Preventive Medicine Reports 29 (2022) 101967

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: www.elsevier.com/locate/pmedr

Short communication

Increasing access and uptake of SARS-CoV-2 at-home tests using a community-engaged approach

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ARTICLE INFO

Keywords:
COVID-19
SARS-CoV-2
Testing
Community engagement
Underserved populations

ABSTRACT

Inequalities around COVID-19 testing and vaccination persist in the U.S. health system. We investigated whether a community-engaged approach could be used to distribute free, at-home, rapid SARS-CoV-2 tests to underserved populations. Between November 18-December 31, 2021, 400,000 tests were successfully distributed via 67 community partners and a mobile unit to a majority Hispanic/Latino/Spanish population in Merced County, California. Testing before gathering (59 %) was the most common testing reason. Asians versus Whites were more likely to test for COVID-19 if they had close contact with someone who may have been positive (odds ratio [OR] = 3.4, 95 % confidence interval [CI] = 1.7–6.7). Minors versus adults were more likely to test if they had close contact with someone who was confirmed positive (OR = 1.7, 95 % CI = 1.0–3.0), whereas Asian (OR = 4.1, 95 % CI = 1.2–13.7) and Hispanic/Latino/Spanish (OR = 2.5, 95 % CI = 1.0–6.6) versus White individuals were more likely to test if they had a positive household member. Asians versus Whites were more likely to receive a positive test result. Minors were less likely than adults to have been vaccinated (OR = 0.2, 95 % CI = 0.1–0.3). Among unvaccinated individuals, those who completed the survey in English versus Spanish indicated they were more likely to get vaccinated in the future (OR = 8.2, 95 % CI = 1.5–44.4). Asians versus Whites were less likely to prefer accessing oral COVID medications from a pharmacy/drug store only compared with a doctor's office or community setting (OR = 0.3, 95 % CI = 0.2–0.6). Study findings reinforce the need for replicable and scalable community-engaged strategies for reducing COVID-19 disparities by increasing SARS-CoV-2 test and vaccine access and uptake.

1. Introduction

The COVID-19 pandemic has dramatically increased disparities in morbidity and mortality. In the United States, >71 million people have been infected with the SARS-CoV-2 virus, and > 850,000 have died (Centers for Disease Control and Prevention, 2022), with infections and deaths disproportionally affecting historically marginalized populations. To mitigate the continuing detrimental health and societal effects of this pandemic, the White House recently distributed 500 million free at-home SARS-CoV-2 tests via online ordering and home

Abbreviations: YMCF, You & Me COVID-Free.

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https://doi.org/10.1016/j.pmedr.2022.101967
Received 21 March 2022; Received in revised form 15 June 2022; Accepted 25 August 2022
Available online 30 August 2022

delivery, with additional test distribution launched in March 2022 (Press and Biden, 2021; NPR, 2022). The availability of these tests presents opportunities for rapid and low-cost SARS-CoV-2 home testing as part of the broader mitigation strategy including masking, treatments, and vaccination (Ciccone et al., 2021). Testing early in the course of the disease will also be imperative as new oral treatments against SARS-CoV-2 become available (Jayk Bernal et al., 2022). However, recent deployments of national testing programs have shown that most (50–60 %) people opt to receive tests from community partners versus online ordering (Fleurence et al., 2021). In response, we launched the You & Me COVID-Free (YMCF) research program that relies 100 % on community engagement to provide households in underserved communities with access to free at-home SARS-CoV-2 antigen tests. Here we report on the distribution and early results of the YMCF program.

2. Methods

YMCF evaluates the distribution and use of at-home, rapid tests and effects on SARS-CoV-2 community transmission. The program, funded by the National Institutes of Health (NIH) as part of the larger Rapid Acceleration of Diagnostics-Underserved Populations (RADx-UP) program, was approved by the Duke University Institutional Review Board. YMCF partnered with the United Way of Merced County (UWMC) to distribute 200,000 test kits (400,000 tests) in Merced County, California, in November-December 2021. Merced County was chosen based on the size of the population, proportion of Hispanic/Latino/Spanish population, established partnerships with the RADx-UP program and the NIH Community Engagement Alliance, ongoing connection to the local health department, county vaccination rates, and county Pandemic Vulnerability Index (Marvel et al., 2020) score.

