Identification of presymptomatic and asymptomatic cases using cohort-based testing approaches at a large correctional facility – Chicago, Illinois, USA, May 2020

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**Key points:** Our findings suggest that early cohort-based testing in detained persons helped identify new SARS-CoV-2 asymptomatic and presymptomatic infections that may have been missed by symptom screening alone. Frequency of testing may be dependent on status of outbreak in the facility.
Abstract

Background: COVID-19 continues to cause significant morbidity and mortality worldwide. Correctional and detention facilities are at high risk of experiencing outbreaks. We aimed to evaluate cohort-based testing among detained persons exposed to laboratory-confirmed cases of SARS-CoV-2 in order to identify presymptomatic and asymptomatic cases.

Methods: During May 1–19, 2020, two testing strategies were implemented in 12 tiers or housing units of the Cook County Jail in Chicago, Illinois. Detained persons were approached to participate in serial testing (n=137) and offered tests at 3 time points over 14 days (day 1, day 3–5, and day 13–14). The second group was offered a single test and interview at the end of a 14-day quarantine period (day 14 group) (n=87).

Results: A total of 224 detained persons were approached for participation and of these 194 (87%) participated in at least one interview, and 172 (77%) had at least one test. Of the 172 tested, 19 were positive for SARS-CoV-2. In the serial testing group, 17 (89%) new cases were detected, sixteen (84%) on day 1, one (5%) on days 3–5, and none on days 13–14; and, in day 14 group, two (11%) cases were identified. More than half (12/19; 63%) of the newly identified cases were pre-symptomatic or asymptomatic.

Conclusion: Our findings highlight the utility of cohort-based testing promptly after initiating quarantine within a housing tier. Cohort-based testing efforts identified new SARS-CoV-2 asymptomatic and presymptomatic infections that may have been missed by symptom screening alone.

Key words: SARS-CoV-2, COVID-19, correctional facilities, serial testing
Introduction

The United States has the highest incarceration rate of any nation in the world — 431 detained persons per 100,000 population — with an estimated 2.3 million people confined on any given day [1]. High rates of infection with SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19), have been reported in correctional and detention facilities across the United States [2]. Correctional and detention facilities are prone to outbreaks of COVID-19 for a variety of reasons, including congregate and crowded living conditions making social distancing, quarantine, and medical isolation challenging [3, 4]. Additionally, movement of staff across housing units and turnover among detained persons increases opportunities for SARS-CoV-2 introduction and transmission [4]. Early testing strategies relied on symptom assessments and were ineffective to identify presymptomatic and asymptomatic infections [5].

The Cook County Jail (CCJ) in Chicago, Illinois, is one of the largest single-site jails in the United States with an average daily census of approximately 6,000 detained persons and a maximum capacity of 7,500 [6]. Prior to the COVID-19 pandemic, CCJ housed detained persons in six divisions, comprised of celled and dormitory housing areas [7]. The first laboratory-confirmed SARS-CoV-2 case in CCJ was identified on March 18th [8]. The Chicago Department of Public Health (CDPH) provided COVID-19 control and mitigation recommendations based on Centers for Disease Control and Prevention (CDC) guidance [9] aligned with the existing practices already in effect at the jail.

Infection prevention and control (IPC) interventions practiced have been described elsewhere [8]. At the time of investigation, CCJ was utilizing temperature and symptoms screening and testing detained persons with a point-of-care assay for SARS-CoV-2 at intake.
Additionally, enhanced sanitation and disinfection practices, isolation of suspect and confirmed SARS-COV-2 cases in single cells, cohorting of other positive detained persons, quarantining all exposed detained persons, social distancing, universal masking of staff and detained persons, and minimization of detained persons and staff movement. Although the number of symptomatic laboratory-confirmed cases declined from early April to early May 2020, the use of testing strategies to identify asymptomatic cases was considered to reduce further transmission of COVID-19 in the facility [8].

During May 1–19, 2020, in partnership with CDPH, Cook County Health (CCH), Cook County Sheriff’s Office (CCSO) and Cermak Health Services (CHS) of Cook County Health, a CDC team conducted an epidemiologic investigation at CCJ. The investigation objectives were to evaluate the utility of serial testing as a method of identifying presymptomatic and asymptomatic cases and to describe symptomology among persons identified during the investigation.

