

Rapid Deployment of Multiple Tactics to Address Severe Acute Respiratory Syndrome Coronavirus 2 Vaccine Uptake in Healthcare Employees With a Focus on Those Who Identify as Black, Indigenous, and People of Color

Dominic K. Chan,^{1,✉} Brittany D. Alegria,² Smitha R. Chadaga,³ Lisa J. Goren,² Traci J. Mikasa,⁴ Anna M. Pearson,⁵ Seth R. Podolsky,⁶ Regina S. Won,⁷ and Jennifer L. LeTourneau⁸

¹Pharmacy, Legacy Health, Portland, Oregon, USA, ²Human Resources, Legacy Health, Portland, Oregon, USA, ³Internal Medicine Service, Legacy Health, Portland, Oregon, USA, ⁴Emanuel Internal Medicine Residency, Legacy Health, Portland, Oregon, USA, ⁵Strategy & Business Development, Legacy Health, Portland, Oregon, USA, ⁶Office of Clinical Transformation, Legacy Health, Portland, Oregon, USA, ⁷Infectious Disease, Legacy Health, Portland, Oregon, USA, ⁸Pulmonary & Critical Care, Legacy Health, Portland, Oregon, USA

Background. In the third quarter of 2021, government entities enacted vaccine requirements across multiple employment sectors, including healthcare. Experience from previous vaccination campaigns within healthcare emphasize the need to translate community modalities of vaccine outreach and education that partner with Black communities, Indigenous communities, and communities of Color stakeholders to increase vaccine confidence broadly.

Methods. This was an observational feasibility study conducted from August through October 2021 that deployed and measured the effect of a multimodal approach to increasing vaccine uptake in healthcare employees. Vaccine data were acquired through the Center for Disease Control Immunization Information Systems across Oregon and Washington. Rates of complete vaccination before the intervention were compared with rates after as a measure of feasibility of this intervention. These data were subdivided by race/ethnicity, age, gender, and job class. Complete vaccination was defined as completion of a 2-dose mRNA SARS-CoV-2 vaccine series or a 1-dose adenoviral vector SARS-CoV-2 vaccine.

Results. Overall preintervention and postintervention complete vaccination rates were 83.7% and 93.5%, respectively. Of those employees who identified as a certain race, black employees demonstrated the greatest percentage difference increase, 18.5% (preintervention, 72.1%; postintervention, 90.6%), followed by Hispanic employees, 14.1% (preintervention, 79.4%; postintervention, 93.5%), and employees who identify as 2 or more races, 13.9% (preintervention, 78.7%; postintervention, 92.6%)

Conclusions. We found that a multimodal approach to improving vaccination uptake in employees was feasible. For organizations addressing vaccine requirements for their workforce, we recommend a multimodal strategy to increase vaccine confidence and uptake.

Keywords. COVID-19; health personnel; SARS-CoV-2; vaccines.

Black communities, Indigenous communities, and communities of Color (BIPOC) disproportionately suffer from coronavirus disease 2019 (COVID-19) with higher rates of test positivity, higher rates of illness, and higher rates of death [1, 2]. Coronavirus disease 2019 shines a light on medical racism [3–5], a distinct public health crisis [6], and the lack of vaccine confidence driven by historical and contemporary impacts of

structural racism in these communities [7]. Traditional modalities of vaccine outreach and education to BIPOC benefit from partnering with stakeholders within these communities [8]. In the third quarter of 2021, many government entities enacted vaccine requirements across multiple employment sectors, including healthcare, with the goal of reducing COVID-19-associated morbidity, mortality, and healthcare surges. In response to this, our health system embarked on a multifaceted effort to improve the confidence and uptake of the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) vaccine among our workforce.

COMMUNITY INTERVENTIONS

Traditional strategies for healthcare education and outreach involve clinic visits, didactic sessions, pamphlets, and flyers. Although conventional methods have been used for vaccination outreach during the COVID-19 pandemic, there remains the

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Correspondence: Dominic K. Chan, PharmD, Legacy Emanuel Medical Center, Inpatient Pharmacy, 2801 N Gantenbein Ave., Portland, OR 97227, USA (dchan@lhs.org).

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need for ongoing outreach to individuals with vaccine hesitancy, inaccessibility, and complacency especially within the BIPOC community [9]. Reluctance and barriers to vaccination within BIPOC communities are deeply ingrained and augmented through historic events and present-day systemic racism. Ongoing marginalization and inequitable access to health and socioeconomic resources play significant roles. As recently as 2002, researchers demonstrated that black Americans were less trusting of healthcare workers and the institutions they represent than white Americans [10]. Vaccine hesitancy is a complex, multifactorial decision extending beyond cognition, with emotional, spiritual, cultural, financial, and accessibility factors playing a role [11]. One effective approach to increase vaccination rates involved a multifaceted approach including collaboration of healthcare workers with religious leaders within a BIPOC community [12]. Singular interventions that assume that vaccine hesitancy is solely due to poor health literacy fail to address the multitude of layers that impacts an individual's decision and ability to get vaccinated. Deeply ingrained historical events have resulted in current day BIPOC mistrust in the healthcare system [13]. Although the vaccine administration disparity between BIPOC and white populations have narrowed over time, there is still a discrepancy that widens as the breakdown becomes more specific by individual BIPOC groups [13, 14]. The COVID-19 pandemic provides a unique opportunity for healthcare systems and providers to shift their approach to patient outreach and education and thus reduce historical and present-day inequities in vaccine education and access.

