Journal of Student-Run Clinics
Original Study

Addressing Vaccination Gaps through Student-Led Initiatives: A Study of Stanford Vax Crew's Impact

Caroline Murtagh[1]*; Aneysis D Gonzalez-Suarez, PhD[1]*; Donna M Zulman, MD, MS[2]

[1]Stanford University School of Medicine, Stanford, California, USA
[2]Division of Primary Care and Population Health, Stanford University School of Medicine, Stanford, California, USA
*Both authors contributed equally to this work

Corresponding Author: Caroline Murtagh; email: carolinemurtaugh222@gmail.com

Published: August 30, 2024

Abstract

Background: Although vaccines are critical to disease prevention, substantial gaps persist in adult vaccination coverage in the United States due, in part, to material and social barriers. Farmworkers face unique challenges to accessing vaccination services, such as migratory residence, immigration status, low levels of insurance, and geographic distance from clinics, many of which were exacerbated during the coronavirus disease 2019 (COVID-19) pandemic. Student-driven, community-focused programs offer a potential mechanism to enhance vaccine equity. Stanford Vax Crew is a student-led organization that partners with community organizations to host pop-up vaccine clinics, which aim to (1) address the material barriers that impact vaccination status, (2) establish trust in vaccine services, and (3) equip future medical professionals with skills to engage in community health initiatives.
Methods: This paper describes the strategies used by the organization to reach surrounding communities with vaccines, especially agricultural workers. It assesses the reach of the program through analysis of demographic data collected at pop-up clinics.
Results: From August 2021 to March 2023, the majority of COVID-19 vaccine recipients were middle-aged adults (61%) of Hispanic ethnicity (82%) working in the agricultural, forestry, or fishing industries (58%). In total, 1377 COVID-19 vaccines were administered by Stanford Vax Crew.
Conclusions: Findings suggest that Stanford Vax Crew's partnerships with diverse institutions helped facilitate access and build trust, thereby enhancing vaccine uptake. Partnership with agricultural employers and community-based organizations targeted farmworkers, which enabled the group to host clinics on farms immediately before and after work hours, which proved especially effective for reaching agricultural workers.

Introduction

Although vaccines are highly effective in reducing the transmission of diseases, millions of adults in the United States fail to receive the vaccines recommended by public health agencies annually.[1-3] Despite the efficacy of the coronavirus disease 2019 (COVID-19) vaccine in reducing morbidity and mortality, more than 30% of the United States population remained unvaccinated or incompletely vaccinated as of May 2023, meaning they had received fewer than two doses in a two-dose primary series or one dose in a single-dose primary vaccine.[4] As of February 2024, less than 13% of people had received the updated 2023-2024 COVID-19 booster.[5]

While vaccine uptake is often examined at the individual level and presented as a person's choice to get vaccinated or not, vaccination status is shaped by political, social, and economic factors that disproportionately impact communities of low socioeconomic status and communities of color.[6,7] These structural deterrents to vaccination can be organized into two categories: (1) material barriers and (2) sources of mistrust. Material barriers include financial costs of

vaccination (e.g., transportation costs, work absences, childcare costs during appointments), storage requirements of the vaccine, and geographic inaccessibility of clinics for hard-to-reach areas.[6-9] Sources of mistrust include misinformation and politicization surrounding the vaccine, language barriers, and a history of marginalization and abuse by the healthcare system.[8-12] Farmworkers represent one population that is uniquely marginalized by both types of vaccination deterrents. In terms of material barriers, farmworkers face low wages, low levels of insurance, and demanding hours in workplaces located far-away from clinics, which can make accessing healthcare financially and geographically challenging.[13] With regards to mistrust, many farmworkers are affected by uncertainties in immigration status, and policies such as Public Charge may prevent individuals from seeking care for fear of denial of citizenship.[13-15] During the COVID-19 pandemic, the threats to the health of this population became even more pronounced. While farmworkers were deemed essential workers and instructed to maintain normal work schedules, often in close proximity to one another without personal protective equipment, they also faced disproportionate obstacles to receiving the COVID-19 vaccine.[16-17]

Student-run free clinics (SRFCs) offer one promising, but underexplored avenue for increasing vaccine uptake in medically-underserved areas, including farmworker communities. Researchers have highlighted the role of healthcare professionals as a primary source of information regarding vaccines.[18-19] Thus, the visibility of healthcare students and their clinical supervisors, along with trusted community collaborators, at community-based clinics may enhance the credibility of services, while the free and often mobile nature of services offered at SRFCs holds promise for mitigating material barriers. Despite this, further elucidation of operational components that enable some SRFCs to offer vaccines, such as sources of vaccines and clinic workflows, is necessary. Furthermore, given that current medical school curricula frequently lack discussion of vaccination barriers, strategies for preparing students to serve as vaccine champions require additional attention.

Here, we describe Stanford Vax Crew, a student organization that provides vaccines throughout the Bay Area and trains future healthcare workers to engage in strategies for promoting vaccine equity, as one model for student-driven vaccine clinics. The goals of this descriptive study are twofold. First, we will outline operational strategies utilized by Stanford Vax Crew to promote COVID-19 vaccine uptake by decreasing material barriers and increasing trust, especially amongst farmworkers, and highlight the impact of the program using metrics such as the number of vaccines administered and the demographics of participants. Second, we will describe the activities used to facilitate student learning and engagement in COVID-19 vaccine equity from August 2021 to March 2023.

