



Primary care professionals' support for Covid-19 vaccination mandates: Findings from a US national survey

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ABSTRACT

Healthcare organizations have been early adopters of Covid-19 vaccine mandates as a strategy to end the pandemic. We sought to evaluate support for such mandates among pediatric primary care professionals (PCPs) in the United States. In February-March 2021, we conducted a national online survey of 1,047 PCPs (71% physicians). We used multivariable logistic regression to assess correlates of PCPs' support for Covid-19 vaccine mandates for health care workers. Most PCPs supported Covid-19 vaccine mandates for health care workers (83%). PCPs were more likely to support mandates if they perceived health care workers to be at highest risk of getting Covid-19 compared to other worker types (8 percentage points, $p < 0.01$). PCPs were also more likely to support mandates if their clinic recommended or required vaccination (11 percentage points and 20 percentage points respectively, both $p < 0.01$). However, PCPs were less likely to support mandates if their clinic offered incentives to vaccinate (10 percentage points, $p < 0.05$). Clinic recommendations and requirements for Covid-19 vaccination may increase support for mandates. Incentives may decrease support, perhaps by creating the perception that viable alternatives to mandates exist.

1. Introduction

The Covid-19 pandemic has resulted in over 1 million deaths in the United States (US) and over 6 million deaths worldwide as of May 2022, according to the World Health Organization and the Centers for Disease Control and Prevention. (World Health Organization, 2022; U.S. Centers for Disease Control and Prevention, 2021) After initially declining during the first several months of 2021, Covid-19 morbidity and mortality began to climb again sharply with the spread of the new, more transmissible Delta variant (U.S. Centers for Disease Control and Prevention, 2021; Engber, 2021) and then again in winter of 2021–22 with the Omicron variant. (U.S. Centers for Disease Control and Prevention, 2021; Hassan, 2022) By spring 2022, about 65% of the total US population was fully vaccinated against Covid-19. (U.S. Centers for Disease Control and Prevention. COVID-19 Vaccinations in the United States, 2022) However, many Americans have been hesitant to be vaccinated, including a substantial minority of health care workers. (King et al., 2021; Hamel et al., 2021; Biswas et al., 2021; Roy et al., 2020; Gadoth

et al., 2021) Vaccine hesitancy among primary care professionals (PCPs) is especially discouraging, as PCPs play a vital role in encouraging Covid-19 vaccination and ending the pandemic; trust in a physician is associated with high patient vaccine confidence, and physicians' recommendations are associated with a higher likelihood to be vaccinated. (Szilagyi et al., 2021; Weintraub et al., 2021; Kirzinger et al., 2021).

Employers have used several strategies to combat vaccine hesitancy. Some employers have mandated vaccination for their employees, especially in the healthcare field, and evidence indicates that employer vaccine mandates may be more acceptable than population-wide mandates. (Largent et al., 2020; Lee, et al., 2021) Other employers, choosing a potentially less contentious or restrictive approach to overcome hesitancy, have recommended vaccination for workers without mandating it or have provided incentives for vaccination, including paid time off or lottery-style prize drawings. (Hamel et al., 2021; Roy and LeBlanc, 2021; Coleman, 2021; Mervosh, 2021; Abelson, 2021).

The US Equal Employment Opportunity Commission has issued guidance that employer-based vaccination mandates are legal, (U.S.

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Equal Employment Opportunity Commission, 2021) and mandates have received support in recent months from courts and health professional associations, especially after the vaccines received full regulatory approval. (District, et al., 1774; Liptak, 2021; Anthes, 2021; Parasidis, 2022) In June 2021, for example, a federal district court judge dismissed a case challenging Houston Methodist Hospital's requirement that all employees be vaccinated, stating that an employee would "simply need to work somewhere else" if they chose not to be vaccinated. (District, et al., 1774) In late July 2021, the American Medical Association and the American Nurses Association, along with more than 50 other medical organizations, issued a statement calling for mandatory Covid-19 vaccination for health care workers, (Anthes, 2021) and in January 2022, the US Supreme Court allowed a rule issued by the Centers for Medicare and Medicaid (CMS) and the Department of Health and Human Services (DHS) mandating Covid-19 vaccination for all health care providers that participate in Medicare or Medicaid programs. (Parasidis, 2022; Musumeci, 2021) Though not without some ethical and political controversy, (Gostin, 2015; Gostin et al., 2021; Galanakis et al., 2013; Omer et al., 2019; Senate, 2022) vaccine mandates for health care workers are now commonplace and their use will likely increase as the deadline for compliance with the CMS rule arrives for all states this spring. (Parasidis, 2022).

