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The role of funded partnerships in working towards decreasing COVID-19 vaccination disparities, United States, March 2021—December 2022

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Abstract

During the COVID-19 vaccination rollout from March 2021- December 2022, the Centers for Disease Control and Prevention funded 110 primary and 1051 subrecipient partners at the national, state, local, and community-based level to improve COVID-19 vaccination access, confidence, demand, delivery, and equity in the United States. The partners implemented evidence-based strategies among racial and ethnic minority populations, rural populations, older adults, people

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Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention (CDC).

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Appendix. Supplementary material

Supplementary data to this article can be found online at https://doi.org/10.1016/j.vaccine.2023.12.061.

with disabilities, people with chronic illness, people experiencing homelessness, and other groups disproportionately impacted by COVID-19. CDC also expanded existing partnerships with healthcare professional societies and other core public health partners, as well as developed innovative partnerships with organizations new to vaccination, including museums and libraries. Partners brought COVID-19 vaccine education into farm fields, local fairs, churches, community centers, barber and beauty shops, and, when possible, partnered with local healthcare providers to administer COVID-19 vaccines. Inclusive, hyper-localized outreach through partnerships with community-based organizations, faith-based organizations, vaccination providers, and local health departments was critical to increasing COVID-19 vaccine access and building a broad network of trusted messengers that promoted vaccine confidence.

Data from monthly and quarterly REDCap reports and monthly partner calls showed that through these partnerships, more than 295,000 community-level spokespersons were trained as trusted messengers and more than 2.1 million COVID-19 vaccinations were administered at new or existing vaccination sites. More than 535,035 healthcare personnel were reached through outreach strategies. Quality improvement interventions were implemented in healthcare systems, long-term care settings, and community health centers resulting in changes to the clinical workflow to incorporate COVID-19 vaccine assessments, recommendations, and administration or referrals into routine office visits. Funded partners' activities improved COVID-19 vaccine access and addressed community concerns among racial and ethnic minority groups, as well as among people with barriers to vaccination due to chronic illness or disability, older age, lower income, or other factors.

Keywords

COVID-19 vaccination; Partnerships; Vaccine equity; Community engagement

1. Background

Disparities in vaccination coverage in racial and ethnic minority groups, populations with lower income, less education, un- or under-insured, and living in rural zip codes have been documented for decades in the United States [1]. During the COVID-19 pandemic, inequities were evident in COVID-19 vaccination distribution, provision, and coverage in these populations [2,3]. To improve COVID-19 vaccination access, confidence, demand, delivery, and equity during the COVID-19 vaccination rollout, the Centers for Disease Control and Prevention (CDC) built upon the breadth and depth of its existing partnerships and formed new strategic partnerships to reach diverse populations. From March 2021 through December 2022, CDC funded 110 non-research focused primary partners (Table 1) and 1051 subrecipient partners to implement a combination of evidence-based strategies (Table 2) [4], in efforts to reduce COVID-19 vaccination disparities in the United States.

In January 2020, CDC set out to better understand factors driving decades of racial and ethnic disparities in adult immunization and factors that might be anticipated to impact COVID-19 vaccine uptake when a COVID-19 vaccine became available. In July 2020, CDC held a 1-day virtual listening session with 17 experts in adult vaccination, racial equity, and community leadership [5]. The major feedback from this convening was that CDC's broad

messaging on vaccination was not resonating with racial and ethnic minority communities. Meeting participants suggested that CDC could meaningfully improve equity in vaccine access and uptake by working more at the local level to train influential messengers who were trusted by and knew how to relate to their own communities and could partner with community-based organizations to reach communities with limited access and/or low vaccine confidence. Based on findings from this listening session and data from prior studies on immunization uptake and confidence in different communities [6,7], CDC launched *the Partnering for Vaccine Equity (P4VE)* program to build a network of partners at the national, state, local, and community levels to reduce vaccination disparities in racial and ethnic minority adult populations [8].

In addition to the P4VE partnerships, CDC funded partnerships with organizations focused on a range of disproportionately affected adult populations (DAAP). DAAP partners focused on improving COVID-19 vaccine access, confidence, demand, delivery, and equity among rural populations, older adults, people with disabilities, people with chronic illness, people experiencing homelessness, people with substance use disorders, and other groups disproportionately impacted by COVID-19.

Additionally, a cohort of partners were funded to focus solely on improving COVID-19 vaccine confidence and demand (VCD). These partners included organizations serving farmworkers in the southeastern U.S. and on the U.S.-Mexico border; partners focused on refugee, immigrants, and migrants; tribal health departments; healthcare organizations, such as the American Pharmacists Association, the American Association of Pediatricians, and the American Hospital Association; National Council of Young Men’s Christian Association (YMCA); and the Institute of Museum and Library Services that supported 100 museums, libraries, and tribal organizations across the country, among others [9].

Partners implemented multi-level, evidence-based interventions, from systems-level interventions, ranging from vaccine policy updates and workflow changes that incorporated COVID-19 vaccine assessments into patient/resident encounters in healthcare systems, community health centers, and long-term care chains, down to community-level interventions, including training vaccine ambassadors as trusted messengers and hyper-local outreach, such as setting up COVID-19 vaccine education tables in farm fields, local fairs, churches, community centers, and barber and beauty shops. Partners also implemented communication interventions, such as engaging in peer-led online groups to combat vaccine misinformation on social media. These interventions have been shown to be effective in improving vaccine delivery, increasing vaccine access, building trust, and overcoming misinformation [10–12].

This paper describes the actions taken by funded partners and sub-recipient partners to improve COVID-19 vaccine access, confidence, demand, delivery, and uptake across a wide range of populations.

2. Methods

Quantitative and qualitative data from May 2021 to December 2022 came from two sources: 1) partners who voluntarily submitted monthly and quarterly progress reports in REDCap forms, which contained structured, customized questions about partners' activities promoting COVID-19 and influenza vaccination, and 2) project officers who input data from monthly partner calls and partner reports into a Partner Data Tracker for partners who did not submit data in REDCap. The quantitative data focused on output- and outcome-oriented metrics, such as number of trainings held, health communication products developed, social media reach, number of vaccination clinics held, and number of vaccinations administered at partner events. Quantitative data were collected and summarized in Microsoft Excel. Z-scores were generated to determine outliers, and data verification checks were conducted with partners before generating descriptive statistics.

Qualitative data were descriptive results from the questions regarding program activities that were exported from partners' REDCap reports into Excel and from the Partner Data Tracker. Questions focused on several domains, including partnership development and implementation, community engagement activities, influential messengers, health communication, challenges, and barriers. Inductive coding was used to identify the patterns that emerged from the reports by labelling and organizing the data into concepts and themes. Seven project officers and technical monitors (Appendix) reviewed the qualitative data and used content analysis to assign codes to statements and sections of text.

3. Results

3.1. Partners focused on reaching racial and ethnic minority groups through the Partnering for Vaccine Equity (P4VE) program

P4VE is a network of 61 primary partners, including national partners, such as the National Council of Negro Women and the CDC Foundation, professional associations, such as the National Hispanic Medical Association, and community-based organizations, such as YMCA of Coastal Georgia, as well as hundreds of subrecipient partners focused on increasing equity in COVID-19 and influenza vaccination in racial and ethnic minority communities.

An example of a national-level P4VE partnership was CDC's collaboration with the Conference of National Black Churches (CNBC), which comprises the leaderships of the largest predominantly Black denominations in the United States. CNBC's membership includes 31,000 congregations, representing 80% of Black Christians, and more than 25 million people in all 50 states [13]. CNBC's "*Mobilizing African American Communities to Overcome Vaccine Hesitancy: Trusted Voices, Trusted Content, Trusted Spaces*" leveraged high-profile faith leaders to dispel vaccine misinformation, provide accurate information, and increase vaccine access. The CDC provided ongoing technical assistance and funding which allowed CNBC to train more than 5200 pastors and faith leaders who then trained additional trusted messengers in their communities, resulting in more than 7100 committed influencers advocating for COVID-19 vaccine uptake. More than one million COVID-19 vaccinations were distributed by CNBC-affiliate vaccination clinics. Additionally, CNBC

supported the efforts of more than 540 churches hosting vaccination sites in Black communities across the country.

