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Evidence on the Effects of the Federal COVID-19 Vaccine Mandate on Nursing Home Staffing Levels

Elizabeth Plummer PhD^{a,*}, William F. Wempe PhD^b

^aTCU Neeley School of Business/TCU School of Medicine, Texas Christian University, Fort Worth, TX, USA

^bTCU Neeley School of Business, Texas Christian University, Fort Worth, TX, USA

ABSTRACT

Keywords:
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Objective: To assess the federal COVID-19 vaccine mandate's effects on nursing homes' nurse aide and licensed nurse staffing levels in states both with and without state-level vaccine mandates.
Design: Cross-sectional study using data from Centers for Medicare and Medicaid Services, Centers for Disease Control and Prevention, and Economic Innovation Group. Including nursing home facility fixed effects provides evidence on the intertemporal effects of the federal vaccine mandate within nursing homes.

Setting and Participants: The sample contains 15,031 nursing homes, representing all US nursing homes with available data.

Methods: On January 13, 2022, the US Supreme Court upheld the federal COVID-19 vaccine mandate for health care workers in Medicare- and Medicaid-eligible facilities, with workers generally required to be vaccinated by March 20, 2022 (ie, the compliance date). We examined actual nursing home staffing levels in 3 time periods: (1) pre-Court decision; (2) precompliance date; and (3) postcompliance date. We separately examined staffing levels for nurse aides and licensed nursing staff. Because 28% of nursing homes were in states with state-imposed vaccine mandates that predated the Supreme Court's ruling, we divided the sample into 2 groups (nursing homes in mandate states vs nonmandate states) and performed all analyses separately.

Results: Staff vaccination rates and staffing levels were higher in mandate states than nonmandate states in all 3 time periods. After the Court's decision, staff vaccination rates increased 5% in nonmandate states and 1% in mandate states (on average). We find little evidence that the Court's vaccine mandate ruling materially affected nurse aide and licensed nurse staffing levels, or that nursing homes in mandate states and nonmandate states were differentially affected by the Court's ruling. Staffing levels over time were generally flat, with some evidence of a modestly greater increase for nurse aide staffing in mandate states than nonmandate states, and a modestly smaller decrease for licensed nurse staffing in mandate states than nonmandate states. Finally, regression results suggest that for both nurse aides and licensed nurses, staffing levels were lower in rural and for-profit nursing homes, and higher in Medicare-only, higher quality, and hospital-based nursing homes.

Conclusions and Implications: Results suggest the federal COVID-19 vaccine mandate has not caused clinically material changes in nursing home's nurse aide and licensed nurse staffing levels, which continue to be primarily associated with factors that are well-known to researchers and practitioners.

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* Address correspondence to Elizabeth Plummer, PhD, TCU Neeley School of Business, TCU Box 298530, Fort Worth, TX, 76129, USA.

E-mail address: c.e.plummer@tcu.edu (E. Plummer).

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Through November 20, 2022, nursing home (NH) residents accounted for 1,344,130 COVID-19 cases and 160,354 deaths in the United States; NH staff accounted for 1,414,581 cases and 2798 deaths.¹ Compared with other populations, COVID-19 has disproportionately affected NHs. Thus, COVID-19 vaccination of NH staff is believed by many to be critical in protecting both residents and staff.² However, such as other individuals, some NH staff have been (and remain) reluctant to be vaccinated.

On January 13, 2022, the US Supreme Court upheld the September 2021 federal vaccine mandate for workers in Medicare- and Medicaid-eligible health care facilities.³ Hence, most NHs may now only employ fully-vaccinated staff, although there are religious and medical exemptions. Compliance dates varied across states, but Centers for Medicare and Medicaid Services (CMS) guidance issued in January 2022 required all NHs to comply with the Court's ruling by March 21, 2022.⁴ Thus, the Court's ruling created an impending vaccine mandate for NH staff, and CMS' subsequent guidance effectively trifurcated recent months into 3 distinct time periods: (1) a pre-Court decision period extending from September 2021 up to the Court's ruling on January 13, 2022; (2) a precompliance period extending from just after the Court's ruling up to March 21, 2022; and (3) a postcompliance period extending from just after March 21, 2022 to the present.⁵

Given the relation between NH staff levels and quality of care, and prior characterizations of NHs' staffing situations as "dire,"⁶ the impact of the federal vaccine mandate on NHs' staffing levels is an important question. If the federal mandate were to increase the available pool of vaccinated NH staff, then NH staffing levels (and thus, quality of care) may be favorably impacted by the mandate. In contrast, if significant numbers of NH staff decline to be vaccinated^{7,8} and are, thus, terminated under the federal mandate, then the mandate may decrease staffing and negatively impact NHs' quality of care. This study's primary purpose is to assess the federal mandate's effects on NHs' staffing levels across the 3 noted time periods, while controlling for other factors that may affect NH staffing.

