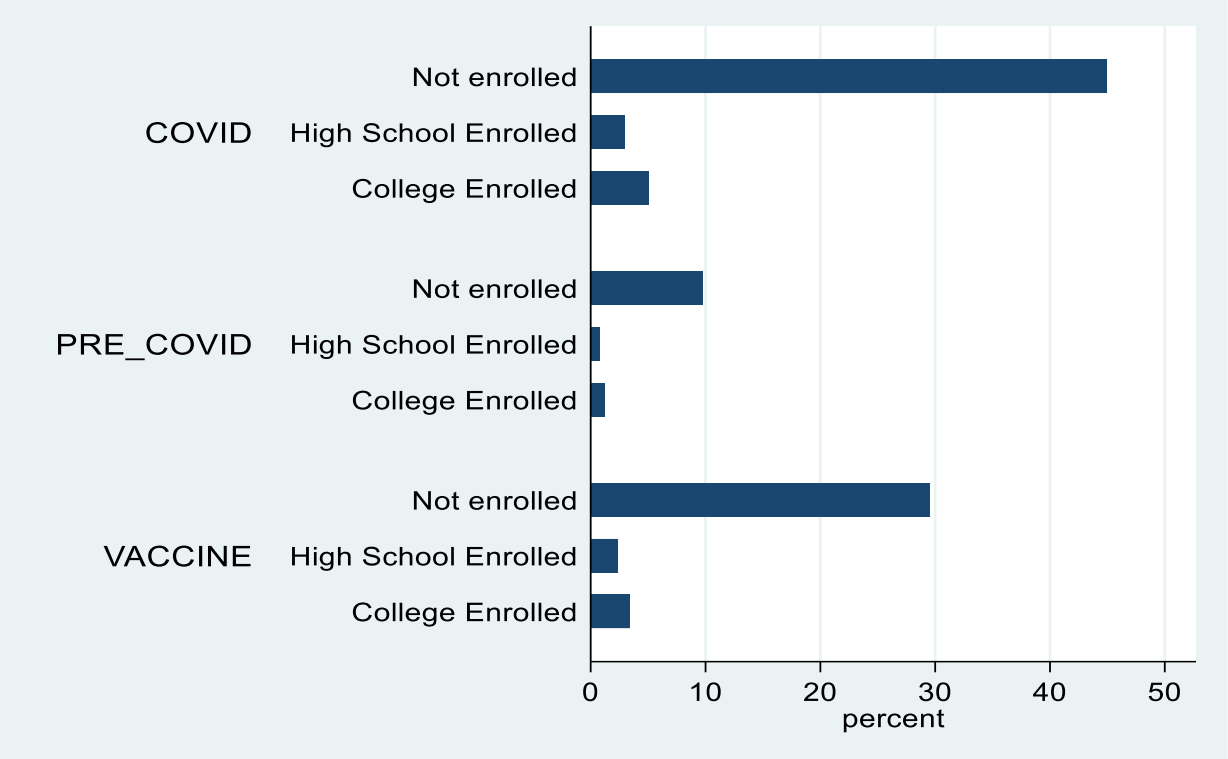

Figure 2: Distribution of HH decision to enroll in High school and college separately.