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Developing and Delivering a Comprehensive Vaccine COVID-19 Program: RapidVax

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RapidVax was developed in January 2021 to increase COVID-19 vaccination rates across Temple University's College of Public Health (CPH) and communities in Philadelphia, including vaccine-hesitant individuals and marginalized groups with limited access to health services. To address the problems of access to vaccination, the CPH clinical team started to vaccinate the clinical-oriented faculty, staff, and students (N = 1,542, with 28.5% of ethnic minorities). As the vaccine rollout proceeded, the need to engage minorities and marginalized groups, as well as improve community access to vaccinations was recognized. A grant from the Philadelphia Department of Public Health allowed the RapidVax project to be scaled up as an interprofessional collaboration between nursing, social work, pharmacy, and public health practitioners, promising to achieve community immunity and decrease disparities in COVID-19 vaccination. Emphasizing community engagement, evidenced-based message design, communication distribution via social media sites and at community events, RapidVax was successfully implemented in Philadelphia communities. The project resulted in the delivery of vaccines to 2,685 individuals, 74.9% of whom were people of color and 16% of whom were homeless. The program was deployed in multiple locations, including the CPH-run Vaux clinic, offering regular hours for unscheduled walk-ins. Pop-up clinics were also offered in partnership with community organizations both within community center locations and public outdoor spaces. Next steps include continuing to build trust with communities through the CPH Vaux community clinic, enhancing community partnerships, and increasing social media engagement and community outreach to increase the vaccination rate among vaccine-hesitant and unvaccinated people.

Keywords: *RapidVax, COVID-19, COVID-19 vaccination, health disparities, vaccine hesitancy, vaccine intervention.*

Introduction

The SARS-CoV-2 crisis has highlighted social and economic inequalities in the United States. People from ethnic minority populations, those who are older, and those with economic disadvantages are at higher risk of both COVID-19 morbidity and mortality[1,2]. Individuals working at 'essential' jobs (e.g., grocery store staff, home health aides) have

been crucial to all Americans during the pandemic but often have limited access to health care and live in crowded conditions[3]. Despite the availability of three effective SARS-CoV-2 vaccines, infection rates among individuals in rural areas, younger people, and those with conservative political beliefs have skyrocketed primarily due to vaccine hesitancy[4].

The World Health Organization EURO Vaccine Communications Working Group proposed the "3 Cs" model to explain vaccine hesitancy: 1) *Confidence*: trust in the effectiveness and safety of vaccines; 2) *Complacency*: perceived risks of vaccine-preventable diseases; and 3) *Convenience*: physical locations at which vaccination can happen[5,6]. Vaccine hesitancy research has mostly emphasized parents making decisions for children[7]. Less is known about adults making decisions for themselves[4]. Eleven months after the introduction of effective SARS-CoV-2 vaccines in the United States (US), vaccination rates in the US lag behind those in Europe, Canada, and many Asian countries. In the US, only 64% of the population eligible for vaccination is fully vaccinated, 76% have received at least one of two doses[8]. In a 2021 survey of Americans, Ruiz and Bell reported that 14% of respondents were unlikely to accept a COVID-19 vaccine and 23% were unsure [4]. More recent numbers indicate that number has decreased,[8] but the Kaiser Family Foundation, which has been tracking vaccine refusal throughout the epidemic, shows 21% of adults still report not being vaccinated, including 14% who report they will never be vaccinated, 3% who report they will only be vaccinated if their employer mandates it, and 4% who report they are still "unsure".[9] As of February 2022, the proportion of fully vaccinated people living in the US outnumbered the unvaccinated.[10] And while racial disparities nationwide are no longer significant[10], Philadelphia continues to show a gap in vaccination rates. Of those fully vaccinated ages 12+, 72% are White and 66% are Black/African American.[11] Unlike early phases of the COVID-19 vaccine rollout in which only certain segments of the population were eligible, COVID-19 vaccines are now widely available to all.[12] Thus, in the US, insufficient levels of vaccination to achieve community immunity and persistent disparities in uptake are mostly attributable to vaccine hesitancy and refusal rather than limited supply.[4,13,14] However, attention to demographic characteristics only tells us *who* is vaccine-hesitant and fails to reveal *why* vaccine hesitancy persists. Polling from the Kaiser Family Foundation suggests that personal connection to COVID-19 and fear of the Delta variant were the largest predictors of the vaccination increase in late summer 2021[15]. However, distrust of healthcare, research, and the government were continued barriers to COVID-19 vaccination despite the increase in vaccination. This underscores the importance of attentiveness to emotional and perceptual drivers of vaccine hesitancy when promoting vaccine uptake.[16]

