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# The Role of a Federally Qualified Health Center in Identification and Management of an Occupational COVID-19 Outbreak

## Lessons for Future Infection Surveillance and Response

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**Abstract:** Federally Qualified Health Centers (FQHCs) have been essential in response to COVID-19 outbreaks among vulnerable populations. Our rural FQHC had a primary role in early detection of and response to a poultry plant-related outbreak at the outset of the pandemic that disproportionately and gravely affected the local Hispanic community. The health center activated a rapid local response that included the community's first mass testing event and first acute respiratory treatment clinic, both of which were central to abatement. Lessons learned from this experience provide important guidance for the potential role of FQHCs in infection outbreak preparedness in marginalized communities. **Key words:** *COVID-19 ambulatory response, COVID-19 pandemic, Federally Qualified Health Center, Hispanic, primary care, public health surveillance*

FEDERALLY QUALIFIED Health Centers (FQHCs) have been essential in novel coronavirus-2019 (COVID-19) response in medically underserved communities, which are among the highest COVID-19 risk populations outside of long-term care facilities (Chillag & Lee, 2020; Halperin et al., 2021; Laurencin & McClinton, 2020; Romero et al., 2020). As key primary care providers for medically underserved populations, one of the roles of FQHCs is surveillance for, identification of, and response to infection outbreaks (O'Sullivan et al., 2020; Rust et al., 2009). While this is recognized as an important role, strategies for integration of FQHCs to serve these essential public health functions are sparsely described and poorly defined (Manning & Pogorzelska-Maziarz, 2016). Unlike acute care hospitals and dialysis facilities, few primary care sites use infection surveillance systems and could benefit from rapidly accessible and reliable data that help identify and contain emerging infections (Manning & Pogorzelska-Maziarz, 2016; Marinaccio et al., 2020; Sloane et al., 2006).

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During the COVID-19 pandemic, standard surveillance integrating multilevel data has been instrumental in reflecting the rapid pace and stochastic nature of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) transmission, albeit with limited utility to forecast or identify directional changes that preceded superspreading events (Althouse et al., 2020; Post et al., 2020). While a key function of local health departments is to interpret available data in the context of local populations and environments for planning and response, in practice these organizations are responding strive to fill many gaps in the health and social safety net while actively responding to imminent community needs, working with limited resources in a fragile environment (Post et al., 2020). FQHCs, on the other hand, have a more focused mandate, which is to provide direct clinical care within the context of improving population health in the community. They have the advantage of readily available and detailed data that reveal the sociodemographic, clinical, and risk-related characteristics of both individuals and the community (O'Sullivan et al., 2020; Sloane et al., 2006; Torner et al., 2019). As such they have the ability to identify potential hotspots, engage stakeholders, and reach subsector populations with synergistic risk factors (Chillag & Lee, 2020; Hawkins, 2020). In fact, frontline health care workers in FQHCs are often the first to obtain information about symptom clusters emerging among their patient population, often in advance of formal reporting systems. In certain occupational outbreaks of COVID-19, subthreshold case counts have been the only harbinger of mass contagion (Günther et al., 2020; Waltenburg et al., 2020), particularly in communities served by FQHCs. Consequently, health centers and staff have emerged as critical to effective surveillance for and early warning of outbreaks among vulnerable communities.

This article describes the experience of a rural FQHC that was at the epicenter of a significant COVID-19 outbreak affecting a large poultry-processing facility during the early months of the pandemic. We detail the experience and lessons learned, and discuss their implication for greater involvement of FQHCs in surveillance and reporting systems to alert and activate a rapid local response for containment and mitigation of future infectious disease outbreaks.

## METHODS

The study was undertaken in a health clinic in a rural county in the Southeastern United States that operates as one access point within a network FQHC. Information about the case presentations, timeline, and events that followed was obtained from the electronic health record (EHR), organizational COVID-19 strategy and planning documents, and personal communications with health center staff and leadership.