Methods

Data Sources

We analyzed data from 4 sources. The CMS Payroll Based Journal (PBJ) datasets include the hours NH staff are paid to work each day, and the CMS Provider Information file includes information on NH characteristics (eg, quality rating, number of beds). The Centers for Disease Control and Prevention (CDC) COVID-19 NH Data file includes information on NH COVID-19 infection rates and vaccination rates. NHs report this COVID-related data weekly. We linked the CMS and CDC datasets using NHs' CMS provider numbers. NHs' community attributes (eg, rural/urban; percentage of white, non-Hispanic residents, median income ratio) are from the Economic Innovation Group's Distressed Communities Index. A NH's community is considered to be its zip code.⁹

Our primary variable of interest is NHs' staffing levels for nurse aides (certified nurse aide, nurse aide in training, medication aide, medication technician) and licensed nursing staff (registered nurse, licensed practical/vocational nurse). Specifically, we use PBJ data to examine how nurse aides and licensed nurses hours per resident per day (PRPD) varied across the three time periods—ie, the 15-week pre-Court ruling period, the 9-week pre-compliance period, and a 15-week post-compliance period ending on July 1, 2022. PBJ data is reported daily, and we use the average hours PRPD for the 5-day work week (Monday–Friday). The CDC COVID-19 files provide our variables for NH staff and resident vaccination rates (we assumed a single dose constitutes vaccination) and the prevalence of COVID-19 and flu cases in NH facilities. In our regressions, we also control for NH attributes (eg, quality ratings, number of beds, profit status), and community attributes, including ruralness, percent white/non-Hispanic, median income, and education level.

Statistical Analysis

In regression analyses, each NH is included up to 39 times, corresponding to the 39 weeks in the 3 periods of interest. We use the pre-Court decision period as the reference period, and examine whether

weekly staffing levels changed in the precompliance and post-compliance periods. We take 2 approaches to examining inter-temporal changes in staffing levels. First, we estimate the model with NH fixed effects. This allows us to compare NH facilities with themselves over time but does not allow us to include variables that do not vary over time. Thus, we next estimate the model with state fixed effects and include the facility- and community-level control variables. The latter specification allows us to not only draw inferences related to our primary interest (ie, the mandate's impact on staffing), but also assess whether facility- and community-level attributes are associated with staffing levels in expected or interesting ways.

Twelve states plus the District of Columbia already had state-imposed vaccine mandates for NH staff before the Supreme Court's ruling. Because the federal ruling was likely more effectual for NHs not already subject to state mandates, we divided our sample accordingly (mandate vs nonmandate states). Thus, we estimated 8 total models corresponding to 2 types of staff (Nurse Aides and Licensed Nursing Staff), 2 types of states (mandate and nonmandate states), and 2 regression models (NH fixed effects and state fixed effects with facility and community characteristics). All analyses were performed using SAS statistical software v 9.4 (SAS Institute).

Results

Figure 1 provides evidence on NH staff and resident vaccination rates and staffing levels. Staff vaccination rates were lower in non-mandate states than mandate states, but increases in vaccination rates during the pre-Court and precompliance periods were greater in nonmandate states (during the postcompliance period, rates were stable). The lower part of Figure 1, A shows that resident vaccination rates were lower in nonmandate states, and that vaccination rates were stable throughout the period examined. Figure 1, B indicates that, on average, staffing levels for both nurse aides and licensed nurses were higher in mandate states than nonmandate states. During the precompliance and postcompliance periods, the graphs for nurse aides suggest a modest increase in staffing levels; the graphs for licensed nurses display a slight downward trend over the 2 periods. These trends are generally present among NHs in both mandate and nonmandate states.

Table 1 presents descriptive evidence on vaccination rates, staffing levels, and facility and community characteristics. There are 10,860 NHs located in nonmandate states and 4171 in mandate states with available staffing data. Mean values for the 2 groups are compared using 2-sample t-tests. Results for vaccination rates measured at 3 specific dates align with inferences drawn from Figure 1—ie, vaccination rates are higher among NHs in mandate states, staff vaccination rates increase more for NHs in nonmandate states (for the March 20 date, a 5% increase in nonmandate states vs a 1% increase in mandate states), and resident vaccination rates are relatively flat over time. Staffing results reported in Table 1 reflect mean staffing levels in each of the 3 periods, and thus, mute the week-to-week variation evident in Figure 1. Although mean staffing levels are generally flat across the 3 time periods, the upward tick for nurse aide staffing in mandate states is somewhat larger than that in nonmandate states (eg, 0.05 increase vs 0.0 increase for the precompliance period). This 0.05 increase in hours PRPD corresponds to 3 minutes PRPD.

Many facility and community characteristics differ between the 2 NH groups in Table 1. On average, NHs in mandate states have higher overall star ratings (3.29 vs 3.07), more beds (128 vs 101), more COVID-19 and flu cases (1.06 vs 0.88), and a lower likelihood of being government owned (0.03 vs 0.07). NHs in nonmandate states are located in more rural and less affluent communities, and in communities with greater proportions of white, non-Hispanic residents ($P < .001$ in all cases).

