Strategies to Address COVID-19 Vaccine Hesitancy Among Ohio Nursing Home Staff

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Abstract

Background and Objectives: Despite federal legislation requiring nursing home (NH) staff members to be vaccinated against COVID-19, unvaccinated staff pose an ongoing public health risk. The research question guiding this study is as follows: What is the relationship between strategies to address vaccine hesitancy and vaccination rates among staff? We used the Diffusion of Innovation (DOI) theory as a theoretical framework.

Research Design and Methods: The sample (*N*=627) included Ohio-based NHs. Using national and state NH data, multivariable linear regression techniques demonstrated the relationship between strategies to address vaccine hesitancy and vaccination rates among NH staff.

Results: Peer counseling and providing sick time or time off for vaccine symptoms were both statistically significant strategies. Compared to facilities that did not engage in peer counseling, those that did saw an average increase of 3.2% of their staff vaccinated. Those that provided sick time or time off saw an average increase of 3.9% of their staff vaccinated. There was no statistically significant relationship between hiring full- or part-time facility infection preventionists and vaccination rates.

Discussion and Implications: In order to foster vaccine confidence among long-term services staff, peer counseling and providing sick time or time off are examples of strategies that can impact vaccination rates among staff. According to DOI, these strategies target the communication channels and social system of an organization. While this study focuses on

NHs, results remain critically important to the remainder of the long-term services system, which does not have vaccine requirements similar to the NH industry.

Key words: COVID-19; Vaccination; Nursing home staff; Long-term services workers; Vaccine hesitancy

Older people with disability, particularly nursing home (NH) residents, are especially vulnerable to the novel coronavirus disease (COVID-19; D'Adamo et al., 2020). Although other preventive public health behaviors such as mask wearing and social distancing are effective in curbing the spread of COVID-19 (World Health Organization, 2020), widespread vaccination is still imperative to maintain long-term control of the virus (Kwok et al., 2021). In the NH setting, this means that not only residents themselves should be vaccinated, but also the staff that care for them.

The success of a vaccination effort is contingent on gaining acceptance, trust, and confidence among its intended population (Kwok et al., 2021). Unfortunately, there has been considerable hesitancy surrounding the COVID-19 vaccine that has dampened nationwide vaccination rates (Coustasse et al., 2020; Tyson et al., 2020; Zitner, 2020). Vaccine hesitancy refers to "the reluctance or unwillingness to be vaccinated or have one's children vaccinated against a disease, even if proven safe and effective" (Coustasse et al., 2020, p. 72). Since COVID-19 vaccines have become available to the U.S. general public, there has been a sizable portion of the population that have reported they either do not plan to or are unsure about being vaccinated (Thigpen & Funk, 2020). Such hesitancy is problematic because unvaccinated individuals are far more likely to contract and spread the virus to others (Zitner, 2020), posing an ongoing risk to themselves and those around them.

Reasons for COVID-19 vaccine hesitancy include a range of factors. Given the novelty of the virus, some worry about the associated unknown effects, while others hold a more general mistrust in science and public health experts (Funk et al., 2020). The vaccine's rapid development and production has also led some individuals to question its safety and efficacy (Tyson et al., 2020). Additionally, there is evidence that the constant politicization of the pandemic may cause individuals to detach from the crisis and therefore underestimate the severity of COVID-19 (Hall Jamieson & Albarracin, 2020; Tyson et al., 2020).

Vaccine hesitancy is quite detrimental to health care professionals, as they are more likely to be exposed to vulnerable populations (Kose et al., 2020) and widespread infection among this population could potentially reduce the available healthcare workforce (Kwok et al., 2021). In a study examining COVID-19 vaccine hesitancy among US medical students, Lucia and colleagues (2020) found 53% of participants were unwilling to participate in a vaccine trial and 23% were unwilling to get vaccinated even post-FDA approval. Furthermore, Kwok and colleagues (2020) identified several reasons behind vaccine hesitancy as cited by hospital health care workers, including potential side effects, trusting their own immune system, not trusting the vaccine, and being unafraid of getting sick. While these studies have shed light on the nuances of vaccine hesitancy among some subsects of health care professionals, no research has focused specifically on NH staff in the US.

In order to address vaccine hesitancy and foster vaccine confidence effectively among NH staff, evidence-based health communication strategies are necessary. Considering the importance of widespread COVID-19 vaccine uptake, research has begun to focus on identifying effective strategies to address vaccine hesitancy. Empirical data suggests it is possible to build vaccine trust among undecided individuals with effective strategies (Jarret et al., 2015). Although the success of strategies can vary based on the degree and source of hesitancy (Sonawane et al., 2021), a systematic review by Jarret and colleagues (2015) found the most effective strategies were those that met the following criteria: targeted unvaccinated and under-vaccinated populations, designed to increase vaccination knowledge and awareness, improved convenience and access to the vaccination, mandated vaccinations or sanctioned against non-vaccination, and engaged influential leaders to promote vaccination.