Throughout the COVID-19 pandemic, communities of color have been disproportionately impacted in terms of health, social, and economic factors[1,2]. Native Americans were most likely to contract, suffer complications, or die from COVID-19, followed by Hispanics and Black Americans.[1, 2] Despite being at increased risk, the history of medical racism in the US has overshadowed minorities' risk perceptions, affecting their willingness to interact with and trust the healthcare system.[13, 16] Vaccine hesitancy stemming from this mistrust has highlighted the need for transparency, empathy, and community-engaged strategies based on effective communication, cultural and linguistic competency, and partnership with community organizations, which are significant predictors of COVID-19 public health intervention effectiveness[17,18]. Building trust necessitates understanding nuances in communities' perceptions, doubts, and fears related to the COVID-19 vaccines, leading to more vaccine confidence in target communities[18].

To address the twin issues of disparities in access and vaccine hesitancy, we developed a community-based vaccination program called RapidVax. The program's first objective was to create a workflow to vaccinate the Temple University College of Public Health (CPH) essential faculty, students, and staff. The second objective was to adapt the knowledge base and

system infrastructure to execute mass vaccination of the general population and reach vaccine-hesitant individuals or those with difficulty accessing health services.

Objective 1: Proof-of-Concept Test of the RapidVax Protocol

Materials and Method

Using an interprofessional team of faculty and students in nursing, kinesiology, social work, public health, and health rehabilitation sciences, the CPH proposed a proof-of-concept test of the RapidVax protocol. The protocol used the principles of Lean and Six Sigma[19] to provide an efficient vaccination workflow to meet the challenges for COVID-19 mass vaccination, taking into consideration Health Insurance Portability and Accountability Act (HIPAA), reporting to the Department of Health, logistics of social distancing, and a minimum 15-minute post-vaccination observation period. The protocol was initially developed in January 2020 to deliver vaccines to CPH members who met Philadelphia's 1A criteria, which outlined who was eligible for vaccination such as teachers or front-line workers, and to test whether it could provide the necessary workflow to safely achieve vaccination rates of 50 individuals per hour. This workflow included needing space for registration, vaccination, making appointments for second shots, and the 15-minute observation period. The advantages of the RapidVax protocol are its flexibility, mobility, and cost-effectiveness. The program does not require huge spaces, such as a convention center, and can be implemented in community spaces, such as churches. The workflow can be scaled up or down to accommodate the size of the population and the available space.

The CPH's information technology team and the health information systems management faculty collaborated with clinical affairs to develop the scheduling, registration, recording and reporting of dose delivery with smart forms. Individuals across the CPH who met the 1A category requirements were invited to self-schedule using a publicly available sign-up tool (SignUpGenius). The invitation included a fact sheet and "frequently asked questions" (FAQ) handout about the Moderna vaccine, which at that time was the vaccine of choice to administer outside of a health care facility because it did not require storage in an ultra-cold freezer and was understood to be more stable at room temperature. Once scheduled, individuals were sent a link to a smart registration form created using REDCap, a HIPAA compliant tool used by universities for research and clinical trials.[20] The smart form captured the demographic information required by the Philadelphia Department of Public Health, among other variables. All individuals were assigned a unique identifier as a master index to link information from different forms.

Upon checking in for vaccination, individuals logged into a second smart form via a secured iPad to complete registration, health screening, contraindication checking, and vaccination consent. Once registered, individuals proceeded to a vaccination station where they were physically distanced from others and were vaccinated. After vaccination, individuals proceeded to the check-out station, where they received a vaccination card and a follow-up appointment if needed. They then sat physically distanced for a 15-minute observation.

