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COVID-19 in a Secure Behavioral Rehabilitation Setting: A Program Evaluation

Jennifer G. Jones

A Clinical Research Project submitted to the Graduate Faculty of

JAMES MADISON UNIVERSITY

In

Partial Fulfillment of the Requirements

for the degree of

Doctor in Nursing Practice

School of Nursing

December 2021

FACULTY COMMITTEE:

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Dedication

This work is dedicated to all the healthcare providers and patients in congregate settings affected by the COVID-19.

Acknowledgments

I would like to thank Dr. Maria deValpine, Dr. Erica Lewis, and Dr. Kristina Blyer for their expert guidance, concise feedback, and inspiration. You have been a dream team.

Thank you to Saman Nasser at The James Madison University Graduate School for assistance in the final stages of preparation. Your expert eye is second only to your patience.

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And to my husband, children, and close friends who provided support, patience, encouragement, food, and presence during this process – you are my dear ones. Thank you.

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Abstract

Problem: The COVID-19 case rate as of June 5, 2020, for prisoners was 5.5 times higher than the United States (US) population case rate (Saloner et al., 2020). A secure behavioral rehabilitation facility in the US was challenged to mitigate the spread of COVID-19 and made many changes to facility and program protocol to meet this challenge.

Methods: The purpose of this program evaluation was to examine the COVID-19 facility response, case rates, percent positivity, and attack rates between units at a secure behavioral rehabilitation facility to inform further policy and procedure recommendations for the mitigation of COVID-19 transmission in congregate living facilities. Case rates and percent positivity were used as a surrogate measure to evaluate this facility's COVID-19 program. A logic model and PRECEDE/PROCEED model were used to guide this program evaluation.

Results: Attack rates varied significantly by unit, from 1 resident case (3.94%) to 31 cases (92.26%). The 7-day rolling average ranged from 0.0% to 4.34% positivity during the study period, and 205/355.6 residents (57.56%) were infected during the 3-month study period.

Summary: COVID-19 places significant logistical and human strain on residents, employers, and administrators of secured congregate settings. Despite a sustained and flexible effort at infection control measures, the study facility still experienced a significant number of cases, special hospitalizations, and deaths. Due to variation in

attack rate between units, further research regarding uptake of infection control measures by residents in secured settings may be beneficial. In addition, this study reinforces the need for feasible and standardized data collection and reporting methods in secured environments. Finally, studies on maintaining core behavioral rehabilitation services in a secured setting during an infectious disease outbreak are recommended.

Keywords: COVID-19, postrelease programs, infection control, congregate setting, program evaluation

Background

The COVID-19 case rate as of June 5, 2020, for prisoners was 5.5 times higher than the United States (U.S.) population case rate (Saloner et al., 2020). Due to this discrepancy, evaluation of COVID-19 management at congregate living facilities can help determine how to mitigate the spread of this disease in congregate settings.

The SARS-CoV-2 virus and the accompanying clinical syndrome, COVID-19, were identified by the World Health Organization on February 11, 2020, in Wuhan, China (CDC, 2020b). Person-to-person spread of the virus through respiratory droplets is significantly increased if individuals are less than 6 feet from one another (CDC, 2020b). Maintaining an appropriate distance is challenging for individuals in congregate living facilities, such as nursing homes, prisons, detention centers, and rehabilitation centers. Individuals who are incarcerated or detained work, study, live, eat and participate in activities of daily living together, creating ample opportunity for virus proliferation (CDC, 2020a). Additionally, those individuals may transfer between facilities, have medical, legal, or family visits or staff interactions; all of these create opportunities for virus introduction into the facility (CDC, 2020a). As of November 2, 2021, the Centers for Disease Control and Prevention (CDC) attributed 441,466 COVID-19 cases and 2,845 deaths to incarcerated individuals (CDC, n.d.).

A secure behavioral rehabilitation facility in the US was challenged to mitigate the spread of COVID-19 and made many changes to facility and program protocol to meet this challenge. The facility is unique because it maintains security features like a correctional facility and offers court-ordered, individualized rehabilitation services to individuals immediately post-incarceration. During the pandemic, policy and program

alterations attempted to balance the rehabilitation needs and individual rights of those served with the facility's security requirements. Attack rates in the facility varied widely between living units. Multiple variables may contribute to the spread or containment of SARS-CoV-2 in the local congregate living facility. Thus, a program evaluation was needed to understand the localized challenge further and make suggestions for improvement.

Literature Review

A literature search was completed on the topic of individuals in congregate living facilities and COVID-19. Due to the study sample's recent incarceration and unique facility type, the literature review conducted as a foundation for this program evaluation encompassed COVID-19 policy and mitigation in correctional facilities and nursing homes. Eligibility criteria for articles included peer-reviewed, English language, publication from January 2020–December 2020, and publication within the United States. The APA PsychInfo database was searched on October 12, 2020, for the following terms: (covid-19 or coronavirus OR 2019-ncov OR sars-cov-2 OR cov-19 AND corrections OR prison OR jail OR incarceration) and (covid-19 OR coronavirus OR 2019-ncov OR sars-cov-2 OR cov-19 AND nursing homes OR care homes OR long-term care OR residential care OR aged care facility AND mitigation OR prevention OR reduction). NCJRS was searched on October 19, 2020, for (correctional facility OR prison OR jail OR imprisonment OR incarceration AND covid-19 OR coronavirus OR 2019-ncov OR sars-cov-2 OR cov-19). Additionally, the following terms were combined to search CINAHL on October 26, 2020: (corrections OR prison OR jail OR incarceration AND covid-19 or coronavirus OR 2019-ncov OR sars-cov-2 OR cov-19); on November 18, 2020, the

following terms were combined to search in CINAHL: (covid-19 OR coronavirus OR 2019-ncov OR sars-cov-2 or cov-19 AND nursing homes OR care homes OR long-term care OR residential care OR aged care facility AND mitigation or prevention or reduction). These searches were repeated in October 2021.

Initial combined searches returned 1,636 results, and the titles were screened for relevance. Fifty-one relevant titles had abstracts or full articles reviewed, and from those, 20 articles were included in this literature review. Opinion, perspective, editorial, and commentary pieces were excluded. Studies including home-based participants, those evaluating quality of life issues or social support for policies, studies focused primarily on staff topics, medical treatment or medical specialty-focused, and studies outside the United States were excluded from this literature review. Studies primarily evaluating decarceration as a disease control mechanism were also excluded, as this facility houses individuals who have completed sentences in correctional facilities and are now in court-ordered rehabilitation (see Figure 1).