Less research has been conducted on what organizations or communities can do to encourage vaccination among their staff, apart from vaccination mandates (Emanuel & Skorton, 2021). In the time period after data were collected for this study, CMS passed the

ruling Omnibus COVID-19 Health Care Staff Vaccination that stated all staff must be fully vaccinated by March 15, 2022, enforced by surveyor guidance (CMS, 2021b). Although facilities that failed to meet 100% vaccination rates were subject to enforcement actions such as civil monetary penalties, denial of payment, or termination, many staff are still not vaccinated (CMS, 2021a; AARP, 2022). For example, even by July 2022 78% of Ohio's direct care staff were fully vaccinated and less than 35% had received at least one booster (AARP, 2022).

In addition to mandates, there are less stringent approaches employers can take to encourage their employees to get vaccinated. Education is a heavily explored key component of successful strategies to reduce vaccine hesitancy, as proper education can help counteract the efforts of circulating misinformation and conspiracy theories (Chou & Budenz, 2020). Although education alone is generally not sufficient to incite lasting change (Finney Rutten et al., 2021), promoting education in conjunction with other strategies could be a primary objective of organizational efforts. Little research has been conducted on specific strategies in the context of the COVID-19 vaccine. Other strategies that may effectively translate to organizational-level vaccine hesitancy include peer counseling, leading by example, and permitting vaccination during work hours. According to the Institute for Healthcare Improvement, the most effective strategy to address vaccine hesitancy is through conversations with trusted peers (Balik et al., 2021). By utilizing these motivating strategies, employers may be able to encourage vaccination among staff, while still keeping employer trust and privacy intact.

Present Study

To best encourage vaccination among NH staff, it is imperative to understand what strategies are effective at reducing vaccine hesitancy and therefore improving vaccine uptake among this population. While there is some documented research on strategies to reduce vaccine hesitancy, no research has been conducted on NH staff specifically. To address this gap, the present study will use a dataset composed from three data sources of Ohio NHs to uncover the extent to which participation in strategies to address vaccine hesitancy affect vaccination rates among staff. The research question guiding this study are as follows: What is the relationship between engaging in various strategies to address vaccine hesitancy and vaccination rates among staff? We hypothesized that compared to facilities that do not engage in strategies to reduce vaccine hesitancy, those that do will exhibit higher rates of staff vaccination.

Theoretical Framework

The present study is rooted in the Diffusion of Innovation (DOI) theory. The DOI is widely used to assist in understanding the adoption of an innovative behavior (Rogers, 2003), such as receiving a new vaccine. Reactions to any innovation vary across the spectrum, with Rogers categorizing individuals as innovators, early adopters, the early majority, the late majority, and laggards. In the context of the COVID-19 vaccine, this means that while some individuals signed-up to receive the vaccine quickly once they were eligible, others waited or even resisted the vaccine (Rogers, 2003). Vaccination as a practice has existed for centuries (Plotkin, 2014) and has also commonly evoked opposition (Porter & Porter, 1988). However, public opinion on the COVID-19 vaccine has been warped by the politicization and misinformation spread throughout mass media (Bolsen & Palm, 2022; Sorrell & Butler, 2022), setting it apart from previous vaccination uptake efforts. DOI theory has recently been

applied to understand the uptake of the COVID-19 vaccine (Mo et al., 2021); however, not in the context of NH staff in the United States.

There are four aspects that explain the uptake of an innovation: attributes of the innovation, characteristics of the adopters, communication channel, and the social system (Rogers, 2003). While it is beyond the scope of the present study to evaluate the attributes of the innovation (i.e., the COVID-19 vaccine) and characteristics of the adopters (i.e., individual NH staff members), the present study uses variables aligned with the latter two factors of the DOI (i.e., communication channel and social system) to understand if engaging in various strategies to reduce vaccine hesitancy have an impact on vaccination uptake among NH staff. Communication channels refer to the medium through which individuals obtain information about the innovative behavior and perceive its usefulness (Mo et al., 2021). Intentionally providing education to staff constitutes a communication channel, be it informal such as conversations with peers or more formal training or education opportunities. Depending on the perceived value of that education, it may have an impact on staff vaccination. With their specialized knowledge of infectious disease processes, surveillance and epidemiologic investigations, and preventing and controlling the transmission of infection agents (Gilmartin et al., 2021), infection preventionists offer an education to NH staff that constitutes as a change to the communication channel in which staff typically received information.