Demographic characteristics of the total patient population were extracted from the 2020 Uniform Data System (UDS) report. Case identification and confirmation described in this article were based on positive SARS-CoV-2 polymerase chain reaction tests obtained by providers of the FQHC network using a private laboratory and ordered between March 1 and April 30, 2020, and recorded in the system's EHR. As part of clinical care and follow-up, a case database was created, which was verified, entered, and analyzed in Microsoft Excel.

The case population was compared with all persons tested, excluding children (aged 0-18), and using a $P$ value of .05 as the threshold for statistical significance. The following variables were included in the analysis: age, sex, race, ethnicity, financial class, household size, health center location, test order date, and test result. An unpaired, 2-tailed $t$-test was applied to compare continuous variables (ie, age) for the tested and case populations and to evaluate for distribution normality. Categorical data were compared using a $\chi^2$. The distribution of tests performed and positive test results over time and by site was presented as a heat map to capture distribution in these 2 dimensions.

This study was reviewed and exempted by the Institutional Review Board of University of North Carolina at Chapel Hill and the health center board of directors.

## RESULTS

### Case presentation and timeline

A possible COVID-19 outbreak in a large poultry-processing plant was initially identified when 2 unrelated plant employees with mild upper respiratory symptoms suggestive of the infection presented to our FQHC network on April 9, 2020. Both were tested and, the next day, when the results were reported, were found to be positive for SARS-CoV-2. Both reported first symptomatic coworkers in the plant, but they denied direct exposure in the course of their work. The treating physicians reported this suspected outbreak to clinic leadership and began informal communications with other community stakeholders, including the occupational health team at the plant and the local chief medical officer of the local hospital. Key information in these early discussions underscored the potential for rapid and widespread contagion based on population and setting characteristics including: (a) large workforce in the plant (approximately 500 workers per shift); (b) a socioeconomically vulnerable workforce comprised of racial/ethnic minorities, the majority of whom were Spanish-speaking, uninsured, living in poverty and many without a recognized residency or citizenship status; and (c) a high-exposure environment at the plant, including crowding, poor ventilation, prolonged shifts, and limited worker protection. Individual reports from and personal communications among physicians staffing the involved health centers and local hospital coalesced to confirm additional suspected cases of symptomatic patients in the plant. The outcome of these discussions was the development of a formal communication plan within the organization and outreach to other stakeholder in the community.

On April 10, health center leadership alerted the local and state health departments of the suspected outbreak and communicated directly with the occupational health nurse at the poultry-processing plant. Five days later, 3 more symptomatic plant workers tested positive for the virus, prompting the health center and local hospital directors to hold an immediate conference among the plant, health department, hospital, and health center leadership. The health center provided evidence of cases within the facility, highlighting the risk of further spread and the implications for the plant and the community. The plant described implementation of basic measures, including mandatory masking and physical distancing, and acknowledged limited adherence to both. Full-scale plant operations continued in the face of unprecedented absenteeism numbering several hundred callouts per day. Plant leadership and some local health officials hypothesized that the outbreak had originated in the community and that the plant had an incidental role in case finding and abatement. Significant discussion ensued to delineate the responsibilities of each stakeholder in committing resources to outbreak investigation and mitigation. Plant leadership agreed to allow an on-site testing event to identify cases among their plant workers and household contacts, and the health department agreed to allow the plant to continue operation.

A mass testing event was arranged through collaboration among health center staff, local and state health departments, state emergency services management, and plant leadership. The 2-day drive-up testing event was held on-site at the poultry-processing plant for workers, family members, and household contacts. The FQHC acted as the primary coordinator, was the provider of record, and retained the major responsibility for ordering, tracking, and communicating test results. A state National Guard civil support team provided supplies and collected test specimens. The FQHC's proprietary laboratory vendor provided specimen storage and transport throughout the event. Subsequently, the health center's COVID-19 team tracked results and communicated positive results to the county health department's infection control team.

**Outbreak characterization**

The FQHC network diagnosed 351 cases of COVID-19 clustered around the poultry-processing facility's employees and family members between March 1, 2020, and April 30, 2020 (Table). Among the cases, 316 were diagnosed by a documented positive SARS-CoV-2 test ordered through the FQHC, and 291 had associated demographic data from the UDS2020 report. Data for a subset of 270 adult patients were reviewed for this analysis.