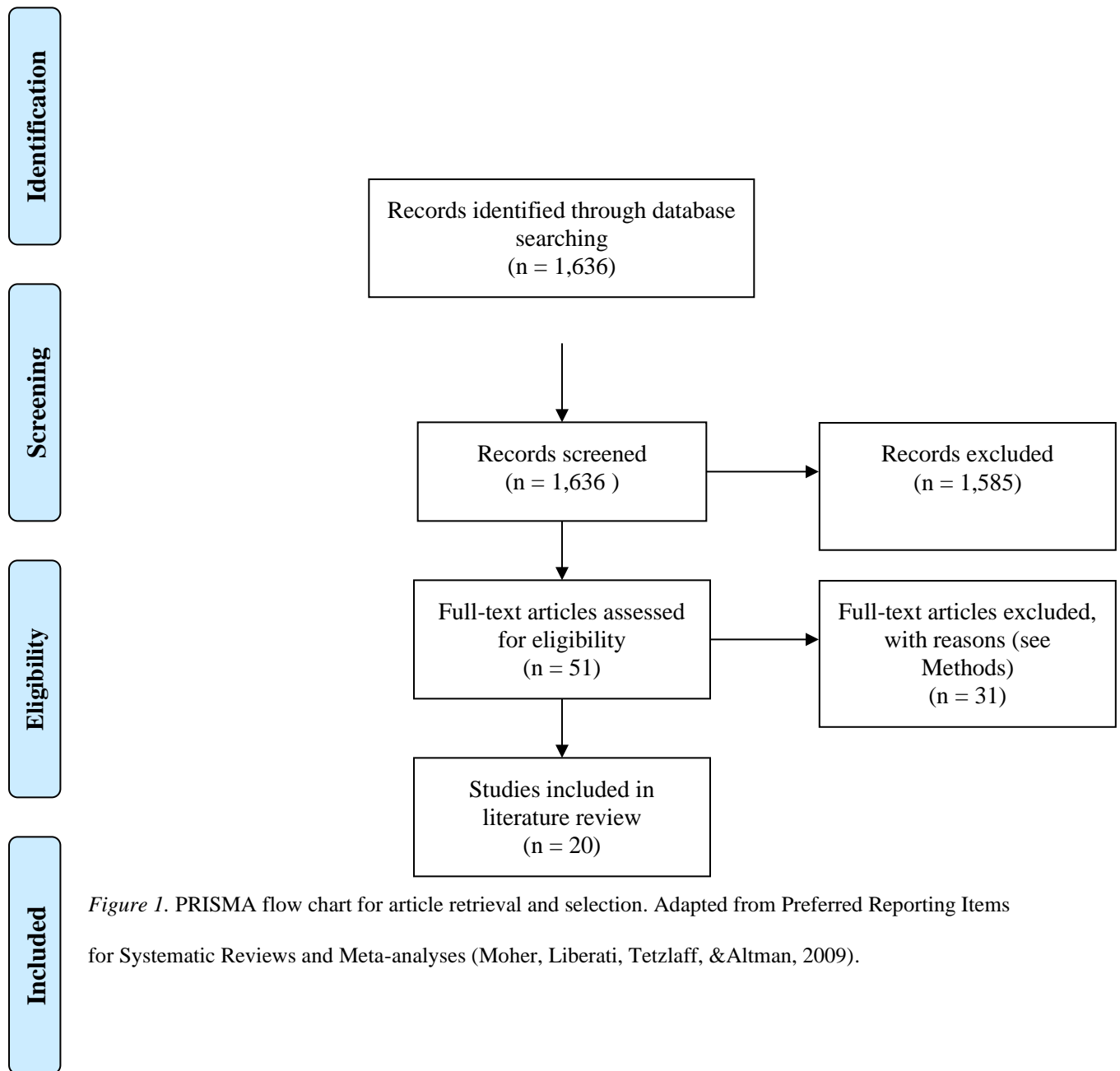
Figure 1. Flow chart of article retrieval and selection

Figure 1. PRISMA flow chart for article retrieval and selection. Adapted from Preferred Reporting Items for Systematic Reviews and Meta-analyses (Moher, Liberati, Tetzlaff, & Altman, 2009).

Transmission/Incidence/Prevalence

An epidemiologic investigation from a nursing home in Washington at the beginning of the U.S. experience of the COVID-19 pandemic highlights the deadly potential of SARS-CoV-2 in a long-term care facility. Identification of the index case at Facility A in Washington on February 28 preceded the identification of 129 total positive cases by March 9; of those, the case fatality rates were 27.2 % among residents, 7.1 % among visitors, and 0% among health care providers (McMichael et al., 2020). Yi et al. (2020) examined long-term care facility COVID-19 surveillance data from 39 states and calculated that in states with available data, assisted living facility (ALF) residents and staff accounted for 4.1% and 0.1% of deaths in the general population, respectively. It is also calculated that 21.4% of ALF resident cases died in reporting states, compared to 2.5% of cases in the general population (Yi et al., 2020).

In a point prevalence survey at a state psychiatric facility, Callaghan et al. (2020) reported that hospital-implemented admission screening and infection control and prevention measures appeared to mitigate the spread of infection to other residents and staff after the admission of 2 SARS-CoV-2 residents in April 2020. While this study was limited due to point prevalence and lack of staff participation, researchers indicated that infection control and prevention measures are essential due to the linkage of psychiatric facilities to other facilities with higher SARS-CoV-2 risk (Callaghan et al., 2020). Wallace et al. (2020a) further acknowledged testing and daily symptom screening as essential mitigation strategies after evaluating early pandemic aggregate data from correctional facilities in 54 jurisdictions. 86% of responding jurisdictions reported at least one positive SARS-CoV-2 case in that study (Wallace et al., 2020).

Davlanter et al.(2020) gave a case report of Puerto Rico's prison system avoiding any outbreak through stringent screening and cohorting of inmates, with only 0.3% of 8,619 inmates testing positive for immunoglobulin G antibodies (indicative of past infection) 0.0% testing positive for immunoglobulin M antibodies (indicative of recent or current infection). The strict cohorting measures described in that case report were not feasible in the study facility, where rehabilitation goals and attendance to therapy and classes are priorities.

Lipsitz et al. (2020) observed a rapid decline in the infection rates in both special focus and usual groups in a longitudinal cohort study of nursing home COVID-19 infections associated with \$130 million additional funding dependent on adherence to mandatory resident and staff testing and a 12-point infection control list. Audit failures and increased infection rates were noted in the last week of the study, suggesting the need for continued support and re-education of infection control measures (Lipsitz et al., 2020). The study's authors raised concerns regarding the ability to continue infection control efforts without significant payment incentives (Lipsitz et al., 2020).