The social system refers to the structure of the environment that might affect the individual's attitudes towards innovation (Rogers, 2003). Participating in strategies to reduce vaccine hesitancy such as providing sick time off for the vaccine's symptoms or incentivizing the vaccine with bonuses or gifts constitute important social system characteristics. In order to best understand what organizations can do to foster vaccine confidence among their team, it is valuable to know what changes to the social system would be most effective. Further,

considering the potential influence on individual attitudes towards the innovation, hiring infection preventionists can also act as a change to the social system. Many NHs are looking to expand their organization's social system by hiring part- or full-time infection preventionists (Reese et al., 2021); therefore, it is important to understand what effect this has on staff vaccination rates.

While infection preventionists have been around before COVID, a new addition to the social system of a NH is COVID-specific programs. For example, the Ohio Vaccine Maintenance Program was launched in February of 2021 in an attempt to help reduce vaccine hesitancy and encourage vaccination by supporting vaccine clinics for residents and staff (DAS, 2021). By participating in this program, facilities gain access to an online portal to monitor the schedule of vaccination clinics and the availability of vaccine doses in real time, to ensure staff and residents have continuous access to vaccination. Programs such as this may be crucial in helping foster vaccine confidence among staff. To better understand this impact, participating in the Ohio Vaccine Maintenance Program will be assessed in the present study, along with several other community-level variables to best isolate the relationship between important aspects of the innovative behavior and the outcome of vaccination rates.

Methods

Data Sources

To uncover the relationship between NH facilities engaging in various strategies to address vaccine hesitancy and the vaccination rates among staff, a dataset composed of the following three sources was used: the 2019 (Wave 14) Biennial Survey of Long-Term Care Facilities (Biennial Survey), the 2021 Centers for Medicare and Medicaid Services (CMS) provider data, and the Washington, Wyoming, Alaska, Montana, Idaho (WWAMI) Rural

Health Research Center (RHRC) Rural-Urban Commuting Area (RUCA) data (Rural Health Research Center). Ethics approval for this secondary data analysis was granted from (*Blinded for review) University Institutional Review Board.

The Biennial Survey is required for Ohio NHs to complete every other year, according to the 2008 Ohio law (173.44 of Ohio Revised Code). The Biennial Survey is required for both skilled nursing facilities (SNF) and residential care facilities (RCF), but the present study focuses solely on the SNF population. Although the Biennial Survey is completed by a NH administrator or other management personnel, the questions relate to the facility as a whole, including broad categories such as reimbursement rates, payment sources, facility services, staffing, and quality (Applebaum et al., 2020). The 2019 Biennial Survey was initially sent out to 964 NHs in early 2021 and data collection continued through September 2021 due to COVID-related delays. Given this retrospective method for data collection, several questions pertaining to the COVID-19 pandemic and impact on NHs were added. The final response rate was 70%.

Similarly, the Centers for Medicare and Medicaid Services (CMS) collect general facility-level data on active licensed Medicare and Medicaid NHs across the county, including number of certified beds, ownership status, staffing, and quality measure scores (CMS, 2021a). Finally, the WWAMI rural-urban classification of Rural-Urban Commuting Area (RUCA) data designates all of the United States' Census tracts rural and urban status using standard Bureau of Census Urbanized Area, Urban Cluster definitions and work commuting information (Rural Health Research Center, 2020).

Measures

Dependent Variable

The outcome variable of interest is vaccination among Ohio nursing home staff, as indicated by the Biennial Survey question, "By March 15, 2021, please estimate what proportion of your staff was fully vaccinated? Please only include numbers, no percent signs or decimal points." Because the text field was locked to only accept numbers, not characters, respondents wrote in their estimation as a whole number.

Independent Variables

The primary variables of interest include strategies to address vaccine hesitancy and use of infection preventionists. First, strategies to address vaccine hesitancy are examined using the Biennial Survey question "How did you address any staff hesitancy about receiving the COVID-19 vaccine? Check all that apply." This question has the following response categories: Peer counseling, Being an example, Providing bonuses or gifts, Extra sick leave for side effect(s), and No action taken. Peer counseling may include communication in-person between coworkers during staff meetings, presentations, and information conversations as well as virtually over email, text messaging, or phone calls (NCIRD, 2021). Being an example may include administrators getting vaccinated themselves, being photographed while doing so, and/or otherwise documenting vaccination (Opitz & Gomez, 2021; NCIRD, 2021). This list of strategies was developed based on common reported practices at the time and reviewed for completeness and relevance by leadership at the Ohio Department of Aging and the Ohio long-term care professional associations. These strategies were not defined in the survey and therefore were left to the administrator's discretion for interpretation.