Background: Stanford Vax Crew

In 2001, a local family medicine physician with deep connections to rural California delivered several leftover influenza vaccines from Stanford University's free clinic to a local farm, with the hopes of vaccinating several farmworkers in preparation for flu season. When he arrived, hundreds of farmworkers lined up, and he vowed to return with more vaccines and a team of healthcare professional trainees that could support vaccination efforts.

This was the origin of Stanford Flu Crew, a student-driven organization dedicated to advancing vaccine equity in the San Francisco Bay Area, California through the operationalization of free influenza vaccine clinics. Since its inception in 2001, Stanford Vax Crew has hosted hundreds of pop-up clinics in diverse community-based settings. However, farmworkers have remained a primary population of focus due to their unique occupational health risks and the program's well-established relationship with farms through its late clinical supervisor, who served as the Medical Director for a local mushroom farm. Additionally, the organization has advanced the goal of exposing healthcare professional students to a model that brings vaccination services directly to the community, and its leaders are responsible for the annual training of first year medical and physician assistant students in vaccination techniques.

In 2021, at the height of the COVID-19

pandemic, the organization underwent a major shift by offering vaccination against COVID-19 in addition to influenza, renaming itself as "Stanford Vax Crew." The organization also expanded its medical education mission through the creation of a COVID-19 vaccination curriculum and the development of an undergraduate program.

Methods

From August 2021 to March 2023, Stanford Vax Crew utilized a series of interventions, borne from the original Flu Crew model, to promote vaccine uptake and to engage students in vaccine-related education. In this study, we describe key performance metrics such as vaccination rates, demographic reach, occupation diversity, and regional distribution to gauge the reach and impact of our program with regards to vaccine uptake, acknowledging that these metrics provide only a snapshot of broader community engagement impact. We also identify outcomes of medical education, such as the number of clinic shifts filled and programs and materials developed by students, as preliminary evidence of student engagement. This study was approved by Stanford University's Institutional Review Board (IRB-69704).

Team Structure

To minimize challenges that student-driven programs often face, including lack of continuity of volunteers and limited resources,[20-21] while elevating the benefits of this model for both trainees and communities, Stanford Vax Crew utilized a three-pronged leadership structure that included medical and physician assistant (PA) students, undergraduates, and clinical advisors, who partnered closely with community-based organizations (Figure 1). Each group had unique, yet complementary responsibilities (Table 1). These groups met weekly during active vaccination months (August-February) and sporadically during the remainder of the year to ensure frequent communication. To ensure a high quality of care, healthcare trainees could volunteer as vaccinators only after completing training in vaccination techniques, and a strict 5:1 ratio of student volunteers to clinical faculty was maintained at all events. Moreover, while physicians at the vaccine clinics were available to address medical inquiries related to vaccines, the organization adhered to a specific role—providing vaccinations—to address a recognized need within the scope of its abilities.

Partnership Formation

To meet the increased urgency for vaccination presented by the pandemic, Stanford Vax Crew met regularly with both established and new partners to adapt and scale its operations to include COVID-19 vaccines, a process which is described in more detail elsewhere.[22]

The intensity of collaborations developed over time in response to evolving vaccination needs, and partners included community clinics, a children's museum, and community-based organizations. Vax Crew built on its partnerships with farms to host clinics in rural communities, with the explicit intent of reaching farmworkers.

Implementation of Vaccine Clinics

Vaccine clinics occurred in three stages, each of which incorporated efforts to address material barriers and increase trust (Figure 2). In the Planning Stage, a leadership team of healthcare students and physician supervisors conducted outreach by email, telephone, and site visits to meet stakeholders, understand gaps in existing vaccination services, and co-plan events with community partners. For instance, to address common material barriers of farmworkers such as insufficient transportation and inability to miss work, Vax Crew partnered with agricultural employers and a non-profit to host vaccine clinics onsite immediately before and after workdays. To build trust, they utilized pre-existing trusting relationships between community-based organizations and the populations they served by asking community partners to promote the pop-up clinics, such as by requesting that agricultural employers circulate information about the events to employed farmworkers in advance. Vaccines were transported to events by the clinical advisors of the program, who obtained supplies from local health departments and from one advisor's clinic through the federal government.

In the Implementation Stage, teams of student vaccinators, faculty supervisors, and