Wallace et al. (2020b) evaluated data collected using the COVID-19 Management Assessment and Response Tool (CMAR) in Louisiana detention facilities. COVID-19 hospitalization rates and death rates for detainees and staff were nearly identical in this report (Wallace et al., 2020b). Additionally, some facilities reported isolating infected individuals for longer than 14 days or using test-based instead of time-based release from isolation, which increased resource use (Wallace et al., 2020b).

While staff movement in and out of facilities is recognized across the literature as a potential source of infection for congregate settings, two studies make

recommendations to reduce staff movement and interactions. Kırbıyık et al. (2020) used network analyses and visualization to evaluate an outbreak at Cook County Jail and identified more connections than expected between staff members. Researchers make multiple suggestions to reduce unnecessary staff interactions, such as reducing the need for staff to convene, closing breakrooms, and discontinuing contact sports (Kırbıyık et al., 2020). White et al. (2020) recommended incentives such as hazard pay and paid sick leave to deter staff from working across facilities.

Universal testing

Three studies reported findings from mass or universal testing in nursing homes or correctional facilities. In a study of 16 jails and prisons from six jurisdictions (41,454 total persons studied), Hagan et al. (2020) reported that symptom-based testing underestimated the number of SARS-CoV-2 cases in a facility; in their study, mass testing increased known cases a median 12.1-fold. Hatfield et al. (2020) studied 288 nursing homes in six United States (U.S.) jurisdictions and found the number of days from first known case to completion of facility-wide testing median=29.5 days; each additional day was associated with 1.3 more cases. Study authors suggest that early facility-wide testing after the first known cases improved the feasibility and effectiveness of cohorting (Hatfield et al., 2020). McBee et al. (2020) echo these suggestions in a study of West Virginia nursing homes.

Serial testing

Multiple studies report on serial testing. Njuguna et al. (2020) discuss the significance of serial testing in Louisiana correctional facilities after finding that 25% of 98 individuals quarantined for close contact with a case had positive results after one or two negative tests. Additionally, 45% of RT-PCR individuals were not symptomatic, with study authors making similar recommendations for testing to inform prompt cohorting of infectious individuals (Njuguna et al., 2020). Sanchez et al. (2020) make equivalent recommendations for serial testing to guide early cohorting and infection prevention and control measures in their study of serial testing in Detroit nursing homes. Taylor et al. (2020) echo those recommendations and include testing healthcare personnel in skilled nursing facilities to guide exclusion from work. Researchers further suggest serial testing of all residents and health care providers until no new cases are detected after 14 days (Taylor et al., 2020). They also suggest infection prevention and control education, flexible medical leave, and personal protective equipment (Taylor et al., 2020). Telford et al. (2020) studied preemptive testing for COVID-19 infections in long-term care facilities in Fulton, Georgia. They found that preemptive testing results in lower overall prevalence when compared to response testing (testing due to known cases) (Telford et al., 2020). The difference between the groups is significant: response group: residents positive, 28% initially, and 42.4 % on follow-up testing, staff positive, 7.4%, and 11.8% on follow-up testing (Telford et al., 2020). Pre-emptive group residents were positive 0.5% initially and 1.5% on follow-up testing; staff positives were 1.0% and 1.7% on follow-up testing (Telford et al., 2020). Recommendations throughout the studies of serial testing include

early and repeated testing to guide prompt cohorting and proper infection prevention and control education.

Factors Associated with Facility Infections

Studies exploring demographics associated with facility COVID-19 infection yielded mixed results. In a study of 514 unique correctional facilities, Gibson et al. (2020) found an overall inmate prevalence of 7,737/100,000, with 3.5 prevalence in Black inmates compared to White and 5.9 prevalence in Hispanic versus non-Hispanic inmates. Among nursing homes, Sun et al. (2020) examined risk factors for infection in 15,300 federally certified US nursing homes and found county infection rate, county population density, number of units, Centers for Medicare and Medicaid Services (CMS) deficiencies, and resident and staff densities to be positively associated with increased infection. These researchers found percent of non-Hispanic White residents to be negatively associated with infection risk (Sun et al., 2020). White et al. (2020) studied the prevalence of SARS-CoV-2 in nursing homes and found nursing home bed size and infection prevalence in the nursing home's county significant predictors of a nursing home outbreak. There was no reliable relationship between prior infection control deficiencies and the probability or severity of the outbreak (White et al., 2020). Bivariate analysis from this study showed a relationship between nursing homes and counties with a higher proportion of Black residents (White et al., 2020). However, multivariate analysis did not establish a significant relationship (White et al., 2020). Converse to Sun et al.'s and White et al.'s findings relating community incidence to facility incidence, Hatfield et al. (2020) found no association between cumulative county incidence and odds of identifying a nursing home case in a study of 125 nursing homes.

Additional Data and Implications

Multiple authors called for greater data transparency and uniformity in reporting across states and facilities (Gibson, 2020; Novinsky et al., 2020; Sun et al., 2020, Yi et al., 2020). Lynch and Goring (2020) outline steps to improve airflow in long-term care resident rooms, including five steps to modify patient rooms to negative pressure.

Novinsky et al. surveyed 50 state Department of Corrections (DOC) websites and one Bureau of Prisons (BOP) website to summarize the state and federal responses to COVID-19 as of June 2020. All 51 areas had suspended visitations and pivoted to alternative communication for visits, with 72% offering free phone calls, video visits, email, and stamps (Novinsky et al., 2020). “Deep cleaning” practices varied between facilities and may have included making cleaning supplies accessible to prisoners or spraying surfaces with disinfectant; other methods may have included supplying free hand soap, increasing infection control signage, and mandatory staff symptom/temperature screening in 41% of states (Novinsky et al., 2020). Symptom screening of the general prison population was not routinely noted and masking practices for prisoners varied, from expected to prohibited (Novinsky et al., 2020). Hand sanitizer remained contraband in most facilities due to high alcohol content and ingestion risk; ten states allowed routine use by prisoners and others limited use (Novinsky et al., 2020).

In summary, early testing, frequent screening via mass testing, adherence to infection control recommendations, with prompt cohorting to quarantine exposed and isolate infected individuals is recommended in congregate settings. Support for infection control measures, to include financial incentives for both facilities and staff, may be necessary for continued adherence. Demographic factors associated with increased

facility infection require further investigation. Standardization and transparency in data reporting are essential for accurate assessment of infection rates and creating mitigation plans. Novinsky et al.'s (2020) study highlights the challenges presented in a secured setting and provides insight into how the management of COVID-19 can be complicated in these scenarios.