Patients from the primary clinic site and a nearby affiliated clinic accounted for 562 (60%) of the 758 tests and 233 (86%) of 270 positive tests in this analysis. A large proportion of cases (51%) were identified in

**Table.** Characteristics of All Clinic Adult Patients[a]

| Characteristics | Clinic Population n = 29 709 | | Tested Population n = 758 | | Case Population n = 270 | | P Value for Difference[b] |
|---|---|---|---|---|---|---|---|
| Age, mean (SD), y | 46.5 (16) | | 40.1 (13) | | 40.5 (12) | | .60 |
| Age range | | | | | | | |
| 19-49 | 17 355 | 58.4% | 577 | 76.1% | 209 | 77.4% | .54 |
| 50-64 | 7 934 | 26.7% | 156 | 20.6% | 53 | 19.6% | .63 |
| ≥65 | 4 420 | 14.9% | 25 | 3.3% | 8 | 3.0% | .70 |
| Gender | | | | | | | |
| Women | 19 203 | 64.7% | 484 | 63.9% | 170 | 63.0% | .70 |
| Men | 10 498 | 35.3% | 274 | 36.1% | 100 | 37.0% | .70 |
| Race | | | | | | | |
| Asian | 536 | 2.0% | 6 | 1.3% | 3 | 1.4% | .46 |
| Black/African American | 7 435 | 27.7% | 113 | 18.6% | 36 | 15.3% | .37 |
| White | 19 438 | 72.3% | 493 | 81.4% | 199 | 84.7% | <.001 |
| Ethnicity | | | | | | | |
| Hispanic | 13 143 | 47.0% | 463 | 64.6% | 200 | 83.0% | <.001 |
| Non-Hispanic | 14 847 | 53.0% | 254 | 35.4% | 41 | 17.0% | <.001 |
| Federal poverty level | | | | | | | |
| ≤100% | 12 969 | 73.4% | 183 | 60.6% | 61 | 55.0% | .46 |
| ≤200% | 4 271 | 24.2% | 107 | 35.4% | 46 | 41.4% | .09 |
| >200% | 435 | 2.5% | 12 | 4.0% | 4 | 3.6% | .87 |
| Household size | | | | | | | |
| 1 | 12 729 | 53.2% | 324 | 59.9% | 121 | 55.8% | .39 |
| 2 | 2 941 | 12.3% | 61 | 11.3% | 28 | 12.9% | .08 |
| 3 | 2 525 | 10.5% | 61 | 11.3% | 22 | 10.1% | .94 |
| 4 | 2 766 | 11.6% | 36 | 6.7% | 17 | 7.8% | .14 |
| ≥5 | 2 973 | 12.4% | 59 | 10.9% | 29 | 13.4% | .02 |
| Financial class | | | | | | | |
| Medicaid | 2 963 | 10.0% | 43 | 5.7% | 10 | 3.7% | .08 |
| Medicare | 4 600 | 15.5% | 28 | 3.7% | 4 | 1.5% | .02 |
| Private insurance | 7 165 | 24.1% | 198 | 26.2% | 88 | 32.6% | .003 |
| Self-pay | 14 329 | 48.2% | 235 | 31.0% | 87 | 32.2% | .59 |
| Contract | 639 | 2.2% | 253 | 33.4% | 81 | 30.0% | .14 |
| Other | 13 | 0.0% | 1 | 0.0% | 0 | 0.0% | .46 |

[a]Individuals tested for COVID-19, and persons who tested positive for COVID-19 (case population) during the March 1 to April 30, 2020, occupational outbreak.
[b]Threshold for statistical significance is $P < .05$.

the 10-day interval between the initial alert and the mass testing event. During that time, the 3 health centers closest to the plant offered drive-up testing and performed an additional 208 tests, identifying 138 cases. The mass event tested an additional 307 individuals and identified 70 additional cases among plant workers, family members, and household contacts.

The tested and case populations were significantly different from the overall adult clinic population along most demographic categories; the background FQHC population was older, had a higher proportion of Black/African American patients, fewer patients of Hispanic background, and a greater proportion of patients with income below 100% of federal poverty level. The overall clinic population also had a higher proportion of patients who were uninsured or covered by public insurance.