Methods

Study population and facility details

During May 2020, CCJ had a lower average daily population, approximately 4,000 detainees [6]. This was due to decompression efforts by the criminal justice system [7, 8]. The facility and an early COVID-19 outbreak in CCJ have been described elsewhere [8]. CCJ is divided into separate divisions, which comprised of celled and dormitory housing areas. Each division has smaller housing units (“tiers”) which are residential units structured as dormitories or celled living units. Celled living units were primarily double occupancy but were utilized as single occupancy during the outbreak. Most dormitory style living units housed between 38-
48 detained persons at full capacity. When possible, this number was decreased by about 50% to adhere to social distancing guidelines.

Individuals with laboratory-confirmed SARS-CoV-2 infection were removed from their tier and moved to isolation celled units or cohort dormitory housing for a minimum of 21 days. Exposed persons remained in the tier and were quarantined together and monitored daily for abnormal vital signs and COVID-19-related symptoms for minimum 14 days.

**Investigation design**

Housing units were selected for inclusion in the investigation if at least one detained person had a positive SARS-CoV-2 test and the unit was placed on quarantine. The investigation team employed two cohort-based SARS-CoV-2 testing strategies within quarantined tiers where a known case of COVID-19 resided (i.e., close contact exposure): 1) one group was offered a test at three time points (serial testing cohort), and 2) a second group was offered a single test at the end of quarantine (day 14 group). All detained persons in the day 14 group were already near the end of their quarantine period at the time of this investigation. Since there are anecdotal reports of correctional facilities performing testing on the last day of quarantine (before lifting restrictions), the utility of these two testing strategies was assessed to assist in prioritization of testing resources.

Serial testing was conducted at three timepoints: day 1, day 3–5, and day 13–14, selected based on the median SARS-CoV-2 incubation period of 5 days [10]. At each timepoint, detained persons were offered a test and brief interview to assess current symptoms and had the option of declining either or both. Day 14 testing occurred on the final day (day 13–14) of quarantine. After detained persons verbally consented, the investigation team
conducted face-to-face interviews using a standardized questionnaire. Symptoms assessed were self-report of fever, cough, dyspnea, chills, myalgia, headache, rhinorrhea, nasal congestion, pharyngitis, anosmia (loss of smell), ageusia (loss of taste), abdominal pain, nausea, vomiting, and diarrhea (≥3 loose stools in 24-hour period). Additionally, at each timepoint, body temperature readings were taken from the temporal region of the forehead using a non-touch infrared thermometer. Questionnaires for day 1 (serial testing cohort) and day 14 group included variables on demographics, COVID-19-related symptoms (in the past two weeks and two months), medical history, potential exposures to known COVID-19 cases, and daily movement within the facility during the last two months. Detained persons with positive test results at any of the three time points were removed from the tier and transferred to an isolation tier. The 14-day quarantine timeline would be reset from the day a new lab-confirmed positive was detected. Detained persons with negative test results remained eligible for subsequent tests and symptom assessments until the individual declined, received a positive test result or completed the 14-day quarantine period.

Those with positive test results were isolated and medically monitored by nursing staff. The CDC team reassessed symptoms approximately one week later and if anyone was symptomatic, it was immediately reported to the nursing manager. Detained persons included in the serial testing cohort who declined both an interview and testing were not eligible for subsequent visits by CDC team. Persons who agreed to at least one component (i.e., interview or testing) were offered an interview and testing at subsequent visits.

**Laboratory testing**

All specimens for SARS-CoV-2 testing were collected by flocked nasopharyngeal (NP) swabs. NP swabs collected at the facility were stored in a cooler at 4°F and transported to the
referral hospital laboratory (John H. Stroger, Jr. Hospital of Cook County) within 12 hours. The laboratory performed one-step, real-time reverse transcriptase–polymerase chain reaction (RT-PCR) on all samples, using the SARS-CoV-2 m2000 RealTime system RT-PCR (Abbott Laboratories, Illinois, USA) [11]. All results were reported to the facility clinical staff within 24 hours of specimen submission, and if positive, detained persons were notified of their individual test result and immediately isolated.