Aims/Purpose

The broad goal of this program evaluation was to evaluate the COVID-19 response in a secure behavioral rehabilitation facility in the fourth quarter of 2020. The specific aims were:

1. Describe iterative facility policy changes over time
2. Describe case rates of COVID-19 from October 1– December 31
3. Describe percent positivity of COVID-19 tests from October 1– December 31
4. Describe variations in attack rates between units from October 1-December 31
5. Compare facility case rates to local health district case rates from Oct. 1-Dec. 31.

This program evaluation may be used to inform future mitigation efforts for disease management in congregate settings.

The purpose of this program evaluation was to examine the COVID-19 facility response, case rates, percent positivity, and attack rates between units at a secure behavioral rehabilitation facility to inform further policy and procedure recommendations for the mitigation of COVID-19 transmission in congregate living facilities. Case rates and percent positivity were used as a surrogate measure to evaluate this facility's COVID-19 program.

Logic Model

The logic model as described by McDavid et al. (2013) was applied to this program evaluation. This model's categories include inputs, activities, outputs, and outcomes (initial, intermediate, and long-term). Program outputs were the number of residents tested during mass testing events. Initial outcomes were the number of cases and percent positivity, with mass test dates serving as important intervals. Intermediate outcomes were measured as interval change in the number of cases and percent positivity between test events, total attack rate per unit, and comparison of facility percent positivity to local health district rates. Finally, long-term outcomes were the number of resident special hospitalizations and deaths attributed to COVID-19 during the study period, as collected from a review of medical records (Figure 2).

Figure 2. Logic Model

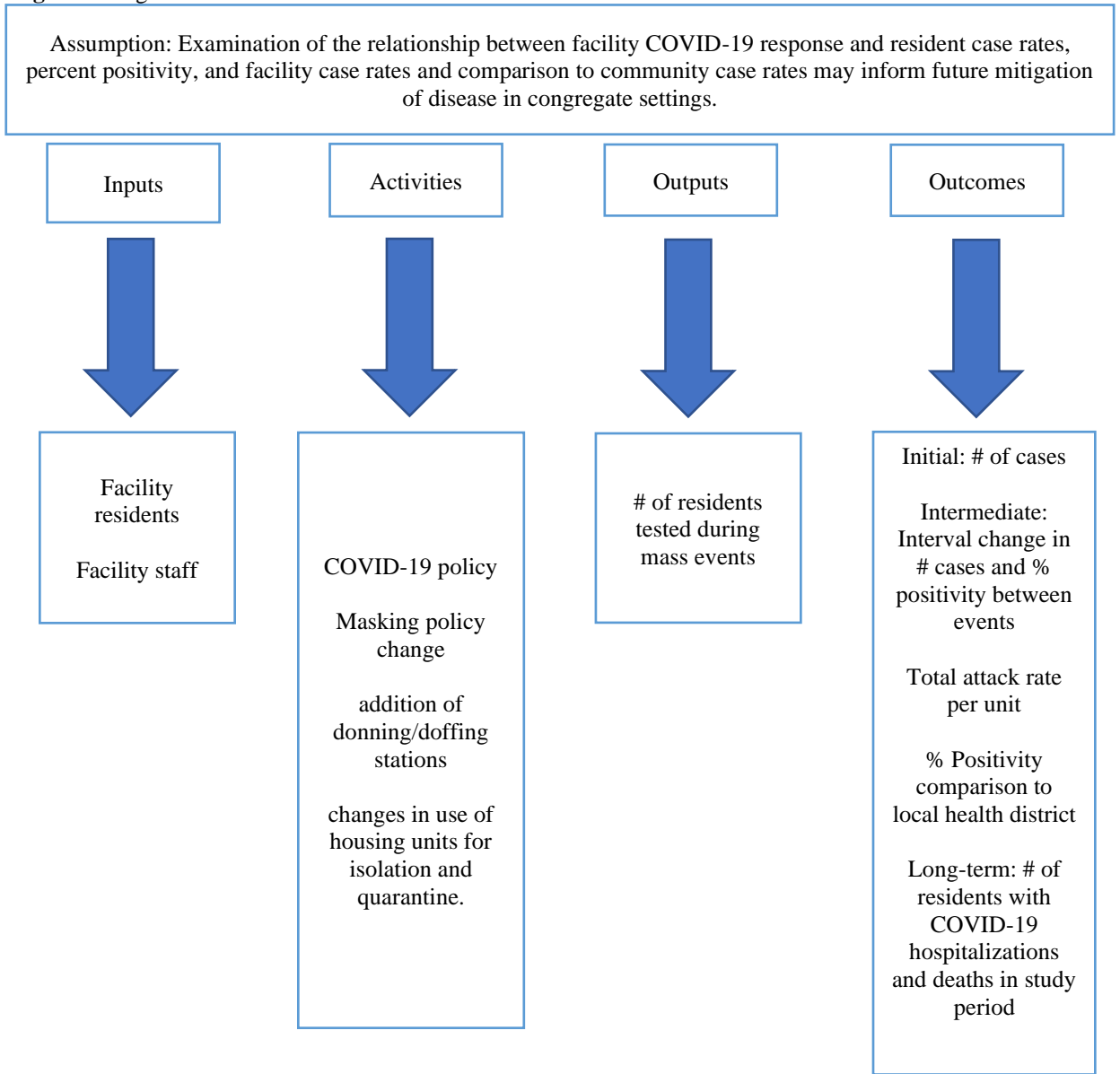


Figure 2. Logic Model. Adapted from CDC Evaluation Workbooks, Documents, and Tools (CDC, 2018)

Contextual factors: Presence of a novel coronavirus in a congregate living facility, documented increased spread, morbidity, and mortality in congregate living facilities per review of literature

Methods

Study Design

Retrospective data collection of SARS-CoV-2 test results and review of facility response via policy and procedure were combined to inform this program evaluation. Cases were obtained from mass testing and facility-initiated testing during the study period. Positive results from Polymerase Chain Reaction (PCR) and rapid antigen (RA) tests were counted as a case. An individual testing positive by more than one test within 90 days was counted as one case.

The PRECEED/PROCEED model, often applied to public health program evaluations, provided additional structure to this program evaluation (Figure 3).