In February 2021, the Ohio Vaccine Maintenance Program was launched (Ohio Department of Administrative Services, 2021). The Biennial Survey asks providers if they participate in the Ohio Vaccine Maintenance Program with response categories of Yes and No. Finally, hiring infection preventionists are addressed. The Biennial Survey asked "Please identify the number of infection preventionists working full-time or part-time as of March 15th, 2021." A dummy variable was created to examine if there was a difference in staff vaccination rates when a facility hired a full- or part-time infection preventionist.

Control Variables

In order to best isolate the relationship between the independent variables and staff vaccination rates, several controls were used. While independent variables were chosen based on the DOI framework, control variable selection was guided by existing research that has identified factors important to quality and innovation in the NH setting (Baldwin et al., 2017; Chisholm et al., 2013; Tanuseputro et al., 2015). As a vaccination mandate put forth by a facility would drastically affect their vaccination rates, that relationship will be controlled for by including the Biennial Survey question "Do you require your staff to have a COVID-19 vaccination?" with response options of Yes and No. Resident vaccination rates will also be controlled for. The following facility-level characteristics will be controlled for using CMS data: facility bed size, number of residents, overall star rating (i.e., out of 5 stars), and ownership status. CMS includes data on for-profit, non-profit, and government-owned ownership status; however, due to the small number of government-owned facilities that category was combined with non-profit. Finally, the RUCA data will be used to control for geographic location (i.e., urban vs. rural).

Data Analysis

Data cleaning and analyses were performed using version 9.4 of the SAS System for Windows (SAS Institute Inc., 2013). The analytic sample consisted of NH providers in the state of Ohio who completed a Biennial Survey and filled out the questions related to COVID. Next, these data were merged with the CMS data by the common variable of Medicare ID Number, and subsequently merged with the RUCA data by the common variable of ZIP code. The RUCA classifications were re-coded from more specific designations of geographic location to dichotomize urban and rural locations. Because this study required data from all the Biennial Survey, CMS, and RUCA, facilities without data in all three sources were eliminated from the dataset, leaving a potential sample of *n*=676 out of a potential of *n*=964 NHs. Missing data was handled by using list-wise deletion, leaving an analytic sample of *N*=627 (65% of facilities). Multivariable linear regression techniques were used to assess all variables. Prior to model finalization, variance inflation factors (VIFs) were calculated to evaluate multicollinearity for all independent variables.

Results

Characteristics of the analytic sample (*N*=627) of NHs in the state of Ohio are shown in Table 1. The facility-level variables reported are ownership status, bed size, star rating, geographic location, if staff vaccination was required, and resident vaccination rates. The majority of NH respondents were for-profit (73.8%, *n*=463) and urban (71.6%, *n*=449) with an average bed size of 92.7(*SD*=39.0) and an average star rating of 3.2(*SD*=1.4) out of a possible 5 stars. The overwhelming majority of facilities did not require vaccinations for staff (90.8%, *n*=569) and had an average proportion of vaccinated residents of 75.7%(*SD*=18.8). Analytic sample results were compared to all NHs in the state as reported in the CMS CASPAR report (CMS, 2021). Overall, the samples were comparable, but the analytic

sample did have a higher proportion of not-for-profit facilities, (26% vs, 21%), and a slightly higher average number of licensed beds (93 vs. 91). The CMS five- star rating and the proportion of facilities classified as urban, were comparable.

<Table 1 about here>

The variables of interest for this study are reported in Table 2. Nearly all facilities engaged in at least one strategy to reduce vaccine hesitancy among staff (99.5%, *n*=624), with education (98.9%, *n*=620) being the most common and providing sick time or time off for vaccine symptoms (19.8%, *n*=124) being the least common. The majority did report participating in the Ohio Vaccine Maintenance Program (89.6%, *n*=562). Ohio regulations did require nursing facilities to have an infection preventionist. Eighty-two percent of facilities reported having at least one full-time infection preventionist on staff and 17% reported having at least one part-time infection preventionist on staff. The average proportion of vaccinated staff in March of 2021 was 45.4%(*SD*=18.8).

<Table 2 about here>

The results of the linear regression model are shown in Table 3. The model explains 24.7% of the variance in the outcome variable (multiple R=0.497) and the model overall was significant ($F [12, 607] = 16.57$, $p<0.0001$). Several individual variables were statistically significant with the dependent measure, the proportion of vaccinated staff. One of the strategies, staff education, to address vaccine hesitancy did not have an effect and was dropped in the final model.