Figure 1. Vaccine clinic phases

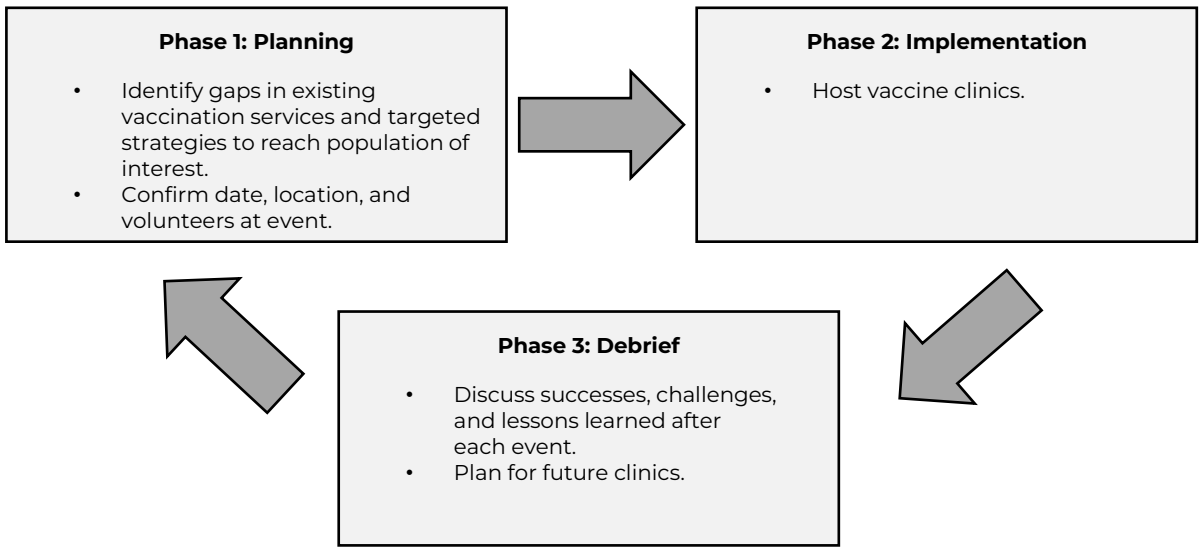


Table 1. Leadership roles and responsibilities

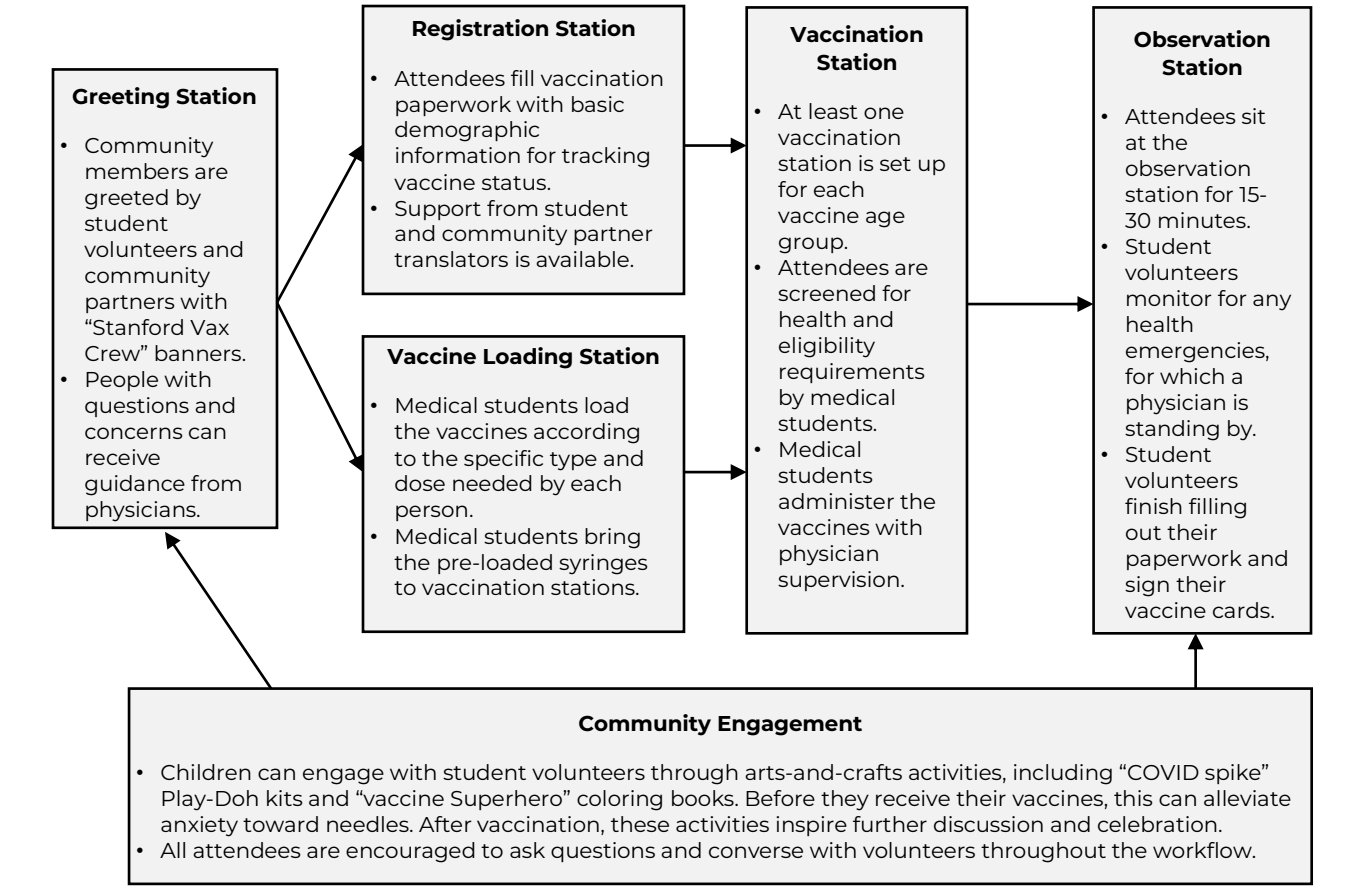
Leadership group	Roles & responsibilities
Medical & physician assistant student leaders	• Internal Coordinators: partner with Student Health Services to plan on-campus influenza vaccination clinics for the Stanford Community • External Coordinators: collaborate with partners to host off-campus influenza vaccination clinics • COVID-19 Directors: collaborate with partners to host off-campus COVID-19 vaccination clinics • Recruitment & Finance: recruit student and faculty volunteers; oversee the program's budget • Education Chair: plan vaccination training for first year medical and physician assistant students as part of Stanford's Practice of Medicine Curriculum
Undergraduate leaders	• Operations Coordinators: train and recruit undergraduate volunteers; coordinate with medical students and community partners to plan events • Community Engagement Coordinator: design and implement activities that promote engagement at clinics • Research Coordinators: plan vaccination-related research and quality improvement projects as student and community partner interests arise
Physician supervisors	• Provide institutional memory and program continuity by leading Vax Crew for 10+ years • Supervise student vaccinators at events