Results

The RapidVax protocol successfully vaccinated 50 individuals an hour on average while maintaining social distancing, showing a proof of concept. Out of all individuals invited for vaccination, data are available for 1,542 people who received both doses. They were predominately female (n = 1,030, 70.9%), and ranged in age from 12 to 88 years, with a mean

age of 34 years. Most were Caucasian (n = 932, 61.6%), followed by Asian (n = 179, 11.6%), Black (n = 111, 15.2%), Native American (n = 6, 0.4%), and other (n = 21, 1.3%); 5.6% reported their ethnicity as Hispanic. To understand more about the RapidVax protocol, we monitored vaccine recipients' satisfaction and intent to complete vaccination. All vaccinated individuals received a self-administered, anonymous survey two days post-vaccination via Qualtrics with three waves of invitations to complete the survey. We received and analyzed 640 surveys.

Vaccine recipient ratings of the RapidVax process were high. Recipients estimated that the average time to complete registration and receive the vaccine was under 10 minutes, and the time from registration to injection was just under 5 minutes. Ratings for staff efficiency, friendliness, and feeling well cared for ranged from 9.40 to 9.76 on a 1 to 10 scale, with higher values reflecting stronger agreement with each sentiment. Overall experience was rated very highly with a mean of 9.5. About 92.8% of recipients indicated that they chose to receive the vaccine to protect family, friends, and community followed by to protect oneself (81.2%), return to normal life (77.4%), and meet their workplace's requirement (67.3%).

Of note, 65.5% indicated they trusted the safety and effectiveness of the vaccine, and 60.3% indicated trust in the vaccine provider (i.e., the CPH). Almost all (n = 632, 98.8%) indicated an intent to return for the second injection. Recipients were asked if they had experienced a list of 11 possible side effects with the option to provide others not specified within the survey or choose no side effects. The most common side effect was a sore arm, followed by fatigue, headache, and muscle pains. Only 24 (5.4%) participants reported no side effects. See Table 1.

Table 1.
Moderna Side Effects Reported by RapidVax Recipients across the Temple University College of Public Health (N = 640)

Symptoms	Cases	Percent
Sore arm	417	93.5
Strange feeling in your arm	57	12.8
Chills	64	14.3
Fever	31	7.0
Headache	110	24.7
Fatigue	169	37.9
Nausea or stomach upset	33	7.4
Muscle or body aches	93	20.9
Shortness of breath	3	0.7
Runny nose	24	5.4
Sore throat	17	3.8
Other (specify):	26	5.8

Objective 2: Scale-Up Plan and Implementation

The next phase of RapidVax included a three-pronged approach to engage the community, develop and implement tailored messaging, and deliver the vaccine. The community deployment of the RapidVax protocol was first performed on February 10, 2021, at the headquarters of the Philadelphia Housing Authority (PHA), the fourth-largest housing authority in the US that provides affordable housing for residents with limited incomes. We vaccinated 265 individuals, with an average of 88 individuals an hour. We tested the workflows again on February 13, when the team vaccinated 137 essential workers from the

community at the CPH's fixed medical site, located in Vaux High School at 2300 Master Street in North Philadelphia. In all, CPH partnered with PHA to offer vaccination to every senior in public housing by the end of April 2021. To advance this strategy and expand to other communities, a team from CPH submitted an application to the Philadelphia Department of Public Health to fund RapidVax, which included proposed core clinical, community engagement, and communications teams. This application was approved on April 19, 2021.

Engaging the Community

To achieve the RapidVax mission to make COVID-19 vaccines and relevant evidence-based information accessible to Philadelphians, and operationalize community engagement strategies,[21] our community engagement team enlisted a diverse set of community leaders from community-based and faith-based organizations in Philadelphia. Since the project's onset, RapidVax has collaborated with over 25 organizations. Representatives met monthly with the RapidVax team to review the project's progress, generate ideas for new partnerships, and execute outreach and vaccination events in diverse settings, such as churches, supermarkets, and at existing community events such as health fairs or block parties. The purpose of this committee was to provide information on specific community needs, how best to engage each community, and how to maximize the success of RapidVax efforts by engaging diverse perspectives. The representatives from these organizations were recruited largely through the CPH's Office of Community Engaged Research and Practice and its existing network, however more partnerships were developed through networking at vaccination and outreach events. When recruiting partners, we considered population of interest, program activity, and partner availability. We prioritized those who served communities with historically low vaccination rates, such as ethnic racial minorities, people who are homeless, and people with substance use disorder. Other crucial criteria for partnership included an organization's availability to contribute consistently, and organizations with different skills and resources to support vaccination efforts.