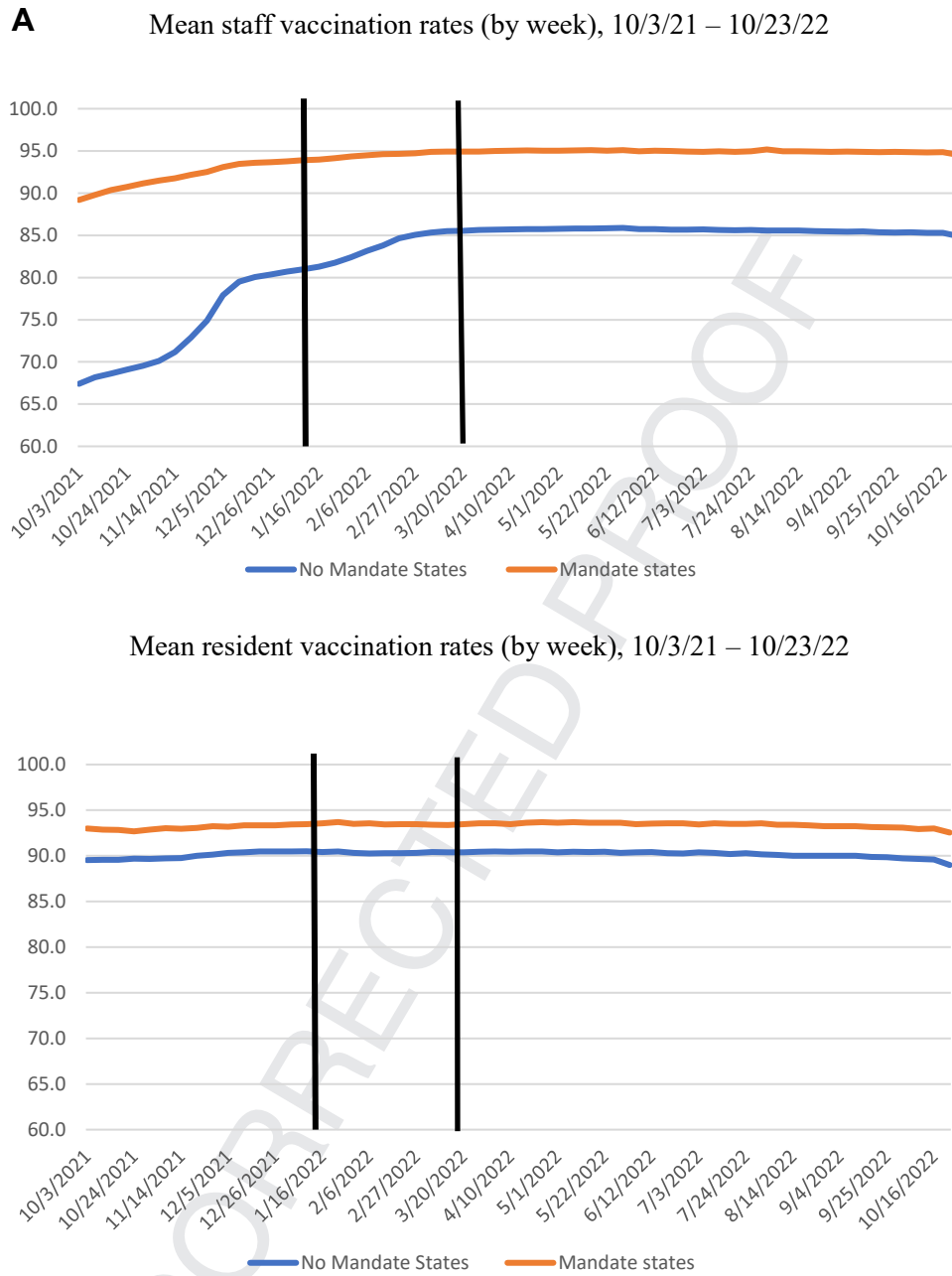
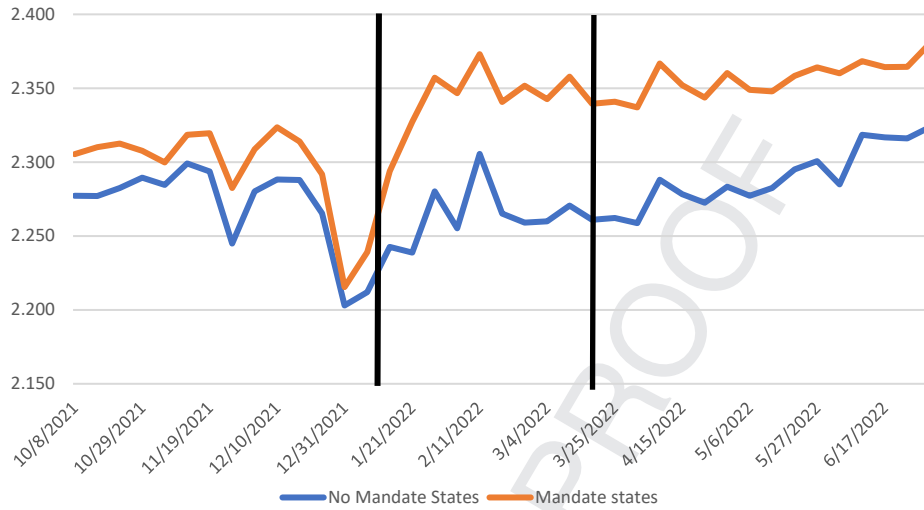