COVID-19: coronavirus disease 2019.

community partners hosted pop-up vaccine clinics. The workflow included greeting by students and community partners, registration, vaccination, and observation, with community engagement throughout (Figure 3). The use of locations identified as convenient for community members by community partners, such as farms and churches, and the efficient workflow minimized barriers such as transportation and time costs. To increase trust in the services, well-known community partners were visible at all events, and the use of activities such as arts and crafts aimed to foster a welcoming environment. Furthermore, volunteers did not ask questions about documentation or insurance status.

In the Debrief Stage, the Stanford Vax Crew leadership team discussed the events at weekly meetings to identify lessons learned and improve future clinics—actively implementing the lessons learned back into the planning stage. Community partners were often consulted as well for feedback on public perception of the clinics and opportunities for strengthening the relationship between Vax Crew and communities. This iterative process ensured that valuable insights from each clinic were utilized to enhance the

Figure 2. Vaccine clinic workflow



COVID: coronavirus disease.

execution of subsequent events.

Medical Education

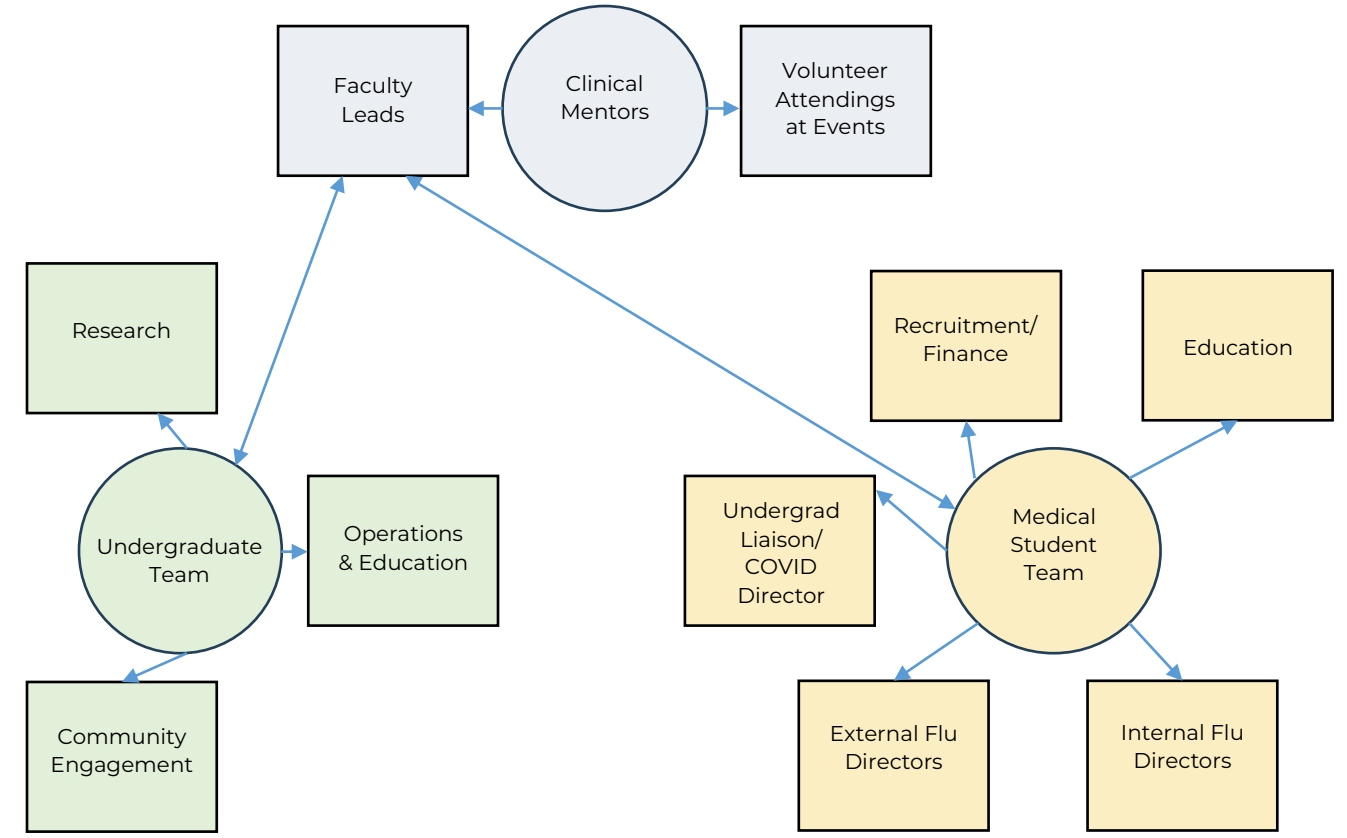
Stanford Vax Crew offered opportunities for healthcare graduate students and undergraduates to engage in community and preventive health. All first-year clinical students were required by the Stanford University School of Medicine to complete vaccination training. They could also receive course credit for volunteering at events.