TRANSLATING COMMUNITY INTERVENTIONS TO HEALTHCARE INTERVENTIONS

Most studies examining interventions addressing vaccine confidence in healthcare focus on influenza [15–23]. Interventions that increase vaccine uptake in healthcare focus on increasing accessibility [16], educational activities and campaigns [17–20], and organization changes including incentives and policy making [21–23]. Many of the studies either do not elucidate the healthcare roles of participants or focus exclusively on providers. Omission of certain workforce roles in healthcare (eg, security, admissions, billing services, housekeeping services, food and nutrition services, etc) within interventional studies highlight the value of incorporating lessons learned from community interventions with healthcare employee-focused interventions.

Barriers

Like community barriers, healthcare barriers that span universally across ethnicities include access, consistency in services, timeliness, availability of qualified, culturally competent providers, and health literacy [24–26]. Although healthcare organizations usually have departments of employee health to facilitate access and consistency, organizational barriers

remain, including hours of operation, internet-and-computer-dependent scheduling, and a potential lack of cultural awareness. Organizational assumptions of equitable access, services, timeliness, and workforce may be widely discordant from reality. This is particularly true in service-driven departments associated with lower wages where employees cannot step away from job accountabilities, have higher out-of-pocket premiums and lower service insurance, rely on public transportation for commuting, and work multiple jobs. Healthcare interventions should resemble community interventions through avoiding or deferring technology-dependent communication and scheduling, mobilizing vaccination opportunities to employee work areas, and ensuring vaccination opportunities beyond typical daytime business hours.

Customize Vaccine Education: Address Health and Science Literacy

Previous studies of health literacy [27] highlight associations of both health and science literacy and education level with behavior and attitude changes toward vaccination, where higher literacy and education leads to positive changes [28–31]. However, broad assumptions of health literacy across healthcare employees may drive suboptimal practices addressing vaccine requirements. To ensure understandable and actionable education, healthcare education interventions must meet audience literacy and local vernacular, be conducted by trusted individuals, and facilitate a psychologically safe environment that fosters open communication. Education efforts must be multimodal with effort to ensure nontechnologic education is at the same quality as technologically reliant dependent education with editing for appropriate health literacy and culturally competent content.

Leverage Professional Organizations: Partner With Culturally Aware Expert Groups and Trusted Leaders

The mere existence of a vaccine requirement can increase distrust of the healthcare organization [32], forcing some employees to choose between their livelihood and what they may believe is medical experimentation. Partnering with professional organizations with established employee trust is essential given that employees may project their generalized fear of a broad vaccine requirement policy onto their respective administration and managers. Employee resource group (ERG) members, professional unions, and local discipline-specific associations may be viable options.

Partnership with community and faith leaders is essential, because they are trusted and effective navigators for community members seeking valid information and logistical guidance for vaccination. If organizational policies permit, including these leaders in interventions is critical. Virtual attendance may be an option if barriers exist. The role and counsel of these leaders is essential to establishing employee trust, particularly in the absence of local associations (ERGs, unions, etc).

Multimodal Interventions

Multimodal interventions may be essential to increase vaccine confidence and vaccination completion [33, 34]. Reliance on singular interventions fails to recognize that multiple factors drive vaccine confidence in individuals [35]. Although no study exists that compares multimodal to single interventions, a combination of interventions across an outreach campaign is more likely to fulfill individual needs and learning styles.

OUR HEALTH SYSTEM EXPERIENCE: TRANSITION FROM THEORY TO IMPLEMENTATION

Our healthcare organization consists of 6 hospitals and over 50 primary care and specialty care clinics across 2 states. Governors of both states created SARS-CoV-2 vaccine requirements for healthcare workers, defining “fully” or “completely vaccinated” as completion of a 1-dose (adenoviral vector) or 2-dose (messenger ribonucleic acid [mRNA]) SARS-CoV-2 vaccine series followed by 14 days after the final dose [36, 37]. Per the requirements, employees who were not fully vaccinated by October 18, 2021 were prohibited from working in a healthcare setting. Before the state vaccine requirements, 83.7% of 13 942 employees were fully vaccinated despite a robust organizational infrastructure and partnerships with community-based organizations that provided all 3 SARS-CoV-2 vaccines. With only 7 weeks to assist employees to meet vaccine requirements, it was clear that vaccine supply and traditional availability were not barriers to a fully vaccinated workforce. Vaccine confidence and ease-of-access were the remaining barriers.