Fig. 1. Vaccination rates and staffing levels. (A) Staff and resident COVID-19 vaccination rates. The vertical axis shows the percentage of staff (residents) vaccinated as of the end of the week indicated. The horizontal axis indicates the end date of each week. (B) Nurse aide and licensed nurse staffing levels. The vertical axis shows the average (mean) number of nurse aide (licensed nurse) hours per resident per day computed for each week. The horizontal axis indicates the end date of each week.

Table 2 reports regression results for staffing levels for nurse aides (Table 2, A) and licensed nurses (Table 2, B), with separate analyses of NHs in nonmandate and mandate states. In all regressions, we include indicator variables for each holiday week, when staffing levels are unusually low (Figure 1). Because NH administrators and regulators are likely more concerned with postcompliance staffing levels, we primarily focus our discussion on staffing levels during the post-compliance period (the most recent period) compared with the pre-Court decision period. And although we use staffing levels for the 15 weeks prior to the Court's ruling as our basis for comparison, these levels may have been impacted by the mandate announcement in September 2021.

In the top portion of Table 2, A, we find that nurse aide staffing for NHs in nonmandate states increased in the postcompliance period. In the NH fixed effects model, the coefficient on postcompliance is 0.0175 ($P < .001$). This equates to an increase of 1.05 nurse aide minutes PRPD, or a 0.7% increase relative to the average nurse aide time PRPD in the pre-Court period (2.27 hours in Table 1). Results from the state fixed effects model indicate a 1.8% (ie, 0.0413/2.27) increase in staffing in the postcompliance period ($P < .001$), or an additional 2.5 nurse aide minutes PRPD. Results in the lower part of Table 2, A suggest that nurse aide staffing increased even more in mandate states. For mandate states, the coefficients on post-compliance are 0.0461 and 0.0767 in the 2 specifications, suggesting staffing increases of 2.0% and

B Mean # of nurse aide hours per resident per day (by week), 10/8/21 – 7/1/22

Mean # of licensed nurse hours per resident per day (by week), 10/8/21 – 7/1/22

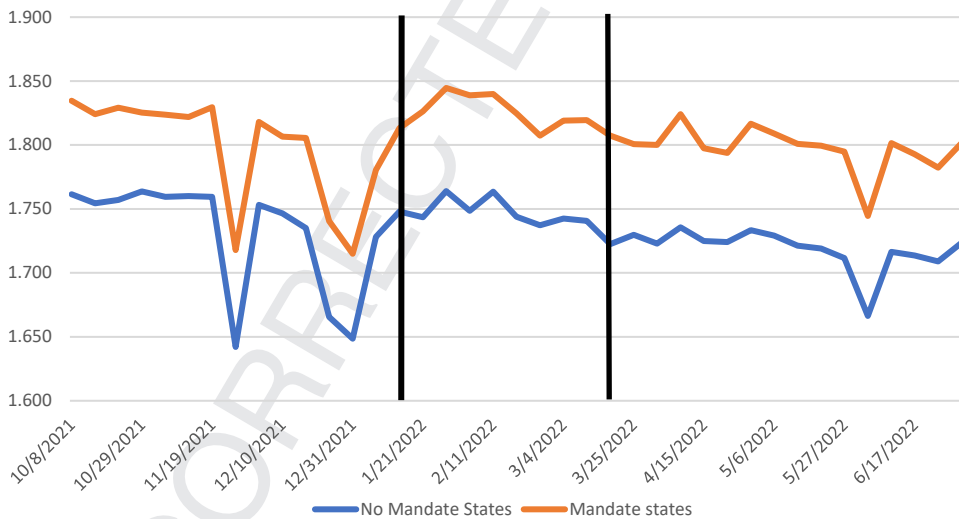


Fig. 1. (continued).

3.3% relative to the 2.30 mean staffing level in the pre-Court period (Table 1). This equates to an additional 2.8 to 4.6 nurse aide minutes PRPD.