In response to heightened interest from undergraduates, the team also built an undergraduate program that enabled undergraduates to volunteer in non-clinical roles, such as registration of attendees and community engagement. They also developed an extracurricular evening seminar series. Seminars occurred quarterly, lasted ninety minutes, and included presentations by physicians, medical students, and community partners. Topics included structural determinants of vaccination, the science behind vaccination, the role of community partners in building trust, and the social ecological model as a framework for health and disease. Presentations were followed by group discussion facilitated by medical student leaders. To foster relationships across learning levels, Vax Crew leaders also hosted peer-to-peer mentorship nights, where healthcare professional students mentored undergraduates in graduate school application processes.

Statistical Analysis of Outcomes

During Vax Crew's pop-up clinics, patients' demographic data were collected through an in-person questionnaire as part of the registration process. Demographics information including the patient's gender, race, ethnicity, age, occupation, and California county of residence was retroactively analyzed from August 2021 to March 2023 to reveal patterns in the distribution of

Figure 3. Standford Vax Crew team structure



COVID: coronavirus disease.

patients who received vaccines. Percentages and counts used for quantification were extracted using MATLAB (R2023a, The MathWorks, Natick, MA) and IBM SPSS Statistics for Mac (Version 29.0, IBM Corp, Armonk, NY).