The wealth of skills and resources from the stakeholder committee was critical to planning vaccination and/or outreach events. Many event attendees, especially those who were vaccine hesitant, may not have attended a vaccine event by choice. However, by partnering with organizations that had recognition and trust in their community, and that offered incentives (e.g., food, entertainment, gift cards) at events, we attracted more community members. Depending on available resources, some stakeholder organizations served as physical sites for vaccination clinics and outreach events. When recruiting partners with a physical location, it was necessary to consider social distancing, workflow configurations, accessibility, and safety. Importantly, because of the flexibility in the RapidVax workflow, we were able to adapt our setup to each location based on space and resources. For example, we purchased tents to set up physically distanced chairs for outdoor observation periods, as weather permitted. Partners without a physical site contributed in other ways, including conceptual and logistical planning at stakeholder meetings or advertising for events throughout their networks.

Community members were also hired and trained as RapidVax Ambassadors to educate Philadelphians about COVID-19 and available vaccines during outreach and vaccination events. Eight ambassadors worked an average of 15-20 hours per week and ranged in age from 18 to 60 years. Five of the ambassadors were women, four were Black, three were Asian and one was a recent immigrant from Saudi Arabia. Ambassadors were recruited via an online job application through recommendations from the stakeholder committee, networking at project events, and a job fair that had computers on site for interested persons without internet or technology at home.

All applicants were interviewed and asked about their interest in the project's goal (COVID-19 vaccination), as well as their experience in community engagement with diverse populations, including community service and customer service positions. An interactive six-hour, three-part training was developed to provide ambassadors with adequate knowledge about COVID-19 vaccines, vaccine hesitancy, interpersonal communication, and cultural competency. Once trained, ambassadors were able to utilize their training and successfully employ their experience as community residents to empathetically address other residents' concerns about vaccines and correct misinformation.

The consistent attendance of RapidVax at events throughout Philadelphia allowed the community-engagement field team to build trust with residents of various communities. For example, RapidVax worked with non-profit community development organizations, police districts, and health and social services organizations to promote and provide vaccination to Philadelphians across in-person and online sites, such as festive events at local parks and on local radio shows. RapidVax also successfully partnered with organizations providing services for those who are homeless and/or have substance abuse disorder, as well as advocacy groups providing services for those with food insecurity and unemployment during the pandemic. Thus, we were able to distribute vaccines in economically distressed areas that are typically challenging to reach.

Developing and Implementing Evidence-Based Tailored Messaging

Understanding Vaccine Hesitancy Among Philadelphians and Perceptual Mapping

To understand the drivers of vaccine hesitancy and inform the RapidVax communication strategy, a cross-sectional survey of vaccine attitudes was conducted among Philadelphians aged 18 years or older. From March to September 2021, surveys were administered in person at community-based events, or online via Qualtrics through Facebook ads in under-vaccinated Philadelphia ZIP codes. The survey assessed demographic information, experiences with COVID-19, beliefs about COVID-19 and vaccines, and trust in healthcare and research. Vaccinated and unvaccinated participants completed the survey, and unvaccinated participants were asked to indicate their intent to receive a COVID-19 vaccine on a 0-10 scale (i.e., 0= "definitely do not want to receive a vaccine", 10= "definitely do want to receive a vaccine"). We classified unvaccinated respondents who rated intent between 0-5 as vaccine hesitant, ratings between 6-10 were classified as not hesitant. The Temple University Institutional Review Board approved this research (protocol number 28139).