Data analyses

Data from the paper-based questionnaires were entered into secured REDCap® electronic data capture tools hosted at CDC [12, 13]. Univariate and bivariate analyses were used to calculate counts and percentages of demographic characteristics, self-reported underlying medical conditions, self-reported symptoms, test results, and refusals by day of testing for both testing strategies. Demographic, clinical, and symptom variables were further stratified by interview and test day, and overall test result (i.e., positive vs. negative). Underlying medical conditions were grouped into twelve categories by medical classifications [14]. Reported symptoms were classified into the Council for State and Territorial Epidemiologists (CSTE) COVID-19 case definition based on CSTE clinical criteria A and/or B. CSTE clinical criteria A were: at least two of the following symptoms—fever (measured or subjective), chills, myalgia, headache, sore throat, new olfactory and taste disorder(s); CSTE clinical criteria B were: at least one of cough or shortness of breath [15]. Cases of COVID-19 identified in this investigation were classified as symptomatic (reporting ≥ 1 criteria A or B symptom(s) with an onset date before the specimen collection date resulting in a positive test), asymptomatic (no criteria A or B symptoms reported), pre-symptomatic (≥ 1 criteria A or B symptom(s) reported with an onset within 7 days after the specimen collection date.
resulting in a positive test and none reported before the specimen collection date resulting in a positive test), or unknown (reporting unknown to ≥ 1 criteria A or B symptom). All analyses were performed using statistical software, SAS 9.4 (Cary, NC, USA), R 3.6.1 (R Foundation, 2019 Statistical Computing), and the networkD3 package (v 0.4; https://cran.r-project.org/web/packages/networkD3/networkD3.pdf) software.

Ethics

This investigation was part of the ongoing public health response to COVID-19; thus, CDC’s Human Research Protection Office determined the activity to meet the requirements of public health surveillance as defined in 45 CFR 46.102(l)(2) and exempt from human subjects’ research regulations. CDPH, CCH, CHS and CCSO approved this project prior to initiation. At each encounter with detained persons, the CDC team provided an overview of the study and procedures and answered any questions before offering an interview or testing. Verbal consent was obtained from each detained person prior to enrollment. Data collection forms were approved under Office of Management and Budget (OMB: 0920-1011).

Results

A total of 224 detained persons from 12 quarantined units were approached for participation in the investigation: 137 persons in seven units from the serial testing group, and 87 persons in five units from the day 14 group. Across both groups, 195 (87%) agreed to participate in at least one component: 171 (88%) consented to both interview and testing, 23 (12%) to interview only, and one (1%) to testing only; 29 (13%) detained persons refused to participate in interview or testing.
Of participants interviewed, most were men (181/193; 94%) and under the age of 50 (168/193; 87%) (Table 1). The majority (67%) of participants self-identified themselves as non-Hispanic Black, 19% as Hispanic, and 6% as non-Hispanic White. Underlying medical conditions were self-reported by 65% of participants; respiratory diseases (32%) were the most common. A history of smoking tobacco was reported by 77% (Table 1).

Interview and test participation varied by group, unit, and day (Table 2). Forty percent (89/224) of detained persons refused a test at least once. Of the serial testing cohort, 31% (43/137) detained persons refused testing on Day 1. Among detained persons who approved testing or interview at least once, there were no differences between refusal rates by sex, underlying medical conditions, or symptom reporting across time points; however, a higher proportion of younger participants (<30 years) refused interview or testing on day 3–5 and day 13–14.

Among the 137 detained persons approached for the serial testing cohort, 96 (70%) were tested during at least one of the three time points (Figure 1). Of these, 17 (18%) had positive test results, 78 (81%) had negative test results, and 1 (1%) did not receive a test result due to specimen spillage in transport (Table 2). Among the 17 persons with a positive test result, 16 (94%) were positive on day 1, and 1 (6%) was positive on days 3–5 (Table 2). No new positives (0/47) were identified through serial testing efforts on days 13–14. Among the 87 detained persons approached for single test (day 14 group), 82 (94%) agreed to participate; 76 (93%) were tested and interviewed. Of the 76 tested, two (3%) had a positive test result. Considering both testing strategies, 19 (11%) of the 172 persons across eight units (six units using the serial testing approach and two units using the single test approach) tested
positive for SARS-CoV-2 at any point. Estimated attack rates over the entire follow-up period ranged from 5% to 43% within tiers.