Table 2, B suggests that staffing levels for licensed nurses decreased in the postcompliance period relative to the pre-Court decision period, with the decrease evident in both nonmandate and mandate states. In nonmandate states, the -0.0302 and -0.0368 coefficients in the 2 specifications (both $P < .001$) represent an approximate 2% decrease in staffing hours relative to the 1.73 mean staffing level in the pre-Court period (Table 1), or a decrease of about 2 minutes PRPD. Licensed nurse staffing decreases are less substantial in mandate states, with results indicating decreases of 0.8% ($P < .001$) and 0.4% ($P = .12$) relative to the 1.80 mean staffing hours in the pre-Court period (Table 1). This equates to a decrease of less than 1 minute PRPD.

In Table 2's state fixed-effects specifications, results for several facility and community characteristics are generally significant, consistent, and economically meaningful. As expected, given staffing's role in NH quality ratings, staffing is higher for NHs with higher star ratings. Staffing is also higher in hospital-based and Medicare-only NHs, but lower in larger and for-profit NHs. Finally, Table 2 results suggest that staffing is generally lower for NHs in rural and less affluent communities, and in communities with larger percentages of white, non-Hispanic residents.

Discussion

A clear risk of the federal COVID-19 vaccine mandate is that NHs in vaccine-resistant communities located in nonmandate states (or mandate states with ineffective enforcement) will face increased

Table 1
Staff and Resident Vaccination Rates, and NH Facility and Community Characteristics, by State Vaccine Mandate Status*

Characteristics	States with No Vaccine Mandate (n = 10,860)		States with Vaccine Mandate [†] (n = 4171)		Test for Differences [‡] P Value
	Mean	(SD)	Mean	(SD)	
Percent of staff COVID-19 vaccinated					
As of January 16, 2022	81.3	14.6	94.0	9.1	<.001
As of March 20, 2022	85.5	12.7	94.9	7.9	<.001
As of October 23, 2022	84.9	13.6	94.5	9.6	<.001
% of residents COVID-19 vaccinated					
As of January 16, 2022	88.1	10.3	91.6	8.1	<.001
As of March 20, 2022	88.4	9.6	91.7	7.9	<.001
As of October 23, 2022	86.8	11.8	90.5	10.3	<.001
Number of nurse aide hours PRPD					
Pre-US Supreme Court decision	2.27	0.62	2.30	0.63	<.001
Precompliance	2.27	0.63	2.35	0.64	<.001
Postcompliance	2.29	0.63	2.36	0.62	<.001
Number of licensed nurse hours PRPD					
Pre-US Supreme Court decision	1.73	0.62	1.80	0.74	<.001
Precompliance	1.75	0.63	1.83	0.73	<.001
Postcompliance	1.72	0.61	1.80	0.74	<.001
Facility characteristics					
Number of staff COVID-19 and flu cases for wk	0.88	2.2	1.06	2.6	<.001
Overall 5-star rating	3.07	1.4	3.29	1.39	<.001
Number of beds	101	50.5	128	83.4	<.001
Percent occupancy	0.74	0.88	0.75	0.19	<.001
Not-for-profit	0.24	0.43	0.23	0.42	.07
Government	0.07	0.26	0.03	0.18	<.001
Hospital-based	0.03	0.18	0.04	0.20	.04
Medicare only	0.04	0.19	0.03	0.18	.43
Medicaid only	0.01	0.11	0.02	0.14	.02
Community characteristics					
Rural	0.21	0.41	0.05	0.21	<.001
Small town	0.29	0.45	0.16	0.37	<.001
Suburban or urban	0.50	0.50	0.79	0.40	<.001
Percent of white, non-Hispanic residents	72.3	23.6	63.9	26.9	<.001
Percent of adults w/no high school diploma	11.8	7.0	11.9	8.4	.68
Median income ratio	96.1	28.1	101.8	35.0	<.001

Variable Definitions:

Time Periods

- Pre-US Supreme Court decision (15-wk period) = 1 for wk ended 10/8/21 through 1/14/22, 0 otherwise.
- Precompliance (9-wk period) = 1 for wk ended 1/21/22 through 3/18/22, 0 otherwise.
- Postcompliance (15-wk period) = 1 for wk ended 3/25/22 through 7/1/22, 0 otherwise.
- Thanksgiving, Christmas, New Year's, and Memorial Day wk = 1 for wk, which includes the holiday indicated, 0 otherwise.

Staffing variables

- Number of nurse aide h PRPD = Total number of PBJ h reported by CNAs, nurse aides in training and med aides/technicians, for 5-d work wk (Mon-Fri), divided by sum of daily census for 5-d work wk.
- Number of licensed nurse h PRPD = Total number of PBJ h reported by RNs and LPNs for 5-d work wk (Mon-Fri), divided by sum of daily census for 5-d work wk.

Vaccination and COVID-19 data

- Percent of staff vaccinated = Percent of NH staff vaccinated with at least 1 dose of COVID-19 vaccine as of end of wk.
- Percent of residents vaccinated = Percent of NH residents vaccinated with at least 1 dose of COVID-19 vaccine as of end of wk.
- Number of staff COVID-19 and flu cases for wk = Number of staff and facility personnel reporting COVID-19, influenza (flu), and/or other acute respiratory illness for that wk.

