

Centering Health Equity Within COVID-19 Contact Tracing: Connecticut's Community Outreach Specialist Program

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ABSTRACT

Context: The COVID-19 pandemic has disproportionately impacted vulnerable populations, including those who are non-English-speaking and those with lower socioeconomic status; yet, participation of these groups in contact tracing was initially low. Distrust of government agencies, anticipated COVID-19-related stigma, and language and cultural barriers between contact tracers and communities are common challenges.

Program: The Community Outreach Specialist (COS) program was established within the Connecticut Department of Public Health (DPH) COVID-19 contact tracing program to encourage participation in contact tracing and address a need for culturally competent care and social and material support among socially vulnerable and non-English-speaking populations in 11 high-burden jurisdictions in Connecticut.

Implementation: In partnership with state and local health departments, we recruited 25 COS workers with relevant language skills from target communities and trained them to deliver contact tracing services to vulnerable and non-English speaking populations.

Evaluation: We conducted a cross-sectional analysis using data from ContaCT, DPH's enterprise contact tracing system. Overall, the COS program enrolled 1938 cases and 492 contacts. The proportion of residents reached (ie, called and interviewed) in the COS program was higher than that in the regular contact tracing program for both cases (70% vs 57%, $P < .001$) and contacts (84% vs 64%, $P < .001$). After adjusting for client age, sex, race and ethnicity, language, and jurisdiction, we found that the COS program was associated with increased reach for contacts (odds ratio [OR] = 1.52; 95% confidence interval [95% CI], 1.17-1.99) but not for cases (OR = 0.78; 95% CI, 0.70-0.88). Rapid qualitative analysis of

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programmatic field notes and meeting reports provided evidence that the COS program was feasible and acceptable to clients and contributed to COVID-19 education and communication efforts.

Conclusion: A COS program employing a client-centered, community-engaged strategy for reaching vulnerable and non-English-speaking populations was feasible and more effective at reaching contacts than standard COVID-19 contact tracing.

KEY WORDS: community health, COVID-19 contact tracing, health equity

Context

Across the United States, the COVID-19 pandemic has disproportionately impacted vulnerable communities, resulting in higher rates of infection, severe illness, and death.¹ In Connecticut, early data on race and ethnicity suggested that Black and Hispanic/Latino residents had higher age-adjusted rates of COVID-19 infection and higher rates of death from COVID-19 than White residents.² For example, between March and August 2020, relative risk of mortality of Hispanic residents and non-Hispanic Black residents within noncongregate settings was 3.9 and 5.2 times higher than White residents, respectively.³ Other populations identified as vulnerable have included undocumented residents, people with limited English proficiency, individuals experiencing homelessness, individuals with disabilities, seasonal/migrant workers, underinsured individuals, and economically disadvantaged individuals.⁴⁻⁶ Vulnerable populations in Connecticut have also faced additional adverse health impacts during the pandemic due to a combination of factors, including structural racism, job loss, inadequate housing, or difficulty accessing essential services.⁷⁻⁹

Contact tracing is a well-established public health intervention used to respond to and mitigate the impacts of infectious diseases on individuals and communities. Contact tracing involves interviewing all cases to identify exposed contacts to screen for concurrent disease, usually by telephone, and providing education and counseling on the importance of quarantine and isolation (Q/I) to prevent further transmission. Depending on the characteristics of the pathogen, the community, and the stage of the epidemic, contact tracing may help reduce transmission, identify outbreak clusters, and facilitate education, support, and health monitoring for affected individuals and households.¹⁰⁻¹⁵ Some contact tracing programs also connect vulnerable populations with critically needed resources (eg, food, temporary housing, and income assistance) to help residents safely Q/I.¹⁶

Unfortunately, contact tracing is challenging to implement, with high proportions of cases and contacts missing contact information, not answering or returning calls, or declining to talk to health workers.^{17,18} Mistrust in government institutions may also inhibit cooperation with contact tracing. These challenges are

especially pronounced in minority communities due to historical human rights violations involving both government and health care institutions.¹⁹ Finally, even willing participants may be reluctant to fully disclose information about themselves or their close contacts because of mistrust and COVID-19–related stigma.²⁰