A multimodal approach was deployed to reach the most individuals while preserving employee psychological safety. Recognizing the vaccine requirement itself would motivate some employees toward full vaccination, a multidisciplinary and multiprofessional vaccine outreach team formed to address intrinsic motivators including individual and community health. Due to scarce personnel resources and limited time, the work focused on 3 goals: (1) assurance of employee awareness of vaccine requirements, with a focus on employees who do not regularly use computers and email in their role and at risk of lack of awareness of the requirement; (2) assurance of employees’ access to information about COVID-19 that they understand to inform their decision about vaccination; (3) assurance of employee access to vaccine education and administration from a trusted source and in a convenient location.

Interventions were designed to appeal to a diverse range of employees across a variety of learning styles. Intentional deployment of multiple interventions, of different and similar types, enabled employees to engage in several opportunities to learn about each SARS-CoV-2 vaccine. Our hypothesis was through this diverse repetition, employees could build a consistent foundation of credible knowledge.

METHODS

From August through October 2021, we implemented a multimodal approach to increasing vaccine uptake by employees of our health system. Vaccine data were acquired through the Centers for Disease Control and Prevention (CDC) Immunization Information Systems (IIS) across Oregon and Washington, which includes vaccination records outside of the organization. The CDC IIS data were reconciled with employee data through the electronic health record (Epic Systems Corporation) to generate vaccination reports via Microsoft Power BI dashboards. We measured our rate of vaccination completion before the intervention and after as a measure of feasibility of this intervention. These data were subdivided by race/ethnicity, age, gender, and job class. Complete vaccination was defined as completion of a 2-dose mRNA SARS-CoV-2 vaccine series or a 1-dose adenoviral vector SARS-CoV-2 vaccine. The multimodal approach is described subsequently in detail. This was deemed exempt research from the institutional review board at Legacy Health.

Building the Team

Clinical leaders in partnership with human resources created the vaccine education & outreach team, a group of clinicians and administrative leaders with a passion for public health and inclusive education. By using principles of behavioral economics and change management, the team developed a multifaceted approach that would deliver a steady amount of clear, simple, and accessible information in a variety of ways.

Team recruitment was done through informal outreach to colleagues with shared goals. Furthermore, curation of relatable clinical educators created a pool of individuals sharing similar cultural backgrounds as employees while assuring specific medical specialists were available to address specific clinical questions (eg, a maternal fetal medicine physician answering questions about pregnancy).

The team was structurally connected to the governance of the healthcare organization SARS-CoV-2 vaccine efforts, and a project manager was essential to building tactical timelines and support. Pilot interventions were done to determine which tactics resonated with target audiences (Supplement Table 1).

Virtual Town Halls

Virtual town halls were framed as “listening sessions” with the goal of providing credible information on vaccine safety to empower employees to make informed decisions. Neither the legality of the vaccine requirement nor the details of the vaccine exception process were discussed during these sessions because this was outside the scope of expertise of the clinicians. Employees with questions about the requirement were referred to the Confidential Employee Hotline and Human Resources. Hospital and health system leaders were engaged to schedule town halls with hospitals, outpatient clinic groups, and

corporate offices. Town halls were restricted to virtual attendance due to COVID-19 capacity restrictions. Times coinciding with shift changes of target departments (eg, environmental services, food and nutrition) were selected to improve access and attendance. Town halls lasted 30 to 60 minutes and consisted of 2 to 5 panelists, with a minimum of 1 clinical educator and 1 nonclinical administrator. Executive leaders assumed the role of moderators tasked with reading precollected and real-time questions to clinician educator panelists. Panelists were free to answer either verbally or through the chat function. Credible references for answered questions were placed into the chat by panelists or designated support staff. Clinical educator panelists and employee audience followed town hall guidelines to ensure psychological safety. The Town Halls started with frequently asked questions, followed by unique presubmitted questions and ending with questions from the chat. We preassigned common and presubmitted questions to specific panelists. Due to early town halls containing inflammatory nonproductive messaging by some attendees, chat guidelines were established that asked that attendees only write questions into the chat and refrain from editorial comments. Finally, we encouraged panelists to share their frontline COVID-19 experiences.

Confidential Employee Hotline

A confidential hotline connected employees anonymously with additional vaccine resources and, if requested, a one-on-one consultation with a clinician to answer questions about vaccine safety. The hotline framework was built off the infrastructure of an existing employee distress hotline operationalized during the beginning of the COVID-19 pandemic and included hours to accommodate workers of all shifts.

The hotline followed an algorithm with instructions and additional resources to help triage employee questions and needs (Supplement Figure 1). The algorithm was continuously updated based on common questions and scenarios.

Employees calling the hotline would be prompted to select an English or Spanish option and would engage a nonclinician first. The primary objective of the nonclinician hotline staff was to empathetically listen, triage the concerns, and provide answers or connect with the appropriate resources. The scope of the clinician hotline included answering basic vaccine requirement questions, referral to on-site vaccine options including directly scheduling appointments with the employee health clinics, and/or refer the employee to the human resources or employee health departments for complex policy-related questions.