The tested and case population characteristics were similar along most variables including age, gender distribution, race, poverty, household size, and financial class. These populations were skewed toward younger ages (19-49), likely reflecting the predominant age range of plant workers and a lower representation of Black/African American persons (27.7% overall population, 18.6% and 15.3% for tested and case populations, respectively). Hispanic patients were overrepresented in the tested and case populations compared with the overall population. Additionally, there was a significant difference between the proportion of Hispanic patients in the tested and case populations (83.0% vs 64.6%, $P < .001$). Other key differences between the tested and case populations were the proportion of patients who reported living in a household of 5 or more persons, and those who were privately insured.

Poverty level was similar in both populations; however, this variable had the largest share of incomplete data (60%), in some cases due to abridged registration for non-primary care patients at mass testing or drive-through rapid testing on-site. Insurance coverage for the tested and case population was difficult to determine, as federal and other funds supported testing and patients who had not established care at the clinic were tested under a COVID-19 contract that obscured previously documented insurer information.

The Figure displays the outbreak both temporally and geographically. The heat maps on the left and right show the number of tests performed and the number of positive tests resulted, respectively, for each day in April 2020 by FQHC site. Site A is the FQHC that serves the community surrounding the plant and the site that identified 1 of the 2 index cases; site B is the neighboring site that provided a significant proportion of testing for plant workers and the surrounding community. The remaining locations are each more than 20 miles away from the plant and from sites A and B. Following presentation of the sentinel case and initiation of a public health response, additional resources were allocated to the sites to increase testing capacity. The Figure highlights the rapid increase in testing in early April and the progressive concentration of cases detected at sites A and B compared with the other health centers in this network. As part of preparation for the mass event, the primary sites added infrastructure and developed important workflows for patient triage, outdoor testing, and result communication; this prepared them to support the on-going need for case detection after the mass testing event.

Of note, site A providers noted, in retrospect, that evidence of the outbreak presented approximately 2 weeks before the index cases were diagnosed. Two patients from the community presented with respiratory symptoms in late March prior to the availability of widespread testing. On March 20, a third-shift plant employee called with a 2-day history of cough, nausea, and diarrhea, but did not meet testing criteria at that time. On March 21, another third-shift employee reported cough and congestion, but was thought to have allergic rhinitis. Yet another third-shift plant employee made 3 phone calls, the first being on March 26 requesting time off due to concern for exposure among symptomatic coworker; the

| Date | Site A | Site B | Site C | Site D | Site E | Site F |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | 1 | 1 | | |
| 3 | 1 | 1 | 2 | | 1 | |
| 4 | | | | | | |
| 6 | | 2 | 1 | 1 | | |
| 7 | | | | 1 | | |
| 8 | 2 | | | 1 | | |
| 9 | 1 | 1 | | 2 | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 13 | | 1 | | 1 | | |
| 14 | 3 | 3 | | | | |
| 15 | 3 | 6 | | 1 | 1 | |
| 16 | 16 | 5 | 1 | | 2 | 1 |
| 17 | 14 | 14 | 1 | | 1 | |
| 18 | 1 | 5 | | 1 | | |
| 20 | 28 | 17 | 1 | 2 | 2 | |
| 21 | 12 | 13 | 4 | 1 | 3 | |
| 22 | 17 | 14 | 1 | 1 | | 8 |
| 23 | 137 | 5 | 4 | 3 | 1 | 6 |
| 24 | 147 | 27 | 4 | 6 | 2 | 9 |
| 25 | 2 | 12 | | | | |
| 27 | 18 | 16 | 1 | 3 | 2 | |
| 28 | 7 | 11 | 3 | 3 | 1 | 1 |
| 29 | 7 | 15 | 4 | 4 | | 1 |
| 30 | 4 | 15 | 6 | 4 | | 5 |