Jurisdictions throughout the United States have experimented with a variety of staffing models for contact tracing, including soliciting volunteers, outsourcing, employing new full-time public health personnel, and using digital tracing. One widely recommended model to improve participation among non-English-speaking vulnerable populations and highly affected racial and ethnic groups involves using contact tracers with similar language and cultural backgrounds to clients in communities where they work.²¹⁻²⁴ Such community-based contact tracing workforces appear to encourage greater participation and adherence to Q/I recommendations and promote trust in the safety and prevention recommendations offered by contact tracers.^{19,25,26}

In the second half of 2020, the Connecticut Department of Public Health (CT DPH) COVID-19 contact tracing program identified low rates of engagement with residents from the state's most vulnerable communities. In response, the Community Outreach Specialist (COS) program was established to recruit more culturally competent and bilingual tracers into the program and provide a more comprehensive strategy to target vulnerable populations.

In this article, we outline the steps that we used to establish the COS program, then evaluate the program's effectiveness in engaging COS clients using quantitative process data, and conclude with a qualitative evaluation of COS program feasibility and acceptability. Our findings may inform tailoring of public health services to vulnerable groups during the COVID-19 pandemic and future infectious disease outbreaks.

Approach

Needs assessment

Beginning in October 2020, the first author conducted a needs assessment in partnership with CT state and local health departments (LHDs) to identify

communities that would most benefit from the COS program. We first identified LHDs with the highest numbers of reported COVID-19 cases (Bridgeport, Danbury, Hartford, New Britain, New Haven, New London, Norwalk, Norwich, Stamford, Waterbury, and Windham/Willimantic) and invited them to participate. We used CDC's Social Vulnerability Index (SVI) to identify the most vulnerable communities within these towns.²⁷ SVI is a composite measure constructed from 15 US census variables related to social factors including socioeconomic status, race/ethnicity/language, household composition, and housing/transportation. In addition, we held virtual discussions with public health leaders (eg, directors and contact tracing program managers of LHDs) and community leaders (eg, nongovernmental organization [NGO] directors, faith-based leaders, community health activists) to identify more specific language needs perceived barriers to engaging vulnerable populations in contact tracing and resources for outreach to these communities. On the basis of these meetings, the COS program prioritized hiring workers fluent in Spanish, Portuguese, Polish, and Haitian Creole.

Program objectives and components

The COS program was launched in December 2020. We sought to develop a culturally competent COS program that (1) increased trust and contact tracing engagement among vulnerable and non-English-speaking populations in the selected communities, defined as increased reach, participation, and willingness to share personal information related to COVID-19 exposures, and (2) was feasible and acceptable to participants and providers.

The program included the following components: (1) targeted, bilingual contact tracing services, in which residents were matched with COS workers who spoke the same language and lived in the same jurisdiction; (2) "warm handoffs" to social service providers, in which the COS worker would directly link residents with unmet needs to a case manager (and provide a narrative presentation about the resident's situation) to coordinate resource support for the duration of the resident's Q/I period; and (3) community-based COVID-19 education and communication activities.

Implementation

Recruitment and staff selection

The COS program recruited 25 specialized contact tracers living in the 11 designated towns and 2 COS supervisors. The recruitment team shared the COS job description with local community-based

organizations and NGOs. They sought candidates who had prior experience in community health or customer service, were bilingual or from similar cultural backgrounds as target communities, and had basic computer literacy and data entry skills. There were no other educational requirements.