Compared to for-profit NH, the non-profit NHs in the model had on average a 4.6% higher proportion of their staff vaccinated, holding all other variables constant (p=0.005). Compared to NHs in rural locations, those in urban geographic locations had on average a

3.9% higher proportion of vaccinated staff (p=0.011). Regarding star rating, with each additional increase in star rating from 1-5, the average proportion of vaccinated staff increased 2.4% (p<0.0001). Requiring staff vaccinations and rates of resident vaccination were also both highly statistically significant (p<0.0001). Compared to facilities that did not require vaccination for staff, those who did had on average 9.2% more of their staff vaccinated. As the rate of vaccinated residents increased by 1%, the rate of vaccinated staff also increased by 0.34%.

Two strategies to reduce vaccine hesitancy, peer counseling and providing sick time or time off for the vaccine/symptoms, were associated with staff vaccination rates. Compared to facilities that did not engage in peer counseling, those that did saw on average a 3.3% higher proportion of their staff vaccinated (p=0.019). Facilities that provided their staff with time off to receive a vaccination saw on average a 3.9% higher proportion of their staff vaccinated (p=0.027). Participating in the Ohio Vaccine Maintenance Program and having an infection preventionist (i.e., full- or part-time) did not yield statistically significant results.

<Table 3 about here>

Discussion

The present study explored the association between engaging in various strategies to address vaccine hesitancy and vaccination rates among staff. It was hypothesized that compared to facilities that do not engage in strategies to reduce vaccine hesitancy, those that do will exhibit higher rates of staff vaccination. Results partially supported this hypothesis and found that peer counseling and providing sick time or time off were both positively associated with significantly higher staff vaccination rates. Peer counseling could be

implemented as a way for NH administrators to not only bolster confidence among staff regarding vaccination, but also as a strategy for other innovation efforts. It is notable that less than 20% of administrators indicated their community provided time off or sick time for vaccination/symptoms, making it the least popular strategy of the five assessed. Providing time off may be an important way for administrators to express support to their staff and gain trust, not only regarding vaccination but other innovation efforts as well.

However, none of the other four (i.e., education, leading by example, providing bonuses or gifts) were significantly related to staff vaccination rates. As previous literature has detailed, education is important in reducing vaccine hesitancy but not sufficient to produce behavior change (Chou & Budenz, 2020). This may support Finney Rutten and colleagues' (2021) proposition that education alone is not enough to incite change; it is education in conjunction with other strategies that is most effective. Previous research identified influential leaders to promote vaccination as successful in improving vaccination among a population (Jarret et al., 2015); however, leading by example was not a significant strategy identified in this study. Similarly, providing bonuses/gifts alone did not have a significant effect in increasing staff vaccination rates.

Additionally, hiring full-time nor part-time infection preventionists in 2021 was not significantly associated with staff vaccination rates. In future research, perhaps specifying the roles of hired infection preventionists would yield more significant results. Similarly, as the chief purpose of the Ohio Vaccine Maintenance Program is to help reduce vaccine hesitancy and encourage vaccination by supporting vaccine clinics for residents and staff, it is surprising this was not statistically effective at improving staff vaccination.

Returning to the Diffusion of Innovation (DOI) theory, this study's focus on strategies to reduce vaccine hesitancy fit best within the framework of communication channels and the

social system (Rogers, 2003). Providing peer counseling, a change to the social system, could also constitute a communication channel because it is a mechanism used by communities to disseminate information about the vaccine and a characteristic of the social system, the findings indicate that both these factors of an innovation are important to individuals' uptake. However, applying the DOI theory to vaccination uptake is a relatively new area (Mo et al., 2021), more research is needed to fully explore this framework as potentially useful for explaining COVID-19 vaccination in various populations.

The findings of this study hold several implications for research, policy, and practice. First, due to constraints of the data used, future research in this area should focus on establishing causal relationships with longitudinal data in order to confidently claim the effectiveness of various strategies to reduce vaccine hesitancy. Randomized controlled trial methodology could be utilized to compare the effectiveness of various strategies to reduce vaccine hesitancy against control groups. Considering Ohio required NHs to hire at least one infection preventionist, future research would benefit from samples without a similar requirement in order to further explore the impact of infection preventionists. Future research may also benefit from exploring other strategies to reduce vaccine hesitancy that were not included in the present study, such as enacting a vaccination task force and collaborating with community leaders (Strully et al., 2021). Finally, considering the emergence of COVID-19 variants has impacted the protection against infection that the vaccination offers, future research may benefit from directing more efforts towards understanding how to maintain an available workforce in the NH setting rather than solely on improving vaccination uptake.