Vaccine mandates for health care workers are a promising strategy to encourage vaccination and to overcome vaccine hesitancy, but only to the extent that health care workers accept them. While previous research has assessed Covid-19 vaccine hesitancy among PCPs, little is known about their support for mandates. To better understand the perspective of these important stakeholders, we surveyed 1,047 PCPs about their support for mandates and their perceived risk of getting and transmitting Covid-19 at work. We then sought to identify correlates of support for Covid-19 vaccine mandates specifically for health care workers, including whether PCPs' clinics' policies of incentives, recommendations, or mandates are associated with PCPs' support for vaccine mandates. This study seeks to understand the acceptability of vaccine mandates for health care workers and to identify contexts in which mandates may have more support.

2. Methods

2.1. Participants and procedures

Participants were US PCPs who were members of a standing national panel maintained by a survey research company. Our study was part of a larger survey about adolescent vaccines during the pandemic, to which we added items about Covid-19 vaccination. PCPs were eligible for the survey if they: 1) were US primary care physicians or other PCPs (i.e., nurse practitioners, physician assistants, and nurses); and 2) provided vaccines to adolescents ages 11–17. Upon recruitment, physicians provided licensure information to verify their identities. Residents of Vermont were excluded from the panel in compliance with state policies governing PCPs.

In February and March 2021, the survey company emailed invitations to panel members and up to two reminder emails. We received completed surveys from 1,055 panel members, yielding a response rate of 61% among physicians and 41% among non-physicians (calculated using AAPOR Response Rate 4). (American Association of Public Opinion Research, 2002) We excluded eight PCPs who indicated that they saw no adolescent patients in a typical week, resulting in a final sample size of 1,047 PCPs. All PCPs provided informed consent to participate in the study. Depending on local market rates, PCPs received from \$15 to \$80 for their participation. The University of North Carolina Institutional Review Board approved the study protocol.

3. Measures

The vaccine mandate survey items began with an introductory

statement: "Assume that [Covid-19] vaccines have received routine FDA approval, are free, and can be easily obtained by most people." A closed-ended item assessed support for Covid-19 vaccine mandates by essential worker type: "Which of these workers should be required to get a Covid-19 vaccine? (Check all that apply.)" Response options were health care workers, first responders, nursing home workers, daycare workers, K-12 teachers, restaurant workers, and "none of these." Two subsequent items assessed Covid-19 risk perceptions by asking respondents to select which group of workers was at highest risk of getting and which group was at highest risk of transmitting Covid-19 at work, using the same pre-specified lists of six worker types. We asked whether PCPs' clinics or systems required them to get the Covid-19 vaccine, if their clinic recommended they get the Covid-19 vaccine, or if their clinic did not have a Covid-19 vaccine policy. Lastly, we asked if PCPs were offered any incentive for getting a Covid-19 vaccine. Seven close-ended options included: paid time off; a gift card; a cash or bonus payment; a small nonmonetary gift; public recognition; something else; or nothing; we combined responses into a single binary measure of any incentive.

We assessed PCPs' demographic and professional characteristics, including training (physician or other PCP), number of years in practice, if they had been vaccinated against Covid-19 (receipt of at least one dose), gender identity, (Cheloff et al., xxxx) and race. Additionally, the survey assessed characteristics of clinics where PCPs worked, including rurality of the area that clinic served; US census region of the clinic; practice type (group, hospital/academic institution, solo, other); whether their clinic was part of a system or network; and the extent of financial strain the clinic experienced due to the Covid-19 pandemic (Table 1). The full survey instrument is available online at <https://noelbrewer.web.unc.edu/wp-content/uploads/sites/16987/2021/09/UNC-Physician-Survey-2021-2.pdf>.