Facility characteristics

- Overall 5-star rating = 1 to 5 based on NH's overall 5-star rating
- Number of beds = Number of beds in NH
- Percent occupancy = Number of NH residents divided by number of beds
- Not-for-profit = 1 if NH is a nonprofit, 0 otherwise
- Government = 1 if NH is government-owned, 0 otherwise
- Hospital-based = 1 if NH is hospital-based, 0 otherwise
- Medicare only = 1 if NH is Medicare only, 0 otherwise
- Medicaid only = 1 if NH is Medicaid only, 0 otherwise

Community characteristics

- Rural = 1 if a NH is located in a rural area; 0 otherwise.
- Small town = 1 if a NH is located in a small town; 0 otherwise.
- Suburban or urban = 1 if a NH is located in an urban or suburban area; 0 otherwise.
- Percent of white, non-Hispanic residents = Percent of population in a NH's community (zip code) who is white, non-Hispanic.
- Percent adults w/no high school diploma = Percent of the 25 + population in a NH's community (zip code) without a high school diploma or the equivalent.
- Median income ratio = Median household income of NH's community (zip code) as a percent of the state's median household income.

*There are 15,031 nursing homes with staffing data: 10,860 in nonmandate states and 4171 in mandate states. Vaccination rates, and facility and community characteristics are not available for all nursing homes with staffing data.

[†]There are 12 mandate states plus D.C.: California, Colorado, Connecticut, Illinois, Maine, Massachusetts, New Jersey, New Mexico, New York, Oregon, Rhode Island, Washington, and D.C.

[‡]P values from a 2-sample t-test.

Table 2
Regression of Staffing Levels on Time Periods and Facility and Community Characteristics, by State Vaccine Mandate Status

A, Number of Nurse Aide Hours per Resident per Day						
	States with No Vaccine Mandate					
	Nursing Home Fixed Effects			State Fixed Effects		
	Coefficient	95% CI	P Value	Coefficient	95% CI	P Value
Time periods						
Pre-US Supreme Court decision	Ref.	Ref.		Ref.	Ref.	
Precompliance	-0.0067	-0.009, -0.004	<.001	0.0035	-0.001, 0.009	.17
Postcompliance	0.0175	0.015, 0.020	<.001	0.0413	0.037, 0.046	<.001
Thanksgiving wk	-0.0328	-0.039, -0.027	<.001	-0.0273	-0.039, -0.016	<.001
Christmas wk	-0.0124	-0.018, -0.006	<.001	0.0073	-0.004, 0.019	.22
New Year's wk	-0.0761	-0.082, -0.070	<.001	-0.0572	-0.069, -0.046	<.001
Memorial Day wk	-0.0056	-0.011, 0.000	.06	-0.006	-0.017, 0.005	.28
Facility characteristics:						
Percent of staff vaccinated				-0.0022	-0.002, -0.002	<.001
Percent of residents COVID-19 vaccinated				0.0063	0.006, 0.007	<.001
Number of staff COVID and flu cases per wk				0.0105	0.010, 0.011	<.001
Overall 5-star rating				0.0458	0.044, 0.047	<.001
Log (number of beds)				-0.0962	-0.101, -0.092	<.001
Percent occupancy				-0.0143	-0.016, -0.012	<.001
Not-for-profit				0.2787	0.274, 0.283	<.001
Government				0.3481	0.341, 0.355	<.001
Hospital-based				0.0911	0.081, 0.102	<.001
Medicare only				0.3700	0.360, 0.380	<.001
Medicaid only				0.2919	0.275, 0.309	<.001
Community characteristics:						
Rural				-0.0476	-0.054, -0.041	<.001
Small town				-0.0089	-0.014, -0.004	<.001
Percent of white, non-Hispanic residents				-0.0015	-0.002, -0.001	<.001
Percent of adult population w/no high school diploma				-0.0016	-0.002, -0.001	<.001
Median income ratio				0.0006	0.001, 0.001	<.001
R ²	0.790			0.257		
Number of nursing home wk	400,954			361,720		
States with Vaccine Mandate						
	States with Vaccine Mandate					
	Nursing Home Fixed Effects			State Fixed Effects		
	Coefficient	95% CI	P Value	Coefficient	95% CI	P Value
Time periods						
Pre-US Supreme Court decision	Ref.	Ref.		Ref.	Ref.	
Precompliance	0.0372	0.034, 0.041	<.001	0.0480	0.040, 0.056	<.001
Postcompliance	0.0461	0.043, 0.049	<.001	0.0767	0.069, 0.084	<.001
Thanksgiving wk	-0.0192	-0.028, -0.010	<.001	-0.0136	-0.033, 0.006	.17
Christmas wk	-0.0128	-0.022, -0.004	.005	-0.0040	-0.024, 0.015	.68
New Year's wk	-0.0954	-0.104, -0.086	<.001	-0.0887	-0.108, -0.069	<.001
Memorial Day wk	0.0043	-0.004, 0.013	.32	-0.0013	-0.020, 0.017	.89
Facility characteristics:						
Percent of staff vaccinated				-0.0040	-0.004, -0.004	<.001
Percent of residents COVID-19 vaccinated				-0.0000	-0.000, 0.000	.99
Number of staff COVID and flu cases per wk				0.0064	0.005, 0.008	<.001
Overall 5-star rating				0.0702	0.069, 0.073	<.001
Log (number of beds)				-0.1900	-0.196, -0.184	<.001
Percent occupancy				-0.5034	-0.521, -0.485	<.001
Not-for-profit				0.2906	0.283, 0.298	<.001
Government				0.5255	0.507, 0.544	<.001
Hospital-based				0.0738	0.057, 0.090	<.001
Medicare only				0.2510	0.233, 0.269	<.001
Medicaid only				-0.0021	-0.026, 0.022	.87
Community characteristics:						
Rural				-0.0966	-0.111, -0.082	<.001
Small town				-0.0148	-0.024, -0.005	.002
Percent white, non-Hispanic residents				-0.0027	-0.003, -0.002	<.001
Percent of adult population w/no high school diploma				-0.0024	-0.003, -0.002	<.001
Median income ratio				0.0012	0.001, 0.001	<.001
R ²	0.826			0.411		
Number of nursing home wk	153,937			111,901		