To improve vaccine confidence and access to COVID-19 and influenza vaccines at the community-level through P4VE, CDC provided supplemental funding to the longstanding "Racial and Ethnic Approaches to Community Health" (REACH) program [14]. Through REACH, CDC partnered with 38 community-based organizations and local health departments that worked to increase influenza and COVID-19 vaccination access and to build vaccine confidence. The REACH recipients trained more than 1000 influential community messengers on COVID-19 vaccination and vaccinated more than 50,000 community members. One REACH recipient, the Southern Nevada Health District (SNHD) in Las Vegas, Nevada, conducted a needs assessment with a partner organization which overlaid social vulnerability index with rates of completed vaccinations in communities in Clark County, which includes Las Vegas. Based on the findings of the needs assessment, SNHD trained 230 community-level spokespersons, including community health workers, faith and cultural leaders, barbers, beauticians, business owners, radio DJs, and other public figures, to combat misinformation and support vaccination uptake with a focus on more socially vulnerable communities with lower vaccine uptake. Additionally, they hosted 147 mobile pop-up clinics serving zip codes in Clark County with low COVID-19 vaccination coverage [15].

3.2. Partners focused on reaching disproportionately affected adult populations (DAAP)

In addition to the 61 primary P4VE partnerships to reduce COVID-19 vaccination disparities in racial and ethnic minority populations, CDC funded 30 primary partnerships with organizations focused on a range of disproportionately affected adult populations (DAAP) from March 2021- December 2022.

CDC partnered with the National Association of Community Health Centers, and they contracted with the National Health Care for the Homeless Council, to implement the Vaccine Ambassador Program. This program used a community health center-based trusted communicator model to facilitate COVID-19 and other vaccinations among three specific populations who face unique barriers to accessing healthcare and are at increased risk for severe COVID-19: people experiencing homelessness, people who engage in sex work, and people with substance use disorders [16]. In the first year of the Vaccine Ambassador Program in 2021, 15 health centers across 13 states participated, of which 11 health centers across 9 states continued into year 2. Overall, 102 Vaccine Ambassadors, including community health workers, nurses, and medical assistants, were hired and/or trained, and 31,591 COVID-19 vaccine doses were administered. Successful implementation of the Vaccine Ambassador Program was driven by local community partnerships, including shelters, food pantries and food distribution sites, encampments, churches, substance use disorder treatment facilities, and syringe services programs (SSPs).

To increase COVID-19 vaccination among older adults and people with disabilities, CDC signed an Interdepartmental Delegation of Authority with the Administration for Community Living (ACL). Through this partnership, ACL funded 56 state aging agencies (that partnered with more than 600 Area Agencies on Aging and thousands of community-

based provider organizations throughout the nation), 352 Centers for Independent Living, 68 University Centers for Excellence in Developmental Disabilities, 57 Protection and Advocacy Systems, 56 Councils on Developmental Disabilities, and 54 state and territory Aging and Disability Resource Center grantees across the country to increase COVID-19 vaccine information distribution and help provide access to COVID-19 vaccines. ACL also expanded their capacity for the Eldercare Locator national hotline and established the Disability Information and Access Line (DIAL). These hotlines helped connect older adults and people with disabilities to local agencies to secure access to information, services, and support in obtaining a COVID-19 vaccine in their local community. Between October 2021 and December 2022, DIAL assisted more than 63,000 people with disabilities and Eldercare Locator assisted more than 145,000 people via phone call, email, live chat, text, and video phone (for American Sign Language users) with general COVID-19 inquiries, including arranging for in-home vaccination and booster shots, assistance scheduling appointments, and other health-related services and supports in their communities.

CDC also partnered with NASTAD, a national alliance of HIV, AIDS, and hepatitis directors across states and U.S. Territories, and their project partner, AIDS United, to fund 58 SSPs over two years. The funding allowed SSPs to expand their services to include COVID-19 vaccination, as well as to provide COVID-19 vaccine education to their participants, particularly people who use drugs and those who are unstably housed, while continuing to provide harm reduction and infectious disease prevention services, including HIV and viral hepatitis services and referrals for substance use disorder treatment. Some SSPs had fixed-site vaccination capabilities, while others offered mobile services, and multiple programs hired people who have lived or living experience of substance use disorder and people who are or have been unhoused for COVID-19 education and outreach. From March through December 2022, 83,954 COVID-19 risk reduction counseling sessions were conducted, 11,822 individuals received on-site or navigation to offsite COVID-19 vaccinations, and 62,186 individuals were referred for COVID-19 vaccinations.

Further, CDC partnered with U.S. Department of Agriculture (USDA)’s National Institute of Food and Agriculture for the *Extension Collaborative on Immunization Teaching & Engagement (EXCITE)* Project [17] to improve COVID-19 vaccination coverage in rural and other medically underserved communities. The EXCITE Project focused on engaging with 72 Land-grant Universities, home of the Cooperative Extension System, and the 32,000 Extension professionals living and working in almost every county across the U.S. Extension professionals provide unbiased, research-related education and extend it into their communities. Their efforts included engaging communities in vaccine education, increasing adult immunization rates, and decreasing barriers to vaccination. More than 15 million individuals were reached by all the EXCITE projects through social media, faith communities, pop-up immunization clinics, and written or verbal messages. Extension professionals brought COVID-19 vaccine education into farm fields, local fairs, churches, community centers, and, when possible, partnered with local health providers to administer COVID-19 vaccines to the communities, with more than 25,000 adult vaccinations administered at more than 1000 vaccination clinics. These efforts collectively show how effective incorporating vaccine education as a part of other ongoing health and well-being education efforts is as a delivery strategy.

3.3. Partners focused specifically on vaccine confidence and demand (VCD)

Additionally, a cohort of 23 vaccine confidence and demand (VCD) partners were funded to focus solely on improving COVID-19 vaccine confidence and demand. As part of the Institute of Museum and Library Services' *Communities for Immunity* program, which was carried out with the Association of Science and Technology Centers, funding was given to local museums and libraries to support them in engaging with their communities to boost COVID-19 vaccine confidence. For example, the C. Williams Rush Museum of African American Arts & Culture in Kingstree, South Carolina, convened six cohorts of conversations among museum staff, medical professionals, unvaccinated Black men, and recently vaccinated individuals, to answer questions and discuss the benefits of vaccination. Additionally, the Kansas City Public Library preserved and shared the stories of previously vaccine hesitant individuals who were later vaccinated, translated materials into new languages, offered vaccination clinics at their branches, and facilitated conversations between youth and medical professionals about COVID-19 vaccine.

3.4. Partners focused on reaching healthcare personnel

As part of P4VE, DAAP, and VCD partner efforts, CDC also reached healthcare providers through 16 primary partnerships with medical, nursing, pharmacy, and healthcare professional societies, including minority-led medical professional associations, such as the National Medical Association, the National Hispanic Medical Association, the Association of American Indian Physicians, and the National Council of Urban Indian Health; medical specialty societies through a partnership with the Council of Medical Specialty Societies (CMSS), a coalition of more than 50 medical specialty societies; long-term care providers through a partnership with AMDA - The Society for Post-Acute and Long-Term Care Medicine, Inc. and the American Healthcare Association/National Center for Assisted Living; hospital and health system leaders through the American Hospital Association-Health Research and Education Trust (AHA-HRET); pharmacists through the American Pharmacists Association; and nursing and community health leaders through the American Association of Colleges of Nursing and the National Nurse-Led Care Consortium. Through these 16 primary partnerships with medical, nursing, pharmacy, and other healthcare professional associations, quality improvement interventions were implemented in health systems, long-term care chains, and community health centers. Additionally, more than 535,035 healthcare personnel were reached through communication efforts and outreach strategies, including trainings.