Training and support

Once hired, COS workers completed the standardized DPH contact tracing training, which included an online contact tracing course,²² simulated virtual interviews and role-plays, and virtual training on using the state's contact tracing management software platform (ContaCT). COS workers received additional virtual training in motivational interviewing; and diversity, equity, and inclusion training to better serve individuals from different cultural backgrounds and lesbian, gay, bisexual, trans, and queer (LGBTQ+) residents. COS trainings also incorporated sessions on public speaking, managing difficult resident interactions, and educating the public about COVID-19 vaccination. Finally, the program incorporated weekly virtual continuing education employing peer-to-peer and experiential learning such as case presentations sharing lessons learned from recent outreach activities.

Program referrals

Using ContaCT, COS workers were assigned COVID-19 cases and contacts for outreach in jurisdictions where they lived and were given access to telephone numbers and addresses. Two modifications to ContaCT enabled this: (1) adding a dedicated queue for COS workers, and (2) allowing LHDs to assign individual records to the COS queue based on language or other relevant needs. With funding from the CT DPH, both COS and non-COS workers conducted contact tracing with both cases and contacts, with some differences between the 2 groups (see Supplemental Digital Content Table S1, available at <http://links.lww.com/JPHMP/B33>). First, COS workers focused primarily on residents in their home jurisdictions while non-COS workers worked statewide. However, COS workers occasionally also assisted other jurisdictions when there was a language or other need. Second, COS worker caseloads were restricted to allow time for daily follow-up throughout the 10-day Q/I period while non-COS workers did not routinely conduct follow-up with specific cases or contacts. Third, unlike non-COS workers, COS workers met with LHD officials and Community Resource Coordinator (CRC) case managers weekly or biweekly to discuss COS case referrals and communicate best practices, often incorporating direct feedback from residents. Fourth,

like other contact tracers, the COS team had access to the state's CRC program, a short-term case management program providing support for housing, food, income, and other needs to promote well-being and facilitate Q/I. However, different from standard contact tracing practice, the COS team provided "warm handoffs" to CRC case managers to help develop and communicate individualized support plans to residents to ensure successful linkage to resources. Warm handoffs are a referral and care transfer process commonly used in primary care health settings, where a provider introduces and immediately transitions patients by phone or in person to another provider working on the integrated care team.^{28,29} The use of warm handoffs has been shown to reduce the stigma of behavioral services and increase the likelihood of client's initiation and engagement in these services.^{28,30-32}

Community education and outreach

In March 2021, the COS program launched a 12-week media campaign (produced by The Latino Way, a local Hispanic marketing agency) to promote awareness of, trust in, and participation in the state's contact tracing program, particularly among vulnerable and non-English-speaking populations. The campaign included messages such as "We won't share your information with immigration" and "I'm here to check that you and the people around you are okay." The COS team developed content in multiple languages (English, Spanish, Portuguese, Polish, Haitian Creole) featuring COS members, including videos, print media, and digital graphics (Figure) for dissemination via non-English television stations (eg, *Telemundo* and *Univision*), local ethnic newspapers, and social media. The total budget for the campaign was \$72 000.

The COS team also provided community education activities, creating and delivering virtual (using Facebook Live and Zoom platforms) and in-person presentations in 5 languages to educate communities about contact tracing, Q/I guidelines, testing, and vaccination. The COS workers networked with local NGOs and community leaders (eg, church pastors) to coordinate presentations and invited bilingual medical doctors or nurse practitioners to attend to answer clinical questions from participants.

Evaluation Strategy

Study design

We carried out a process evaluation using both quantitative data from ContaCT and qualitative documentary evidence including routine programmatic

reports. We also sought to characterize the feasibility, acceptability, and context of the COS program using the qualitative data. We defined feasibility as the extent to which the COS program was successfully implemented within the LHDs and communities based on objective measures and acceptability as a perception among program stakeholders that the program was agreeable or satisfactory.³³

Quantitative data collection and analysis

We carried out a cross-sectional analysis of COVID-19 cases and close contacts reported to ContaCT between March 23, 2021, when complete data on allocation of residents to the COS first became available, and May 31, 2021. This analysis includes all cases and contacts in all CT jurisdictions.