3.1. Statistical analysis

We calculated PCPs' perception of the risk of getting and transmitting Covid-19 at work by worker type and assessed the association of perceived risks of getting and transmitting Covid-19 at work with support for vaccine mandates by worker type using Pearson's Chi-square and Fisher's Exact tests. As health care workers were perceived to be most at risk for getting Covid-19 and the majority of respondents supported vaccine mandates for health care workers, we next conducted regression analyses to identify correlates of PCPs' support for Covid-19 vaccine mandates for health care workers (yes vs. no). We first used bivariate logistic regression to identify correlates of support for Covid-19 vaccine mandates, using demographic and Covid-19 vaccine-related survey items. We included a variable for the perceived risk of health care workers getting Covid-19 at work, defined as a binary variable. We then used a multivariable logit model to estimate the average marginal effects of correlates of support for Covid-19 vaccine mandates. Marginal effects yield predicted probabilities, interpreted in our model as comparative likelihood of vaccine mandate support for health care workers measured in percentage points. We identified covariates to include in the final multivariable logit model based on significance in the bivariate logistic regression results, examination of pairwise correlations to avoid collinearity, testing of interaction terms, and results of model fit testing. We excluded perceived risk of transmission of Covid-19 at work because of high correlation with the risk of getting Covid-19 at work measure. We ran all models using robust Delta-method standard errors and reported average marginal effects. We conducted all statistical analyses using STATA 16.1 (College Station, Texas, USA).

4.

Our sample of PCPs included 747 physicians (71%) and 300 nurses and advanced practice providers (29%). PCPs identified as white (68%), Asian (16%), Black (4%), and other races (11%, including 8% who indicated "prefer not to say"). Half of the sample practiced in suburban

Table 1
Primary care professional (PCP) sample characteristics (n = 1,047).

| Respondent characteristic | n | (%) |
|--|-----|------|
| Training | | |
| Physician | 747 | (71) |
| Other PCP ^a | 300 | (29) |
| Years in practice | | |
| 0–9 | 252 | (24) |
| 10–19 | 395 | (38) |
| ≥20 | 400 | (38) |
| Gender | | |
| Woman | 515 | (49) |
| Man | 492 | (47) |
| Other ^b | 40 | (4) |
| Race/Ethnicity | | |
| White | 717 | (68) |
| Asian | 170 | (16) |
| Black | 41 | (4) |
| Other | 119 | (11) |
| Vaccination behavior | | |
| At least 1 dose | 908 | (87) |
| No doses | 139 | (13) |
| Clinic characteristic | | |
| Rurality | | |
| Suburban | 525 | (50) |
| Urban | 363 | (35) |
| Rural | 159 | (15) |
| Region | | |
| South | 333 | (32) |
| Northeast | 265 | (25) |
| Midwest | 247 | (24) |
| West | 202 | (19) |
| Practice type | | |
| Group | 569 | (54) |
| Hospital/academic institution | 254 | (24) |
| Solo | 127 | (12) |
| Other ^c | 97 | (9) |
| Part of healthcare system/network | | |
| No | 457 | (44) |
| Yes | 590 | (56) |
| Financial strain from Covid-19 pandemic | | |
| None or a little | 360 | (34) |
| Moderate | 489 | (47) |
| A lot | 198 | (19) |
| Clinic Covid-19 vaccination policy | | |
| None | 149 | (14) |
| Clinic recommended Covid-19 vaccination for PCPs | 823 | (79) |
| Clinic required Covid-19 vaccination for PCPs | 75 | (7) |
| Clinic offered PCP an incentive for getting a Covid-19 vaccine | | |
| No | 949 | (91) |
| Yes | 98 | (9) |

^a Includes nurses, nurse practitioners and physician assistants.

^b Includes neither woman nor man, prefer to self-describe, and prefer not to say.