The CMSS partnership included working at the medical professional society-level to review vaccination policies, guidelines, and educational materials of 7 funded specialty societies that care for adults with chronic medical conditions. During 2022, 6 of the 7 societies released new clinical guidance or policy statements that fully comply with the Standards for Adult Immunization Practice [18] and signed onto the National Adult and Influenza Immunization Summit's "Call to Action to Protect All Adults from Vaccine-Preventable Disease and Disability". Specialty societies also actively developed and disseminated resources for their members. The American College of Cardiology adapted training materials on vaccine hesitancy to be used by their members with their patients [19]. The American Thoracic Society created a fact sheet on COVID-19 and lung health and produced

a webinar on how to communicate with patients about vaccination [20]. To enhance connection to state immunization registries, the American Society of Nephrology developed resources related to the use of state immunization information systems (IISs).

AMDA implemented a quality improvement project, “Moving Needles” [21]. There were increases in bivalent COVID-19 vaccination coverage among residents in all nine of their long-term care pilot sites between October and December 2022, the period when the bivalent booster vaccine was introduced. By December 2022, vaccination coverage with the COVID-19 bivalent booster for residents at all nine sites ranged between 59% and 96%. Seven of the nine long-term care pilot sites came close to or exceeded their coverage for the initial monovalent COVID-19 booster dose that was available until September 2022. For staff, bivalent booster dose coverage ranged from 5% to 25% in the same nine sites, which although low, was above the national average in seven of the nine sites.

The AHA-HRET partnership created a recorded video series to train members as Vaccine Ambassadors who served as local spokespersons to encourage COVID-19 vaccination in their communities. AHA-HRET hosted monthly Community of Practice calls where Ambassadors gathered and shared successes and challenges and used the feedback to improve the program. In 2022, AHA-HRET partnered with the Children’s Hospital Association to reach pediatric hospital leadership and their staff, recruiting new Ambassadors with the ability to tailor messages for increasing confidence in pediatric COVID-19 vaccinations. AHA-HRET also used a national heat map of vaccination rates to identify localities where paid promotion may be most impactful for Vaccine Ambassador public service announcements, podcasts, or social media campaigns. These efforts resulted in more than 11 million impressions on a single pediatric-focused vaccination video on social media.

3.5. The Learning Community and Vaccine Resource Hub

CDC supported partners’ work through the development and maintenance of a Learning Community forum, which brought together more than 500 organizations funded through the P4VE program. The Learning Community ensured that the partner network could ramp up their programs quickly, share promising practices and materials, help each other navigate common challenges, and access learning opportunities to achieve vaccine equity. Within the Learning Community, PAVE recipients, technical assistance partners, and subject matter consultants met at least monthly to share their expertise through group learning events, Communities of Practice, one-on-one coaching with subject matter experts, and data technical assistance. The Learning Community helped partners address urgent needs, share insights, and strengthen their capacity to address broader long-standing inequities in adult vaccination. As of December 2022, the Learning Community had 4020 attendees at 75 webinars, office hours, and other group learning events.

CDC also developed a Vaccine Resource Hub (VRH) [22], which provided an online site for partners to share free and accurate educational materials to support COVID-19 vaccination uptake within racial and ethnic minority communities. The VRH offered infographics, tool-kits, talking points, fact sheets, videos, success stories, podcast recordings, ready-to-use communication products, and many other resources that funded partners and the general

public could use and adapt to their local communities and train trusted messengers. Partners were able to customize graphics or use ready-made resources that had been tailored to reach priority populations in campaigns such as, “Don’t Play the Waiting Game” which promoted COVID-19 booster vaccination. Other examples included educational materials on receiving the COVID-19 vaccine as part of National Hispanic Heritage Month created exclusively for the Hispanic and Latino communities. The VRH hosted over 115 stories that celebrated the power of partnerships, innovations, and accomplishments of partners as they worked to create healthier communities through COVID-19 vaccination. Trending topics and talking points provided real-time information about COVID-19 and influenza vaccines. Capacity building resources included social media best practices for organizations to better reach their audience. As of December 2022, the VRH received more than 1154 resources in over 50 languages from participating P4VE partners, allowing communication products to be adapted for various communities. Over 46,000 users have visited the site and downloaded 10,849 resources.

3.6. Partnering to combat mis- and disinformation via social media

CDC also partnered with organizations focused on using social media to combat mis- and disinformation about COVID-19 and influenza vaccines. CDC Foundation and UnidosUS were funded to partner with seven multi-media agencies with marketing and public health information expertise and grassroots accountability organizations to address the rapidly increasing amount of vaccine misinformation circulating among people from racial and ethnic minority groups. Through creative and cross-collaborative social media activities, these seven partners – Upstreamers, Culture ONE World, The Center for Black Health & Equity, NAACP Atlanta, Slate Social, The Public Good Projects, and Ad Council – monitored vaccine messages circulating on social media, debunked and slowed the spread of misinformation, and developed proactive affirmative messaging campaigns about vaccination to counter misrepresentations and deliberate malicious falsehoods targeting racial and ethnic minority groups.

Through coordinated monthly meetings and resource sharing, these partners contributed to the CDC’s evidence base of effective interventions, insights, and culturally relevant social media assets. The P4VE social media partners also provided capacity-building and technical assistance support to the social media partners they fund and other P4VE partners. The Center for Black Health & Equity led train-the-trainer workshops on how to spot misinformation, how social media messaging affects the perception of vaccines, and how to engage with social media platforms that have also been developed into an online public training, Truth Check [23], where actress Jennifer Lewis was the spokesperson. In an additional novel and innovative approach to public health communications and messaging, Slate Social, Ad Council, and The Public Good Projects vetted, trained, and partnered with 2000 macro- and micro-influencers to address vaccine hesitancy using their own voices, across influencers’ preferred platforms. The Public Good Projects developed Spanish language capacities for Project VCTR (Vaccine Communication Tracking and Response) [24], and developed a tool, Health Listening [25], that provided weekly health messaging to help communities respond to misinformation.

Social media partners built capabilities and interventions across different communication levels using digital health literacy, promising approaches, and community engagement. As of December 2022, partners collectively developed 1647 culturally relevant English and Spanish messages to help address and counter COVID-19 and influenza vaccine misinformation and disinformation on social media platforms. There were 4.94 million shares, saves, and reports with social media-based campaigns. These products were disseminated via various social media platforms, including TikTok and Instagram, and are located on the Vaccine Resource Hub.

3.7. Data Informed Technical Assistance (DITA)

To inform the above work conducted by its partners, CDC established the Data Informed Technical Assistance (DITA) effort which was staffed by data scientists to provide: 1) regular reports to inform vaccine outreach efforts (e.g., to identify communities with historically low influenza vaccination rates but high vulnerability to COVID-19); 2) capacity building in accessing and interpreting data for action; and 3) on-demand, high-complexity technical assistance. DITA support started with the initial 38 REACH community-based organizations and local health departments before expanding to the entire CDC-funded partner network. Recipients of DITA support worked with the DITA team to identify data needed to target planned vaccination activities. Developed reports were disseminated in interactive meetings for each primary partner with attendance by representatives of subrecipients.

DITA provided on-demand, high complexity technical assistance to requesting local/state/tribal health authorities and CDC-funded partners to support vaccine outreach. Community organizations and public health authorities could contact CDC directly to request DITA services, followed by the joint development of analytical outputs to inform vaccine activities. Example products included zip-code level analysis on barriers present in low-coverage neighborhoods and distance analysis of hard-to-reach populations relative to federally qualified health centers. This allowed rapid and direct access to data science products needed by organizations implementing vaccination activities. By December 2022, DITA had provided over 800 tailored analysis reports and conducted over 200 group and individual technical assistance sessions to support partners in using data for action. Partners have indicated through surveys and direct feedback that DITA support enabled them to plan and focus programming and outreach, tailor communication materials, coordinate vaccination events, and identify potential partnership opportunities with organizations in their community.