If a clinician consultation was requested, the nonclinician hotline staff would send a request via text message to the clinicians on call with employee contact information and a brief indication of the nature of the inquiry. The first clinician to respond would accept the request and call back the employee directly within 1 hour or at the preferred callback time.

Department Staff Huddles

Most hospital departments have shift-change “huddles” where all employees attend a short meeting addressing daily workflow updates led by a department leader. These were ideal settings for outreach education to employees with potential barriers to electronic communication or with lower health literacy levels. Employee vaccination data were used to identify departments with low vaccination rates and efforts were directed to these areas. Huddle education teams, including a clinician educator to answer vaccine safety questions and administer vaccines and an administrator to answer vaccine requirement policy questions, would spend on average 15 minutes reviewing the vaccine requirement. Some employees continued conversations with the outreach team up to 1 hour, particularly employees who decided to become vaccinated.

Written Educational Material

Weekly written resources on vaccine safety were published for employees. Topics included common themes from townhalls and department huddles. Written material was reviewed by health literacy experts to ensure the summarizing messages were written at sixth grade reading levels. All materials were highlighted in the organization’s weekly newsletter with previous written resources continuously referenced in subsequent newsletters. Leader conversation guides containing curated guiding principles, talking points, and resources were regularly sent to managers and administrators to prepare them for employee vaccine and requirement conversations.

Vaccination Stations

Freestanding walk-up vaccination options at hospitals and clinics were stood up in partnership with the department of employee health to increase scheduling-free access. Insufficient workforce initially prohibited operationalizing mobile vaccine carts. Carts were deployed after the period of this paper.

RESULTS

Figure 1 illustrates the distribution of interventions and first-dose administrations. On September 2, 2021 (the date by which the first dose of a 2-dose SARS-CoV-2 vaccine must be administered to achieve full vaccination by the target date of October 18, 2021), 83.7% of 13 942 healthcare employees were documented as meeting the vaccine requirement. After interventions, 93.5% of 13 969 healthcare employees were completely vaccinated by October 4, 2021, and 151 healthcare employees (1.1%), although not yet completely vaccinated, had received the first dose of a 2-dose SARS-CoV-2 vaccine. Hiring and attrition of healthcare employees continued through this period, leading to the increase in total number of employees on October 4, 2021 (Table 1). Before interventions, employees under the age of 40 years old had the lowest complete vaccination rates, followed by 40 to 64 and those 65 years old and older having the highest proportion, 80%, 86%, 90%, respectively,