We developed a testing protocol that outlined instructions on how and when to use the tests. The main message was to test prior to gatherings with loved ones (e.g., holidays, birthdays, worship). In addition, instructions included testing if symptomatic, exposed, or at high risk for contracting SARS-CoV-2. We used the Quidel QuickVue COVID-19 Test for this study. This test has Food and Drug Administration emergency use authorization for over-the-counter, at-home use in asymptomatic and symptomatic individuals ≥ 2 years of age (Quidel, 2022). Individuals were told to follow the test instructions provided by the manufacturer.

2.1. Distribution of tests and data collection

Community partners provided residents of community households with tests facilitated by UWMC and a YMCF-branded mobile unit. Before the program started, local community partners attended a YMCF orientation that provided a program overview and described the distribution toolkits, guides, quick reference cards, communications and branded tools, consent forms, and frequently asked questions.

We posted distribution events on the YMCF website and social media (see below). Distributors could dispense up to 5 test kits per household (10 tests); no identification was required for test pickup. Distributors documented test distribution via an online portal and recorded the number of test boxes distributed per household, household zip code, and community partner. We instructed participants to document test use and results via scanning a QR code with a mobile device or entering via URL (Supplementary Figure 1). As participants documented test use, we provided the option to complete a short de-identified survey and a longer survey requiring informed consent (to be reported in a follow-up publication). Community partners were provided distribution tracking and survey data results weekly in the form of a newsletter and online dashboard (Supplementary Figure 2). We provided incentives at the household level to encourage test use and survey completion in the form of Amazon gift cards.

Table 1
Demographics and other characteristics for YMCF survey participants (N = 2591).

Characteristic	n (%)
Age, years (n = 2571)	
<18	410 (16)
≥18	2169 (84)
Race[a] (n = 851)	
White	530 (62)
Other	179 (21)
Asian	73 (9)
Black	28 (3)
Multiple	41 (5)
Ethnicity (n = 2473)	
Hispanic/Latino/Spanish	1418 (57)
Not Hispanic/Latino/Spanish	1055 (43)
Language of survey completed (n = 2591)	
English	2332 (90)
Spanish	259 (10)
Reason for testing[a] (n = 2591)	
Testing before gathering	1517 (59)
Experiencing symptoms	465 (18)
Close contact with confirmed COVID-19 case	319 (12)
Close contact with potential COVID-19 case	225 (9)
Other	196 (8)
Someone in household with confirmed COVID-19	133 (5)
Someone in household with suspected COVID-19	107 (4)
Test results (n = 2469)	
Negative	2234 (90)
Positive	235 (10)
Vaccination status (n = 2515)	
Vaccinated[b]	2058 (82)
Not vaccinated	457 (18)
Likelihood of future vaccination[c] (n = 382)	
Very likely	83 (22)
Somewhat likely	54 (14)
Not very likely	133 (35)
Not at all likely	112 (29)
Perceived easiest place to access oral COVID-19 medication[a] (n = 1708)	
Pharmacy only	781 (46)
Doctor's office or other health professional	550 (32)
Community settings[d]	377 (22)

[a] Participants could indicate all answer choices that applied for Race, Reason for testing, and Easiest place to access oral COVID-19 medication.
[b] At least one vaccine dose.
[c] Likelihood of vaccination answered only by participants not already vaccinated.
[d] Community settings = grocery store, community center, place of worship, community park, neighborhood school, or other.

2.2. Communication and marketing strategies

We conducted marketing campaigns in both Spanish and English to reach communities across multiple channels, including websites (YouAndMeCovidFree.org; TuyYoLibresdeCovid.org), local advertising, and social media. Messaging highlighted the goal of maximizing detection of index cases, and promoting vaccination, physical distancing, and masking. Also, we provided communication toolkits to community partners with poster and flyer templates, social media posts and graphics, sample email and newsletter text, and videos.

2.3. Data analysis

We used survey data to generate descriptive characteristics for community partners, total kits distributed, and participants (self-reported sociodemographics [age, race (White, Black, Asian, Multiple, Other), ethnicity (Hispanic/Latino/Spanish or Not Hispanic/Latino/Spanish)], reasons for test use, current or future potential for vaccination, test results, and access to treatment). We fit binary logistic regression models to the data to examine the relationship between sociodemographic factors and outcomes, and ordinal logistic regression for likelihood of vaccination and medication access. A p-value of < 0.05

Table 2
Regression estimates for the association between demographic factors and COVID-19 testing, vaccination, and medication outcomes (N = 2591).