3.8. New partnerships formed

An analysis of data reported by P4VE partners from May 2021 to December 2022 showed that they developed over 18,545 new partnerships (Fig. 1). For example, local community organizations built new partnerships with grocery stores, immunization coalitions, and vaccine administrators (e.g., health clinics, health departments, or healthcare provider groups) to promote COVID-19 vaccine-related information to populations of focus and to increase vaccination opportunities. This new network of partners increased vaccine confidence and equitable access to vaccines by engaging influential messengers, utilizing

social and traditional media outlets to disseminate tailored immunization information in multiple languages, and conducting vaccination events with local providers. Additionally, a network of partnerships with health and non-health-based organizations was built across different systems and levels, (i.e., state, local, community-based, and minority-serving organizations), to accelerate vaccine equity work.

3.9. Overarching impact

Through these partnerships, from May 2021- December 2022, more than 295,000 community-level spokespersons were trained as trusted messengers and more than 2.1 million COVID-19 vaccinations were administered at new or existing vaccination sites. More than 535,035 healthcare personnel were reached through communication efforts and outreach strategies. Over 200 nationwide COVID-19 vaccination educational campaigns were launched by P4VE partners in 44 languages and dialects, including Bengali, Khmer, and Pohnpeian. Additionally, quality improvement interventions were implemented in healthcare systems, long-term care settings, and community health centers that resulted in changes to the clinical workflow to incorporate COVID-19 vaccine assessments, recommendations, administration or referrals, and documentation into the IIS. Vaccination policies were also updated by medical professional societies and in clinical settings.

3.10. Challenges faced by partners

Recurrent challenges reported by partners included difficulty procuring enough COVID-19 vaccines early in the rollout to meet initial demand and keeping current with rapidly changing COVID-19 vaccine recommendations. Additionally, vaccine misinformation and disinformation around vaccine development and origins, potential side effects on fertility, new COVID-19 variants, and booster doses continued to perpetuate vaccine hesitancy within racial and ethnic minority communities. Other disproportionately affected adult populations faced different challenges, including vaccination access for rural populations due to long distances to the nearest vaccination site, and linguistic challenges related to scheduling appointments and receiving COVID-19 vaccine-related information for non-native English speakers.

Partners working with health systems, long-term care settings, and community health centers also encountered challenges. Adequate staffing, receiving adult vaccination data from outside entities due to unidirectional connections to the IIS, and evolving COVID-19 vaccination guidelines were among a few of the challenges reported.

4. Discussion

CDC collaborated with 110 national, state, local, and community-based funded primary partners and more than 1000 sub-recipient partners across the United States, including organizations without prior experience in public health and immunizations, to increase vaccine confidence, equity, and uptake. The diversity and breadth of the CDC-funded partner network was strategic because of the longstanding trust and reach of the partners in their communities of focus. Through the efforts of P4VE, DAAP, and VCD partners and their

subrecipient partners, COVID-19 vaccine access, confidence, demand, delivery, and uptake across a wide range of populations was improved.

Funded partners' activities expanded COVID-19 vaccine access and addressed community concerns which helped counter the lower COVID-19 vaccination coverage among Black, Hispanic, Latino, and Alaska Native/American Indian populations compared with whites, as well as among people with lower incomes, lack of health insurance, or lack of access to healthcare providers versus respective comparison groups. Over the course of the COVID-19 vaccination rollout, differences among vaccination coverage for Black, Hispanic, and white populations narrowed, and the coverage for Hispanic/Latino individuals nationally rose above whites. Vaccination coverage for Black individuals also increased [26]. Although national-level data showing reduced racial and ethnic disparities in COVID-19 vaccination coverage cannot be directly attributed to efforts of the CDC-funded partner network, these improvements highlight the need for continuing contributions of local community outreach and trusted community messengers.

The total number of reported vaccinations administered at events that partners held was a fraction of the hundreds of millions of COVID-19 vaccine doses administered in the United States. Nonetheless, the trust building and outreach to populations that have a longstanding history of vaccination disparities and lower vaccine confidence, exacerbated by the effects of structural racism and mistrust of healthcare and government [27,28], cannot be underscored. The funded partners reached populations who experienced some of the most challenging barriers to vaccination, where creating one opportunity for vaccination might be equivalent in time and effort to hundreds of vaccinations in populations who are seeking out vaccines. Their efforts also created novel partnerships between organizations that resulted in new opportunities for vaccine access.

There are several lessons learned from the vaccine equity programmatic work. Partnerships that developed across organization levels and systems demonstrated promise in improving vaccination uptake and confidence among populations of focus. Inclusive, hyper-localized outreach through partnerships with community-based organizations, faith-based organizations, vaccination providers, and local health departments proved critical to building a broad network of trusted messengers. These vaccine ambassadors disseminated accurate COVID-19 vaccine-related information and improved vaccine confidence and trust among community members, thereby increasing the demand for COVID-19 vaccines. To improve sustainability of the progress made, these partnerships should be built to be lasting, long-term relationships, rather than temporary ones. It is also important to ensure that local voices are not only heard, but also acted upon. Additionally, multiple health communication channels helped improve the health literacy of community members on immunization. Partners that conducted quality improvement interventions in healthcare settings found that incorporating COVID-19 vaccination into the workflow and creating a culture of vaccination helped improve vaccination coverage.

To overcome evaluation and reporting challenges, ongoing technical assistance was provided to partners, as many partners were new to government funding and program evaluation requirements. CDC worked with partners to build logic models so that partners developed

process measures, outputs, and short- and long-term outcomes, in efforts to better measure program impact.

5. Limitations

Since these were all non-research partnerships, we were not able to definitively state whether one intervention or combination of interventions was more effective than another for specific populations. This points to the need for future implementation science research to better understand to what extent inequity is addressed by these intervention programs. The total reported numbers of vaccinations administered might be an underestimate and is not a true reflection of the impact of these partnerships. It is possible that people might have decided to become vaccinated while interacting with a partner at an outreach event and then been vaccinated at a different site. Additionally, partners did not always have local healthcare providers onsite administering COVID-19 vaccine at their events, but rather, focused on the conversations, addressing myths, and building trust. Future research partnerships can use different ecological and population-based methods to measure impact that encompasses more comprehensive successes than vaccinations administered.

6. Conclusion

Partners weathered the changing landscape of the pandemic and were able to reach populations disproportionately affected by COVID-19. Continued work with trusted, innovative partners can sustain and build upon the progress made in improving vaccine delivery, increasing vaccine access, building trust, and overcoming misinformation to further advance vaccine equity.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data availability

This article does not contain research data.

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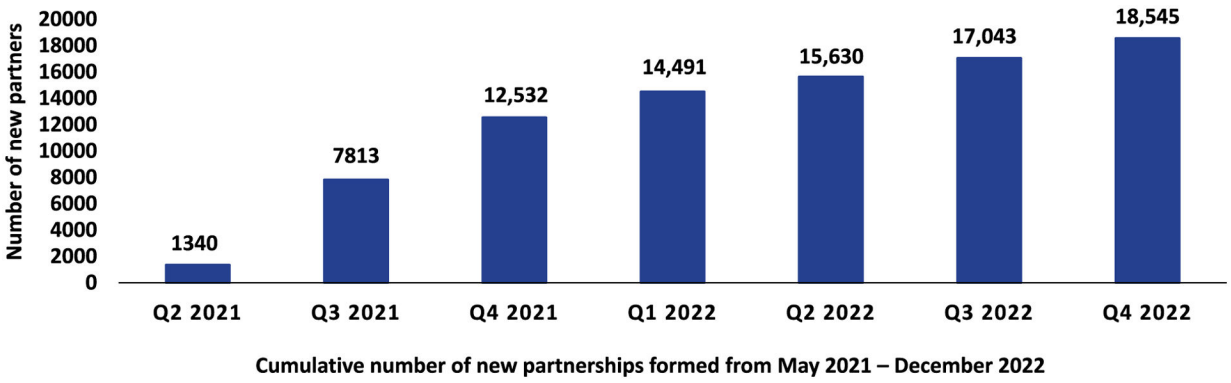

Fig. 1.