^c Includes Federally Qualified Health Centers, and state, local, community, public health, and non-profit clinics.

areas (50%), while about one-third practiced in urban (35%), and 15% practiced in rural areas. Most PCPs practiced in group practice settings (54%) and as part of a system or network (56%). Nearly 20% of PCPs responded that their clinic had experienced “a lot” of financial strain from the Covid-19 pandemic. At the time of our study, few PCPs (7%) said that their clinics required them to receive a Covid-19 vaccine, but 79% said that their clinic recommended it. Only 9% of PCPs reported that their clinic offered an incentive for getting Covid-19 vaccine (Table 1). The most common incentive was paid time off (3%). Other incentives included public recognition (2%), a cash bonus or payment (1%), a small nonmonetary gift (1%), a gift card (1%), or something else (1%) (not shown). The majority (87%) of our sample had received at least one dose of any Covid-19 vaccine (Table 1).

4.1. Support for vaccine mandates and perceived Covid-19 risk

Support for Covid-19 vaccine mandates was highest for health care and nursing home workers (both 83%). Support for mandates was also high for first responders (81%), teachers and daycare workers (71%), and restaurant workers (58%) (Fig. 1). About 13% of PCPs did not support mandates for any of the listed worker types.

Most respondents (60%) identified health care workers as being at highest risk of getting Covid-19 at work. Less commonly identified as being at highest infection risk were first responders (16%), followed by nursing home workers (13%), teachers (K-12, 4%), restaurant workers (4%), and daycare workers (2%). The groups with the highest perceived risk of transmitting Covid-19 at work were nursing home workers (37%) and health care workers (26%). Other groups with the highest perceived risk of transmitting Covid-19 were restaurant workers (17%), teachers (7%), daycare workers (6%), and first responders (5%). Higher perceived risk of getting and transmitting Covid-19 at work was associated with higher support for vaccine mandates (both $p < 0.01$, Appendix Table A1).

4.2. Correlates of support for Covid-19 vaccine mandates for health care workers

PCPs practicing in clinics that recommended the Covid-19 vaccine were more likely to support vaccine mandates; the marginal effect of 0.197 indicates that those PCPs were 19.7 percentage points ($p < 0.000$) more likely to support mandates compared to PCPs practicing in clinics that did not recommend or require the vaccine. PCPs practicing in clinics that required the Covid-19 vaccine were also more likely to support mandates (11.2 percentage points, $p = 0.003$) compared to PCPs practicing in clinics that did not recommend or require the vaccine. However, PCPs practicing in clinics that offered an incentive for the Covid-19 vaccines were less likely to support vaccine mandates (10.0 percentage points, $p = 0.028$), compared to PCPs practicing in clinics that did not offer vaccine incentives (Table 2).

PCPs who perceived health care workers to be at highest risk of getting Covid-19 at work were more likely to support vaccine mandates compared to PCPs who thought other professions were at highest risk (7.8 percentage points, $p = 0.001$). Physicians were 6.5 percentage points more likely ($p = 0.012$) to support vaccine mandates for health care workers compared to other PCPs. Compared to PCPs with <10 years of practice, PCPs with 20 or more years in practice were more likely to support vaccine mandates (8.6 percentage points, $p = 0.004$), though there was no difference between PCPs with 10–19 years of practice and PCPs with <10 years of practice. PCPs who identified as Asian were more likely to support mandates than PCPs who identified as white (7.4 percentage points, $p = 0.007$). Compared to practicing in an urban area, PCPs practicing in suburban and rural areas were less likely to support vaccine mandates (5.4 percentage points, $p = 0.022$, and 12.4 percentage points, $p = 0.001$, respectively). Compared to PCPs practicing in the Northeast, PCPs practicing in all other regions were less likely to support vaccine mandates. The difference was most notable among PCPs in the South, where PCPs were 8.5 percentage points ($p = 0.003$) less likely to support vaccine mandates than those in the Northeast (Table 2).

In bivariate analyses, we found that practice type, network affiliation, and financial strain were not associated with support for vaccine mandates and thus were not included in our multivariable model. Although gender was a statistically significant predictor in the bivariate analyses, we excluded it from the multivariable logit model because of strong correlation with the training measure and model fit testing (Table 2).