We extracted demographic and clinical characteristics from ContaCT. Our primary quantitative outcome related to contact tracing engagement was reach, defined as the proportion of contacts and cases called and interviewed. Secondary outcomes included timeliness (ie, proportion of residents called within 24 hours of registration), and completeness of race and ethnicity capture in ContaCT among contacts (ie, proportion of contacts with race and ethnicity recorded). We conceptualized race and ethnicity capture as a surrogate for completion of the integrated health equity assessments that COS workers were trained to provide. This indicator is an important metric for assessing the COS program's ability to collect race and ethnicity information to monitor and respond to racial health disparities in real time. Before initiating the COS program, race and ethnicity capture among contacts was low across all jurisdictions (between 18% and 38%), likely due to contact tracers' discomfort asking these questions. We focused on contacts, because race and ethnicity for cases was often captured by testing centers before entering ContaCT. For a full list of social determinants of health indicators collected within the CT state contact tracing program, see Supplemental Digital Content Table S2 (available at <http://links.lww.com/JPHMP/B34>).

We stratified all analyses by cases and contacts. We first calculated descriptive statistics for all variables. Then, we used tests of proportions to identify differences in reach, timeliness, and demographic data completeness between the COS and non-COS groups. We further assessed the impact of the COS program on the primary outcome (ie, reach) using unadjusted and adjusted generalized estimating equations with a logit link function and a working exchangeable correlation structure to account for clustering by geographic jurisdiction.³⁴ In these models, the primary



FIGURE English and Spanish Social Media Ads
This figure is available in color online (www.JPHMP.com).

exposure was the COS program; residents who were not assigned to the COS program served as the reference group. We entered age, sex, race, ethnicity, and language preference in the adjusted model.³⁵ We used multiple imputation to account for missing covariates and conducted complete case analysis in secondary analyses. We selected the number of imputations based upon the degree of data missingness, with one additional imputation for every 1% increase in data missingness.³⁶

Qualitative data collection and analysis

We collected routine documentary evidence from COS workers, including minutes from weekly

meetings with LHDs, debriefing notes from meetings and trainings, case presentations and write-ups, open-ended responses from postpresentation forms completed by COS workers, and internal chat posts (RingCentral). We analyzed the data using a rapid qualitative analysis approach.³⁷ The first author reviewed all data and used thematic analysis³⁸ and the matrix method³⁹ to synthesize findings across data sources and to identify emergent themes related to COS program objectives. The first and second authors then met to discuss themes until reaching consensus. We used data triangulation to ensure reliability and validity. Finally, the first author presented and discussed key findings with the COS team as a member check.

Human subjects

The study protocol was reviewed by the Yale University Institutional Review Board and deemed exempt research under the category of public health activities and purposes.

Results

Reach, timeliness, and race and ethnicity capture

Table 1 depicts participant demographics. A total of 43 116 cases and 12 198 contacts were included in the analysis; of those, 1938 cases and 492 contacts were enrolled in the COS program. Distribution of age and sex were similar between the COS and non-COS groups for both cases and contacts. Among clients with complete data, COS cases, compared with non-COS cases, were more likely to be members of a racial and ethnic minority group (80% vs 46%, $P < .001$), primarily speak a language other than English (60% vs 5%, $P < .001$), and be referred to the CRC program for specific social needs (16% vs 5%, $P < .001$). Similarly, COS contacts, compared with non-COS contacts, were more likely to be members of a racial and ethnic minority group (93% vs 53%, $P < .001$), primarily speak a language other than English (74% vs 6%, $P < .001$), and be referred to the CRC program for specific social needs (12% vs 3%, $P < .001$).

Seventy percent of COS-assigned cases were reached versus 57% of COS-unassigned cases ($P < .001$), while 84% of COS-assigned contacts were reached versus 64% of COS-unassigned contacts ($P < .001$; Table 2). For timeliness, 62% of COS-assigned cases were reached within 24 hours compared with 53% of COS-unassigned cases ($P < .001$). Seventy-four percent of COS-assigned contacts were reached within 24 hours compared with 56% of COS-unassigned contacts ($P < .001$). Race and ethnicity information was collected from 70% of COS-assigned contacts compared with only 43% of COS-unassigned contacts ($P < .001$).