P4VE partners formed 18,545 new partnerships with local organizations, immunization coalitions, and vaccine administrators delivering population-focused COVID-19 vaccination information and providing access points.

Table 1

CDC-funded non-research primary partners focused on reducing COVID-19 vaccination disparities.

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
1	P4VE	**Alaska Native Tribal Health Consortium**	Racial and Ethnic Approaches to Community Health (REACH) recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Tribal or Indian organization; nonprofit	Alaska	Alaska	Racial/ethnic minority groups	Community-based efforts
2	P4VE	**Allegheny County**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; Local or county health department	Pennsylvania	Pennsylvania	Racial/ethnic minority groups	Community-based efforts
3	P4VE	**American Heart Association**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Texas	Texas	Racial/ethnic minority groups	Community-based efforts
4	P4VE	**Asian & Pacific Islander American Health Forum (APIAHF)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	California	National	Racial/ethnic minority groups	Community-based efforts
5	P4VE	**Association of American Indian Physicians (AAIP)**	AAIP worked to improve tribal health leadership capacity to prioritize COVID-19 vaccination and strengthen provider competencies to increase vaccination coverage in Indian country.	Medical, nursing, pharmacy, or healthcare professional association	Oklahoma	National	Racial/ethnic minority groups, Medical, professional, or healthcare workers	Support for healthcare providers
6	P4VE	**Association of Immunization Managers (AIM)**	Association of Immunization Managers (AIM) provided technical assistance and support to REACH recipients and jurisdictions.	Nonprofit	Maryland	National	Racial/ethnic minority groups	Technical assistance
7	P4VE	**Association of State and Territorial Health Officials (ASTHO)**	In this funding mechanism, academic institutions, public health institutes, and ASTHO identified promising practices on equitable distribution, administration, and/or uptake of COVID-19 and influenza vaccination then funded subrecipient	Nonprofit	Virginia	National	Racial/ethnic minority groups	Evaluation

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
			partners to implement the promising practices and evaluate the outcomes.					
8	P4VE	**California Department of Public Health**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	State health department	California	California	Racial/ethnic minority groups	Community-based efforts
9	P4VE	**CDC Foundation (CDCF)**	Foundations/national organizations funded and supported community-based organizations to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base. CDCF was also funded to support the Vaccine Resource Hub for the Partnering for Vaccine Equity (P4VE) program and to coordinate the social media subrecipients to combat mis- and disinformation about COVID-19 vaccine.	Nonprofit	Georgia	National	Racial/ethnic minority groups	Community-based efforts
10	P4VE	**Cicatelli Associates Inc. Buffalo**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	New York	New York	Racial/ethnic minority groups	Community-based efforts
11	P4VE	**City of Hartford**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; Local or county health department	Connecticut	Connecticut	Racial/ethnic minority groups	Community-based efforts
12	P4VE	**City of Miami Gardens**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government	Florida	Florida	Racial/ethnic minority groups	Community-based efforts
13	P4VE	**City of Minneapolis**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government	Minnesota	Minnesota	Racial/ethnic minority groups	Community-based efforts
14	P4VE	**City of San Antonio Metropolitan Health District**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; Local or county health department	Texas	Texas	Racial/ethnic minority groups	Community-based efforts

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
15	P4VE	**City of Worcester**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government	Massachusetts	Massachusetts	Racial/ethnic minority groups	Community-based efforts
16	P4VE	**Community Catalyst**	Foundations/national organizations funded and supported community-based organizations to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	Massachusetts	National	Racial/ethnic minority groups	Community-based efforts
17	P4VE	**Conference of National Black Churches (CNBC)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	Georgia	National	Racial/ethnic minority groups	Community-based efforts
18	P4VE	**County of San Diego, Health and Human Services Agency, Public Health Services**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county health department	California	California	Racial/ethnic minority groups	Community-based efforts
19	P4VE	**Cuyahoga County District Board of Health**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; Local or county health department	Ohio	Ohio	Racial/ethnic minority groups	Community-based efforts
20	P4VE	**DeKalb County Board of Health**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county health department	Georgia	Georgia	Racial/ethnic minority groups	Community-based efforts
21	P4VE	**Eastern Michigan University**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	University or academic institution	Michigan	Michigan	Racial/ethnic minority groups	Community-based efforts
22	P4VE	**Geisinger Clinic**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit; Healthcare organization	Pennsylvania	Pennsylvania	Racial/ethnic minority groups	Community-based efforts

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
23	P4VE	**Greater Flint Health Coalition, Inc.**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Michigan	Michigan	Racial/ethnic minority groups	Community-based efforts
24	P4VE	**Health and Hospital Corporation of Marion County**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; local health department	Indiana	Indiana	Racial/ethnic minority groups	Community-based efforts
25	P4VE	**Health Partners Initiative DBA Partnership for a Healthy Lincoln**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Nebraska	Nebraska	Racial/ethnic minority groups	Community-based efforts
26	P4VE	**Houston County Board of Health / North Central Health District**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county health department	Georgia	Georgia	Racial/ethnic minority groups	Community-based efforts
27	P4VE	**Leadership Council for Healthy Communities**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	District of Columbia	District of Columbia	Racial/ethnic minority groups	Community-based efforts
28	P4VE	**Lowell Community Health Center**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Federally Qualified Health Center (FQHC)	Massachusetts	Massachusetts	Racial/ethnic minority groups	Community-based efforts
29	P4VE	**Michigan State University**	In this funding mechanism, academic institutions, public health institutes, and ASTHO identified promising practices on equitable distribution, administration, and/or uptake of COVID-19 and influenza vaccination then funded subrecipient partners to implement the promising practices and evaluate the outcomes.	University or academic institution	Michigan	Michigan, Maryland, Illinois, North Carolina	Racial/ethnic minority groups	Evaluation
30	P4VE	**Mississippi Public Health Institute**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase	Nonprofit	Mississippi	Mississippi	Racial/ethnic minority groups	Community-based efforts

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
			confidence in and access to COVID-19 and influenza vaccines.					
31	P4VE	**Montgomery Area Community Wellness Coalition**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Alabama	Alabama	Racial/ethnic minority groups	Community-based efforts
32	P4VE	**Multnomah County Health Department**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; Local or county health department	Oregon	Oregon	Racial/ethnic minority groups	Community-based efforts
33	P4VE	**National Alliance for Hispanic Health (NAHH)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	District of Columbia	National	Racial/ethnic minority groups	Community-based efforts
34	P4VE	**National Association of Community Health Centers (NACHC)**	NACHC supported community health centers to build vaccine access and confidence for racial and ethnic minority patient populations through innovative partnerships between community health centers and local organizations.	National	Maryland	National	Patients of community health centers and other medically underserved populations, Racial/ethnic minority groups	Health center or provider support
35	P4VE	**National Association of County and City Health Officials (NACCHO)**	NACCHO supported local health departments to build vaccine access and confidence for racial and ethnic minority populations in their jurisdictions.	Nonprofit	District of Columbia	National	Racial/ethnic minority groups	Health department or provider support
36	P4VE	**National Council of Urban Indian Health (NCUIH)**	NCUIH worked to improve the health of American Indians and Alaska Natives (AI/AN) living in urban areas by implementing strategies to reduce racial and ethnic disparities in adult vaccination coverage. NCUIH partnered with 41 Urban Indian Organizations located in 22 states to improve timely and direct communication with urban AI/AN health leaders and experts, while amassing a specific and strategic plan for improving influenza and COVID-19 vaccination health disparities among AI/ANs.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National, District of Columbia	Racial/ethnic minority groups, Medical, professional, or healthcare workers	Support for healthcare providers