5. Discussion

In a survey of over 1,000 US PCPs, the overwhelming majority supported Covid-19 vaccine mandates for health care workers. We found

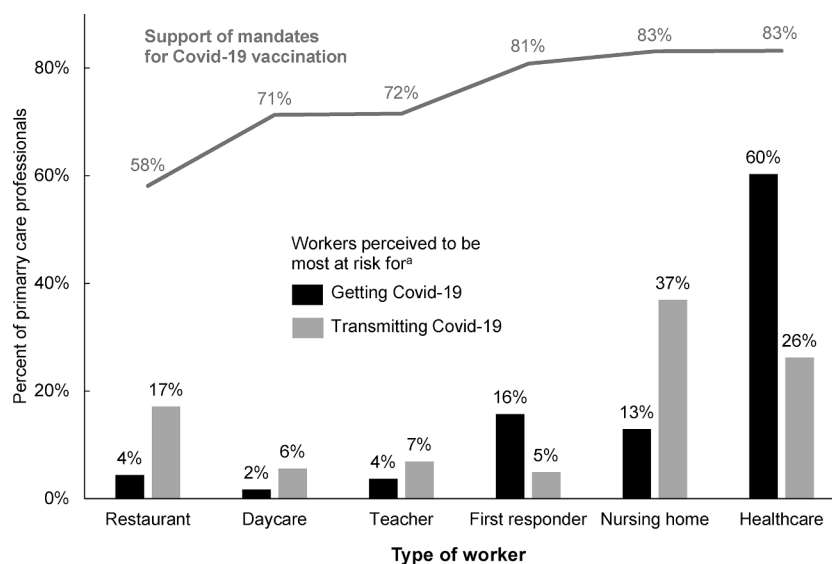


Fig. 1. Support of Covid-19 vaccine mandates for workers and perceived risk of their getting and transmitting the disease ^aPercentages do not add to 100% due to respondents selecting “none of these” for getting Covid-19 ($n = 14$, 1.34%) and transmitting Covid-19 ($n = 26$, 2.48%), not shown.

that perceived risk of getting Covid-19 at work was associated with support for vaccine mandates across essential worker types, and PCPs perceived health care to be most at risk of getting Covid-19 at work. We found that clinic recommendations for Covid-19 vaccination and existing mandates were positively associated with support for mandates, but incentives were negatively associated with support for mandates. Other covariates, including rurality, years of practice, and physician training, were also associated with support for vaccine mandates for health care workers.

We found that PCPs perceived themselves at high risk and were willing to support a policy of Covid-19 vaccine mandates for all health care workers, not just individual vaccine uptake. Prior research has found a positive association between perceived risk of disease and vaccine uptake. (Brewer et al., 2004; O'Connor et al., 1999) This study extends that literature, finding that PCPs who perceived themselves to be at high risk of Covid-19 are also more likely to support a vaccine mandate policy for health care workers. Research has found similar provider support for influenza vaccine mandate policies for health care workers. (deSante et al., 2010).

PCPs working in clinics that already mandated or recommended vaccination were more likely to support vaccine mandates, indicating that exposure to a policy (Hall et al., 2018) may also lead to greater support for a policy. In one recent study, exposure to a policy led to an increase in perceived effectiveness, which in turn was associated with greater support for that policy. (Hall et al., 2018) Other research has described a positive association between perceived effectiveness of a policy and policy support. (Sunstein, 2016) PCPs working in clinics with vaccine mandates are exposed to mandates, may perceive that mandates are effective, and, as we found, are more likely to support vaccine mandate policies as compared to PCPs in clinics not requiring vaccination. Perceived effectiveness may also explain our inverse finding about vaccine incentive policies: working in a clinic that offered vaccine incentives was associated with lower support for vaccine mandates for health care workers. If incentives are perceived to be effective, PCPs may not believe that mandates are necessary to encourage vaccination and may thus prefer a less restrictive policy. A preference for a less intrusive alternative to mandates, or for the proverbial carrot to the stick, makes sense, especially if less intrusive policies are perceived to be effective. (Sunstein, 2016; Diepeveen et al., 2013; Evers et al., 2018) Employers planning to mandate vaccinations may want to emphasize the effectiveness of mandates in efforts to increase employee support. Incentive policies to encourage Covid-19 vaccination are widely popular among

employers and governments who may not be willing to impose mandates, (Hamel et al., 2021; Roy and LeBlanc, 2021; Coleman, 2021) and research has demonstrated that incentives are effective in promoting vaccination. (Community Preventive Services Task Force, 2019; Brewer et al., 2017) However, less restrictive clinic policies that fall short of a mandate, such as incentives and recommendations, may not be as effective at quickly achieving high vaccination coverage. (Lawler, 2017; Volpp and Cannuscio, 2021; Schumacher et al., 2021) And in the health care context, high vaccination coverage is critical to protect health care workers and their patients, and to preserve the health care workforce needed during a pandemic.