Across in-person and online surveys, 688 responses were collected. Roughly one-third of respondents (n = 210, 33.8%) reported being unvaccinated. Among the unvaccinated respondents, 89.5% (n = 188) reported their hesitancy status; 58.5% (n = 110) were vaccine hesitant and 41.5% (n = 78) were not hesitant. Comparing demographics in those hesitant and not hesitant using Chi Square, race (p=.30), ethnicity (p=.20), gender(p=.13), education (p=.32), income (p=.94), and health insurance (p=.55) were not significantly different. However, mean age ($p < .001$) and age groups were significantly associated with vaccine hesitancy. For example, 72.5% of unvaccinated people aged 18-39 years reported vaccine hesitancy ($p < .001$).

Using these data, the RapidVax communication team conducted perceptual mapping and vector message modeling analyses to produce three-dimensional displays (i.e., maps) of how groups perceive relationships among a set of attributes to inform message strategy to move people towards a decision[22] (for more information on these methods, see https://sites.temple.edu/turiskcommlab). Combining perceptual mapping with segmentation analysis allowed an understanding

about trust in healthcare and research among vaccinated and unvaccinated Philadelphians to create a messaging strategy to address vaccine hesitancy. The team identified subgroups within the total sample who had different concerns about the vaccines and addressed *why* people may be hesitant rather than only focusing on *who* is hesitant. Analyses revealed seven themes underlying vaccine hesitancy (e.g., minorities' suspicions about COVID-19 information, mistrust in government, and the perception that health messages keep changing). See Supplement A for themes and suggested strategies.

Dissemination of RapidVax health communication materials

The RapidVax communication team conducted a communication needs assessment with our key stakeholders prior to implementing community-based clinics. Each community partner's needs, such as use of existing communication channels and their specific vaccine concerns, were assessed to inform a targeted, culturally and linguistically tailored messaging strategy for each group. This helped identify the most effective means of disseminating vaccine information to their community members (e.g., social media posts, flyer distribution, banners).

We used perceptual mapping results to create RapidVax communication materials (i.e., a "Communication 101" document that provided sample messages and ways to answer questions about vaccines, and fact sheets about the vaccines including side effects, vaccine myths, and the reasons to be vaccinated). Community partners and the RapidVax community engagement and communication teams used these resources when talking with people about vaccination. Before clinics, the community engagement and communication teams held community-based events to deliver education materials, address concerns about the vaccines, and build camaraderie with the community. They would engage attendees and observe their behaviors to inform the best education approaches, including which fact sheets to use as visual aids during conversations about vaccination.

To broaden the project's reach, a website (sites.temple.edu/rapidvax) was created to centralize information, host freely accessible targeted communication materials, highlight community partners, and display a calendar of RapidVax clinics. We also utilized Facebook ads that targeted ZIP codes surrounding locations of clinics to promote our presence. Twenty-one separate ads were placed one to two weeks every day before an event, resulting in 1,806,608 ad views, 544,868 reaches to unique Facebook profiles, 600 post clicks to our website or a registration form, and 475 post reactions (e.g., likes, comments, shares). Finally, RapidVax established Twitter and Instagram accounts to connect with our community partners and the broader Philadelphia community, posting information about current vaccination clinics and other vaccine-specific messaging.

Delivery of Vaccine

To accommodate individual preferences, we stocked all three available vaccines (Moderna, Pfizer, Janssen and Janssen) whenever possible and offered them at all clinics. Offering choices and accommodating individual preference for a specific vaccine brand alleviated stressors among vaccine-hesitant individuals. Many individuals expressed gratitude for this opportunity to express their agency. Equally important was the ability of clinical and non-clinical staff to speak knowledgeably about the different brands of vaccines, their different dosing regimens, and the interval between first and second dose or the first dose and, ultimately booster. The clinical team developed redundant systems to double-check administration workflows to ensure quality, safety, and specific forms to document vaccine risks, variation in dosing, and consents for adults, teens, pediatric populations, and boosters.

Table 2 represents the RapidVax weekly vaccine distributions by demographic information at the community level, from February to November 12, 2021.

RapidVax successfully vaccinated 2,685 individuals during its community campaign, 66.44% of whom were Black and 21.15 % of whom were White; 9.45% reported their ethnicity as Hispanic.