Regarding practice and policy, the significance of peer counseling indicates that long-term services providers should incorporate peer counseling as a strategy to address vaccine hesitancy and bolster vaccination of their staff. State- and federal-level policy makers may help these efforts by including a peer counseling component to existing continuing education

units (CEUs) and recertifications for LTSS workforce. Additionally, providing time off or sick time for vaccine symptoms may be an easy way for organizations to gain the trust of their employees.

Limitations

The sample included 65% of facilities in the state and while the profile was similar to the industry overall, vaccine outcomes could vary for missing facilities. Using cross-sectional data limits the study's ability to understand causal relationships. Additionally, it is important to emphasize the data was self-reported by NH administrators and the survey did not provide definitions of the strategies. This means some reports may be erroneous due to ambiguity or misinterpretation of the survey items. Namely, the strategy "Being an example" was intended to be indicative of administrators leading their staff by example and getting vaccinated themselves. Future research may explore the staff perspective to gain a more comprehensive assessment of the issue.

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Conflict of Interest

None.

Ethical Approval

Ethics approval was obtained from the Miami University Institutional Review Board (reference #04073e).

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The data and analytic methods used are available for replication. Public use data are available through the Scripps Gerontology Center, Miami University. The study was not pre-registered.

References

173.44 of Ohio Revised Code (2008). Survey of nursing homes and residential care facilities. *Ohio Legislative Service Commission.* https://codes.ohio.gov/ohio-revised-code/section-173.44

AARP. (2022). *AARP Nursing Home COVID-19 Dashboard*. https://www.aarp.org/ppi/issues/caregiving/info-2020/nursing-home-covid-dashboard.html

Applebaum, R., Nelson, M., Straker, J. K., Harrington, A. K., & Bowblis, J. R. (2019). Maybe you can go home again: Ohio's strategy to provide long-term services and supports for a growing older population. Scripps Gerontology Center. Miami University, Oxford, OH.

Baldwin, R., Chenoweth, L., dela Rama, M., & Wang, A. Y. (2017) Does size matter in aged care facilities? A literature review of the relationship between the number of facility beds and quality. *Health Care Management Review*, *42*(4), 315-327. https://doi.org/10.1097/HMR.0000000000000116

Balik, B., Hilton, K., & Isaac, T. (2021). *IHI Tool: Conversation Guide to Improve COVID-19 Vaccine Uptake.* Institute for HealthCare Improvement.

https://healthcentricadvisors.org/wp-content/uploads/Resource-IHITool_Conversation-Guide-to-Improve-COVID-19-Vaccine-Uptake.pdf

Bolsen, T., & Palm, R. (2022). Politicization and COVID-19 vaccine resistance in the U.S. *Progress in Molecular Biology and Translational Science, 188*(1), 81–100. https://doi.org/10.1016/bs.pmbts.2021.10.002

Centers for Medicare and Medicaid Services [CMS]. (2021a). *Provider Information.* https://data.cms.gov/provider-data/dataset/4pq5-n9py

Chisholm, L., Weech-Maldonado, R., Laberge, A., Lin, F.-C. & Hyer, K. (2013). Nursing home quality and financial performance: Does the racial composition of residents matter? *Health Services Research, 48*(6), 2060-2080. https://doi.org/10.1111/1475-6773.12079

CMS (2021a). Long-Term Care and Skilled Nursing Facility Attachment A QSO 22-07-ALL. https://www.cms.gov/files/document/qso-22-07-all-attachment-ltc.pdf

CMS (2021b). *Medicare and Medicaid Programs; Omnibus COVID-19 Health Care Staff Vaccination*. 42 CFR Parts 416, 418, 460, 482, 483, 484, 485, 486, 491, and 494 final rule. https://www.federalregister.gov/documents/2021/11/05/2021-23831/medicare-and-medicaid-programs-omnibus-covid-19-health-care-staff-vaccination

Chou, W-Y, S., & Budenz, A. (2020). Considering emotion in COVID-19 vaccine communication: Addressing vaccine hesitancy and fostering vaccine confidence. *Health Communication, 35*(14), 1718-1722. https://doi.org/10.1080/10410236.2020.1838096

Coustasse, A., Kimble, C., & Maxik, K. (2020). COVID-19 and vaccine hesitancy: A challenge the United States must overcome. *Journal of Ambulatory Care Management, 44*(1), 71-75. https://doi.org/10.1097/JAC.0000000000000360

D'Adamo, H., Yoshikawa, T., & Ouslander, J. G. (2020). Coronavirus disease 2019 in geriatrics and long-term care: The ABCDs of COVID-19. *Journal of the American Geriatrics Society, 68*(5), 912–917. https://doi.org/10.1111/jgs.16445 PMID:32212386