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
37	P4VE	**National Hispanic Medical Association (NHMA)**	The NHMA "Si Se Puede! Vaccination for All!" immunization campaign's goal was to reduce disparities in uptake and increase COVID-19 vaccination rates for Hispanics.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National, District of Columbia	Racial/ethnic minority groups, Medical, professional, or healthcare workers	Support for healthcare providers
38	P4VE	**National Kidney Foundation of Michigan**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Michigan	National, Michigan	Racial/ethnic minority groups	Community-based efforts
39	P4VE	**National Medical Association (NMA)**	NMA's "Increasing Adult Immunizations in African American Patients with Special Emphasis on Influenza and COVID 19" project supported efforts to increase adult immunization coverage for adults in racial and/or ethnic minority populations and address disparities in influenza and COVID-19 vaccination.	Medical, nursing, pharmacy, or healthcare professional association	Maryland	National	Racial/ethnic minority groups, Medical, professional, or healthcare workers	Support for healthcare providers
40	P4VE	**National Minority Quality Forum (NMQF)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	District of Columbia	National, District of Columbia	Racial/ethnic minority groups	Community-based efforts
41	P4VE	**National Network of Public Health Institutes (NNPHI)**	In this funding mechanism, academic institutions, public health institutes, and ASTHO identified promising practices on equitable distribution, administration, and/or uptake of COVID-19 and influenza vaccination then funded subrecipient partners to implement the promising practices and evaluate the outcomes.	Nonprofit	District of Columbia	National	Racial/ethnic minority groups	Evaluation
42	P4VE	**National Urban League (NUL)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	New York	National	Racial/ethnic minority groups	Community-based efforts
43	P4VE	**Northwest Portland Area Indian Health Board (NPAIHB)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities,	Nonprofit	Oregon	Washington, Oregon, Idaho	Racial/ethnic minority groups	Community-based efforts, Disseminating best practices,

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
			form partnerships, and build the evidence-base.					Evaluation, Health center or provider support, Technical assistance
44	P4VE	**Partners In Health**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Massachusetts	Massachusetts	Racial/ethnic minority groups	Community-based efforts
45	P4VE	**Pennsylvania State University Hershey Medical Center**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	University or academic institution	Pennsylvania	Pennsylvania	Racial/ethnic minority groups	Community-based efforts
46	P4VE	**Pima County Health Department**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county health department	Arizona	Arizona	Racial/ethnic minority groups	Community-based efforts
47	P4VE	**Presbyterian Healthcare Services**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	New Mexico	New Mexico	Racial/ethnic minority groups	Community-based efforts
48	P4VE	**Public Health Advocates**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	California	California	Racial/ethnic minority groups	Community-based efforts
49	P4VE	**Public Health Institute (PHI)**	In this funding mechanism, academic institutions, public health institutes, and ASTHO identified promising practices on equitable distribution, administration, and/or uptake of COVID-19 and influenza vaccination then funded subrecipient partners to implement the promising practices and evaluate the outcomes.	Nonprofit	California	Georgia, Texas, Wisconsin, California	Racial/ethnic minority groups	Evaluation
50	P4VE	**Rosedale Assistance & Opportunities: RAO**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	North Carolina	North Carolina	Racial/ethnic minority groups	Community-based efforts

Total Number of Funded Partners in Each Partner Category	Partner Category[a]	Name of Partner Organization[b]	Summary of Award	Organization Type	Location (State or Territory)	Geographic Areas where Funded Activities Occur	Population(s) of Focus	Key Activities
51	P4VE	**Seattle-King County Public Health Department**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county government; Local or county health department	Washington	Washington	Racial/ethnic minority groups	Community-based efforts
52	P4VE	**Southern Connecticut State University**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	University or academic institution	Connecticut	Connecticut	Racial/ethnic minority groups	Community-based efforts
53	P4VE	**Southern Nevada Health District (SNHD)**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Local or county health department	Nevada	Nevada	Racial/ethnic minority groups	Community-based efforts
54	P4VE	**The Institute for Family Health**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Federally Qualified Health Center (FQHC)	New York	New York	Racial/ethnic minority groups	Community-based efforts
55	P4VE	**The National Council of Negro Women (NCNW)**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	District of Columbia	National, Texas, Florida, South Carolina, Georgia, North Carolina, Maryland, Ohio, Pennsylvania, Virginia, California, Mississippi	Racial/ethnic minority groups	Community-based efforts
56	P4VE	**UnidosUS**	In this funding mechanism, 8 national organizations funded and supported local affiliates to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base.	Nonprofit	District of Columbia	National	Racial/ethnic minority groups	Community-based efforts
57	P4VE	**University of Arkansas for Medical Sciences**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	University or academic institution	Arkansas	Arkansas	Racial/ethnic minority groups	Community-based efforts

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58	P4VE	**University of Florida (UF)**	In this funding mechanism, academic institutions, public health institutes, and ASTHO identified promising practices on equitable distribution, administration, and/or uptake of COVID-19 and influenza vaccination then funded subrecipient partners to implement the promising practices and evaluate the outcomes.	University or academic institution	Florida	Florida	Racial/ethnic minority groups	Evaluation
59	P4VE	**Urban Institute**	Foundations/national organizations funded and supported community-based organizations to lead vaccine confidence and access activities in their communities, form partnerships, and build the evidence-base. Urban Institute was also funded to support the Learning Community for the P4VE program.	Nonprofit	District of Columbia	National	Racial/ethnic minority groups	Community-based efforts
60	P4VE	**Wabanaki Public Health & Wellness**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Maine	Maine	Racial/ethnic minority groups	Community-based efforts
61	P4VE	**Young Men's Christian Association (YMCA) of Coastal Georgia, Inc.**	REACH recipients built on long-standing health equity work in racial and ethnic minority communities to increase confidence in and access to COVID-19 and influenza vaccines.	Nonprofit	Georgia	Georgia	Racial/ethnic minority groups	Community-based efforts
1	DAAP	**Administration for Community Living (ACL)**	ACL recipients worked to increase COVID-19 vaccinations in community-dwelling older adults and persons with disabilities.	Federal government	District of Columbia	National	Older adults and persons with disabilities	Community-based efforts
2	DAAP	**Alameda County Health Care Services Agency**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	California	California	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
3	DAAP	**Albuquerque Area Indian Health Board**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Tribal or Indian organization	New Mexico	New Mexico	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts

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4	DAAP	**AMDA - The Society for Post-Acute and Long-Term Care Medicine, Inc.**	AMDA implemented quality improvement interventions in long-term care chains to increase COVID-19, influenza, and routine adult vaccination coverage in staff and residents.	Medical, nursing, pharmacy, or healthcare professional association	Maryland	National	People in long-term care, Medical, professional, or healthcare workers, Older adults, People with chronic conditions, Racial/ethnic minority groups	Disseminating best practices, Evaluation, Other
5	DAAP	**Association of University Centers on Disabilities (AUCD)**	AUCD worked directly with communities and people with disabilities to improve vaccine confidence.	University or academic institution	Maryland	Maryland	People with disabilities	Community-based efforts
6	DAAP	**Benton County Government**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Arkansas	Arkansas	Individuals/communities that were disproportionately affected by COVID-19	Community-based efforts
7	DAAP	**CDC Foundation (CDCF)**	CDCF funded Centers for Independent Living to provide tools, resources, and support to ensure equitable access to COVID-19 vaccines for people with disabilities.	Nonprofit	Georgia	National	Persons with disabilities	Community-based efforts
8	DAAP	**Community Education Group (CEG)**	CEG supported COVID-19 vaccination efforts for rural communities living with HIV/AIDS.	Nonprofit	District of Columbia	National	Rural populations	Community-based efforts
9	DAAP	**Cook County Illinois**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Illinois	Illinois	Individuals/communities that were disproportionately affected by COVID-19	Community-based efforts
10	DAAP	**Council of Medical Specialty Societies (CMSS)**	CMSS funded specialty societies and health systems to increase COVID-19, influenza, and routine adult vaccination coverage in patients with chronic medical conditions.	Medical, nursing, pharmacy, or healthcare professional association	Washington DC	National	People with chronic conditions or who see specialty medical providers	Disseminating best practices, Evaluation
11	DAAP	**County of Jackson OH**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to	Local or county government	Ohio	Ohio	Individuals/communities that were disproportionately affected by COVID-19	Community-based efforts