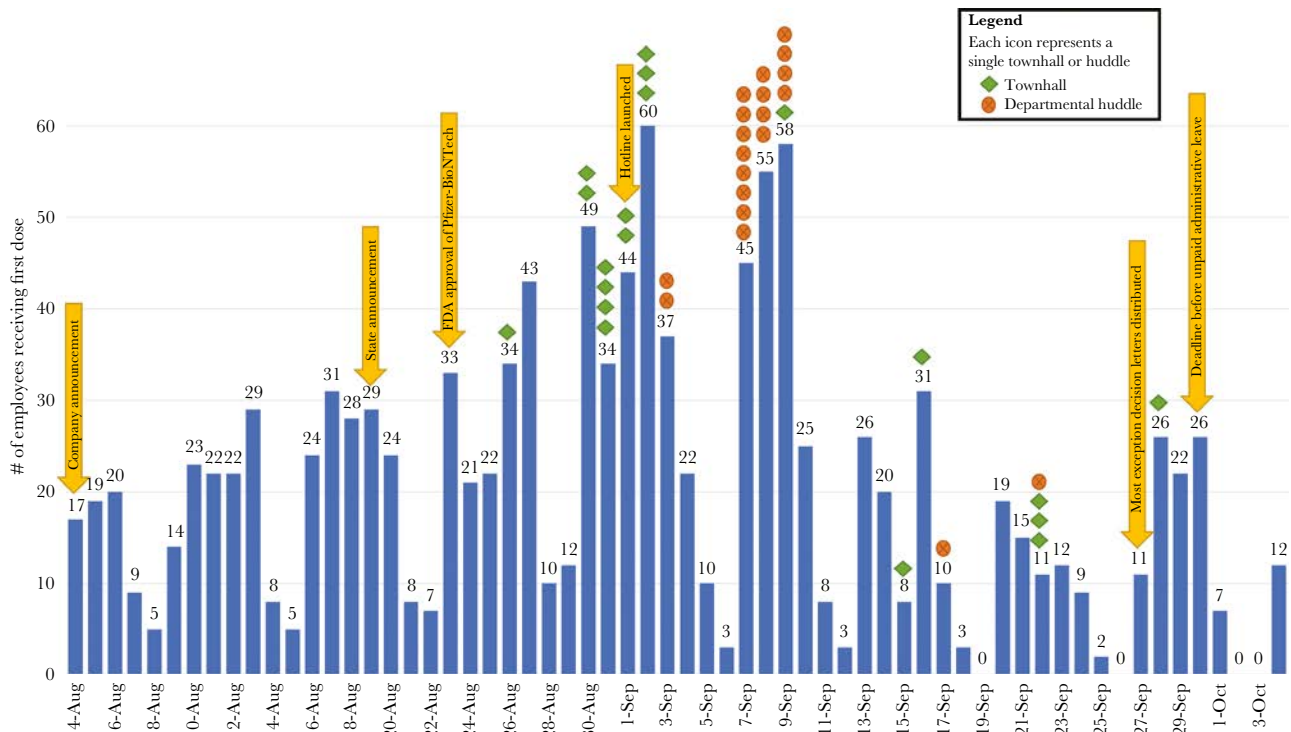


Figure 1. Distribution of interventions and number of first doses given to employees.

with an increase of 12%, 9%, and 6%, respectively, after interventions. There was a similar percentage increase in vaccination completion in both employees who identified as females and males. Vaccination completion percentage demonstrated more variability among race and ethnicity groups. Of those employees who identified as a certain race, black employees demonstrated the lowest preintervention vaccination completion, 408 (72.1%), and the greatest postintervention increase in vaccination completion 511 (90.6%), 18.5% difference, followed by Hispanic, 2 or more races (not Hispanic), American Indian/Alaskan Native, Hawaiian/Other Pacific Islander, white, and Asian/Pacific Islander, 14.1%, 13.9%, 13.7%, 11.6% 8.8%, and 8.2%, respectively (Table 2). The percentage increase of vaccination completion after interventions among employees who identify as BIPOC was greater than employees who do not, 12.5% vs 9.0%, respectively. More than 10 job classes showed a completion increase of at least 11.1% (Table 3).

DISCUSSION

Coronavirus disease 2019 continues to cause significantly disproportional devastation to communities that identify as BIPOC across the United States. Factors that drive disproportional outcomes are present both in communities and in employment. This observational feasibility study found that rapid implementation of multimodal interventions to improving SARS-CoV-2 vaccination with specific tactics for employees

who identified as BIPOC can significantly increase vaccination across all ethnicities. We offer the following lessons learned:

1. Clear Is Kind - Government vaccine requirements create tight timelines, in an ongoing setting of urgency caused by a pandemic. Rapid prioritization and deprioritization of efforts is essential to center the work and focuses team members. As an organization committed to principles of diversity, equity, and inclusion, we intentionally developed tactics focused on addressing access and equity issues. We were also clear this meant lessening the focus on individuals and groups without those same barriers.
2. Start Yesterday and Think Ahead - Outreach efforts are accelerated in a setting of trust, which requires time. Earlier outreach would have enabled a more sustainable engagement model and increased trust among the unvaccinated. During initial SARS-CoV-2 vaccine deployment, mass vaccine acceptance was assumed and quick attainment of “herd immunity” targets of 60%–80% were deemed feasible. Initiating outreach efforts soon after significant low vaccine confidence was detected would have been ideal. According to our data, this may have resulted in early increased vaccination rates across most ethnicities.
3. Vaccines Are Personal - Our data and experience suggest that healthcare employees often have very personal reasons for making vaccine decisions. This was further confounded by geopolitical polarization across the United States—something