(continued on next page)

Table 2 (continued)

(B) Number of Licensed Nurse Hours per Resident per day						
States with No Vaccine Mandate						
Nursing Home Fixed Effects				State Fixed Effects		
	Coefficient	95% CI	P Value	Coefficient	95% CI	P Value
Time periods						
Pre-US Supreme Court decision	Ref.			Ref.		
Precompliance	-0.0109	-0.013, -0.009	<.001	-0.0258	-0.030, -0.021	<.001
Postcompliance	-0.0302	-0.032, -0.028	<.001	-0.0368	-0.041, -0.033	<.001
Thanksgiving wk	-0.1255	-0.130, -0.121	<.001	-0.1121	-0.123, -0.101	<.001
Christmas wk	-0.0961	-0.101, -0.091	<.001	-0.0932	-0.104, -0.082	<.001
New Year's wk	-0.1179	-0.123, -0.113	<.001	-0.1145	-0.125, -0.104	<.001
Memorial Day wk	-0.0626	-0.067, -0.058	<.001	-0.0604	-0.071, -0.050	<.001
Facility characteristics:						
Percent of staff vaccinated				0.0012	0.001, 0.001	<.001
Percent residents COVID-19 vaccinated				-0.0035	-0.004, -0.003	<.001
Number of staff COVID and flu cases per wk				0.0088	0.008, 0.010	<.001
Overall 5-star rating				0.0633	0.062, 0.065	<.001
Log (number of beds)				-0.2703	-0.274, -0.266	<.001
Percent occupancy				-0.0428	-0.045, -0.041	<.001
Not-for-profit				0.1366	0.132, 0.141	<.001
Government				0.1524	0.146, 0.159	<.001
Hospital-based				0.5427	0.533, 0.552	<.001
Medicare only				0.8196	0.810, 0.829	<.001
Medicaid only				-0.0240	-0.040, -0.008	.003
Community characteristics:						
Rural				-0.1881	-0.194, -0.182	<.001
Small town				-0.0818	-0.086, -0.077	<.001
Percent white, non-Hispanic residents				-0.0004	-0.001, -0.000	<.001
Percent adult population w/no high school diploma				-0.0040	-0.004, -0.004	<.001
Median income ratio				0.0002	0.000, 0.000	<.001
R ²	0.859			0.355		
Number of nursing home wk	384,131			346,141		
States with Vaccine Mandate						
Nursing Home Fixed Effects				State Fixed Effects		
	Coefficient	95% CI	P Value	Coefficient	95% CI	P Value
Time Periods						
Pre-U.S. Supreme Court decision	Ref.	Ref.		Ref.	Ref.	
Pre-compliance	0.0108	0.007, 0.014	<.001	-0.0126	-0.022, -0.003	.009
Post-compliance	-0.0157	-0.019, -0.013	<.001	-0.0066	-0.015, 0.002	.12
Thanksgiving wk	-0.1157	-0.124, -0.108	<.001	-0.1027	-0.125, -0.080	<.001
Christmas wk	-0.0914	-0.099, -0.083	<.001	-0.0884	-0.111, -0.066	<.001
New Year's wk	-0.1228	-0.131, -0.115	<.001	-0.1312	-0.154, -0.109	<.001
Memorial Day wk	-0.0633	-0.071, -0.056	<.001	-0.0674	-0.089, -0.046	<.001
Facility characteristics						
Percent of staff vaccinated				0.0038	0.003, 0.004	<.001
Percent of residents COVID-19 vaccinated				-0.0150	-0.015, -0.014	<.001
Number of staff COVID and flu cases per wk				0.0111	0.010, 0.012	<.001
Overall 5-star rating				0.0711	0.068, 0.074	<.001
Log (number of beds)				-0.4417	-0.449, -0.435	<.001
Percent occupancy				-0.9033	-0.924, -0.883	<.001
Not-for-profit				0.1719	0.163, 0.180	<.001
Government				0.3623	0.342, 0.382	<.001
Hospital-based				1.0893	1.071, 1.107	<.001
Medicare only				0.6217	0.602, 0.641	<.001
Medicaid only				0.0088	-0.023, 0.041	.59
Community characteristics						
Rural				-0.3092	-0.326, -0.292	<.001
Small town				-0.1715	-0.182, -0.161	<.001
Percent white, non-Hispanic residents				-0.0010	-0.001, -0.001	<.001
Percent adult population w/no high school diploma				-0.0035	-0.004, -0.003	<.001
Median income ratio				0.0016	0.001, 0.002	<.001
R ²	0.900			0.472		
Number of nursing home wk	147,501			106,383		