Number of SARS-CoV-2 tests performed per day by FQHC site

| Date | Site A | Site B | Site C | Site D | Site E | Site F |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | 1 | | | |
| 4 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | 1 | | | 1 | | |
| 9 | 1 | 1 | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 13 | | 1 | | 1 | | |
| 14 | 3 | 1 | | | | |
| 15 | 3 | 5 | | | | |
| 16 | 9 | 3 | | | 1 | |
| 17 | 9 | 7 | 1 | | | |
| 18 | 1 | 3 | | | | |
| 20 | 19 | 14 | | 1 | | |
| 21 | 7 | 11 | 2 | | 1 | |
| 22 | 13 | 10 | | 1 | | 5 |
| 23 | 29 | 1 | | | | 2 |
| 24 | 33 | 14 | 2 | 2 | | |
| 25 | 2 | 9 | | | | |
| 27 | 11 | 9 | | 1 | | |
| 28 | 3 | 9 | 1 | 1 | | |
| 29 | 2 | 6 | | 1 | | |
| 30 | | 3 | 1 | | | 1 |

Number of positive SARS-CoV-2 tests per day by FQHC site

**Figure.** Number of SARS-CoV-2 tests performed and number of positive SARS-CoV-2 tests across the health center network, April 2020. SARS-CoV-2 indicates severe acute respiratory syndrome coronavirus 2.

patient reported that employees were not using masks, were located 1 to 2 ft apart, and were working despite active upper respiratory symptoms. These phone notes were 3 among hundreds of phone calls during that period; therefore, their significance only became visible afterward.

## DISCUSSION

Review of this small community health center's role in the identification of and response to an outbreak in a mass poultry-processing facility provides evidence for an evolving role of FQHCs in surveillance for and response to infectious outbreaks as a result of new experiences with COVID-19 (Halperin et al., 2021; O'Sullivan et al., 2020). The key findings in this study are the following: (1) this rural health center identified an emerging outbreak and activated the impromptu early warning system for this community, (2) the health center played a central role in accelerating a response due to its bridging role between the community and workplace, and (3) our retrospective review revealed that, among our data, there were earlier signs that went unappreciated.

This rural health center identified an emerging outbreak of COVID-19 in this mass poultry-processing facility at a critical point for intervention and before the caseload reached the threshold of alarm through standard surveillance measures. The treating physicians were familiar with this occupational setting through their ongoing care of plant workers and awareness of risk factors, including crowding, prolonged shifts, high-exposure workflow, and poor ventilation, that made the plant a potential hotspot for contagion. Comprising more than 50% of the clinic population, Hispanic workers were recognized as a vulnerable subgroup that would be disproportionately exposed, at higher risk for severe disease due to prevalence of chronic conditions and have minimal recourse due to community-specific social and structural factors (eg, language, financial hardship, and limited health care access), and that the potential impact of this outbreak spreading to the community was also significant. This illustrates that FQHCs have specific advantages that allow them to effectively serve as a sentinel entity for public health surveillance for infectious outbreaks in congregate settings, especially those outside the public sphere where the health safety net has limited reach and jurisdiction (Halperin et al., 2021).

Currently, few primary care offices have the infrastructure for, or are connected with, formal surveillance systems (Manning & Pogorzelska-Maziarz, 2016; O'Sullivan et al., 2020; Torner et al., 2019). Reporting of infectious conditions is largely managed outside of most primary care practices and focuses on hospitals, and local health departments; the single exception being the voluntary Outpatient Influenza-like Illness Surveillance Network (ILINet). FQHCs have the significant advantage of embedded data collection systems and, by mission and mandate, are working to incorporate data management solutions for population health that will make this information more accessible. This is a key rationale for greater involvement of FQHCs on the leading edge of a dynamic surveillance system that incorporates new and more sensitive indicators of infectious trends that share temporal and geographic information and improve our ability to forecast and our early warning systems (Althouse et al., 2020; Manning & Pogorzelska-Maziarz, 2016; Post et al., 2020). Rapid local dissemination among health centers and other primary care networks can also provide guidance for local action when outbreaks emerge in a small community, ahead of statewide or national mandates to increase infection control (Post et al., 2020). Further study would be important to understand whether such integration could create a more versatile system for socially or geographically isolated communities whose trends and resources may differ significantly from urban areas where data collection and analysis are focused (Chillag & Lee, 2020).