Figure 3. PRECEDE/PROCEED

PRECEDE			
Phase 1 Social Assessment	Phase 2 Epidemiological Assessment	Phase 3 Educational and Ecological Assessment	Phase 4 Administrative Policy Alignment
Prepare for and manage the impacts of SARS-CoV-2 in a secure behavioral rehabilitation facility	The COVID-19 case rate in congregate settings is significantly higher than community case rates.	Individuals who are incarcerated or detained work, study, live, eat and participate in activities of daily living together, creating ample opportunity for virus proliferation (CDC, 2020b)	Iterative since the onset of the pandemic, formal policy issued August 7, 2020.

PROCEED			
Phase 5 Implementation	Phase 6 Process Evaluation	Phase 7 Impact Evaluation	Phase 8 Outcome Evaluation
COVID-19 policy with any additional directives, mass testing in coordination with the local health department	# of residents tested during mass events	# of cases and % positivity, interval change in # cases and % positivity over study period variation in attack rates between units	# of residents with COVID-19 hospitalizations and deaths in study period

Figure 3. PRECEDE/PROCEED Model. Adapted from Green and Kreuter, 2005.

Setting

Data for this program evaluation was obtained from a secure behavioral rehabilitation center in the rural southeastern US. The facility receives individuals immediately post-incarceration for court-ordered behavioral rehabilitation, which must be completed before court-ordered release into the community. The facility serves the entire state.

Study Sample

The study sample included any resident physically residing in the main facility building from October 1, 2020, through December 31, 2020. This study excludes data from residents housed in an adjacent building on the same campus or housed in a separate facility due to policy in the case or census counts for this study. All individuals in the study were biologically male per medical record review. The average main building bimonthly census during the study period was 355.6 residents. The average unit bimonthly census between the living units ranged from 22.2 to 38.2 residents.

Ethical Considerations

Approval for this program evaluation was obtained from the Institutional Review Board (IRB) at the study facility and James Madison University. The retrospective data collection through facility record review included de-identified data from October 2020 through December 2020.

Sources of Data

The facility infection control nurse maintained the facility outbreak line list, which contained case information including individual name, date of diagnosis, home unit, morbidity, and mortality information. This served as the primary data source list.

Individual resident chart review occurred when clarification was needed.

Communications from administrative staff regarding changes in operation or policy during the study period due to COVID-19 were reviewed. Email and telephone communication with indicated staff provided further clarification of policy and procedure when necessary. Policy change over time and possible causes for attack rate variation between units were discussed with the facility infection control nurse and chief nurse executive. While local health district data and facility policy were used in this study, these citations are redacted.

Data Analysis

Positive cases during the study were counted by unit and for the entire facility. The average unit and facility census was used as the denominator when calculating percent positive and attack rates. The mean unit and facility censuses were calculated by averaging the census on mass test dates every two weeks during the study period from October 8, 2020, through December 8, 2020. This contrasts with the usual percent positive calculation in community settings, which use the total number of tests as the denominator. Any prior positives were removed from the denominator when calculating percent positivity.

Results

Using the Logic Model as a guide, the results are reviewed.

Inputs

Inputs included facility residents and facility staff. The bimonthly census of the involved units ranged from 341 to 364, with an average bimonthly census of 355.6. The

facility staff were not counted in the number of individuals tested or in positive case counts but were considered an input due to participation in policy changes.

Activities

Activities included facility COVID-19 policy and any changes or additions to the policy over the study period. These additions or changes included restricted movement, the use of personal protective equipment (PPE), and general communications reiterating guidance and other relevant information. These activities correspond to Phase 5 (Implementation) of the PRECEED/PROCEED model (Figure3).

Policy

Program activities include facility COVID-19 policy (policy objective: "to establish procedures for the facility to prepare and manage risks") and any subsequent directives sent via memorandum regarding the management of COVID-19 at the facility. While the formal COVID-19 policy was issued August 7, 2020, the policy development was iterative and in practice via directives from the facility director before that date. The purpose of the policy was to prepare for and manage the impacts of SARS-CoV-2 (COVID-19). It served to guide the evaluation of residents under investigation from COVID-19 and the management of employees, visitors, and contractors. Policy changes represent attempts to mitigate the spread of SARS-CoV-2 within the facility while maintaining a semblance of usual rehabilitative services and daily activities.

Restricted movement, PPE, and Screening

Restricted facility movement via unit quarantine, isolation, and limitation of services was used to stop the spread of COVID-19 during the study period. On October 3, 2020, Units 1, 2, 11, and 12 were placed on indefinite quarantine, group sessions were

canceled, the library and the facility store closed, and outside recreation was offered by individual units only. All non-emergent transportation was canceled, and any transportation from the adjacent building to the main building on campus was canceled.

On October 7, 2020, Unit 1 was placed on isolation, with formal recommendations PPE, staffing, food service, and cleaning. These recommendations included limiting and logging the number of staff entering the unit per department; RN COVID-19 screening every shift on isolation and quarantine units; safety officer to maintain a PPE station for proper donning/doffing of N-95 respirator; gown, goggles, gloves, food trays delivered to the entry of the unit and distributed by unit staff; cleaning products at the entrance of units and distributed as needed; and patio access closed. Staff responding to behavioral emergencies were issued N-95 respirators. Medical care for residents on unit 1 was provided on the living unit, and medical care for other units was provided on the unit as much as possible. Additionally, unit 13 was designated for isolation of known positive residents, while unit 14 was used to quarantine symptomatic patients and new admissions awaiting test results. Unit 6 was designated as overflow for the same purpose. A larger donning station for units 1-4 was established on October 16, 2020, in a badge-accessible room. Some staff who required PPE had difficulty obtaining access to the room promptly.

On October 23, 2020, staff were noted to be improperly doffing at the unit 1 doffing station, and the station did not have adequate supplies. Through collaboration with the infection control nurse, nursing staff, medical staff, residential services, and the safety officer, new signage was placed, and the station was restocked. The request for an additional doffing station outside units 13 and 14 was made on November 9, 2020.

On October 26, all treatment groups throughout the facility were canceled indefinitely and staff responsible for treatment began providing individual sessions with residents on living units. Electronic tablets were also available for communication with treatment staff. Distribution of property and other packages resumed on all units except units 1, 3, and 4. Due to continued delayed access to property on units 1, 3, and 4, one free mail item per day was given to residents on those units. Additionally, off-unit vocational services were canceled. Medical providers were encouraged to provide services on living units as often as reasonably possible. Full PPE (gloves, N-95, goggles, gown) became mandatory for staff working on quarantine units as of November 5, 2020.