Table 1. Employee Demographics Before Intervention

Employees, N (%)	All Employees	American Indian/ Alaskan Native	Asian/Pacific Islander	Black	Hispanic	Hawaiian/Other Pacific Islander	White	Two or More Races (Not Hispanic)	Not Indicated
Age, Years	13 942	87 (0.6%)	1204 (8.6%)	566 (4.1%)	1175 (8.4%)	121 (0.9%)	10351 (74.2%)	399 (2.9%)	39 (0.3%)
<40	6054 (43.4%)	33 (379%)	547 (45.4%)	236 (41.7%)	716 (60.9%)	57 (47.1%)	262 (65.7%)	4176 (40.3%)	27 (69.2%)
40-64	7334 (52.6%)	52 (60%)	613 (50.9%)	304 (53.7%)	441 (37.5%)	60 (49.6%)	132 (33.1%)	5720 (55.3%)	12 (30.8%)
>65	554 (4.0%)	2 (2.3%)	44 (3.7%)	26 (4.6%)	18 (1.5%)	4 (3.3%)	5 (1.3%)	455 (4.4%)	0
Gender									
Female	10 715 (76.9%)	67 (77%)	862 (71.6%)	406 (71.7%)	880 (74.9%)	86 (71.1%)	312 (78.2%)	8071 (78%)	31 (79.5%)
Male	3222 (23.1%)	20 (23%)	341 (28.3%)	160 (28.3%)	295 (25.1%)	35 (29%)	87 (21.8%)	2277 (22%)	7 (17.9%)
Not indicated	5 (0.04%)	0	1 (0.08%)	0	0	0	0	3 (0.03%)	1 (2.6%)
Job Class									
Safety/Security	130	1 (0.8%)	5 (3.8%)	9 (6.9%)	15 (11.5%)	1 (0.8%)	92 (70.8%)	7 (5.4%)	0
Housekeeping Services	533	7 (1.3%)	73 (13.7%)	114 (21.4%)	109 (20.5%)	26 (4.9%)	189 (35.5%)	13 (2.4%)	2 (0.4%)
Patient Care, non-RN	1314	16 (1.2%)	110 (8.4%)	85 (6.5%)	219 (16.7%)	17 (1.3%)	819 (62.3%)	45 (3.4%)	3 (0.2%)
Food and Nutrition Services	428	3 (0.7%)	67 (15.7%)	43 (10.0%)	79 (18.5%)	14 (3.3%)	210 (49.1%)	11 (2.6%)	1 (0.2%)
Facilities Maintenance	157	1 (0.6%)	5 (3.2%)	2 (1.3%)	8 (5.1%)	3 (1.9%)	137 (87.3%)	1 (0.6%)	0
Clinics	323	2 (0.6%)	16 (5.0%)	9 (2.8%)	38 (11.8%)	2 (0.6%)	246 (76.2%)	9 (2.8%)	1 (0.3%)
Health Information Management	351	2 (0.6%)	25 (7.1%)	30 (8.5%)	43 (12.3%)	6 (1.7%)	231 (65.8%)	12 (3.4%)	2 (0.6%)
Material Services	152	3 (2.0%)	17 (11.2%)	7 (4.6%)	15 (9.9%)	4 (2.6%)	101 (66.4%)	5 (3.3%)	0
Office and Clerical	741	5 (0.7%)	34 (4.6%)	31 (4.2%)	113 (15.2%)	8 (1.1%)	521 (70.3%)	27 (3.6%)	2 (0.3%)
Patient and Family Services	220	2 (0.9%)	12 (5.5%)	12 (5.5%)	27 (12.3%)	1 (0.5%)	161 (73.2%)	5 (2.3%)	0

Abbreviations: RN, registered nurse.