Residents assigned to the COS program, compared with those who were not, had increased odds of being reached, whether they were cases (odds ratio [OR] = 1.50; 95% confidence interval [95% CI], 1.22-1.86) or contacts (OR = 1.98; 95% CI, 1.61-2.44; Table 3). After adjusting for age, sex, race and ethnicity, language, and jurisdiction, residents in the COS program, compared with those not in the COS program, were reached more often if they were contacts (OR = 1.52; 95% CI, 1.17-1.99) but not if they were cases (OR = 0.78; 95% CI, 0.70-0.88). Results were similar with complete case analysis (see Supplemental Digital

TABLE 1
Clinical and Demographic Characteristics Among All Cases and Contacts, Stratified by Community Outreach Support Assignment^a

Characteristics, n (%)	COS	Non-COS
<i>Cases (n = 43 116)</i>	n = 1 938	n = 41 178
Age, y		
0-18	442 (22.8)	9 607 (23.3)
19-44	789 (40.7)	19 320 (46.9)
45-64	541 (27.9)	9 312 (22.6)
65+	145 (7.5)	2 297 (5.6)
Missing	21 (1.1)	642 (1.6)
Sex		
Female	1 000 (51.6)	20 736 (50.4)
Male	928 (47.9)	19 992 (48.6)
Missing	10 (0.5)	450 (1.1)
Race and ethnicity		
White	287 (14.8)	16 032 (38.9)
Black	118 (6.1)	4 360 (10.6)
Hispanic	981 (50.6)	7 205 (17.5)
Asian	27 (1.4)	1 001 (2.4)
Other	12 (0.6)	259 (0.6)
Missing	513 (26.5)	12 321 (29.9)
English-speaking	768 (39.6)	38 916 (94.5)
Referred to CRC	313 (16.2)	2 079 (5.0)
<i>Contacts (n = 12 198)</i>	n = 492	n = 11 706
Age, y		
0-18	243 (49.4)	3 700 (31.6)
19-44	142 (28.9)	3 034 (25.9)
45-64	55 (11.2)	1 869 (16.0)
65+	20 (4.1)	389 (3.3)
Missing	32 (6.5)	2 714 (23.2)
Sex		
Female	222 (45.1)	3 616 (30.9)
Male	176 (35.8)	3 166 (27.1)
Missing	94 (19.1)	4 924 (42.1)
Race and ethnicity		
White	25 (5.1)	2 368 (20.2)
Black	12 (2.4)	643 (5.5)
Hispanic	299 (60.8)	1 723 (14.7)
Asian	3 (0.6)	207 (1.8)
Other	5 (1.0)	127 (1.1)
Missing	148 (30.1)	6 638 (56.7)
English-speaking	130 (26.4)	10 947 (93.5)
Referred to CRC	60 (12.2)	363 (3.1)

Abbreviations: COS, Community Outreach Support; CRC, Community Resource Coordinator (CRC) program, a short-term case management program providing residents with support for housing, food, income, and other needs to promote well-being and facilitate quarantine and isolation.

^a Among the 14 527 cases living in one of the 11 jurisdictions with the COS program, 1938 (13.3%) were assigned to the COS program. Among the 4312 contacts living in one of the 11 jurisdictions with the COS program, 492 (11.4%) were assigned to the COS program.

TABLE 2
Contact Tracing Outcomes, Stratified by COS Assignment

Outcomes, n (%)	Total	COS	Non-COS	P
Cases (n = 43 116)				
Reach	24 973 (57.9)	1 352 (69.8)	23 621 (57.4)	<.001
Timeliness	22 555 (53.3)	1 159 (61.5)	21 396 (52.9)	<.001
Contacts (n = 12 198)				
Reach	7 949 (65.2)	412 (83.7)	7 537 (64.4)	<.001
Timeliness	5 848 (56.9)	294 (74.2)	5 554 (56.2)	<.001
Data completeness for race and ethnicity	5 412 (44.3)	344 (70.0)	5 068 (43.3)	<.001

Abbreviation: COS, Community Outreach Support.

