

The Chelsea Project: Turning Research and Wastewater Surveillance on COVID-19 Into Health Equity Action, Massachusetts, 2020–2021

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Chelsea, Massachusetts, had one of the highest COVID-19 transmission rates in New England in the summer of 2020. The Chelsea Project was a collaborative effort in which government entities, local nonprofit organizations, and startups partnered to deploy wastewater analysis, targeted polymerase chain reaction testing and vaccine outreach, and a community-led communications strategy. The strategy helped increase both testing rates and vaccination rates in Chelsea. Today Chelsea has one of the highest vaccination rates among US cities with comparable demographics. (*Am J Public Health*. 2023;113(6):627–630. <https://doi.org/10.2105/AJPH.2023.307253>)

The Center of Complex Interventions sought to create an initiative in Chelsea, Massachusetts, to build block-level sensing and intervention in response to COVID-19 in collaboration with community-based organizations (CBOs) and the city government. Leaders of the initiative, labeled the Chelsea Project (TCP), designed a system to collect and analyze data on COVID-19 rates in wastewater and collaborated with community health workers to distribute information, offer personal protective equipment, and provide vaccine appointments to residents in high-risk areas within a one-week period. This intervention demonstrates how transforming data into community action through trusted messengers has a positive impact on protective behaviors and vaccination rates.

INTERVENTION AND IMPLEMENTATION

Community survey results revealed that, as of October 2020, most people in Chelsea had not had a COVID-19 test.¹ As a response, TCP combined surveillance of virus concentrations in local wastewater, culturally resonant outreach on protective behaviors, and qualitative data from health care worker conversations held with community members. Both mobile and static testing and vaccine units responded to wastewater mapping and guidance from community health workers to determine the best locations and timing for outreach.

Wastewater Testing

Wastewater surveillance captures changes in virus concentrations,

reflecting the magnitude of community transmission while ensuring anonymity. TCP collected 24-hour composite wastewater samples from four sites (selected according to population density and viability of collection) on Mondays and interpreted and communicated results through city channels.

Community-Based Organizations

Local CBOs and the Chelsea Department of Public Health received wastewater results each Wednesday afternoon. Public health directors from two CBOs and the city's communications director met every Thursday morning to discuss trends in wastewater results and vaccine rates. Communication strategies and outreach coordination were determined on the basis of these trends.

Promotoras de Salud

Two CBOs and the city department of public health hired and trained local women as community health workers (*promotoras de salud*). The *promotoras* met with one of the CBO public health directors on Thursday afternoons to report on residents' concerns regarding COVID-19, vaccines, and access to social protections. The director trained *promotoras* on the significance of recent wastewater trends and code-signed an outreach approach for that week. From Friday to Sunday, the *promotoras* targeted high-risk neighborhoods and supported residents in accessing vaccine clinics. They also spoke to residents about their concerns with COVID-19, vaccines, and other issues related to their current stressors. Through these conversations, *promotoras* were able to clarify misinformation and encourage vaccination.

Mobile Vaccine and Testing Van

TCP worked with Mass General Brigham Hospital to deploy its mobile testing

and vaccine unit to high-risk neighborhoods. *Promotoras* were consulted about the best location and schedule for this van to ensure high traffic and accessibility.

Social Media

CBOs and the city provided daily updates through Facebook and TikTok on testing and vaccination and to clarify misinformation. TCP produced a series of videos with local leaders urging residents to get vaccinated. Through weekly Facebook live sessions facilitated by a CBO with a physician or public health official, residents texted their questions and received immediate answers.

Grassroots Vaccine Appointment System

Promotoras had direct access to vaccine appointments at local vaccine sites through WhatsApp. This system eliminated barriers related to accessing Web sites in English, waiting for an operator to provide an appointment, or missing confirmation callbacks.

Planning and Strategizing

TCP core members (Table 1) met every Friday to discuss weekly activities, plan for the following week, and strategize in response to citywide data and national trends.

PLACE, TIME, AND PERSONS

Chelsea occupies two square miles north of Boston. It has an estimated population of 40 000 residents, but there may be up to 75 000 residents according to informal estimates.² A city of mostly low-wage Latinx immigrants, it is known for having overcrowded and substandard housing and high levels of poverty and food insecurity. A study carried out in April 2020 revealed antibodies to COVID-19 among 30% of Chelsea residents.³ By June 10, 2020, Chelsea had recorded 2839 cumulative cases of COVID-19, a rate of 7537 per 100 000, and a positivity rate of 38% (in contrast to the state positivity rate of 15%), indicating both high rates of disease and low rates of testing.^{4,5} An in-depth positivity analysis showed that

TABLE 1— Names and Roles of Chelsea Project Participants: Chelsea, MA, 2021

Organization Name	Title of Participant(s)	Role in TCP
Center of Complex Interventions	Executive director Special projects director	Leadership of TCP Friday meetings Provision of funding for <i>promotoras</i> , video series, and wastewater testing
Chelsea Police Department	Community engagement specialist	Assistance in partnership building within and outside of Chelsea
City of Chelsea	Public health director Director of communications	Recruitment of <i>promotoras</i> Operation of vaccine clinic Distribution of test kits to CBOs
Metropolitan Area Planning Council	Public health director	Wastewater data analysis Vaccine data visualization
La Colaborativa	Health equity and public health director	COVID-19 positivity analysis and qualitative research Recruitment and training of <i>promotoras</i> Housing of vaccine clinic and mobile clinics Facilitation of Thursday meetings
Greenroots	Health equity and public health director	Recruitment and training of <i>promotoras</i>

Note. CBO = community-based organization; *promotoras* = *promotoras de salud* (community health workers); TCP = the Chelsea Project.

residents testing positive were mostly those who were in their 40s during the first surge of COVID-19 in summer 2020.¹

We began wastewater testing in November 2020 and outreach efforts in January 2021. Vaccine rollout began in February 2021.