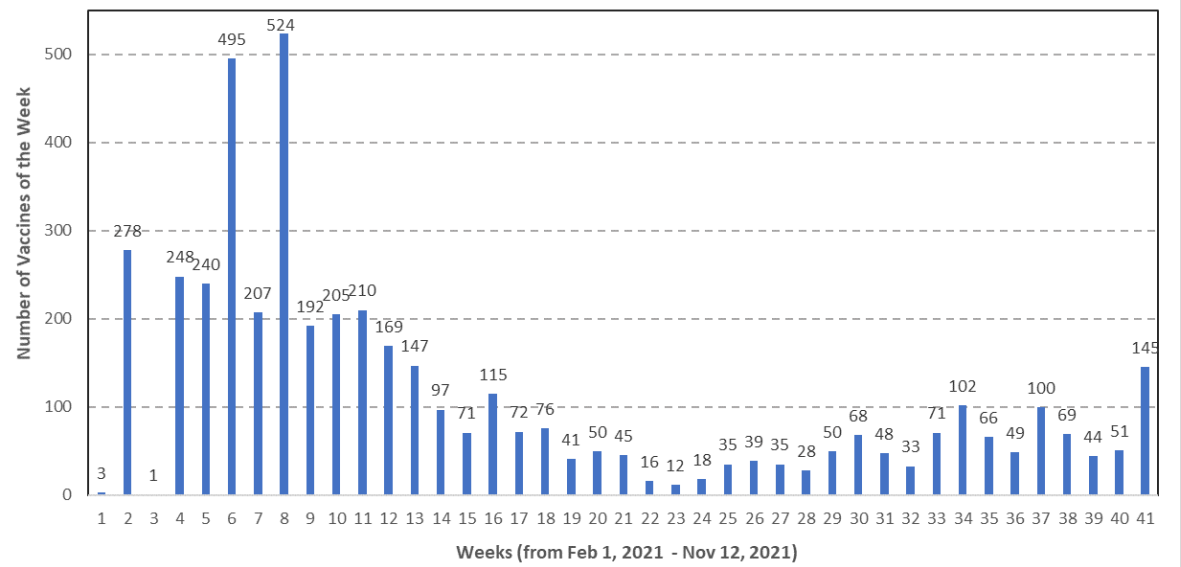
The percentages of males (50%) versus females (49.42%) vaccinated by RapidVax was in line with national datasets[10]. Thirty-six percent (36.69%) of the population vaccinated by the RapidVax team were aged 60 years or older. Full demographic information is included in Table 2.

Table 2.
RapidVax's Vaccine Distributions at the Community Level by Demographic Constructs from 02/01/2021 to 11/12/2021

Demographic constructs	N	Percent
Race		
American Indian/Alaska Native	14	0.52
Asian	94	3.50
Black or African American	1784	66.44
Other	117	4.36
White	568	21.15
Native Hawaiian	3	0.11
No responses	105	3.91
Ethnicity		
Latinx	254	9.45
Not Latinx	2249	83.76
Prefer not to answer	169	6.29
No responses	13	0.48
Gender		
Female	1327	49.42
Male	1342	50
Non-binary/third gender	5	0.19
No responses	11	0.41
Age		
5 to 11	6	0.22
12 to 18	112	4.17
19 to 30	297	11.06
31 to 40	374	13.93
41 to 50	383	14.26
51 to 60	510	18.99
> 60	985	36.69
Unknowns	18	0.67
Total:	*2685 Unique Individuals*	

Figure 1 illustrates the trends in willingness and enthusiasm for vaccination. More individuals were vaccinated in Week 6 and Week 8 (April 2021) than in the following weeks. The vaccination rates dropped markedly during Weeks 22 and 23 (July 2021), potentially in response to Philadelphia lifting its mask mandate, leading many to believe the pandemic was over. The vaccination rates increased again in Week 34 (September 2021), potentially due to the surge of the Delta variant and looming mandates for vaccination within the city.