Results

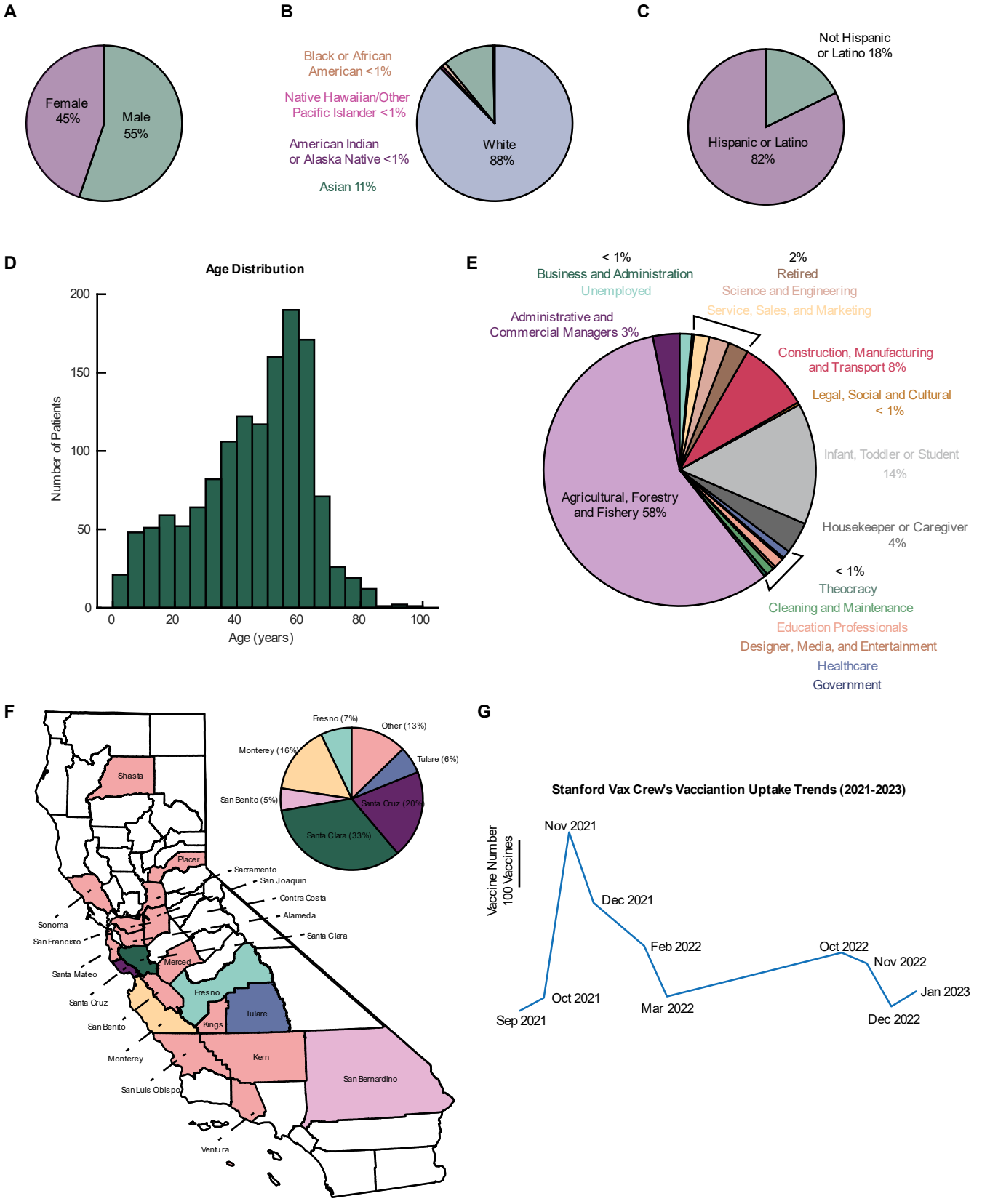
COVID-19 Vaccine Uptake

From August 2021 – March 2023, 1377 COVID-19 vaccines were administered by Stanford Vax Crew. The patient population was relatively even between self-identified men (n=760, 55%) and women (n=617, 45%) (Figure 4A). Most recipients were White (n=1116, 81%), with a large portion identifying as Hispanic/Latino ethnicity (n=1088, 79%) (Figure 4B-C). Most patients were between 40-70 years old (n=839, 61%), with 35% (n=483) between the ages of 0-39 and 4% (n=53) over the age of 71 (Figure 4D). The industry distribution was particularly striking: 58% (n=799) of those who received vaccines worked in the agricultural, forestry, or fishing industry (Figure 4E). In contrast, those in white-collar industries such as business and administration, legal services, and science/engineering represented less than 3% (n=40) of the vaccinated cohort (Figure 4E). Vaccines were administered predominantly in the Bay Area, but also across many regions of Central and Southern California (Figure 4F). Santa Clara and Santa Cruz were the predominant locations of patients receiving vaccine services, representing 32% (n=445) and 19% (n=265) of the total vaccinated population, respectively. The greatest number of vaccines were administered during 2021, highlighting the crucial role the clinics played during this critical period of the pandemic response (Figure 4G).

Medical Education Outcomes

As a metric for the breadth of students involved in Vax Crew, from Fall 2021 – Winter 2023, 213 shifts were filled by student volunteers at COVID-19 vaccination events, with additional

Figure 4. Demographic patterns of patients served through Stanford Vax Crew



shifts filled during influenza clinics. As an indicator for medical education opportunities, the quarterly extracurricular vaccine seminars were attended by approximately six to fifteen students per session, although exact attendance was not recorded. Finally, as outcomes of student initiative and engagement, the creation of an undergraduate team resulted in the development of new products in response to needs identified at clinics, such as an educational "Vaccine Superhero" coloring book that aimed to promote community collaboration at events and a research project on the knowledge, attitudes, and practices of farmworkers toward vaccines to inform future interventions.

Discussion

To assess the factors that enabled the vaccination of 1377 individuals, including 58% (n=799) farmworkers, this study identified interventions utilized by Stanford Vax Crew within the material barriers and mistrust framework, which organizes common structural deterrents to vaccination and can be used to guide strategies that facilitate vaccine uptake. However, this research also revealed declining vaccination rates experienced by the program over time, which reflects national trends and calls for additional strategies to combat vaccine fatigue. To further explore the additional goal of enhancing community health learning for healthcare professional trainees, this study demonstrated opportunities and challenges that Stanford Vax Crew faced in medical education.

Addressing Material Barriers

Material barriers to COVID-19 vaccination have been well-documented and include time, transportation, cost, and geography.[9] For Stanford Vax Crew, the availability of free government vaccines provided an opportunity to deliver services at no cost to community members, which is especially important for populations with low levels of insurance, such as farmworkers. Since vaccine commercialization, the program has continued to rely on partnerships with county health departments to obtain vaccine doses. Additionally, some partners offered social services and incentives at events, such as food drives, health screenings, and free museum tickets. Furthermore, the choice of convenient locations enabled the team to mitigate geography barriers for participants, such as farmworkers in the Central Valley. Partnership with agricultural employers and a nonprofit was especially effective, given the large number of agricultural workers vaccinated. This was made possible by dual leadership of Vax Crew's founder, who served not only as the clinical advisor of Vax Crew but also as the Medical Director of a local farm.

Other student-driven programs can consider partnering with clinicians at their home institutions along with public health departments to obtain vaccines. To promote turnout within medically underserved communities, including farmworkers, students can collaborate with community partners, employers, and occupational health specialists already serving their populations of interest for support in choosing convenient locations and offering relevant wrap-around social supports.

Building Trust

The team faced challenges to building trust amongst community members, particularly religious institutions, whose endorsement of the vaccine was essential for increasing event turnout. Lack of alignment with partners was associated with decreased participation.

To overcome pre-existing mistrust and misinformation surrounding the COVID-19 vaccine, the leaders of Vax Crew engaged in conversations with partners prior to clinics to understand and incorporate goals of every party and provide updated public health information. Familiar community partners were then visibly present at events to gain the trust of community members and to support Vax Crew in disseminating accurate information about the vaccine. The group also benefited from a track-record of impactful influenza vaccine clinics that demonstrated their clinical and operational competence. Furthermore, physicians were available to answer questions and dispel misinformation. At all clinics, diverse, multilingual student and community partner volunteers mitigated cultural and language differences. For instance, Spanish-speaking team members were present at nearly every event, given that Spanish is the most-spoken language

in California after English, and most of Vax Crew's vaccine recipients were Hispanic or Latino. Informational flyers and registration forms were also available in Spanish.

Thus, to build trust, other groups seeking to adopt this model can consider collaborating closely with trusted community partners, providing accurate and accessible information about vaccines, and ensuring culturally humble interpreters are readily available at clinics.

Declining Vaccination Rates

Notably, the peak vaccine administration period was November 2021, coinciding with a high demand for free government-issued vaccines in the year immediately following their release, during a time when institutional capacities were stretched to meet the surge in public need for vaccination.[23,24] This spike is indicative of the critical role that Vax Crew played in providing vaccine access amid the initial rollout phase, filling gaps as existing systems were challenged to scale up operations rapidly. Following this peak, there was a noticeable decline in the number of vaccines administered, as increased vaccine availability led to higher community vaccination rates. As the next vaccination season commenced in October 2022, there was a resurgence in vaccine administration, likely driven by the introduction of updated booster shots targeting new virus variants and a reinvigoration of public health initiatives designed to increase vaccine uptake (i.e., expanded clinic hours and locations, targeted outreach to underserved communities, and education campaigns to address vaccine hesitancy).[25]

Still, during the period of study, Vax Crew experienced an overall decline in number of COVID-19 vaccines provided, which mirrors a national trend of declining vaccination rates despite recommendations to receive boosters. To overcome this "vaccine fatigue," student-driven programs may consider turning to strategies found to be effective in the literature, such as advertisements appealing to sense of community, incentives, and communication of expert consensus and celebrity endorsement, while also continuing to partner with trusted community-based organizations to disseminate updated, accurate information about boosters at community events.[26,27]

Advancing Medical Education

The overall popularity of the program was evident in the large number of students who participated in Vax Crew events. Still, the team faced challenges in engaging student volunteers during certain parts of the academic year.

