# EMERGING INFECTIOUS DISEASES®

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## Infectious Diseases and Carceral Health

Supplement to April 2024

**SkyART Just-Us. *Flying or Dying* (2020).** Acrylic paint, paint pen, and watercolor on canvas, 67 in × 54 in/170 cm × 137 cm. ©SkyART Just-Us, Chicago, Illinois, USA.

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# EMERGING INFECTIOUS DISEASES®

**Infectious Diseases and Carceral Health** **Supplement to April 2024**


## On the Cover

**SkyART Just-Us. *Flying or Dying* (2020).** Acrylic paint, paint pen, and watercolor on canvas, 67 in x 54 in/170 cm x 137 cm. © SkyART Just-Us, Chicago, Illinois, USA.

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## Introduction



## COVID-19

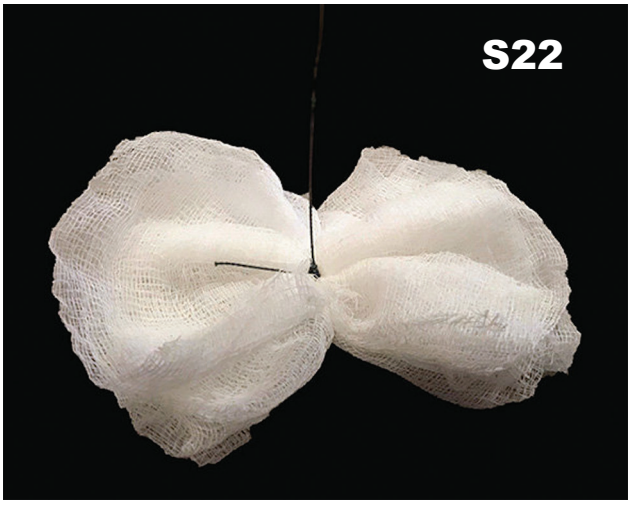


## Surveillance



## Outbreaks and Investigations





## Prevention



## Policy



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Supplement to April 2024



## About the Cover



# Carceral Health is Public Health

Liesl M. Hagan, Emily Mosites,[1] Laura Hughes-Baker, Jay Butler

The incarceration rate in the United States is the highest in the world, 664 persons per 100,000 population in 2021 (*1*,*2*). The Bureau of Justice Statistics estimated that >5.5 million persons were under the supervision of US adult carceral systems at a single point in 2021, including persons in prison or jail and those on probation or parole (*1*,*2*). In total, ≈450,000 persons were released from state and federal prisons during 2021, and another 7 million cycled through local jails, each returning to their families and communities (*3*,*4*).

The effects of incarceration extend well beyond those who have been confined. Approximately 400,000 staff work within carceral facilities as corrections officers, and many more work as healthcare providers, administrators, educators, volunteers, and in other roles (*5*). Outside of the facilities themselves, ≈113 million adults, half of all adults in the United States, have an immediate family member who has been held in a prison or jail for at least 1 night (*6*).

Simply stated, carceral health is public health. Every person's health has inherent value, and their wellbeing matters to them and to their loved ones, regardless of whether they are incarcerated. In addition, the walls of prisons and jails are porous, and 2-way movement of both people and pathogens affects the entire community.

The articles in this supplement of *Emerging Infectious Diseases*, Infectious Diseases and Carceral Health, explore ways that persons with infectious disease risks are concentrated within carceral systems, how the physical environment and culture within facilities can contribute to disease spread, the wide variations in access to healthcare during confinement, and implications that those compounding factors have on reentry and broader community health. Many articles identify actionable ways to address those challenges and to promote a mainstream understanding of carceral health as a critical component of public health.