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			populations disproportionately affected by COVID-19.					
12	DAAP	**County of Yuma**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Arizona	Arizona	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
13	DAAP	**Delaware State Department of Health**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	State health department	Delaware	Delaware	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
14	DAAP	**Harris County Texas**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Texas	Texas	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
15	DAAP	**Health Care Cost Containment System of Arizona**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Arizona	Arizona	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
16	DAAP	**Health Resources and Services Administration (HRSA)**	HRSA provided information for rural and farming communities to reduce vaccine hesitancy, increase vaccinations, and build an evidence-based pandemic and emergency planning vaccination toolkit for rural communities.	Federal government	District of Columbia	National	Rural populations, Other	Health center or provider support
17	DAAP	**Massachusetts Department of Public Health**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	State health department	Massachusetts	Massachusetts	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
18	DAAP	**Mississippi State Department of Health**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to	State health department	Mississippi	Mississippi	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts

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			populations disproportionately affected by COVID-19.					
19	DAAP	**NASTAD**	NASTAD provided support for recognized Syringe Services Programs (SSPs) to provide health information around vaccines and links to COVID-19 vaccine providers for the people they serve.	Nonprofit	District of Columbia	National	People who use and inject drugs	Other - funding to support increased capacity of Syringe Services Programs to provide vaccination services
20	DAAP	**National Association for Chronic Disease Directors (NACDD)**	This project used unique approaches in leveraging mayors and military commanders to reach local communities and reduce vaccine hesitancy at the community level through Public Service Announcements.	Nonprofit	National, Local	National; Rural	Other; under vaccinated; Military	Technical assistance
21a	DAAP	**National Association of Community Health Centers (NACHC)**	NACHC contracted with the National Health Care for the Homeless Council (NHCHC) to train vaccine ambassadors to improve COVID-19 vaccine acceptance among people experiencing homelessness, people with substance use disorders, and people who engage in sex work.	National	Maryland	National	Patients of community health centers, specifically people experiencing homelessness, people with substance use disorders, and people who engage in sex work	Health center or provider support
21b	DAAP	**National Association of Community Health Centers (NACHC)**	NACHC supported Community Health Centers to improve COVID-19, influenza, and routine adult vaccination through quality improvement interventions.	National	Maryland	National	Patients of community health centers and other medically underserved populations, Racial/ ethnic minority groups	Health center or provider support
21c	DAAP	**National Association of Community Health Centers (NACHC)**	NACHC worked with the Migrant Clinicians Network to deploy strike teams for vaccination support to health centers in the US Virgin Islands and Puerto Rico.	National	Maryland	US Virgin Islands, Puerto Rico	Patients of community health centers and other medically underserved populations	Health center or provider support
22	DAAP	**New Jersey Department of Health**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	State health department	New Jersey	New Jersey	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts

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23	DAAP	**NORC Walsh Center for Rural Health Analysis at the University of Chicago**	NORC created and piloted an interactive data visualization tool to inform rural COVID-19 vaccination planning and partner outreach.	University or academic institution	Illinois	National	Rural populations, Other	Other
24	DAAP	**North Carolina Department of Health and Human Services**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	State health department	North Carolina	North Carolina	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
25	DAAP	**Prince George's County Fire/EMS**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Maryland	Maryland	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
26	DAAP	**Puerto Rico Science Technology and Research Trust**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	US territory or freely associated state	Puerto Rico	Puerto Rico	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
27	DAAP	**Rhode Island Department of Health**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	State health department	Rhode Island	Rhode Island	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
28	DAAP	**Sonoma County Health Services Department**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	California	California	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
29	DAAP	**United States Department of Agriculture (USDA) / National Institute of Food and Agriculture (NIFA)**	USDA's U.S. Cooperative Extension Program piloted and implemented partnerships that supported reaching rural and other medically underserved communities to improve COVID-19 vaccine acceptance and access.	Federal government	District of Columbia	National	Rural populations	Community-based efforts

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30	DAAP	**Washington County Ambulance District**	In this funding mechanism, 18 state, county, and tribal health departments funded training for and deployment of community health workers to populations disproportionately affected by COVID-19.	Local or county government	Missouri	Missouri	Individuals/ communities that were disproportionately affected by COVID-19	Community-based efforts
1	VCD	**Alianza Americas**	Alianza Americas worked with the Mobile Health Units of the US-Mexico Border Health Commission to target the surrounding border communities with COVID-19 vaccine education to improve vaccine confidence.	Nonprofit	Illinois	National	Older adults, Racial/ ethnic minority groups, Rural populations, Refugee, immigrant, and migrant populations, Other	Disseminating best practices, Technical assistance, Community-based efforts
2	VCD	**American Academy of Pediatrics (AAP)**	AAP worked to improve confidence in COVID-19 vaccine among pediatric healthcare clinicians, non-clinical staff within pediatric healthcare settings, their patients, and their patients' families by implementing activities that promoted vaccine confidence and improved the implementation of evidence-based programs.	Medical, nursing, pharmacy, or healthcare professional association	Illinois	National	Medical, professional, or healthcare workers	Technical assistance, Support for healthcare providers, Disseminating best practices
3	VCD	**American Association of Colleges of Nursing (AACN)**	This project focused on empowering nursing faculty and students to have effective COVID-19 vaccine conversations.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National	Medical, professional, or healthcare workers	Support for healthcare providers
4	VCD	**American College Health Association (ACHA)**	This project worked to increase COVID-19 vaccine confidence in higher education settings.	Nonprofit	Maryland	National	Other	Disseminating best practices, Technical assistance
5	VCD	**American College of Obstetricians and Gynecologists (ACOG)**	ACOG focused on increasing COVID-19 vaccination rates among people who are pregnant by training OB-GYN practitioners as vaccine champions and equipping them with resources and support to implement evidence-based strategies for vaccine confidence.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National	Medical, professional, or healthcare workers, Pregnant people	Disseminating best practices, Evaluation; Support for healthcare providers; Technical assistance; Other
6	VCD	**American College of Preventive Medicine (ACPM)**	ACPM trained Preventive Medicine providers on effective COVID-19 vaccine conversations.	Medical, nursing, pharmacy, or	District of Columbia	National	Medical, professional, or healthcare workers	Support for healthcare providers