Content Table S3, available at <http://links.lww.com/JPHMP/B35>).

Feasibility and acceptability

Qualitative data showed that COS services were feasible and acceptable among vulnerable and non-English-speaking populations. During team debriefing meetings, COS workers reported that residents often disclosed their reluctance to participate in contact tracing or share personal information for several reasons, including language or cultural barriers, concerns about disclosing an undocumented immigration status, mistrust of government or health services, and previous experiences of discrimination within health care or government services. COS workers reported that residents often told them that they felt more willing to return a call or engage in contact tracing after hearing messages in their own language or speaking with COS workers who shared a similar cultural background. For example, one resident e-mailed COS program administrators to thank the COS worker for her assistance with her parents, who were both diagnosed with COVID-19 and did not speak English: “[The COS worker’s] ability to speak Polish immediately put my parents at ease. She really made a difference.”

COS workers reported that they could often relate to challenges that residents were facing, due to shared cultural backgrounds and/or lived experiences. COS workers perceived that this level of empathy and understanding increased residents’ willingness to share personal health information and enabled them to be more candid about their COVID-19 risk behaviors. Furthermore, COS workers reported that they regularly incorporated motivational interviewing skills (eg, empathy, affirmations, open-ended questions, reflections, and validation) to empower residents to make decisions about how to protect themselves and their families from COVID-19

transmission. COS workers reported that residents appreciated this approach and often provided feedback that they felt “heard” and validated during calls.

In addition, COS workers reported that the “warm handoffs” to connect residents to resources were well received. COS workers also provided follow-up support and advocacy for vulnerable residents who were reluctant or unable to access recommended services. For example, COS workers reported that many undocumented residents expressed fear of being detained by law enforcement after accessing resources. Others were hesitant to accept services because of shame or the perceived stigma of accepting government assistance. In one situation, even after a resident was referred to a CRC, he felt too ashamed to tell the CRC that he had no food at home. In another example, a local social service agency was referred to assist a resident with groceries, but she was unable to communicate her food needs in English because she only spoke Haitian Creole. In these situations, COS workers were able to communicate directly to the CRCs and social service agencies, provide translation services, and advocate for the resident’s support needs to be met during their Q/I period.

Finally, we found COS communication and education efforts to be feasible and acceptable in target communities. Over 12 weeks, the campaign received 385 000 views on 2 Spanish-speaking TV stations (*Television* and *Univision*), 172 000 views on 6 publications (*La Voz*, *Tribuna*, *White Eagle*, *Gente con Salud*, *Inquiring News*, and *Northend Agents*), and 400 000 views on 2 social media platforms (Facebook/Instagram). Public responses to social media ads (via comments) were mixed, although mostly positive. Positive comments generally concerned the work of COS workers (eg, “Phenomenal service. Thank you!”), and negative comments were mostly related to residents’ concerns with government surveillance (eg, “Don’t let them into your home. Snooping will

TABLE 3
Bivariate and Adjusted Analyses of Associations With Successfully Reaching Cases and Contacts for Intake Interview