Among the 194 detained persons that agreed to interview, 139 (72%) did not report symptoms, 52 (27%) reported symptoms; for the remaining 3 (2%) respondents reported symptoms were unknown or missing. (Table 3). Of the detained persons reporting symptoms, 28 (54%) had symptom onset during the two weeks prior to specimen collection, 18 (35%) had symptom onset more than two weeks prior, 2 (4%) had an unknown onset date, and 4 (8%) were presymptomatic. Among the 19 detained persons with a SARS-CoV-2 positive test result, a substantial proportion were asymptomatic (63%) at the time of specimen collection. One-third of detained persons were asymptomatic at the time of testing, later developed symptoms. Among the seven detained persons with positive test results who reported symptoms at the time of specimen collection, 57% reported symptom onset during the prior two weeks and 43% reported symptom onset more than two weeks prior. A total of 151 detained persons had a negative test result for SARS-CoV-2, with a quarter reporting at least one symptom in the preceding two months (Table 3).

Among the 19 detained persons with a positive test result for SARS-CoV-2, the most commonly reported symptoms in the two weeks prior to testing were loss of taste or smell (47%), headache (32%), and chills (26%) (Figure 2). Of the 151 detained persons interviewed with negative test results, commonly reported symptoms in the preceding two weeks included headache (15%) loss of taste or smell (8%), cough (8%), dyspnea (8%), chills (7%), and nasal congestion (7%).
Discussion

Cohort-based SARS-CoV-2 testing of quarantined detained persons at one of the largest single-site jails in the United States led to the prompt identification and isolation of asymptomatic and presymptomatic persons with SARS-CoV-2 infection, and likely reduced transmission. Twelve of the 19 detained persons with a SARS-CoV-2 positive test result were asymptomatic (63%) at the time of specimen collection; four of these developed symptoms after testing. Symptom screening alone would have been ineffective in identifying new cases, given that a high percentage of detained persons with positive test results for SARS-CoV-2 did not report COVID-19 symptoms at the time of specimen collection. Early identification and isolation of SARS-CoV-2 infection, through cohort-based testing, including strategies already in use at CCJ, reduces the likelihood of transmission, especially in congregate living facilities [8].

The overall estimated attack rate in selected tiers (11%) was lower than previous reports in CCJ (98% in one dormitory) and other correctional facilities [8, 16]. This likely reflects success in mitigating transmission through prevention measures adopted by CCJ management. Among the seven quarantined tiers where cohort-based serial testing was implemented, 17% of enrolled detained persons tested positive for SARS-CoV-2 infection during the 14-day quarantine period; estimated attack rates within tiers ranged from 5% to 43%. However, the attack rates may be underestimated for a variety of reasons, including refusals and potential misclassification of previous infections [17]. Finally, we cannot rule out that detained persons may have already recovered from a SARS-CoV-2 infection prior to the investigation.

While two cases were identified in the day 14 group, cohort-based testing closest to the start of quarantine had the highest yield and identified the majority of SARS-CoV-2
infections (16/19, 84%). One case was identified on day 3-5 and none on day 14. This is consistent with evidence suggesting that serial testing in congregate settings such as correctional facilities can identify new cases before symptom onset and potentially prior to their infectious period, allowing them to be isolated early and interrupting transmission [17]. Additionally, the short testing turnaround time at CCJ affiliated laboratory, made implementation of control strategies feasible.

The majority of the newly detected cases were asymptomatic or presymptomatic. However, among detained persons with a positive test result that reported at least one symptom, headache and loss of taste or smell were the most commonly reported symptoms. Among detained persons with a negative test result, 25% reported symptoms compatible with COVID-19. While non-specific symptoms may be explained by circulation of other respiratory infections or seasonal allergies, the large number of detained persons with negative test results who reported loss of taste or smell might suggest possible false negative test results or confabulation of symptoms or prior COVID-19 infection.

We observed high rates of refusals among participants at CCJ, particularly at the start of the investigation. One possibility that could have impacted rates of participation was that there is evidence to suggest that detained persons may fear losing personal privileges such as access to common areas or phone calls, risk financial consequences including copays associated with accessing health care [18, 19]. Detained persons may want to avoid the disruption of being moved to isolation or another facility upon a positive test result and some enrolled subjects reported that loss of access to the commissary was a major reason for refusal. Facility staff should consider non-coercive strategies to encourage testing uptake, such as health promotion and education. When possible, starting serial testing soon
after a case is identified as well as planning for separation of persons who decline testing could prevent potential transmission from close contacts with unknown infection status. No differences in facility characteristics were observed in the 12 quarantined units.