Several other clinic-level and individual-level characteristics were associated with support for vaccine mandates for health care workers. Our finding that physicians were more likely to support vaccine mandates than other PCPs is consistent with previous research noting that nurses were more hesitant than physicians about getting the Covid-19 vaccine. (Biswas et al., 2021; Gadoth et al., 2021) Similarly, our findings related to rurality and region mirror trends of Covid-19 vaccine hesitancy across the US. (Hamel et al., 2021; Biswas et al., 2021; Gadoth et al., 2021) Employers in regions where PCPs are less likely to support mandates, for example, in rural communities or in the South, may choose incentives to encourage vaccinations rather than mandates to limit opposition or to avoid anti-vaccine sentiment. (Omer et al., 2019) Multifaceted vaccination campaigns, using vaccine incentives combined with recommendations and education, have been shown to increase coverage of the influenza vaccine in the health care context, but these campaigns did not reach the same coverage levels as vaccine mandates. (Schumacher et al., 2021).

Strengths of this work include a nationwide sample of PCPs, which offers insight into support for vaccine mandates from health care workers themselves. However, our sample was limited to PCPs providing care to adolescents, as this research was part of a larger survey assessing routine adolescent vaccinations in the Covid-19 pandemic; support for mandates may vary across different provider specialties. Although the survey had a high response rate, we do not have information about non-respondents, and acknowledge that PCPs who did not respond may have been more or less supportive of vaccine mandates than those who did respond. It is also possible that PCPs opposed to vaccination may have been fired or quit their jobs and may not be included in the sample, but this is unlikely as mandates were not often being enforced at the time of this survey in March 2021. And while we believe that the introductory statement included in the survey was

Table 2
Correlates of support for Covid-19 vaccine mandates for health care workers.

| | No. of PCPs ^a who supported Covid-19 vaccine mandates/ total in category | (%) | Bivariate Marginaleffect | (Std. error) | Multivariable Adjusted marginal effect | (Std. error) |
|---|---|------|-----------------------------|--------------|---|--------------|
| Clinic vaccine policy | | | | | | |
| None | 108/149 | (72) | referent | referent | | |
| Clinic recommended the Covid-19 vaccine | 693/823 | (84) | 0.117** | (0.039) | 0.112** | (0.037) |
| Clinic required the Covid-19 vaccine | 70/75 | (93) | 0.209** | (0.047) | 0.197** | (0.046) |
| Clinic offered incentive for the Covid-19 vaccine | | | | | | |
| No | 798/949 | (84) | referent | referent | | |
| Yes | 73/98 | (74) | -0.096* | (0.046) | -0.100* | (0.045) |
| Type of worker perceived at highest risk of getting Covid-19^b | | | | | | |
| Other | 323/416 | (78) | referent | referent | | |
| Health care workers | 548/631 | (87) | 0.092** | (0.024) | 0.078** | (0.023) |
| Training | | | | | | |
| Other PCP ^c | 230/300 | (77) | referent | referent | | |
| Physician | 641/747 | (86) | -0.091** | (0.028) | 0.065* | (0.026) |
| Years of practice | | | | | | |
| 0-9 | 205/252 | (81) | referent | referent | | |
| 11-19 | 314/395 | (79) | -0.019 | (0.032) | 0.006 | (0.032) |
| ≥20 | 352/400 | (88) | 0.067* | (0.029) | 0.086** | (0.030) |
| Gender | | | | | | |
| Woman | 421/515 | (82) | referent | referent | - | - |
| Man | 426/492 | (86) | 0.048* | (0.023) | - | - |
| Other ^d | 24/40 | (60) | -0.217** | (0.079) | - | - |
| Race/Ethnicity | | | | | | |
| White | 596/717 | (83) | referent | referent | | |
| Black | 33/41 | (80) | -0.026 | (0.063) | -0.040 | (0.070) |
| Asian | 155/170 | (91) | 0.081** | (0.026) | 0.074** | (0.027) |
| Other | 87/119 | (73) | -0.100* | (0.043) | -0.101* | (0.042) |
| Rurality | | | | | | |
| Urban | 319/363 | (88) | referent | referent | | |
| Suburban | 435/525 | (83) | -0.050* | (0.024) | -0.054* | (0.024) |
| Rural | 117/159 | (74) | -0.143** | (0.039) | -0.124** | (0.037) |
| Region | | | | | | |
| Northeast | 238/265 | (90) | referent | referent | | |
| Midwest | 201/247 | (81) | -0.084** | (0.031) | -0.076* | (0.030) |
| South | 264/333 | (79) | -0.105** | (0.029) | -0.085** | (0.029) |
| West | 168/202 | (83) | -0.066* | (0.032) | -0.065* | (0.033) |
| Practice type | | | | | | |
| Solo | 105/127 | (83) | referent | referent | | |
| Group | 470/569 | (83) | -0.001 | (0.037) | - | - |
| Hospital/academic institution | 211/254 | (83) | 0.004 | (0.041) | - | - |
| Other ^e | 85/97 | (88) | 0.050 | (0.047) | - | - |
| Part of healthcare system or network | | | | | | |
| No | 384/457 | (84) | referent | referent | | |
| Yes | 487/590 | (83) | -0.015 | (0.023) | - | - |
| Financial strain from Covid-19 pandemic | | | | | | |
| None or a little | 293/360 | (81) | referent | referent | | |
| Moderate | 406/489 | (83) | 0.016 | (0.027) | - | - |
| A lot | 172/198 | (87) | 0.055 | (0.032) | - | - |