PURPOSE

TCP aimed to decrease the rates and impact of COVID-19 in Chelsea. The project design ensured that outreach, testing, and vaccine scheduling were available outside of working hours. Training and deploying *promotoras* ensured that messengers were trusted by the mostly Hispanic and immigrant population. The project maintained health equity at its center, and all decisions incorporated a human-centered design involving local residents, researchers, and public health experts to ensure applicability and relevance. Frequent meetings with TCP core members built trust and enabled us to pivot rapidly in the face of change.

EVALUATION AND ADVERSE EFFECTS

TCP used data triangulation, which involved collecting and analyzing quantitative and qualitative data and transforming data insights into action through the human-centered design. A clear indicator of success is the overall vaccine rate, which exceeded that of similar cities in Massachusetts; by mid-August 2021, the overall vaccination rate among adults exceeded 90% and ranked as one of the highest rates in the country for a city with similar demographics (Figure 1).⁶

Wastewater monitoring serves to detect changes in COVID-19 rates. These changes activated an on-the-ground response that included informing the public and distributing personal protective equipment and test kits. Given data indicating that the Omicron variant was surging in parts of Europe and evidence of increasing levels of COVID-19 specific to that variant, the Chelsea Board of Health passed a mask mandate in November 2021 by recommendation of TCP.

We are unaware of any adverse effects of this intervention.

SUSTAINABILITY

The collaboration activated by TCP provides a model for designing public health interventions. The diverse participants included data scientists and researchers, policymakers and state employees, CBOs, and local outreach workers. The diversity of the composition of TCP participants enables a 360-degree view of the problem, produces a variety of solutions, and improves equity in program design.

PUBLIC HEALTH SIGNIFICANCE

We lack surveillance data to estimate the true community case counts because some free, publicly available polymerase chain reaction test sites closed and at-home testing goes unreported. Wastewater testing allows passive surveillance, which provides early data on changes in levels of COVID-19

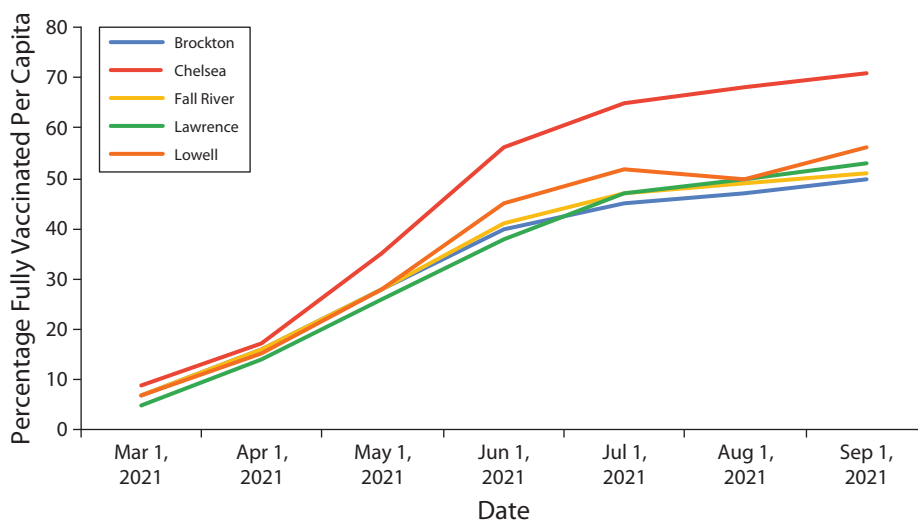


FIGURE 1— Full Vaccination Rates (Both Initial Doses) in Chelsea, MA, and Nearby Cities With Similar Demographics: 2021

Source: Massachusetts Department of Public Health.⁶

transmission and can enable public health-aligned community and municipal decision making in an evidence-informed manner.⁷ Expanding wastewater testing to other infectious diseases is a promising new area.⁸

Human-centered design by communities enables projects to create solutions that are relevant, meaningful, and applicable. Through local CBOs, TCP consulted with the community on how to make information, education, and access trustworthy and streamlined.

The continuum of research into action through diverse stakeholders could inform the design and implementation of other projects. TCP was unique in Massachusetts in sharing results of data collected among those most affected by a disease, in turn empowering them to make decisions regarding their health in trusted spaces. In a time of increased urgency to design equitable responses,⁹ TCP provides a blueprint for improving the lives of the most vulnerable. *AJPH*

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CONTRIBUTORS

C. Alonso and S. Bates conceptualized the article. C. Alonso wrote and revised the article. S. Bates and B. Keppard contributed to revising the article. B. Keppard designed the data visualization. S. Bates, D. Cortez, and K. Dinakar conceptualized the project. All of the authors participated in project implementation.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

HUMAN PARTICIPANT PROTECTION

The actions described in this article are not subject to protocol approval because no research involving human participants was conducted.

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