Characteristics ^a	Bivariate Analyses			Adjusted Analyses		
	OR	95% CI	P	OR	95% CI	P
<i>Cases (n = 43 116)</i>						
COS						
Assigned to COS	1.50	1.22-1.86	<.001	0.78	0.70-0.88	<.001
Not assigned to COS (reference)	1.0	...	...	1.0	...	...
Age, y						
0-18	2.02	1.85-2.21	<.001	1.98	1.81-2.17	<.001
19-44	1.42	1.30-1.54	<.001	1.43	1.31-1.56	<.001
45-64	1.57	1.43-1.71	<.001	1.57	1.43-1.71	<.001
65+ (reference)	1	...	...	1	...	...
Male sex	0.86	0.82-0.89	<.001	0.85	0.82-0.89	<.001
Race and ethnicity						
White	0.30	0.21-0.42	<.001	0.33	0.23-0.46	<.001
Black	0.39	0.28-0.54	<.001	0.42	0.30-0.59	<.001
Hispanic	0.59	0.42-0.82	.002	0.51	0.37-0.72	.001
Asian	0.51	0.36-0.74	.001	0.51	0.35-0.74	.002
Other (reference)	1	...	...	1	...	...
English-speaking ^b	0.27	0.24-0.32	<.001	0.31	0.28-0.35	.001
<i>Contacts (n = 12 198)</i>						
COS						
Assigned to COS	1.98	1.61-2.44	<.001	1.52	1.17-1.99	.002
Not assigned to COS (reference)	1.0	...	...	1.0	...	...
Age, y						
0-18	2.50	2.04-3.07	<.001	2.53	2.05-3.11	<.001
19-44	1.47	1.20-1.80	.001	1.47	1.20-1.81	<.001
45-64	1.29	1.05-1.59	.02	1.31	1.07-1.62	.01
65+ (reference)	1	...	...	1	...	...
Male sex	0.94	0.82-1.07	.33	0.90	0.78-1.03	.11
Race and ethnicity						
White	0.64	0.41-1.01	.06	0.73	0.46-1.17	.19
Black	0.72	0.47-1.10	.13	0.79	0.51-1.22	.29
Hispanic	0.81	0.54-1.21	.30	0.78	0.51-1.17	.23
Asian	1.00	0.61-1.66	.99	1.03	0.61-1.73	.91
Other (reference)	1	...	...	1	...	...
English-speaking ^b	0.54	0.46-0.64	<.001	0.62	0.51-0.75	<.001

Abbreviations: CI, confidence interval; COS, Community Outreach Support; OR, odds ratio.

^aMissing observations replaced using multiple imputation.

^bNon-English-speaking residents served by the COS program included Spanish, Portuguese, Polish, and Haitian-Creole speakers.

prevail.”). Between March and May 2021, the COS team also reached 363 residents through virtual and community-based presentations conducted in Spanish and Portuguese. COS workers perceived these presentations to be well received by participants, particularly when paired with the provision of on-site community-based vaccine clinics. COS workers reported that participants often thanked them for their improved

understanding of Q/I guidelines and the COVID-19 vaccine after these events.

Discussion and Conclusion

The COS program offers a model that adapts conventional COVID-19 contact tracing using a client-centered approach, with the goal of improving health

equity. In our experience in Connecticut, we found that COS workers were able to draw on a shared language or cultural background and knowledge of their own communities to better engage vulnerable and non-English-speaking residents, engender trust, and encourage participation in the state DPH contact tracing program. Our findings suggest that this approach contributed to increased reach of contacts (although not cases) and improved race and ethnicity capture for contacts. In addition, our qualitative analysis demonstrated the program's feasibility and acceptability from the perspectives of COS workers. The COS team also contributed to contact tracing communication and education efforts through a multimedia campaign and community-engaged virtual presentations.

While published evaluations of comparable programs are scarce, we are aware of several other health equity-focused contact tracing programs that have been deployed in the United States. The Baltimore City Corps,⁴⁰ Oregon-Washington Tracing Health Program,⁴¹ and the Massachusetts COVID-19 Community Tracing Collaborative (CTC)⁴² program have all employed health equity and community-based approaches. Although these programs differed in size and approach at the time of these reports, they shared several features with the CT COS program, including a focus on (1) hiring people from local communities most impacted by COVID-19, (2) providing services in appropriate languages and cultural context, and (3) providing strong linkages between contact tracing and community resources. In contrast to the CT COS program, these programs have integrated additional strategies to increase health equity. For example, the Baltimore City Corps specifically recruited contact tracers who were unemployed because of the pandemic and offered them free community health worker training to promote long-term career development. The Oregon-Washington Tracing Health Program provided contact tracers training in mental health first aid, which allows them to provide crisis support, trauma-informed outreach, and suicide prevention to vulnerable residents. Finally, the Massachusetts COVID-19 CTC program includes an "Immigrant Working Group" that focuses on connecting undocumented and immigrant contact tracing clients with support and resources. These strategies could be adapted and evaluated to increase health equity in contact tracing programs in other settings.