This investigation was subject to several limitations. First, our investigation began as the number of new cases in the facility were decreasing and relied on PCR-based testing, which measures the current presence or absence of virus, and cannot identify those who may have already cleared the infection [8]. The prevalence of disease could be underestimated, and the transmission potential may have been lower in tiers with recovered individuals. Also, symptom assessments and survey data are self-reported and dependent on a person’s ability to recall when symptoms occurred. Second, we observed high rates of refusals among detained persons, particularly at the start of the investigation, potentially resulting in underestimation of the burden of SARS-CoV-2 in this population.

Our findings highlight the utility of cohort-based approaches to testing, which can effectively identify presymptomatic and asymptomatic cases compared to symptom screening alone. Further, timely and effective measures to separate infected detained persons (i.e., cohorting and isolation in single occupancy cells) and staff can mitigate continued transmission of SARS-CoV-2 in detention facilities. Early testing of close contacts in quarantine, in conjunction with IPC and other mitigation measures, may slow transmission in correctional facilities and the surrounding community.
NOTES

 Contributions: RD, KC, PKM, PAA, JET, IG and CJZ provided overall leadership and guidance to the investigation. AW, MMA, DAM, AFM, JTV, PKM and CJZ completed the investigation of cases and collected epidemiological data. RD, KC, KF, AW, RS, MK, KK, MT, AMB, JET, PAA, SRB, CCM, RL, JG, BG and SGW provided technical assistance and input in content areas, including epidemiological methods, data analysis and subject matter expertise. AW, KF, RS, MK, KC, RD, PKM and CJZ drafted and revised this manuscript. All authors reviewed, revised, and approved the final manuscript.

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Table 1. Demographic characteristics of detained persons tested for SARS-CoV-2, by test result; Cook County Jail Chicago, Illinois – May 2020

| Demographic Characteristics | Interview Results n=193* | SARS-CoV-2 Test Results n=169 |
|-----------------------------|--------------------------|--------------------------------|
|                             | Positive, n=19           | Negative, n=150                |
| Age median (IQR), years     | 33 (25–43)               | 41 (30–49)                     |
| ≤29                         | 77 (40)                  | 4 (21)                         |
| 30–49                       | 91 (47)                  | 11 (58)                        |
| ≥50                         | 25 (13)                  | 4 (21)                         |
| Sex, n (%)                  |                          |                                |
| Men                         | 181 (94)                 | 19 (100)                       |
| Women                       | 12 (6)                   | 0 (0)                          |
| Race/Ethnicity, n (%)       |                          |                                |
| Hispanic                    | 36 (19)                  | 3 (16)                         |
| White, Non-Hispanic         | 12 (6)                   | 1 (5)                          |
| Black, Non-Hispanic         | 130 (67)                 | 14 (74)                        |
| Other*, Non-Hispanic        | 15 (8)                   | 1 (5)                          |
| Previous tobacco use (ever used), n (%) | 148 (77) | 16 (84) | 113 (75) |
| Daily                       | 119 (62)                 | 10 (53)                        |
| Less than daily             | 29 (15)                  | 6 (32)                         |
| Not at all                  | 44 (23)                  | 3 (16)                         |
| Underlying medical condition§, n (%) | 126 (65) | 10 (53) | 98 (65) |
| Respiratory disease         | 62 (32)                  | 8 (42)                         |
| Asthma                      | 53 (28)                  | 6 (32)                         |
| COPD†                       | 8 (4)                    | 2 (11)                         |
| Cardiovascular disease      | 32 (17)                  | 4 (21)                         |
| Hypertension                | 28 (15)                  | 4 (21)                         |
| Other cardiovascular disease/condition* | 5 (3) | 0 (0) | 4 (3) |
| Body Mass Index (BMI)(kg/m²) | 58 (30)                  | 1 (5)                         |
| Obesity: 30.0–<40.0         | 52 (27)                  | 0 (0)                          |
| Severe obesity: ≥40.0       | 6 (3)                    | 1 (5)                          |
| Immunocompromising disease/condition Δ | 5 (3) | 2 (11) | 3 (6) |
| Hemoglobin disorder‡        | 4 (2)                    | 1 (5)                          |
| Diabetes mellitus (type 2)  | 7 (4)                    | 1 (5)                          |
| Other chronic disease/condition** | 7 (4) | 1 (5) | 5 (3) |

Abbreviation: IQR = interquartile range
*224 detained persons were approached for interview and nasopharyngeal swab (NP) collection: 111 detained persons agreed to interview from the serial cohort on Day 0; 82 agreed to interview from the Day 14 only group. Of these 193 detained persons interviewed (on Day 0 for serial testing cohort; Day 14 for Day 14 only group), 169 agreed to NP collection on Day 0, Day 3–5 or Day 13–14. 24 detained persons refused testing and interview; 2 agreed to testing only. 1 additional person agreed to interview on Day 3–4 only, and so is excluded from Table 1.