	Reason for test use						Test result		Vaccination status				Perceived easiest place to access COVID-19 oral medications	
	Close contact possible COVID-19		Close contact COVID-19 positive		Household member COVID-19 positive		Positive COVID-19 test result		Received at least one vaccine dose		Likelihood of future vaccination[a]		Pharmacy only vs doctor's office or community setting[b]	
	OR_{Adj}[c]	95 % CI	OR_{Adj}[c]	95 % CI	OR_{Adj}[c]	95 % CI	OR_{Adj}[c]	95 % CI	OR_{Adj}[c]	95 % CI	OR_{Adj}[d]	95 % CI	OR_{Adj}[d]	95 % CI
Age, years														
<18	0.9	0.4–1.8	**1.7**	**1.0–3.0**	1.3	0.5–3.5	1.2	0.6–2.2	**0.2**	**0.1–0.3**	**0.3**	**0.1–0.6**	1.0	0.6–1.7
≥18	.	.	.	.					.	.	.	.		
Race														
Black	1.9	0.6–5.9	0.6	0.1–2.8	1.8	0.2–14.6	1.9	0.6–5.9	NA	NA	NA	NA	1.0	0.4–2.6
Other	1.1	0.6–2.1	1.6	0.9–2.9	0.9	0.3–2.5	0.6	0.3–1.4	1.0	0.6–1.7	1.2	0.5–2.7	1.0	0.6–1.5
Asian	**3.4**	**1.7–6.7**	1.5	0.7–3.1	**4.1**	**1.2–13.7**	**2.2**	**1.1–4.6**	1.2	0.5–2.5	0.6	0.1–2.5	**0.3**	**0.2–0.6**
Multiple	0.3	0.0–2.2	1.1	0.4–3.0	2.0	0.4–9.1	1.2	0.4–3.6	1.2	0.5–3.0	0.3	0.1–1.9	1.7	0.7–3.9
White	.	.	.	.					.	.	.	.	.	.
Ethnicity														
Hispanic/ Latino/ Spanish	1.2	0.7–2.1	0.9	0.5–1.4	**2.5**	**1.0–6.6**	1.0	0.6–1.8	0.8	0.5–1.2	0.7	0.3–1.5	0.9	0.6–1.3
Non-Hispanic/ Latino/ Spanish	.	.	.	.					.	.	.	.		
Language														
English	0.8	0.3–2.1	2.9	0.7–12.5	1.7	0.2–13.4	0.8	0.3–2.3	0.9	0.4–2.3	**8.2**	**1.5–44.4**	1.2	0.5–2.8
Spanish	.	.	.	.	.	.	.	.	.	.	.	.	.	.

NA = odds ratio not estimable due to small sample sizes.
Bolded estimates p <.05.
[a] Likelihood of future vaccination per one unit change (Not at all likely to not very likely; Not very likely to somewhat likely; Somewhat likely to very likely).
[b] Community settings = grocery store, community center, place of worship, community park, neighborhood school, or other.
[c] Estimates based on binary logistic regression, adjusted for age, race, and ethnicity.
[d] Estimates based ordinal logistic regression, adjusted for age, race, and ethnicity.

was considered statistically significant; all analyses were performed using SAS 9.4 software (SAS Institute, Cary, NC).

3. Results

Between November 18 and December 31, 2021, we distributed 200,000 kits (400,000 tests) via 67 community partners (181,655 kits) and the mobile unit (18,345 kits across 12 events). As of January 24, 2022, there were 3262 QR code scans/URL entries, and of those, 2591 (79 %) responses to the short survey. Survey data are summarized in Table 1. Testing before gathering (59 %) was the most common reason for using the test kit, although among people who tested positive, the most common reason for testing was experiencing symptoms (47 %). Eighty-two percent of participants reported receiving at least one vaccine dose at the time of test use. Of participants not currently vaccinated, 36 % reported that they were very likely or somewhat likely to get vaccinated for COVID-19. Ten percent of test results (n = 235) were positive. Of these, 56 % (128) were in Hispanic/Latino/Spanish individuals, 60 % in those reporting race (45) were White, 19 % (45) were in unvaccinated people, 17 % (40) were in minors, and the most common testing reason was experiencing symptoms (47 %). The majority of participants (46 %) preferred accessing oral COVID medications from a pharmacy/drug store only.