On November 9, 2020, primary group treatment resumed for units 5-12 and vocational services allowed resident participants from units 5-12 for food delivery and off-unit cleaning. On November 23, 2020, units 1 and 2 resumed some services, such as package delivery, and return to in-person primary group was anticipated on November 30, 2020. However, 25 new positive cases occurred from November 29-November 30, 2020, which strongly influenced facility procedure. Subsequently, on November 30, 2020, all packaged distribution was suspended, all treatment groups were canceled, off-unit vocational programs were suspended, and individual therapy occurred only on units not on quarantine or isolation. Patio and recreation yard access was staggered by units. Hygiene items were supplied by the facility for residents and distributed on living units. On December 14, 2020, COVID-19 screening was delegated from medical clinic registered nurses (RNs) to the licensed practical nurses (LPNs) staffing each unit. Any abnormal results were to be reported to the charge nurse and promptly assessed. The

number of cases exceeded space for separate isolation by December 10, 2020, and the facility was advised to have infected residents isolate in place on their home units.

Mass Testing

Mass testing was coordinated with the local health department and was conducted approximately every two weeks beginning October 9, 2021. These tests were PCR tests processed via services coordinated by the local health department. All staff and residents were offered testing at these mandatory test dates, except individuals who had tested positive in the last 90 days. Notification of each mandatory event was sent via email ahead of the test date by the facility director.

General Communication

One method of disease control utilized by the facility manager was frequent communication of the COVID-19 status of the facility, with a report of current staff and resident positive cases. These communications encouraged the use of face coverings, hand hygiene, social distancing and urged employees to self-monitor for signs and symptoms of COVID-19. They prompted employees to stay home if sick and promptly notify infection control if ill. Encouragement to use available support services for COVID-19-related stress was often included in these communications. The first communication during the study period occurred on 10/1/2020. These frequent status updates continued throughout the study period. Staff were notified on 10/29/2021 of a pending vaccine intent survey and were sent extensive vaccine information on December 15, 2021. Staff were notified on November 5, 2021 that a monetary supplement would be provided for individuals working with COVID-19 positive cases.

Additional Measures

The food service director fogged the facility staff areas with a United States Environmental Protection Agency Approved disinfectant every Friday beginning November 27, 2020 and continued through the end of the study period. Items and areas fogged included the primary entrance and control space, door and vehicle keys, radios, safety and riot gear. Housekeeping staff fogged resident patios daily and any resident room when room transfers occurred. There were no changes made to the heating, ventilation, and air conditioning system (HVAC) during the study period. Approximately one month following the study period, the safety officer and the state safety and health organization determined the facility HVAC met the required standard.

Output

The primary output was the number of residents tested at each mass testing event. This output corresponds to Phase 6 (Process Evaluation) of the PRECEED/PROCEED model (Figure 3). Any resident who tested positive less than 90 days prior was not retested. Some residents refused testing at mass testing events but consented to testing between events due to exposure or symptoms. Overall, resident compliance decreased over time, with 10 (2.75%) offered residents refusing tests on the first mass test date and 31 (8.66%) refusing tests on the final test date.

October 9, 2020 – 329 of 364 (90.38%) were tested, 10 (2.75%) refused

October 23, 2020 – 303 of 362 (83.7%) were tested, 32 (8.84%) refused

November 4, 2020 – 294 of 353 (83.57%) were tested, 22 (6.23%) refused

November 18, 2020 – 260 of 341 (76.25%) were tested, 19 (5.57%) refused

December 8, 2020 – 212 of 358 (59.22%) were tested, 31 (8.66%) refused

Outcomes

Cases, percent positivity, comparison to local health district, variation in attack rates per units, and COVID-19 related special hospitalizations and deaths correspond to Phases 7 and 8 (Impact Evaluation and Outcome Evaluation) of the PRECEED/PROCEED Model (Figure 3).

Number of Cases

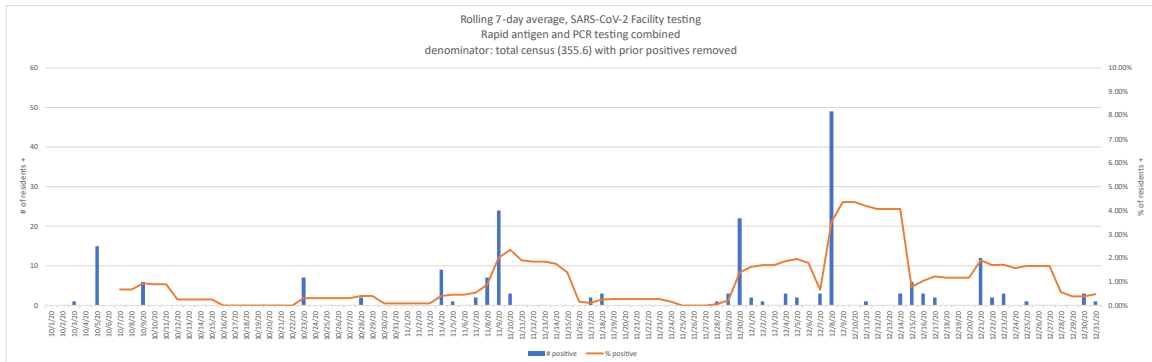
Total facility case rates over the study period were measured, and case rates between units were also compared. The total facility number of cases over the study period was 205, with an average census over the study period of 355.6 residents. 2 residents consistently refused testing and were not counted as positive cases for the purpose of this study but were considered positive by the facility infection control nurse due to exposure. 74 positive tests results were obtained from the five mandatory mass test dates that occurred during the study period. 131 positive test results were obtained from symptom screening by facility providers and nurses and from testing close contacts of positive cases. 123 (60%) of the 205 cases occurred in approximately the last third of the study period. Positive cases per unit ranged from one case on unit 12, to 34 cases with one test refusal on unit seven.

Percent Positivity

The percent positive for the facility was calculated as a seven-day rolling average for the study period. The average facility census was used as the denominator, with the prior positives removed (Figure 3). The rolling seven-day average range exceeded 1% only eight days in the first two months of the study period, with a range of 0% to 2.33%

from October 1, 2020 to November 27, 2020. From November 28, 2020, to December 31, the seven-day rolling average ranged from .05% to 4.34%.