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§ Totals will not sum to 193; these categories are not mutually exclusive. Classification and sub-categories were created based on CDC guidance.[14] They are inclusive of the conditions, diseases, or disorders most commonly reported by detained persons.

† Chronic obstructive pulmonary disease, including emphysema and chronic bronchitis.

‡ Inclusive of heart arrhythmia, Type II heart block (Mobitz Type II), mitral valve prolapse, congenital heart abnormality, and history of heart attack.

Δ Inclusive of HIV/AIDS, corticosteroid use, and autoimmune disease.

± Inclusive of sickle cell disease.

** Inclusive of hepatitis C, diverticulitis, gout, and history of cancer.
Table 2. SARS-CoV-2 testing uptake and results in 12 quarantined tiers by testing strategy, tier, and testing day; Cook County Jail Chicago, Illinois – May 2020

| Tier | No. of days since index case to Day 1 | No. in each cohort | Overall attack rate (%) | TOTAL No. in each cohort | TOTAL Testing Eligible | Testing Total | Testing Refusal | Testing Positive Result | TOTAL Testing Eligible | Testing Total | Testing Refusal | Testing Positive Result | TOTAL Testing Eligible | Testing Total | Testing Refusal | Testing Positive Result |
|------|--------------------------------------|-------------------|------------------------|--------------------------|------------------------|-----------------|-----------------|------------------------|------------------------|-----------------|-----------------|--------------------------|------------------------|-----------------|-----------------|--------------------------|
| 1    | 2                                    | 16                | 13                     | 16                       | 13                    | 3 (19)         | 1 (8)           |                        | 14                      | 10              | 4 (29)         | 1 (10)                    | 12                      | 5               | 7 (58)         | 0 (0)                    |
| 2    | 2                                    | 22                | 9                      | 22                       | 11                    | 1 (50)         | 2 (18)          |                        | 17                      | 8               | 9 (53)         | 0 (0)                    | 15                      | 8               | 7 (47)         | 0 (0)                    |
| 3    | 6                                    | 20                | 5                      | 20                       | 8                    | 1 (60)         | 1 (13)          |                        | 13                      | 1               | 1 (92)         | 0 (0)                    | 12                      | 1               | 1 (92)         | 0 (0)                    |
| 4    | 3                                    | 16                | 6                      | 16                       | 16                    | 0 (0)          | 1 (6)           |                        | 15                      | 14              | 1 (7)          | 0 (0)                    | 15                      | 12              | 3 (20)         | 0 (0)                    |
| 5    | 4                                    | 22                | 0                      | 22                       | 11                    | 1 (50)         | 0 (0)           |                        | 12                      | 6               | 6 (50)         | 0 (0)                    | 12                      | 6               | 6 (50)         | 0 (0)                    |
| 6    | 1                                    | 21                | 43                     | 21                       | 21                    | 0 (0)          | 9 (43)          |                        | 12                      | 11              | 1 (8)          | 0 (0)                    | 11                      | 11              | 0 (0)          | 0 (0)                    |
| 7    | 1                                    | 20                | 10                     | 20                       | 14                    | 6 (30)         | 2 (14)          |                        | 14                      | 6               | 8 (57)         | 0 (0)                    | 14                      | 4               | 1 (71)         | 0 (0)                    |
| Subtotal | 137                             | 137             | 94                     | 3 (31)                   | 1 (17)                  | 6 (1)          | 1 (2)           | 1 (0)                  | 91                      | 47              | 4 (48)         | 0 (0)                    | 91                      | 47              | 4 (48)         | 0 (0)                    |
| $t$ | $c$ | $d$ | $e$ | $f$ | $g$ | $h$ | $i$ |
|-----|-----|-----|-----|-----|-----|-----|-----|
| 8   | 1   | 20  | 5   | 20  | 15  | 5   | (25) |
| 9   | 1   | 17  | 6   | 17  | 16  | 1   | (6)  |
| 10  | 7   | 14  | 0   | 14  | 11  | 3   | (21) |
| 11  | 5   | 16  | 0   | 16  | 15  | 1   | (6)  |
| 12  | 1   | 20  | 0   | 20  | 19  | 1   | (5)  |
| Subtotal | 87 | 87  | 76  | 1   | (13) | 2   | (3)  |