Regression estimates are shown in Table 2. Asians compared with Whites were more likely to test for COVID-19 if they had close contact with someone who may have been positive (odds ratio [OR] = 3.4, 95 % confidence interval [CI] = 1.7–6.7). Minors were more likely than adults to test for COVID-19 if they had close contact with someone who was confirmed positive (OR = 1.7, 95 % CI = 1.0–3.0), whereas Asian (OR = 4.1, 95 % CI = 1.2–13.7) and Hispanic/Latino/Spanish (OR = 2.5, 95 % CI = 1.0–6.6) versus White individuals were more likely to test if they had a positive household member. Asians compared with Whites were also more likely to receive a positive test result. Minors were less likely than adults to have been vaccinated (OR = 0.2, 95 % CI = 0.1–0.3). Among unvaccinated individuals, those who completed the survey in English versus Spanish indicated that they were more likely to get vaccinated in the future (OR = 8.2, 95 % CI = 1.5–44.4). Also, Asians compared with Whites were less likely to prefer accessing oral COVID medications from a pharmacy/drug store only versus a doctor's office or community setting (OR = 0.3, 95 % CI = 0.2–0.6).

4. Discussion

As a nation, we have seen COVID-19 inequalities play out in our health systems (Evans et al., 2021). In light of the White House's distribution of tests nationally, and the preference for SARS-CoV-2 test acquisition from trusted community partners, the YMCF research program successfully provided 400,000 free, rapid, at-home tests to underserved communities. The majority of participants used tests before gathering, a key strategy for COVID-19 mitigation, reinforcing the importance of promoting test access to those most at-risk for COVID-19 through community-engaged strategies. Test positivity rates were similar to those reported in Merced County during the study period (Centers for Disease Control and Prevention, 2022). Interestingly, we observed limited documentation of test use, even with clear financial incentives for documentation. Alternatively, perhaps few people were actually testing. We hypothesize that test documentation was much lower than actual test use, based on well-reported concerns about data sharing due to the potential for group harms inherent in research with underserved populations (Corbie-Smith et al., 2018). However, we did not collect data to determine whether our hypothesis was correct. This work emphasizes the need to identify accurate and appropriate ways to improve test uptake and document testing and results.

Regression results suggested the importance of partnering with local

organizations to tailor the promotion of testing and increase treatment access for population subgroups. Also, we observed that > 60 % of unvaccinated participants who responded to the survey were unlikely to get vaccinated, representing an opportunity for further intervention on vaccine hesitancy using community engagement approaches. Vaccination rates were higher than for Merced County (82 % vs 58 % had at least one dose), indicating that study participants may be more likely to self-report vaccination or more willing to accept vaccination, or that individuals not yet vaccinated and willing to test are less likely to report. Although survey findings are limited to those who opted into the survey and may suffer from selection bias, particularly given a high proportion of missing values for both race and preference for accessing oral medications, local partnerships with community organizations who facilitated data collection may promote representativeness.

5. Conclusion

YMCF reinforces the need for replicable and scalable community-engaged strategies for reducing COVID-19 disparities by increasing access, promoting uptake, and ensuring inclusion for SARS-CoV-2 testing and vaccines.

6. Funding source

This study was funded by the National Institute on Minority Health and Health Disparities at the NIH (4U24MD016258-02). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH. You & Me COVID-Free™ is funded through the RADx-UP Coordinating and Data Collection Center and NIH emergency cooperative agreement 1U24MD016258.

7. Clinical trial registration

NCT05212883.

CRediT authorship contribution statement

E.M. D'Agostino, G. Corbie, W.A. Kibbe, C.P. Hornik, and M. Cohen-Wolkowiez conceptualized and supervised the research. A. Richmond, A. Dunston, A. Damman, and M. Alvarado administered the project. E.M. D'Agostino and L. Wruck curated the data and completed the formal analyses. E.M. D'Agostino and M. Cohen-Wolkowiez wrote the original draft and editing. All authors provided critical review.

Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: C. P. Hornik reports relationships with Anavex Pharmaceuticals, Cytokinetics, Inc., Purdue Pharma L.P., SC Pharma, Tellus Therapeutics, Inc., and UCB Pharma. M. Cohen-Wolkowiez receives support for research from the NIH [1U24-MD016258], National Institute of Allergy and Infectious Diseases [HHSN272201500006I, HHSN272201300017I, 1 K24-AI143971], Eunice Kennedy Shriver National Institute of Child Health and Human Development [HHSN275201000003I], U.S. Food and Drug Administration [5U18-FD006298], and industry for drug development in adults and children. The other authors report no potential conflicts of interest.

Acknowledgments

We acknowledge the following individuals for their valuable contributions to the You & Me COVID-Free program: Robert Hypes and Janet Appling-Kasper at the United Way of Merced County, California; Rita Joyner at Community-Campus Partnerships for Health, North Carolina; Quidel, San Diego, California; and You & Me COVID-Free community partners and participants of Merced County, California.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2022.101967.

References

Centers for Disease Control and Prevention. COVID Data Tracker. https://covid.cdc.gov/covid-data-tracker/#datatracker-home. Accessed January 28, 2022.

Centers for Disease Control and Prevention. COVID Data Tracker: COVID-19 Integrated County View. https://covid.cdc.gov/covid-data-tracker/#county-view?list_select_state=California&data-type=Risk&list_select_county=6047. Accessed January 28, 2022.

Ciccone, E.J., Conserve, D.F., Dave, G., Hornik, C.P., Kuhn, M.L., Herling, J.L., Song, M., Alston, S., Singler, L., Schmidt, M.D., Jones, A., Broderick, S., Wruck, L.M., Kibbe, W. A., Aiello, A.E., Woods, C.W., Richmond, A., Cohen-Wolkowiez, M., Corbie-Smith, G., 2021. At-home testing to mitigate community transmission of SARS-CoV-2: protocol for a public health intervention with a nested prospective cohort study. BMC Public Health. 21 (1) https://doi.org/10.1186/s12889-021-12007-w.

Corbie-Smith G, Wynn M, Richmond A, et al. Stakeholder-driven, consensus development methods to design an ethical framework and guidelines for engaged research. *PLoS One*. 2018;13(6):e0199451. doi: 10.1371/journal.pone.0199451.

Evans, A., Webster, J., Flores, G., 2021. Partnering with the faith-based community to address disparities in COVID-19 vaccination rates and outcomes among US Black and Latino populations. JAMA 326 (7), 609–610. https://doi.org/10.1001/jama.2021.12652.

Fleurence RL, DiNenno EA, Riley WT, McMahon MJ, Lauer MS. CDC–NIH initiative provides free COVID-19 rapid home tests in North Carolina, Tennessee. *Health Affairs Blog*. October 27, 2021. doi:10.1377/hblog20211025.437195.

Jayk Bernal, A., Gomes da Silva, M.M., Musungaie, D.B., Kovalchuk, E., Gonzalez, A., Delos Reyes, V., Martín-Quirós, A., Caraco, Y., Williams-Diaz, A., Brown, M.L., Du, J., Pedley, A., Assaid, C., Strizki, J., Grobler, J.A., Shamsuddin, H.H., Tipping, R., Wan, H., Paschke, A., Butterton, J.R., Johnson, M.G., De Anda, C., 2022. Molnupiravir for oral treatment of Covid-19 in nonhospitalized patients. N. Engl. J. Med. 386 (6), 509–520.

Marvel SW, House JS, Wheeler M, et al. The COVID-19 Pandemic Vulnerability Index (PVI) Dashboard: Monitoring county-level vulnerability using visualization, statistical modeling, and machine learning. Preprint posted online September 13, 2020. *medRxiv*. 2020;2020.08.10.20169649. doi:10.1101/2020.08.10.20169649.

NPR. You can order free COVID tests from the government again. March 7, 2022. https://www.npr.org/2022/03/07/1085022030/you-can-order-free-covid-tests-from-the-government-again. Accessed March 16, 2022.

Associated Press. President Biden pledges to deliver 500 million COVID-19 rapid tests to Americans. *MarketWatch*. December 21, 2021. https://www.marketwatch.com/story/president-biden-pledges-to-deliver-500-million-covid-19-rapid-tests-to-americans-01640088844. Accessed January 28, 2022.

Quidel. QuickVue At-Home OTC COVID-19 Test: Healthcare Provider Instructions for Use. https://www.fda.gov/media/147265/download. Accessed January 28, 2022.