Figure 4. 7-day rolling average

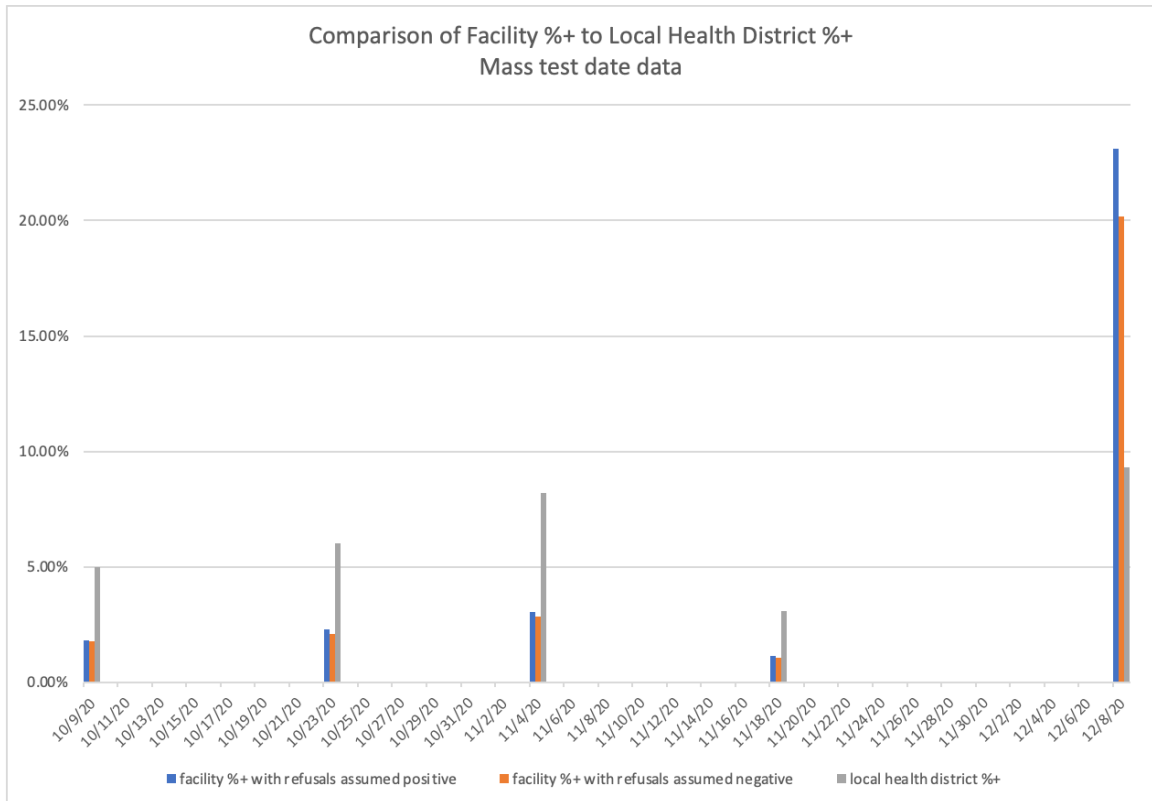


Test-over-test (number positive over number of tests completed) calculation could not be performed for the entire study period, as the number of tests completed daily is unknown due to multiple logistical factors. Test-over test calculation was performed for each mass test date. The percent positive was calculated to account for test refusals as either positive cases or negative tests results, which resulted in a variation between 0.05%-2.95% in percent positivity on mass test dates (Figure 4).

Comparison to Local Health District

A continuous comparison to the local health district rates cannot be made due to the dissimilarity in the denominator between the local health district and the facility (total number of tests v total facility census). No direct correlation can be made due to the significant difference between a closed environment and the community and a significant number of the positive facility cases being diagnosed between mass test dates. The general directional trend in percent positivity is similar to that in the local health district but is likely due to the facility's contribution to the health district's overall percent positive rate (Figure 5).

Figure 5. Comparison to local health district



Attack Rate per Unit

The attack rate per unit varied significantly. Attack rates for units 6, 13, and 14 were not calculated, as these units were used for only isolation and quarantine and did not maintain a census. The attack rate ranged from 3.94% (1) on unit 12 to 92.26% (31) on unit 3. The attack rates on unit 9 5.81% (2) and unit 5 18.02% (4) were among the lowest, with the remainder of the unit attack rates 45.18 % and higher. It is recognized that while not measured, there were varying rates of resident adherence to masking, social distancing, and cleaning protocols, with the infection control nurse reporting residents of unit 9 adhering to social distancing by setting living unit chairs apart during television watching and by organizing cleaning chores on the unit. Unit 5 houses residents that

require a higher level of assistance with activities of daily living. Increased staff assistance and reminders may be attributed to a lower attack rate on this unit (Figure 6).

Figure 6. Facility Attack Rate by Unit

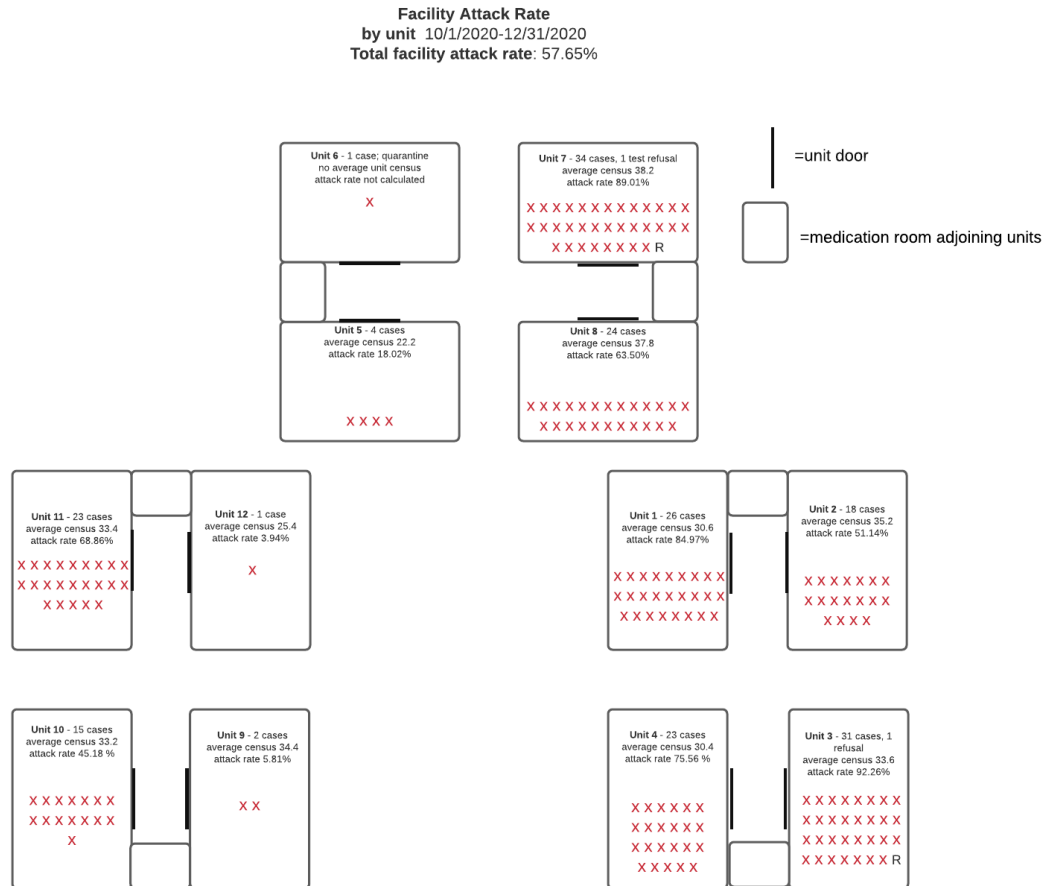


Figure 6. General configuration of study facility’s primary living units. Not to scale. Additional features (classrooms, store, gym, etc.) are not featured here.