Table 2. Pre- and Postoutreach Vaccination Completion by Ethnicity

Characteristics		All Employees	American Indian/Alaskan Native	Asian/Pacific Islander	Black	Hispanic	Hawaiian/Other Pacific Islander	White	Two or more races (not Hispanic)	Not indicated
September 2, 2021	N	13942	87 (0.6%)	1204 (8.6%)	566 (4.1%)	1175 (8.4%)	121 (0.9%)	10351 (74.2%)	399 (2.9%)	39 (0.3%)
Complete Vaccination										
Overall	11670 (83.7%)	67 (77%)	1078 (89.5%)	408 (72.1%)	933 (79.4%)	103 (85.1%)	8740 (84.4%)	314 (78.7%)	27 (69.2%)	
Age, Years										
<40	4848 (80%)	22 (66.7%)	480 (87.8%)	150 (63.6%)	551 (77%)	45 (79%)	3381 (81%)	200 (76.3%)	19 (70.4%)	
40-64	6325 (86%)	43 (82.7%)	558 (91%)	232 (76.3%)	369 (83.7%)	54 (90%)	4952 (86.6%)	109 (82.6%)	8 (66.7%)	
65 and above	497 (90%)	2 (100%)	40 (91%)	26 (100%)	13 (72.2%)	4 (100%)	407 (89.5%)	5 (100%)	0	
Gender										
Female	8893 (83%)	53 (79.1%)	774 (89.8%)	277 (88.2%)	684 (77.7%)	75 (87.2%)	6761 (83.8%)	245 (78.5%)	24 (77.4%)	
Male	2774 (86%)	14 (70%)	303 (88.9%)	131 (81.9%)	249 (84.4%)	28 (80%)	1977 (86.8%)	69 (79.3%)	3 (42.9%)	
Not Indicated	3 (60%)	0	1 (100%)	0	0	0	2 (66.7%)	0	0	
Incomplete Vaccination* or Unvaccinated										
Overall	2272 (16.3%)	20 (23%)	126 (10.5%)	158 (27.9%)	242 (20.6%)	18 (14.9%)	1611 (15.6%)	85 (21.3%)	12 (30.8%)	
Age										
<40	1206 (20%)	11 (33.3%)	67 (12.2%)	86 (36.4%)	165 (23%)	12 (21.1%)	795 (19%)	62 (23.7%)	8 (29.6%)	
40-64	1009 (14%)	9 (17.3%)	55 (9%)	72 (23.7%)	72 (16.3%)	6 (10%)	768 (13.4%)	23 (17.4%)	4 (33.3%)	
65 and above	57 (10%)	0	4 (9.1%)	0	5 (27.8%)	0	48 (0.9%)	0	0	
Gender										
Female	1822 (17%)	14 (20.9%)	88 (10.2%)	129 (31.8%)	196 (22.3%)	11 (12.8%)	1310 (16.2%)	67 (21.5%)	7 (22.6%)	
Male	448 (14%)	6 (30%)	38 (11.1%)	29 (18.1%)	46 (15.6%)	7 (20%)	300 (13.2%)	18 (20.7%)	4 (57.1%)	
Not Indicated	2 (40%)	0	0	0	0	0	1 (33.3%)	0	1 (100%)	
October 4, 2021	N	13969	86 (0.6%)	1220 (8.7%)	564 (4%)	1178 (8.4%)	123 (0.9%)	10345 (74%)	405 (2.9%)	48 (0.3%)
Complete Vaccination										
Overall	13061 (93.5%)	78 (90.7%)	1192 (97.7%)	511 (90.6%)	1101 (93.5%)	119 (96.7%)	9643 (93.2%)	375 (92.6%)	42 (89.4%)	
Age, Years										
<40	5579 (92%)	27 (84.4%)	536 (97.1%)	197 (85.7%)	664 (92.6%)	56 (95%)	3820 (91.3%)	246 (92.5%)	33 (91.7%)	
40-64	6944 (95%)	49 (94.2%)	613 (98.4%)	287 (93.5%)	421 (95%)	59 (98.3%)	5381 (94.5%)	124 (92.5%)	10 (83.3%)	
65 and above	539 (96%)	2 (100%)	43 (95.6%)	27 (100%)	16 (88.9%)	4 (100%)	442 (95.5%)	5 (100%)	0	
Gender										
Female	9985 (93%)	63 (91.3%)	854 (97.6%)	360 (88.5%)	824 (92.8%)	85 (95.6%)	7472 (92.7%)	292 (92.7%)	34 (94.4%)	
Male	3068 (95%)	15 (88.2%)	337 (98%)	151 (96.2%)	277 (95.5%)	34 (97.1%)	2165 (95%)	83 (92.2%)	6 (75%)	
Not Indicated	9 (90%)	0	1 (100%)	0	0	0	6 (100%)	0	2 (66.7%)	
Unvaccinated										
Overall	907 (6.5%)	8 (9.3%)	28 (2.3%)	53 (9.4%)	77 (6.5%)	4 (3.3%)	702 (6.8%)	30 (7.5%)	5 (10.6%)	
Age, Years										
<40	498 (8%)	5 (15.6%)	16 (2.9%)	33 (14.3%)	53 (7.4%)	3 (5.1%)	365 (8.7%)	20 (7.5%)	3 (8.3%)	
40-64	384 (5%)	3 (5.8%)	10 (1.6%)	20 (6.5%)	22 (5%)	1 (1.7%)	316 (5.5%)	10 (7.5%)	2 (16.7%)	
65 and above	25 (4%)	0	2 (4.4%)	0	2 (11.1%)	0	21 (4.5%)	0	0	

Table 2. Continued

Characteristics	All Employees	American Indian/Alaskan Native	Asian/Pacific Islander	Black	Hispanic	Hawaiian/Other Pacific Islander	White	Two or more races (not Hispanic)	Not indicated
Gender									
Female	755 (7%)	6 (8.7%)	21 (2.4%)	47 (11.5%)	64 (72.2%)	3 (3.4%)	589 (73.3%)	23 (73%)	2 (5.6%)
Male	151 (5%)	2 (11.8%)	7 (2%)	6 (3.8%)	13 (4.5%)	1 (2.9%)	113 (5.0%)	7 (78%)	2 (25%)
Not Indicated	1 (10%)	0	0	0	0	0	0	0	1 (33.3%)
Incomplete Vaccination*									
Overall	151	2 (2.3%)	9 (0.7%)	16 (2.8%)	20 (1.7%)	2 (1.6%)	94 (10.9%)	6 (1.5%)	2 (4.2%)
Difference in Complete Vaccination (Post-Intervention from Pre-Intervention)									
Overall	1391 (9.8%)	11 (13.7%)	114 (8.2%)	103 (18.5%)	168 (14.1%)	16 (11.6%)	903 (8.8%)	61 (13.9%)	15 (18.3%)

Abbreviations: mRNA, messenger ribonucleic acid.

*Incomplete Vaccination: 1 dose mRNA vaccine received.