staffing challenges as noncompliant staff separate—voluntarily or nonvoluntarily—from their employing NHs. We find the Supreme Court's vaccine mandate ruling appears to be (at most) modestly associated with changes in NHs' staffing levels, regardless of state mandate status. In descriptive analyses, we report that post-Court ruling increases in staff vaccination rates for NHs in nonmandate states exceeded—by a factor of 5—those in mandate states. From regression analyses, we find that, after the compliance date, nurse aide staffing increased modestly in both types of states, and licensed nurse staffing decreased even more modestly in both state types. On average, the changes in staffing range from 1 to 4 minutes PRPD. Whether these changes are clinically significant depends on how those incremental minutes are dispersed across residents. And while it might be argued that nonmandate states' somewhat smaller increase in nurse aide staffing and somewhat larger decrease in licensed nurse staffing arises from differential responses to the vaccine mandate, the small magnitude of staffing changes precludes general policy conclusions. For NHs in both types of states, the main staffing drivers continue to be facility characteristics such as quality, size, ownership type, and Medicare status, and community characteristics such as ruralness, affluence, and ethnicity.

Our findings are of course subject to limitations, with one being particularly noteworthy. Although the robustness of our inferences is aided by the use of CMS PBJ data, the staffing levels do not map directly to actual shortages of NH staff. Such shortages are self-reported by NHs to the CDC, and are thus, subject to possible misrepresentation. For example, incentives exist for NHs to report they have no staffing shortages to avoid regulatory scrutiny or concerns among those seeking NH care. Alternatively, NHs could report staffing shortages with the hope that doing so would pressure policymakers to moderate vaccine mandates. Overall, our study's design employs the most reliable data available on actual nurse staffing, but does not directly measure whether that staffing—and quality and mix of nursing staff—is sufficient to meet NHs' needs. We also do not provide evidence on NHs' staffing strategies. Administrators will face staffing challenges and higher labor costs if they have an insufficient number of vaccinated staff, and must thus hire contract workers or pay vaccinated staff overtime. More evidence is needed on NHs' staffing sufficiency and quality, which are the measures most relevant to NH administrators and policymakers.¹⁰

Conclusions and Implications

Results of this study suggest the federal COVID-19 vaccine mandate (and the Supreme Court's approval thereof) was not, as feared by some, an inflection point in NHs' ability to source staff. Moreover, we find the NH facility and community characteristics most associated with NH staff shortages to be similar in both mandate and non-mandate states, and largely consistent with previously identified

characteristics. Given these results, and the demonstrated ability of vaccines to protect NH staff and residents, encouraging vaccine uptake—perhaps by enhanced education regarding the vaccine's safety and efficacy and a greater focus on nurses' role in shaping population health—may prove beneficial.^{11,12} Likewise, ongoing institutional leadership related to NH facility management and adaptation to community characteristics will continue to be important in maintaining appropriate levels and quality of NH staff.

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- McGarry BE, Gandhi AD, Syme M. Association of state COVID-19 vaccine mandates with staff vaccination coverage and staffing Shortages in US nursing homes. *JAMA Health Forum.* 2022;3:e222363. This study reports no significant increases in self-reported staffing shortages following announcements of statelevel vaccine mandates. In untabulated analyses, we found no evidence that self-reported staffing shortages changed significantly following the Supreme Court's vaccine mandate ruling (through March 2022). Nevertheless, 22 Attorneys General have petitioned CMS to repeal the COVID-19 vaccine mandate, in part because it intensifies NH staffing shortages. Congressional negotiators recently agreed to repeal the COVID-19 vaccine mandate for military service members. See <https://www.beckershospitalreview.com/workforce/22-statesask-cms-to-withdraw-healthcare-worker-vaccine-mandate.html> and <https://www.wsj.com/articles/lawmakers-spar-over-marijuana-energy-permits-indefense-bill-talks-11670355641?mod=djemalertNEWS>
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