Special Hospitalizations

6.3% of infected individuals (13) required inpatient hospital care due to COVID-19 during the study period. Hospitalized residents during the study period were from Unit 1 (3), Unit 3 (4), Unit 4 (2), Unit 7 (1), Unit 8 (2) and Unit 11 (1).

Deaths

There were three COVID-19 related deaths during the study period. The case fatality rate at this facility during this study was 1.4%. Deaths occurred on November 18, December 16, and December 24, 2020. All deaths occurred during special hospitalization. One death occurred in a resident from Unit 3 and 2 deaths occurred in residents from Unit 8.

Discussion

Managing the pandemic poses challenges for secured congregate settings, as they cannot be shut down (Sims et al., 2021). Despite policy and procedures to mitigate the spread of SARS-CoV-2, the infection rate in this congregate setting increased significantly during the last third of the study period. Policy changes occurred in response to increased and decreased facility cases. There were barriers to staff usage of PPE, which were eventually resolved. Ultimately, a rise in cases at the end of November precipitated significantly restricted movement within the facility. Moreover, the primary function of the facility – behavioral rehabilitation – was hampered significantly during the pandemic due to being unable to hold usual group therapy sessions. During the periods of most restricted movement, residents were confined to living units but were never confined to individual rooms. Such confinement may have slowed the spread of disease but would have constituted a violation of rights per this particular institution's guidelines.

The percent positivity rate as calculated for this study was relatively low, from 0.05%-4.34%. This rate allowed for 205 total cases in the three-month study period, for a facility attack rate of 57.56%. This attack rate is similar to the attack rate described in

larger setting by Lewis et al., (2021) in which 1368 (52%) of 2632 of inmates were ultimately infected during a correctional facility outbreak, despite prompt isolation and activity limitations. In a review of Department of Corrections data, Saloner et al. (2020) report a case rate among federal and state prisoners of 587 per 100,000. The study facility crude rate calculated significantly higher at 58/100. Toblin et al. (2021) report a from a study of the Federal Bureau of Prisons, that in facilities testing $\geq 85\%$ of inmates, the combined infection fatality rate was 0.8% and ranged from 0.0%-3.0%. The study facility case fatality rate was 1.4% (3). 13 residents required special hospitalization during the study period. Hospitalized residents require the presence of minimally two security staff members 24 hours per day, which placed significant staffing strain on the security department during the pandemic.

Adherence to infection control guidelines (social distancing, masking, and cleaning) is surmised to have contributed to the low number of infections on 3 living units. This raises the question of how to increase resident compliance with recommendations, which can be particularly challenging in a behavioral health setting.

The CDC summary released May 7, 2021, indicates that spread of SARS-CoV-2 via contaminated surface (fomite transmission) is less likely, with official modes of transmission listed as "Modes of SARS-CoV-2 transmission are now categorized as inhalation of virus, deposition of virus on exposed mucous membranes, and touching mucous membranes with soiled hands contaminated with virus" (CDC, 2021a). However, correctional facilities and similar congregate settings are given guidance for "enhanced cleaning and disinfecting practices" due to difficulty social distancing in small spaces, employees and inmates sharing space, and the higher rate of chronic disease in the

incarcerated population (NIOSH, 2021). This includes routine disinfecting of shared workspaces and equipment, which was observed by the study facility.

In addition to usual infection control measures, hazard pay was offered to employees working on infected units, as recommended in prior studies. Accommodations were also made for residents due to restricted visitation, as in prior studies.

Limitations

This study has several limitations. The study facility is unique and there was not literature available for comparison. As such, the literature review was completed with other congregate settings, such as nursing homes and correctional facilities. Correctional facilities are often used as a point of reference, as the study facility is a secured setting. The data collected was over a three-month period that did not cover the entire late 2020 through early 2021 outbreak at this facility. Any cases occurring after December 31, 2020 during this outbreak were not counted, and may have changed case counts and case fatality rates. Additionally, the residents housed in an adjacent building were not included in this data, though no cases occurred in that building during the study period. There was no feasible way to count a test over test percent positivity rate for the entire study period, as the total number of tests completed per day was not available for all but the mass test dates. Staff infections were not included; any relationship between staff and resident infections cannot be ascertained from this study.

Age, race, and other demographic information were not included in this study, though would be helpful in further discerning morbidity and mortality from COVID-19 in this and similar populations. Resident and staff perspectives were not included in this

study but may provide useful insight to the effects of COVID-19 on daily life and work in a congregate setting.

Conclusion

COVID-19 infections placed significant strain on the study facility as administrators attempted to balance rehabilitation needs with infection control. SARS-CoV-2 spreads easily in congregate settings such as prisons, where true social distancing is simply not possible, and congregate living facilities have the potential to overwhelm local healthcare resources (Wetzel and Davis, 2020). This study facility showed a sustained and flexible effort at infection control measures while attempting to maintain rehabilitation services, but like so many other congregate settings still experienced a significant number of cases, special hospitalizations, and deaths.

The study facility crude rate calculated significantly higher at 58/100. It is estimated that without vaccination, virtually every resident would eventually become infected given this rate. As with other studies, more readily available data (such as number of tests performed daily) is recommended. It is recognized that this facility, like all congregate settings affected by COVID-19, were piecing together practices in a time of unknowing and that data collection and reporting have improved over the course of the pandemic. Due to variation in attack rate between units, further research regarding uptake of infection control measures by residents in secured settings is recommended. Additionally, research to determine feasible and standardized methods of data collection and reporting are recommended for secured settings. Finally, research aimed at maintaining core behavioral rehabilitation services in a secured setting during an infectious disease outbreak is recommended.

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