Emanuel, E. J., & Skorton, D. J. (2021). Mandating COVID-19 vaccination for health care workers. *Annals of Internal Medicine*, 174, 1308-1310. https://doi.org/10.7326/M21-3150

Finney Rutten, L. J., Zhu, X., Leppin, A. L., Ridgeway, J. L., Swift, M. D., Griffin, J. M., St Stauver, J. L., Virk, A., & Jacobson, J. M. (2021). Evidence-based strategies for clinical organizations to address COVID-19 vaccine hesitancy. *Mayo Clinic Proceedings, 96*(3), 699-707. https://doi.org/10.1016/j.mayocp.2020.12.024

Funk, C., Kennedy, B., & Johnson, C. (2020). *Trust in medical scientists has grown in U.S., but mainly among democrats.* Pew Research Center. https://www.pewresearch.org/science/2020/05/21/trust-in-medical-scientists-has-grown-in-u-s-but-mainly-among-democrats/

Gilmartin, H., Reese, S. M., & Smathers, S. (2021). Recruitment and hiring practices in United States infection prevention and control departments: Results of a national survey. *American Journal of Infection Control, 49*. 70-74. https://doi.org/10.1016/j.ajic.2020.07.024

Hall Jamieson, K., & Albarracín, D. (2020). The relation between media consumption and misinformation at the outset of the SARS-CoV-2 pandemic in the US. *Harvard Kennedy School Misinformation Review, 1* (Special Issue on COVID-19 and Misinformation), 1–22. https://doi.org/10.37016/mr-2020-012

Jarret, C., Wilson, R., O'Leary, M., Eckersberger, E., & Larson, H. (2015). Strategies for addressing vaccine hesitancy: A systematic review. *Vaccine, 33*(34). 4180-4190. https://doi.org/10.1016/j.vaccine.2015.04.040

Kose, S., Mandiracioglu, A., Sahin, S., Kaynar, T., Karbus, O., & Ozbel, Y. (2020). Vaccine hesitancy of the COVID-19 by health care personnel. *The International Journal of Clinical Practice, 75*(e13917). https://doi.org/10.1111/ijcp.13917

Kwok, K. O., Li, K-K., Wei, W. I., Tang, A., Wong, S. Y. S., & Lee, S. S. (2021). Influenza vaccine uptake, COVID-19 vaccination intention and vaccine hesitancy among nurses: A survey. *International Journal of Nursing Studies, 114*(103854). https://doi.org/10.1016/j.ijnurstu.2020.103854

Lucia, V. C., Kelekar, A., & Afonso, N. M. (2020). COVID-19 vaccine hesitancy among medical students. *Journal of Public Health, 43*(3), 445-449. https://doi.org/10.1093/pubmed/fdaa230

Mo, P. K., Luo, S., Wang, S., Zhao, J., Zhang, G., Li, L., Li, L., Xie, L., & Lau, J. T. F. (2021). Intention to receive the COVID-19 vaccination in China: Application of the diffusion of innovation theory and the moderating role of openness to experience. *Vaccines, 9*(129). https://doi.org/10.3390/vaccines9020129

National Center for Immunization and Respiratory Diseases [NCIRD]. (2021). *How to Build COVID-19 Vaccine Confidence in the Workplace*. https://stacks.cdc.gov/view/cdc/108253

Ohio Department of Administrative Services [DAS]. (2021). *COVID-19 Update: Vaccine Maintenance Program, Nursing Home Visitation, Phase 1B Medical Conditions.* https://governor.ohio.gov/wps/portal/gov/governor/home

Opitz, E. L., & Gomez, D. P. (2021). Board considerations for covid-19 vaccine programs. *Board Leadership: Innovative Approaches to Governance, 2021*(175), 6-7. https://doi.org/10.1002/bl.30189

Plotkin, S. (2014). History of vaccination. *Proceedings of the National Academy of Sciences, 111*(34), 12283-12287. https://doi.org/10.1073/pnas.1400472111

Reese, S. M., Gilmartin, H., & Smathers, S. (2021). Challenges and opportunities in recruiting, hiring, and training infection preventionists across facility settings. *American Journal of Infection Control*, *49*(8), 973-977. https://doi.org/10.1016/j.ajic.2021.05.001

Rogers, E. M. (2003) *Diffusion of Innovations,* 5th ed.; Free Press: New York, NY, USA.

Rural Health Research Center. (2020). Rural-Urban Commuting Area Codes (RUCAs). https://depts.washington.edu/uwruca/

SAS Institute Inc. (2013). Statistical Analysis Systems (Version 9.4). Cary, NC: SAS Institute.