The first several articles focus on COVID-19, both to understand the pandemic's disproportionate effects on incarcerated persons and staff working in carceral settings and to demonstrate the pressing improvements needed to address carceral public health broadly. Waddell et al. provide a national picture of successes and challenges during responses to COVID-19 in carceral facilities through qualitative interviews with staff from facilities and health departments across the country (*7*). Two additional articles provide state perspectives by focusing on specific scenarios. Tunstall et al. describe the work of a multidisciplinary governmental team in Colorado to keep youth and staff in juvenile facilities safe (*8*). Gurrey et al. describe how partnerships forged between the Washington State Department of Health and Department of Corrections during the pandemic supported their joint response to a large tuberculosis outbreak in the state's adult prison system during 2021–2022 (*9*).

Although the COVID-19 pandemic catalyzed and invigorated carceral–public health partnerships in many jurisdictions, it also revealed the patchwork coverage of carceral systems within existing public health data sources at local, state, and national levels. Two articles in this supplement illustrate creative public health surveillance strategies that facilities and health departments developed to fill those data gaps, and potential applications to other infectious diseases. Saber et al. describe a COVID-19 wastewater testing program developed through a partnership between academic researchers and a local urban jail in Georgia (*10*), and Porter et al. evaluate a semiautomated strategy to identify COVID-19 cases associated with local jails in Minnesota by using keyword matching within case reports and electronic laboratory reports received by the health department (*11*).

In addition to COVID-19, this supplement highlights 3 infectious disease outbreaks and case summaries in state prisons and local jails as examples of responses to emerging health threats in carceral settings. Hennessee et al. present data on recent *Candida*

Author affiliation: Centers for Disease Control and Prevention, Georgia, USA

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[1]Current affiliation: Multnomah County Health Department, Oregon, USA

*auris* cases among persons confined in state prisons in multiple states and describe considerations for infection control in healthcare and non-healthcare spaces within those facilities (*12*). Kamali et al. describe an outbreak of invasive *Serratia marcescens* in a California state prison in which genomic sequencing was used to identify contact patterns and possible transmission sources (*13*). Hassan et al. present findings from qualitative interviews with staff and persons detained in the Cook County Jail in Chicago, Illinois, after potential exposure to mpox (*14*), highlighting the need to include persons living and working in affected facilities when developing disease prevention programs and response strategies.

Several articles discuss access to everyday infectious disease prevention, another key facet of carceral health. Laryea-Adekimi et al. describe a process to develop vaccine education messaging and identify communication methods preferred by persons incarcerated in prisons in several countries in Europe (*15*). Wolf et al. document successes and challenges in implementing a routine screening program for sexually transmitted infections among youth detained in Utah juvenile facilities (*16*). Two articles focus on preexposure prophylaxis (PrEP) to prevent HIV infection, from different vantage points. Nijhawan et al. present findings from a study among persons recently released from confinement (*17*), demonstrating high prevalence of risk factors for HIV combined with low awareness of their risk. From the other side of the walls, Huang et al. describe the development and early results from a novel PrEP program available to persons incarcerated within the Federal Bureau of Prisons as part of re-entry planning (*18*). To conclude that section, McNamara et al. review the evolution of policy and practice for hepatitis C testing and treatment within prisons and jails (*19*), emphasizing the importance of carceral settings in hepatitis C elimination throughout the United States.

The final 2 articles emphasize the potential influence of facility and public policy on the future of carceral health. Kendig et al. make the case for developing comprehensive infection prevention and control programs tailored to the unique implementation challenges within carceral environments and discuss the need to invest in staff training and enhanced carceral–public health collaborations (*20*). Finally, Wurcel et al. describe recent trends in state-level efforts to improve access to healthcare during confinement and continuity of care after release through waivers of the Medicaid Inmate Exclusion Policy (*21*).

Collectively, the articles in this supplement highlight 4 pressing needs to improve carceral public health. First, partnerships among health, social service, and carceral agencies need to improve at all jurisdictional levels. Lessons from COVID-19 highlight a variety of ways to achieve this goal, and organizations found success when they broadened the definition of who their partners are or should be, not only outside their organizations but also within them, including incarcerated persons (*8*,*10*,*14*,*15*).