* In Cohort 4, day 0/1, 3 nasopharyngeal (NP) swabs were collected but no results found due to tube leakage - included in testing eligible, included in testing total, excluded from testing refusal. In Cohort 3, day 0/1, 1 NP was collected but no results found due to incorrect order - included in testing eligible, included in testing total, excluded from testing refusal. In Cohort 3, day 3/4, 1 NP was collected but no result found due to mislabeling - included in testing eligible, included in testing total, excluded from testing refusal.

** Overall attack rate is calculated by dividing the total number of new positive cases by the total detained persons eligible for testing over the entire 14-day period.
Table 3: Symptom status of detained persons tested for SARS-CoV-2 at Cook County Jail Chicago, Illinois, by testing strategy and test results; Cook County Jail Chicago, Illinois – May 2020

| Symptom status                          | Interview Results n=194* | SARS-CoV-2 Test Results n=170‡ |
|-----------------------------------------|--------------------------|--------------------------------|
|                                         | Serial Testing Cohort n=112 | Day 14 Testing Cohort n=82 | Positive, n=19 | Negative, n=151 |
| Asymptomatic*, n (%)                    | 77 (69)                  | 62 (76) | 5 (31) | 1 (100) | 2 (100) | 55 (71) | 56 (76) |
| Presymptomatic§, n (%)                  | 4 (4)                    | NA     | 4 (25) | 0 (0) | 0 (0) | 21 (27) | 17 (23) |
| Symptomatic¶, n (%)                     | 29 (26)                  | 19 (23) | 7 (44) | 0 (0) | 0 (0) | 10 (48) | 11 (65) |
| Onset in past 2 weeks                   | 15 (52)                  | 13 (68) | 4 (57) | — | — | 11 (52) | 4 (24) |
| Onset >2 weeks ago                      | 14 (48)                  | 4 (21)  | 3 (43) | — | — | 0 (0) | 2 (12) |
| Onset unknown                           | 0 (0)                    | 2 (11)  | 0 (0) | — | — | 0 (0) | 1 (1) |
| Unknown**, n (%)                        | 2 (2)                    | 1 (1)   | 0 (0) | 0 (0) | 0 (0) | 1 (1) | 1 (1) |

*194 detained persons agreed to interview during at least one time point throughout the course of the investigation.
‡171 agreed to testing and interview during at least one time point throughout the course of the interview. 1 did not receive final test results due to specimen spillage and is excluded from the SARS-CoV-2 test results section in Table 3.
#Two positives were identified in the single test day 14 group.
*Persons reporting no Council of State and Territorial Epidemiologists (CSTE) criteria A or B COVID-19 symptoms in the 2 weeks prior to testing. Criteria A: fever, subjective fever, chills, myalgia, headache, sore throat, loss of taste or smell. Criteria B: cough or shortness of breath.
§Persons who reported onset of symptoms after the date of specimen collection that resulted in a positive test.
¶Persons reporting ≥1 CSTE criteria A or B COVID-19 symptom.
**Persons reporting unknown to ≥1 CSTE criteria A or B COVID-19 symptom.
NOTES

Figure 1. Flow diagram of the number of detained persons tested, interviewed, and refused in the serial testing cohort; Cook County Jail Chicago, Illinois – May 2020

Serial testing was conducted in 7 tiers (housing units) at 3 time points over 14 days (day 1, day 3–5, and day 13–14). Detained persons who were cohorted and placed under quarantine due to exposure to a recent laboratory-confirmed case were approached to participate in the investigation. Eligible detained persons either interviewed and tested, only interviewed, or refused both. Detained persons with a positive test result were isolated and followed for clinical observation: those with negative test result were contacted again on later time points.

Figure 2: Number and percent of detained persons reporting symptoms in 2 weeks prior to testing, by SARS-CoV-2 test result; Cook County Jail Chicago, Illinois – May 2020

*152 detained persons tested negative; 1 detainee refused interview at all visits and is excluded from Figure 2.