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				healthcare professional association				
7	VCD	**American Health Care Association/ National Center for Assisted Living (AHCA - NCAL)**	AHCA- NCAL worked to prevent the spread of COVID-19 in long-term care through promoting COVID-19 vaccine confidence and uptake in long-term care staff.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National	Medical, professional, or healthcare workers, People in long-term care	Disseminating best practices
8	VCD	**American Hospital Association - Health Research & Educational Trust (AHA-HRET)**	AHA-HRET trained vaccine ambassadors and created a video series called “COVID-19 Myths Busted” to improve COVID-19 vaccine confidence.	Medical, nursing, pharmacy, or healthcare professional association	Illinois	National	Medical, professional, or healthcare workers, Pregnant people, Rural populations, Other	Disseminating best practices, Support for healthcare providers
9	VCD	**American Pharmacists Association (APhA)**	APhA implemented a micro-targeting approach, identifying rural and metropolitan areas with patient populations in the “movable middle”. APhA trained pharmacists to provide COVID-19 vaccinations in these areas and deliver specific communication, information, and teaching resources.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National	Medical, professional, or healthcare workers, General	Support for healthcare providers
10	VCD	**American Psychological Association (APA)**	The APA project focused on understanding mental health determinants of COVID-19 vaccine hesitancy.	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National	Medical, professional, or healthcare workers, Other	Disseminating best practices, Evaluation, Support for healthcare providers
11	VCD	**Americares**	Americares’ free health clinics in medically underserved areas used interventions to understand the reasons for vaccine trust in the community and developed the Peer Learning Network to help providers communicate the importance of vaccination to their patients.	Nonprofit	Connecticut	National	Medical, professional, or healthcare workers, Other	Health center or provider support, Disseminating best practices, Evaluation, Community-based efforts, Other
12	VCD	**Association of American Medical Colleges (AAMC)**	AAMC initiated the “Connected Care for COVID-19” effort which aimed to directly address digital health literacy and promote more equitable access to COVID-19 vaccines, information, and resources by collaborating with and	Medical, nursing, pharmacy, or healthcare professional association	District of Columbia	National	Medical, professional, or healthcare workers, Refugee, immigrant, and migrant populations, Rural populations, Older adults,	Disseminating best practices

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			providing primary care providers tools to address questions.				People with chronic conditions, People with disabilities, Pregnant people, Racial/ethnic minority groups, Other	
13	VCD	**CDC Foundation (CDCF)**	CDCF funded trusted messengers in the arts to build confidence in COVID-19 vaccines through arts and culture. A series of artwork and events were carried out in communities throughout the United States with low vaccination rates and/or disproportionately impacted by the pandemic. The goal of this project was to help make COVID-19 vaccination messages more accessible/ acceptable, inspire dialogue, and amplify minority voices.	Nonprofit; Foundation	Georgia	National	Individuals/ communities that were disproportionately affected by COVID-19, Arts and culture organizations	Community-based efforts
14	VCD	**Centro de los Derechos del Migrante (CDM)**	CDM worked with community partners to deliver COVID-19 vaccines and build vaccine confidence among migrant workers in protein-processing industries.	Nonprofit	Maryland	Delaware, Maryland, Virginia, South Carolina, North Carolina, Georgia, National	Refugee, immigrant, and migrant populations, Racial/ ethnic minority groups, Rural populations, Other	Community-based efforts, Disseminating best practices, Technical assistance, Health department support, Other
15	VCD	**Institute of Museum and Library Services (IMLS)**	IMLS' "Communities for Immunity" supplied funding to museums and libraries across the United States to support vaccine confidence at the local level. Efforts included sharing information and connecting communities with opportunities to get vaccinated against COVID-19.	Federal government	District of Columbia	National	General	Community-based efforts
16	VCD	**National Association of County and City Health Officials (NACCHO)**	NACCHO equipped local health departments to address vaccine hesitancy and increase vaccine uptake through the use of census block vaccination data and COVID-19 infection rates to inform their efforts to reach target populations.	Nonprofit	District of Columbia	National	Refugee, immigrant, and migrant populations, Racial/ ethnic minority groups	Health department or provider support
17	VCD	**National Center for Farmworker Health (NCFH)**	NCFH worked to support multiple farmworker-serving organizations in the southeastern U.S. and on the U.S.-Mexico border where COVID-19 vaccination	Nonprofit	Texas	National	Other	Disseminating best practices, Evaluation, Health center or

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			rates were substantially lower than the northeastern or western U.S. to increase COVID-19 vaccine confidence.					provider support, Technical assistance
18	VCD	**National Council of Young Men's Christian Association (YMCA)**	YMCAs used partnerships across sectors to improve COVID-19 vaccination access and confidence through vaccination clinics.	Nonprofit	Illinois	National	Other	Community-based efforts
19	VCD	**National Indian Health Board (NIHB)**	NIHB addressed COVID-19 vaccine confidence through Tribal Health Departments.	Nonprofit	District of Columbia	National	Racial/ethnic minority groups, People with chronic conditions, Older adults, Patients of community health centers and other high-risk populations, People with disabilities, People in long-term care, Pregnant people, Rural populations, Other	Disseminating best practices, Health department support, Technical assistance, Health center or provider support, Community-based efforts
20	VCD	**National Nurse-Led Care Consortium (NNCC)**	NNCC worked to improve vaccine confidence and uptake among patients.	Medical, nursing, pharmacy, or healthcare professional association	Pennsylvania	National	Medical, professional, or healthcare workers, Patients of community health centers and other high-risk populations, Pregnant people, Racial/ethnic minority groups, People with chronic conditions, Other	Disseminating best practices, Technical assistance, Community-based efforts, Evaluation, Support for healthcare providers, Other
21	VCD	**National Resource Center for Refugees, Immigrants and Migrants (NRC-RIM), University of Minnesota**	NRC-RIM supported health departments and community-based organizations working in refugee, immigrant and migrant (RIM) communities to increase COVID-19 vaccine confidence.	University or academic institution	Minnesota	National, Georgia, Colorado, California, Utah, Arizona, Washington D.C.	Refugee, immigrant, and migrant populations	Community-based efforts, Developing and disseminating best practices, Evaluation, Health department support, Technical assistance, Online training, Other

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22	VCD	**Task Force for Global Health (TFGH) / Global Health Crisis Coordination Center (GHC3)**	TFGH/GHC3 worked with the National Association of Community Health Centers and Emory University to engage community health centers and their residents in co-designing trusted vaccine messages and equipping influential messengers for local communities to increase COVID-19 vaccine confidence.	Nonprofit	Georgia	Georgia, Illinois, New York, Pennsylvania, Ohio, California, South Carolina, Maryland, Florida, Oregon, Texas	Racial/ethnic minority groups	Evaluation, Community-based efforts
23	VCD	**University of Texas, Austin**	University of Texas, Austin engaged social workers in boosting COVID-19 vaccine confidence and uptake through a subcontract with the National Association of Social Workers (NASW).	University or academic institution	Texas	National	Other	Community-based efforts

[a] In the "Partner Category" column, P4VE means "Partnering for Vaccine Equity" partners, DAAP means "Disproportionately Affected Adult Population" partners, and VCD means "Vaccine Confidence and Demand" partners.

[b] In the "Name of Partner Organization" column, CDC Foundation (CDCF), the National Association of Community Health Centers (NACHC), and the National Association of City and County Health Officials (NACCHO) had projects in more than one partner category.

Table 2

Evidence-based interventions to reduce COVID-19 vaccination disparities in the United States.

	Systems- and Policy-Level Interventions	Quality Improvement Interventions (in a Clinical Setting)	Provider-Level Interventions	Community-Level Interventions	Communication Interventions
Examples	Developing partnerships across organization levels and systems	Implementing standing orders and reminder recalls	Implementing motivational interviewing techniques	Training vaccine ambassadors (who are also considered to be trusted messengers in the community)	Combatting mis/disinformation on social media platforms
	Having partners develop logic models at the onset of the project that incorporate process measures, outputs, and short- and long-term outcomes, in efforts to better measure program impact	Creating a culture of vaccination in the office for all staff	Making strong vaccine recommendations	Having partners engage in a Learning Community or Communities of Practice to share challenges, lessons learned, and engage in ongoing technical assistance	Using messages that have undergone testing with the intended population and have images representing the population of focus
	Having professional medical societies review their vaccine policy statements/guidelines and update, if necessary	Incorporating COVID-19 vaccination into the workflow	Using presumptive language when making vaccine recommendations	Inclusive hyper-local outreach through partnerships with community-based organizations, faith-based organizations, vaccination providers, and local health departments	Setting up national hotlines to assist persons with disabilities and older adults to be connected to an appropriate local agency to attain access to vaccine information, services, and support in obtaining a COVID-19 vaccine