One of the unexpected findings of this evaluation was that the COS program had increased reach for contacts but not cases. It is unclear why this occurred and could be related to selection bias, measurement error, or a true difference in intervention effectiveness between groups. Future research should explore how

contact tracing programs could more effectively document and achieve reach to all cases and contacts. Furthermore, since the referral process to the COS program was primarily triggered by specific primary languages other than English, it is likely that some vulnerable households were missed, including vulnerable English-speaking racial and ethnicity minority populations and individuals speaking languages not covered by the COS. Future iterations of this program should explore whether COS workers could improve engagement and outcomes in these groups as well.

Our evaluation had a few limitations. First, we had a large amount of missing demographic data, which we addressed by using multiple imputation and complete case analysis. The large amount of missing data may have impacted the validity of our results for both multiple imputation and complete case analysis if the data were not missing at random.³⁶ Furthermore, the missing demographic data limited our ability to assess if and how race and ethnicity, sex, and age may have confounded the observed effects of the COS program. Second, we did not collect a comprehensive list of covariates relevant to health equity, such as socioeconomic status, LGBTQ+ identity, disability status, and access to health care; these factors should be further explored in future evaluations of health equity programs to ensure they are reaching vulnerable communities. Future studies may also benefit from assessing additional contact tracing outcomes such as adherence to Q/I recommendations. Third, we were also unable to quantify the frequency of "warm handoffs" between the COS program and the CRC program, as these data were not systematically recorded. Fourth, there were also some limitations to our use of data completeness as a measure of health equity. Other factors besides improved cultural competency of COS staff likely contributed to the observed differences, including variation in training, script adherence, and prioritization strategies among staff and volunteers coming from a centralized staffing pool and 11 different LHDs. Fifth, we did not collect qualitative data directly from cases or contacts about their own evaluations of the program, an important limitation.

There were also several strengths to this study. We employed a pragmatic approach that used routinely collected public health data to assess how well the COS met its programmatic objectives. Our findings from this statewide evaluation of more than 55 000 residents undergoing contact investigation may be generalizable to other similar public health settings. Finally, this study represents one of the first to evaluate a health equity approach to a state COVID-19 contact tracing program, and the results may be used to inform other contact tracing programs focused on health equity.

Implications for Policy & Practice

- Effective public health interventions for COVID-19, including communication campaigns, should include consultation and collaboration with community organizations and trusted leaders during their development and throughout implementation. These stakeholders understand the needs of their communities and provide valuable context for policy makers.
- It is important to recruit contact tracers from communities they will primarily serve. A workforce that is representative of its residents can yield greater public participation in public health interventions for COVID-19. This practice may also help build long-term skills and workforce capacity of residents, rather than relying on external consultants who do not remain in the communities.
- Program evaluation should be considered from initiation of program planning. Program planners should ensure that data systems collect key process and outcome metrics to enable successful evaluations.
- Technologies created to facilitate public health interventions (eg, contact tracing software platforms) should be flexible to accommodate rapid program iteration.
- Cultural competency training should be provided to contact tracers, with a specific focus on how to respectfully collect important health equity data, including race and ethnicity, gender identity, employment information, income, and other information related to social determinants of health.

In summary, this COS program evaluation highlights multiple successes and a few challenges to increasing health equity within contact tracing. Recruiting a community-based workforce that reflected the cultural and linguistic diversity of targeted populations proved to be a feasible, acceptable, and effective strategy for increasing community engagement, building trust, and improving reach within the state contact tracing program.

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