To advance its objective of building medical education opportunities in community health, Vax Crew was aided by a committed leadership team that championed the program and its integration into formal and informal curricula. Additionally, the team was supported by institutional funding and external grants, the latter of which was awarded to one physician advisor's practice by state public health programs and helped cover costs of Vax Crew's growing operations. Events that were within two hours typically cost ~$100-$200 total for all student food and gas, while events that were greater than two hours away (requiring the team to stay overnight) cost $1000-$1200 total for travel, food, and lodging. Finally, the program may have benefitted from its narrow scope. While many SRFCs offer a variety of primary care services, Vax Crew is focused only on vaccination drives, enabling it to target all its resources toward this goal.

Future groups seeking to adapt this model could also consider applying for grants or partnering with departments with a vested interest in community and employee health to obtain funding. They may also reflect on the missions of their clinics (e.g. providing comprehensive primary care versus vaccination services alone) to enable appropriate targeting of resources.

Limitations and Future Directions

This descriptive study has some limitations. First, the total number of farmworkers working at or residing near the vaccination sites was unavailable, which enabled only an absolute number of farmworkers vaccinated to be calculated rather than a proportion. Future studies could explore the proportion of farmworkers vaccinated who had access to the clinics (e.g. number vaccinated out of the total number of farmworkers employed at a site) as a measurement of impact. Additionally, future studies could ascertain additional demographic details, such as nationalities of origin, to improve understanding of uptake

amongst subgroups. Finally, while this research identified the number of volunteer shifts filled and outcomes of the undergraduate program as indicators of student engagement, future studies could incorporate interviews or surveys of student perception toward vaccination before and after Vax Crew involvement to improve understanding of program impact on medical education.

Conclusion

Vaccination programs led by students present a potential approach to bridging disparities in preventive care by increasing vaccine uptake. As evident by the large number of agricultural workers vaccinated, Vax Crew was especially effective in reaching farmworkers due to strategies such as partnering with farm employers, hosting clinics onsite immediately before and after work, and providing vaccines at no cost.

Overall, Stanford Vax Crew provided 1377 individuals with the COVID-19 vaccine from 2021-2023, many of whom were farmworkers and other essential workers. This model offers insights to improving vaccine uptake, especially amongst farmworkers, by increasing access and building trust, while supporting students in experiential learning of community health.

Acknowledgements

We would like to thank the incredible Stanford Vax Crew team, including our excellent faculty advisor, Dr. Fast, and our dedicated community partners, without whom this work would not be possible. We would also like to dedicate this manuscript to Dr. Walt Newman, founder, mentor, and champion of Stanford Vax Crew. As an exceptional family medicine physician and public health visionary, Dr. Newman touched the lives of thousands of patients, students, and community partners through the two decades of leadership that he provided to Stanford Vax Crew. His legacy lives on in the friendships he built, mentees he inspired, and patients he served. May this manuscript serve as a testament to his endless efforts to advance health equity.

Disclosures

The authors have no conflicts of interest to disclose.