Sonawane, K., Troisi, C. L., Deshmukh, A. A. (2021). COVID-19 vaccination in the UK: Addressing vaccine hesitancy. *The Lancet Regional Health - Europe 1*, 100016. https://doi.org/10.1016/j.lanepe.2020.100016

Sorell, T., & Butler, J. (2022). The politics of covid vaccine hesitancy and opposition. The *Political Quarterly, 93*(2), 347–351. https://doi.org/10.1111/1467-923X.13134

Strully, K. W., Harrison, T. M., Pardo, T. A., & Carleo-Evangelist, J. (2021). Strategies to address COVID-19 vaccine hesitancy and mitigate health disparities in minority populations. *Frontiers in Public Health* [Advanced online access]. https://doi.org/10.3389/fpubh.2021.645268

Tanuseputro, P., Chalifoux, M., Bennett, C., Gruneir, A., Bronskill, S. E., Walker, P., & Manuel, D. (2015). Hospitalization and mortality rates in long-term care facilities:

Does for-profit status matter? *Journal of the American Medical Directors Association, 16*(10), 874-883, https://doi.org/10.1016/j.jamda.2015.06.004.

Thigpen, C., & Funk, C. (2020). *Most Americans expect a COVID-19 vaccine within a year; 72% say they would get vaccinated.* Pew Research Center. https://www.pewresearch.org/fact-tank/2020/05/21/most-americans-expect-a-covid-19-vaccine-within-a-year-72-say-they-would-get-vaccinated/

Tyson, A., Johnson, C., & Funk, C. (2020). *U.S. public now divided over whether to get COVID-19 vaccine.* Pew Research Center. https://www.pewresearch.org/science/2020/09/17/u-s-public-now-divided-over-whether-to-get-covid-19-vaccine/

World Health Organization. (2021). *United States of America.* https://covid19.who.int/region/amro/country/us

Zitner, T. (2020, June). *Vaccine hesitancy and the unique challenge of COVID-19.* Washington, DC: National Consumer League. https://www.nclnet.org/vaccine_hesitancy_covid19

Table 1. Descriptive Statistics for Control Variables Comparing Ohio Freestanding Nursing Homes and the Analytic Sample

Characteristic	Analytic Sample	State Licensed Nursing Homes
Total number of nursing homes, *n*	627	952
Ownership status, *n* (%)		
Non-profit	164 (26.2)	195 (20.5)
For-profit	463 (73.9)	756 (79.5)
Bed size, mean (SD)	92.7 (39)	90.9 (38.9)
Star rating, mean (SD)	3.2 (14)	3.3 (1.4)
Geographic location, %		
Urban	448 (71.6)	686 (72.1)
Staff vaccination required, *n* (%)		
Yes	58 (9.3)	—
Proportion of vaccinated residents, %	75.7	—

Note. N = number; SD = standard deviation

Table 2. Descriptive Statistics for Independent and Dependent Variables

Characteristic	**%**
Strategies to Reduce Vaccine Hesitancy	
Staff Education	98.9
Peer Counseling	53.4
Being an Example	90.6
Bonuses or Gifts	34.9
Sick Time or Time Off for Symptoms	19.8
No Action Taken	0.5
Participation in Ohio Vaccine Maintenance Program	89.6
Hiring Infection Preventionists in 2021	
Full-Time	82.8
Part-Time	17.2
Proportion of Vaccinated Staff	45.4

Table 3. Linear Regression Results for Staff Vaccination Rates

Variable	**B**	**SE**	***t***	***p***
Ownership Status				
Non-Profit (ref= for-profit)	4.56*	1.60	1.25	0.005
Bed Size	0.0003	0.02	2.85	0.998
Star Rating	2.36***	0.52	4.50	<0.0001
Geographic Location				
Urban (ref=rural)	3.85*	1.51	2.56	0.011
Staff Vaccination Required	9.19***	2.33	3.94	<0.0001
Participation in Ohio Vaccine Maintenance Program	0.05	2.22	0.02	0.981
Proportion of Vaccinated Residents	0.34***	0.04	9.26	<0.0001
Strategies to Reduce Vaccine Hesitancy				
Peer Counseling	3.29*	1.40	2.36	0.019
Being an Example	-1.79	2.36	-0.76	0.448
Bonuses or Gifts	1.10	1.46	0.76	0.450
Sick Time or Time Off for Symptoms	3.86*	1.74	2.21	0.027
Hiring Infection Preventionists in 2021				
Full-Time (ref= part-time)	0.71	1.79	0.40	0.692

Note. B = unstandardized parameter estimate; SE = standard error.

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$