Table 3. Top 10 Pre- and Postoutreach Vaccination Completion Increases by Job Classes

Job Class	September 2, 2021		October 4, 2021		Increase
	Vaccinated ^a	Unvaccinated ^a	Vaccinated	Unvaccinated ^a	
Safety/Security	86 (66.2%)	44 (33.8%)	119 (93.0%)	9 (7.0%)	26.8%
Housekeeping Services	372 (69.8%)	161 (30.2%)	471 (89.4%)	56 (10.6%)	19.6%
Patient Care, non-RN	957 (72.8%)	357 (27.2%)	1171 (89.3%)	141 (10.7%)	16.4%
Food and Nutrition Services	341 (79.7%)	87 (20.3%)	401 (93.7%)	27 (6.3%)	14.0%
Facilities Maintenance	125 (79.6%)	32 (20.4%)	147 (93.6%)	10 (6.4%)	14.0%
Clinics	254 (78.6%)	69 (21.4%)	295 (91.9%)	26 (8.1%)	13.3%
Health Information Management	255 (72.6%)	96 (27.4%)	302 (85.8%)	50 (14.2%)	13.1%
Material Services	124 (81.6%)	28 (18.4%)	143 (94.7%)	8 (5.3%)	13.1%
Office and Clerical	589 (79.5%)	152 (20.5%)	692 (92.6%)	55 (7.4%)	13.2%
Patient and Family Services	180 (81.8%)	40 (18.2%)	209 (92.9%)	16 (7.1%)	11.1%

Abbreviations: RN, registered nurse.

^aUnvaccinated: having received no vaccine administration, or 1 dose of mRNA vaccine.

previously unseen in other required vaccines for healthcare workers [38]. Many individuals had questions driven by misinformation, particularly via social media. Employees also believed the vaccine requirements were decided hastily, causing distrust for both the organization and the requirement. This highlighted the importance of understanding underlying personal preferences for racially diverse employees to create culturally appropriate educational opportunities.

4. Leverage Multiple Modalities - The primary goal of this work was ensuring information access through a variety of approaches. Leveraging multiple modalities allowed us to address a variety of learning styles and preferences, while also creating repetition of credible and digestible information.
5. Tailor and Listen to the Messenger, Not the Message - A variety of disciplines and individuals available for several roles was central to success, enabling opportunities including leveraging the knowledge of an obstetrician for the pregnancy-focused town hall and a trusted black pharmacist to deliver information and vaccines to many black employees. The interventions would be more homogenous and less successful without diversity in messengers. Our health system partnered with groups and programs to reach our community collectively. Groups and organizations came to us with their vision. We learned that when engaging in cross-sector work, it was important to fall back and step in where requested as opposed to driving our agenda.

As a result of these interventions, we learned that individuals had concerns about the vaccine that we had not previously anticipated. To help guide other institutions, we share our

“frequently asked questions” in town halls and on clinician hotline calls (Table 4).

Limitations

Multiple limitations exist. Vaccine records from outside the organization were occasionally delayed, because some external entities (clinics, pharmacies) indicated they “batched” their data entry weekly into the CDC IIS system. The human resource department accommodated by ensuring employees who were completed vaccinated after the deadline would not lose continuity in their years of services and associated employment benefits. In addition, this study did not quantify nor qualitatively analyze the impact of our interventions on improving compliance with vaccine requirements versus the presence of the requirement alone. Future qualitative studies in this area will help shed light on which interventions have the most impact.

CONCLUSIONS

We found that a multimodal approach to improving vaccine uptake in employees was feasible. We described the implementation, practical considerations, and efficacy of this approach. Due to our organization’s learning culture, finding the team members to implement this rapidly and successfully was relatively easy. For organizations addressing vaccine requirements for their workforce, we recommend multiple tactics that will help dispel vaccine misinformation, provide the individual with psychological safety around making a choice around receiving the vaccine, and allow for one-on-one clinical expert discussions.

Table 4. Frequent Themes From Town Halls and Hotlines

Town Halls	Clinician Hotline	Triage Hotline
Natural immunity	Anticipated side effects	Help on where to get a vaccine and/or schedule a vaccine appointment
Breakthrough infections	Negative 1st-dose experience	Timing of getting the vaccine and adhering to organization’s vaccine requirement (ie, unpaid administrative leave and employment termination deadlines)
Vaccine development and approval was too fast	Pre-existing health condition	Medical or religious exceptions (out of scope, would redirect to Human Resources or Employee Health)
Effects of mRNA on the body	Allergies to other meds	Help on where to get a vaccine and/or schedule a vaccine appointment
Vaccine safety with fertility, pregnancy, breastfeeding	Vaccine safety with pregnancy and breastfeeding	COVID-19 exposure (out of scope, redirect to Employee Health)
Long-term side effects (ie, 10 years)	Received 1st dose several months ago and/or want to switch brands	Negative side effects from recently received vaccine (out of scope, redirect to Employee Health)
Fetal cell use in vaccine development	Fetal cell use in vaccine development	Booster availability (Out of Scope)
Difference between FDA-approved and EUA-approved Pfizer-BioNtech vaccine	Difference between FDA-approved and EUA-approved Pfizer-BioNtech vaccine	
VAERS data	When to get the vaccine if recently sick or exposed to COVID-19	
When to get the vaccine if recently sick or exposed to COVID-19	Blood clot risks Effects of mRNA and if it is bad for you	

Abbreviations: COVID-19, coronavirus disease 2019; EUA, *Emergency Use Authorization*; FDA, US Food and Drug Administration; meds, medications; mRNA, messenger ribonucleic acid; VAERS, Vaccine Adverse Event Reporting System.

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