References

1. Orenstein WA, Ahmed R. Simply put: vaccination saves lives. Proc Natl Acad Sci U S A. 2017;114(16):4031-3. https://doi.org/10.1073/pnas.1704507114 LINK
2. Nandi A, Shet A. Why vaccines matter: understanding the broader health, economic, and child development benefits of routine vaccination. Hum Vaccin Immunother. 2020;16(8):1900-4. https://doi.org/10.1080/21645515.2019.1708669 LINK
3. Abbas KM, Kang GJ, Chen D, Werre SR, Marathe A. Demographics, perceptions, and socioeconomic factors affecting influenza vaccination among adults in the United States. PeerJ. 2018;6:e5171. https://doi.org/10.7717/peerj.5171 LINK
4. USA Facts. US Coronavirus vaccine tracker [Internet]. USA Facts; [updated 2024 May 10; accessed 2023 Apr 22]. Available from: https://usafacts.org/visualizations/covid-vaccine-tracker-states LINK
5. Centers for Disease Control and Prevention. Vaccination Trends—Adults [Internet]. Atlanta (GA): CDC; [updated 2024 Jun 10; accessed 2023 Feb 19]. Available from: https://www.cdc.gov/respiratory-viruses/data-research/dashboard/vaccination-trends-adults.html LINK
6. Galarce EM, Minsky S, Viswanath K. Socioeconomic status, demographics, beliefs and A(H1N1) vaccine uptake in the United States. Vaccine. 2011;29(32):5284-9. https://doi.org/10.1016/j.vaccine.2011.05.014 LINK
7. Njoku A, Joseph M, Felix R. Changing the narrative: structural barriers and racial and ethnic inequities in COVID-19 vaccination. Int J Environ Res Public Health. 2021;18(18):9904. https://doi.org/10.3390/ijerph18189904 LINK
8. Kuehn M, LaMori J, DeMartino JK, et al. Assessing barriers to access and equity for COVID-19 vaccination in the US. BMC Public Health. 2022;22(1):2263. https://doi.org/10.1186/s12889-022-14636-1 LINK
9. Zhang Y, Fisk RJ. Barriers to vaccination for coronavirus disease 2019 (COVID-19) control: experience from the United States. Glob Health J. 2021;5(1):51-5. https://doi.org/10.1016/j.glohj.2021.02.005 LINK
10. Han Q, Zheng B, Abakoumkin G, Leander NP, Stroebe W. Why some people do not get vaccinated against COVID-19: Social-cognitive determinants of vaccination behavior. Appl Psychol Health Well Being. 2023;15(3):825-45. https://doi.org/10.1111/aphw.12411 LINK
11. Zhang X, Guo Y, Zhou Q, Tan Z, Cao J. The mediating roles of medical mistrust, knowledge, confidence and complacency of vaccines in the pathways from conspiracy beliefs to vaccine hesitancy. Vaccines (Basel). 2021;9(11):1342. https://doi.org/10.3390/vaccines9111342 LINK
12. Bogart LM, Ojikutu BO, Tyagi K, et al. COVID-19 related medical mistrust, health impacts, and potential vaccine hesitancy among black americans living with HIV. J Acquir Immune Defic Syndr. 2021;86(2):200-7. https://doi.org/10.1097/QAI.0000000000002570 LINK
13. Hoerster KD, Beddawi S, Michael Peddecord K, Ayala GX. Healthcare use among California farmworkers: predisposing and enabling factors. J Immigr Minor Health. 2010;12(4):506-12. https://doi.org/10.1007/s10903-009-9305-0 LINK
14. Vilar-Compte M, Gaitan-Rossi P, Felix-Beltran L, Bustamante AV. Pre-COVID-19 social determinants of health among Mexican migrants in Los Angeles and New York City and their increased vulnerability to unfavorable health outcomes during the COVID-19 pandemic. J Immigr Minor Health. 2022; 24:65-77. https://doi.org/10.1007/s10903-021-01283-8 LINK
15. Katz M, Chokshi D. The "Public Charge" proposal and

public health: implications for patients and clinicians. JAMA. 2018; 320(20): 2075-6. https://doi.org/10.1001/jama.2018.16391 LINK

16. Handal AJ, Iglesias-Ríos L, Fleming PJ, Valentín-Cortés MA, O'Neill MS. "Essential" but expendable: farmworkers during the COVID-19 pandemic-The Michigan Farmworker Project. Am J Public Health. 2020;110(12):1760-2. https://doi.org/10.2105/AJPH.2020.305947 LINK
17. Ibarra AB. Eager to be vaccinated, California farmworkers face vaccine obstacles. Sacramento (CA): CalMatters; 2021 Aug 3 [accessed 2023 Nov 14]. Available from: https://calmatters.org/health/coronavirus/2021/03/california-farmworkers-vaccine-obstacles/ LINK
18. Storey D. COVID-19 vaccine hesitancy. Glob Health: Sci Pract. 2022; 10(1):e2200043. https://doi.org/10.9745/ghsp-d-22-00043 LINK
19. Paterson P, Meurice F, Stanberry LR, et al. Vaccine hesitancy and healthcare providers. Vaccine. 2016;34(52):6700-6. https://doi.org/10.1016/j.vaccine.2016.10.042 LINK
20. Chen K, Kruger J, McCarther N, Meah Y. Interprofessional, learner-driven collaboration for innovative solutions to healthcare delivery in student-run clinics. J Interprof Care. 2020;34(1):137-9. https://doi.org/10.1080/13561820.2019.1635094 LINK
21. Brown L, Gensel A, Steele E, et al. Creating a women's health coalition at a student run free clinic: A model for increasing access to and quality of care. J Stud Run Clin. 2023;9(1). https://doi.org/10.59586/jsrc.v9i1.366 LINK
22. Cheng M, Murtagh C, Macias B, Torres DT, Newman W. Stanford Vax Crew: a model for agile, community-centered vaccination campaigns. Health Secur. 2023;21(6):459-66. https://doi.org/10.1089/hs.2023.0027 LINK
23. Sandmann FG, Jit M. Rapid COVID-19 vaccine rollout: immense success but challenges ahead. Lancet Infect Dis. 2022;22(3):302-4. https://doi.org/10.1016/S1473-3099(21)00616-2 LINK
24. Burki TK. Challenges in the rollout of COVID-19 vaccines worldwide. Lancet Respir Med. 2021;9(4):e42-3. https://doi.org/10.1016/S2213-2600(21)00129-6 LINK
25. Centers for Disease Control. CDC Recommends the First Updated COVID-19 Booster. [Internet]. Atlanta (GA): CDC; 2022 Sep 1 [accessed 2024 August 19]. Available from: https://www.cdc.gov/media/releases/2022/s0901-covid-19-booster.html LINK
26. Su Z, Cheshmehzangi A, McDonnell D, Pereira da Veiga C, Xiang YT. Mind the "Vaccine Fatigue." Front Immunol. 2022;13:839433. https://doi.org/10.3389/fimmu.2022.839433 LINK
27. Stamm TA, Partheymuller J, Mosor E, et al. Determinants of COVID-19 vaccine fatigue. Nat Med. 2023;29(5):1165-71. https://doi.org/10.1038/s41591-023-02282-y LINK