## Lessons Learned

Our multisite FQHC network played an essential role in negotiating, organizing, and leading a collaborative effort for investigation and mitigation of the outbreak. This review identified several key factors that were important to the success of this intervention:

- Ongoing personal relationships with multiple stakeholders, including plant management, county health department, and the local hospital's staff, enabled FQHC leadership to broker the sensitive discussion of rising case rates among plant workers, the extent and effectiveness of infection control measures at the plant, impact of pandemic on production, and delineation of responsibilities to mitigate disease spread among plant workers and the community. Particularly critical to this role were preexisting relationships with the plant management through ongoing care of plant workers and a history of direct personal communications with the plant's occupational health nurse. Thus, FQHCs seeking to maximize their potential to respond to community health events and outbreaks should value and nurture a wide variety of personal contacts with workplaces, other health care providers, churches, businesses, governmental bodies, and other local resources.
- The health center's ability to rapidly pivot operations to focus on pandemic support for the plant and the community simultaneously. Support for the plant included providing Spanish language educational materials for distribution, increased access for assessment and testing of affected workers, and clear and direct lines of communication around illness-related leave requests that reduced the burden for both the workers and plant management while facilitating care.
- The health center's rapid response in increasing testing access as soon as the outbreak was suspected, including setting up drive-through testing on-site and by organizing the 2-day mass testing event. The rate and volume of testing (Figure) illustrates the health center's critical role in communities where immediate plant closures, mass testing, and

aggressive contact tracing can occur within just a few days of outbreak detection (Günther et al., 2020; Waltenburg et al., 2020). The potential for an outbreak to affect a rural community rapidly and deeply, with a spiral of unemployment, economic hardship, and morbidity if not managed quickly, exemplifies the problem of "synergistic disparities" that has disproportionately affected rural and racial/ethnic minority populations during the pandemic (Chillag & Lee, 2020; Hawkins, 2020; Laurencin & McClinton, 2020). FQHCs, with their unique and deep connections, can become informants and facilitators for outbreak responses sensitive to local constraints.

Despite the success of early mobilization and rapid response, reflection on the evolution of pandemic spread in our community reveals important lessons for future response. In retrospect, early information from patient phone calls and individual conversations revealed that cases were likely emerging at least 1 to 2 weeks prior to the formal outbreak detection. On reflection, site-based organizational planning would have easily identified expected hotspots and vulnerable subgroups whose intersection could potentiate a superspreading event. Furthermore, the lines of communication could have facilitated contingency planning and offered support prior to detection of cases in the community or in the plant, as either would have a significant impact on the other. Absenteeism is a common occupational surveillance measure, but not a routinely accessible one. During the pandemic, we had the opportunity to track this sensitive indicator from patient phone calls and reports. In one instance, a phone note from a patient requesting leave on March 26, 2020, due to concerns about coworkers with cough and fever reporting to work, could have positioned us to reach out to the plant or the plant workers to advise precautions and offer evaluation. This would have preempted the public notices at the plant of COVID-19 cases by more than a month, likely decreasing the total number of cases in the plant and the community. As surveillance systems evolve in light of this pandemic and its persistence, FQHCs have the opportunity to develop a more active approach for surveillance that focuses on different data sets and new mechanisms for detection (Althouse et al., 2020; Rust et al., 2009).

## CONCLUSION

FQHCs are at the leading edge of pandemic identification and management among vulnerable communities and have several advantages that could help transform the approach to surveillance and early warning among medically vulnerable populations. In this case of a large COVID-19 outbreak in a rural poultry-processing plant, a direct alert from health center leadership to the local and state health authorities, and rapid expansion of testing services by the FQHC network expedited community response but also highlights the need for more robust reporting that could have led to even earlier responses. Embeddedness in a population allows health centers to help detect and rapidly respond to emerging outbreaks. Given the continued presence and outbreak potential of COVID-19 and the potential for outbreaks of other diseases to develop, it is important for FQHCs to understand how to screen for and respond to potential sentinel events.

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