Note. Marginal effect and adjusted marginal effects are average marginal effects. Std. errors = robust Delta-method standard errors. Dashes (-) indicate the variable was not included in the multivariable model.

* $p < 0.05$; ** $p < 0.01$; see text for actual p-values.

^a PCP = Primary care professional.

^b 1 if PCPs felt health care workers were at highest risk, 0 if PCPs felt that other or none of the listed professions were at highest risk.

^c Includes nurses, nurse practitioners and physician assistants.

^d Includes neither woman nor man, prefer to self-describe, and prefer not to say.

^e Includes Federally Qualified Health Centers, and state, local, community, public health, and non-profit clinics.

sufficient to encourage respondents to incorporate assumptions about FDA approval and availability of vaccines, we did not test these assumptions as separate survey items, and are unable to comment specifically on the impact of FDA approval and vaccine availability on support for vaccine mandates. We note that the survey was completed in early spring of 2021; by spring of 2022, vaccine mandates for health care workers have become increasingly common, potentially further strengthening support among PCPs. Additionally, our survey addressed some but likely not all relevant variables associated with PCPs' views on Covid-19 vaccine mandates for health care workers. Because of this

limitation and the cross-sectional study design, we frame our findings as associations rather than causal effects.

6. Conclusions

This research presents important findings about PCPs' perspectives on Covid-19 vaccine mandates as well as individual and clinical characteristics that influence their support for mandates – an increasingly used policy in the health care field. We found that PCPs generally supported Covid-19 vaccine mandates for health care workers and that

perceived risk of getting Covid-19 at work is associated with support for vaccine mandates. Working in a clinic that already mandated vaccination may elicit higher support for mandates, but working in a clinic that incentivizes vaccines may lower support for vaccine mandates and make mandates seem less necessary; future study should investigate potential unintended consequences of vaccine incentives. Vaccine mandates for health care workers in the US will likely become more prevalent and expand beyond employers that participate in federal programs, and exposure to mandates through clinic policies may increase support for their use.

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CRedit authorship contribution statement

Brigid K. Grabert: Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Melissa B. Gilkey:** Conceptualization, Methodology, Visualization, Writing – review & editing. **Qian Huang:** Data curation, Validation, Writing – review & editing. **Wei Yi Kong:** Validation, Writing – review & editing. **Peyton Thompson:** Conceptualization, Methodology, Writing – review & editing. **Noel T. Brewer:** Conceptualization, Methodology, Visualization, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pmedr.2022.101849>.

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