Figure 1.
Weekly Numbers of Vaccines Distributed by RapidVax from 02/01/2021 to 11/12/2021. The Y-axis represents the number of doses, and the X-axis represents weeks.



Implications and Next Steps

RapidVax has demonstrated efficacy and effectiveness in increasing COVID-19 vaccination rates across Temple University's CPH and communities in Philadelphia. With the emphasis on community engagement, evidenced-based message designs, and vaccine deliveries, RapidVax has vaccinated close to 5,000 individuals. Through this exercise, CPH reestablished trust in the community via consistent presence at a formerly closed clinic (Vaux), providing education and vaccinations four days a week, in addition to pop-up clinics in communities across Philadelphia. This trusting relationship with the community has played a paramount role in getting hard-to-reach individuals vaccinated.

RapidVax focused on engaging with Philadelphians who were most likely to have vaccine hesitancy (e.g., racial and ethnic minorities, people who are homeless, those with substance use disorders) and those with access issues to obtain a vaccination (e.g., house-bound seniors, individuals working irregular hours, individuals with transportation problems). Our three-pronged strategy of developing tailored communications, engaging communities with appropriate messaging, and providing vaccination at easily accessible sites, was successful. We continue, however, to examine which components of the communication plan were the active ingredient in this success. For example, individuals' engagement with Facebook ads targeting ZIP codes surrounding clinic locations was low, with only 600 post clicks to the RapidVax website or registration form out of 1,806,608 impressions. This finding indicates the need to identify effective

communication elements and channels, which will further tailor our social media engagement and enhance our communication strategies.

A potential cost-effective method to increase social media engagement would be to design Facebook and other social media ads based on the seven themes from the perceptual mapping results (see Supplementary A). The map-informed communication materials (e.g., the Communication 101 document and fact sheets about COVID-19 vaccines) are freely accessible on the RapidVax website, yet Facebook users who did not click on the ads may not have seen those evidence-based documents. Designing and testing which type of ads increase the engagement rate would allow us to better understand the effective communication elements needed with our vaccine-hesitant audiences and inform future social media engagement strategies. The effectiveness of communication materials that assist community partners and communication staff during community events also needs to be further assessed. As the number of unvaccinated individuals shrinks, the need for micro-targeting communication materials and delivery strategies will become paramount.

Other crucial next steps include continued presence in the community, maintaining existing community partnerships, and observing best practices in engagement to maintain sustainable trusting relationships. This will allow us to demonstrate the genuine motives of the CPH and create a solid foundation to advance community-based projects in the future. As many Philadelphians have actively initiated creative ways to support their communities in vaccination, connecting people with complementary missions to form creative partnerships, offering skills training, and connecting them with CPH members with similar interests are potential next steps.

Conclusions

RapidVax achieved its goal of extensive outreach into minority and marginalized communities in Philadelphia; 74.9% of those we vaccinated at the community level were people of color. Working with an organization that serves the homeless and provides substance disorder treatment, we were able to vaccinate 412 individuals who would not have otherwise received vaccinations. The program also vaccinated 1,175 seniors in public housing and approximately 2,000 essential workers. The flexibility of the workflows also allowed RapidVax to be one of the first to offer boosters and pediatric vaccinations. Importantly, RapidVax demonstrates the value and importance of interprofessional collaboration between clinical disciplines such as nursing, social work, and pharmacy, along with public health professionals, to provide comprehensive services of tailored information and vaccination.

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Conflicts of Interest

There is no conflict of interest.

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Statement of Contributions

Laura A. Siminoff wrote and edited all manuscript sections, was the principal investigator on the grant that funded RapidVax, developed and analyzed the college surveys, and provided overall oversight of the project. Susan VonNesson-Scanline was the Co-PI on the grant that funded RapidVax, was the clinical lead, wrote clinical sections, and edited the manuscript. Huanmei Wu led the health informatics component of the project, wrote the data analytics section, and edited the manuscript. Briana T. Richardson led community engagement, wrote the community engagement sections, and edited the manuscript. Patrick J. Kellly assisted with writing the communication section and the collection and analysis of that data. Sarah Bauerle Bass wrote the communication section, edited the manuscript, and directed the communication messaging data collection and analyses.

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