Second, carceral and public health partners need to share data to reach common goals, including readiness for the next public health threat (*7*–*11*). When facilities participate fully in public health surveillance, infectious disease outbreaks in prisons and jails can be identified earlier, preventing illness and death and allowing the facility to return to normal operations faster. Through sustained communication and data transparency, health departments can muster resources to support carceral facilities during public health emergencies and can offer training and assistance to prevent infectious disease outbreaks.

Third, access to preventive healthcare during incarceration needs to expand. A movement toward caring for the overall health of persons during confinement has been growing in recent years, and more carceral administrators now view the health of the populations under their care and custody as part of their responsibilities. To continue that momentum, expanding opportunities for preventive healthcare interventions during confinement and enabling continuity of care during transitions back into the community are essential.

Finally, to effectively collaborate, share data, and support healthcare in carceral settings, public health and carceral systems need to better understand one another. A growing number of health departments are making the decision to dedicate staff to public health needs within carceral facilities—positions largely funded through time-limited COVID-19 appropriations—and some carceral systems are likewise investing in maintaining staff focused on population health. Some states have also embedded health department staff within facilities, supporting those positions jointly through the department of health and department of corrections. However, those examples are not the norm. Sustained funding is needed to scale up and support such investments for the long term.

As the articles in this supplement demonstrate, carceral facilities do not exist in isolation; instead, quite the opposite is true. The health of persons living and

working in those settings reverberates through communities across the country in myriad ways—when staff return home from work each day, when incarcerated persons are transferred between facilities in different jurisdictions or participate in work release programs, and when most eventually are released to reunite with their families. As a society, our varied agencies and institutions—and we as individual practitioners, staff, and community members—each have a role to play in safeguarding and improving people's health during confinement, supporting their continued health and success after release and, ultimately, encouraging alternatives to incarceration and evolution of criminal justice systems to better support public health.

### A Note on Terminology

Throughout this supplement, the general term "carceral" is used to refer to facilities collectively, without specifying facility type, such as prison or jail. Similarly, "confinement" and "incarceration" are used to refer to the state of being held within any of these facilities broadly. When needed, more specific terms are used to refer to particular types of facilities. "Correctional facilities" refer to state and federal prisons, which primarily hold persons who have been tried for a crime, convicted, and sentenced, typically for a duration of >1 year. "Detention facilities" refer to locally administered jails and police lockups, federal pretrial facilities, and facilities administered by immigration authorities. Jails and federal detention facilities hold persons accused of a crime who are awaiting adjudication, trial, or sentencing, and in some cases persons who have been tried, convicted, and sentenced for a short duration. Immigration detention facilities hold persons for civil rather than criminal charges while they undergo immigration proceedings or await deportation. When referring to facilities holding only youth, articles in this supplement use terms including "youth confinement," "youth detention," and "juvenile detention." Preferred terminology varies by jurisdiction.

"Probation" and "parole" are types of community supervision. "Probation" refers a period of supervision in the community imposed by the court as an alternative to incarceration. "Parole" refers to a period of community supervision after an early, conditional release from prison.

Some articles in this supplement use the term "justice system" to refer to the collective processes and systems involved in arrest, detention, trial, and outcomes including probation, parole, and incarceration. Other articles use "criminal legal system" as an alternative to "justice system" to reflect historical and current challenges to achieving justice through these processes and systems in the United States.

## About the Author

Ms. Hagan is an epidemiologist serving as Senior Scientist for Correctional Health within the Office of Readiness and Response, Centers for Disease Control and Prevention, Atlanta, Georgia, USA. Her research interests focus on the health of people who are incarcerated and people experiencing homelessness.

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Address for correspondence: Liesl Hagan, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop H24-12, Atlanta, GA 30329-4018, USA; email: vqf8@cdc.gov

# Lessons Learned from COVID-19 Response in Correctional and Detention Facilities

Caroline Waddell, Ashley Meehan, Megan Schoonveld, Zoe Kaplan, Michael Bien, Claire Bailey, Emily Mosites, Liesl M. Hagan

The COVID-19 pandemic disproportionately affected persons held in and working in correctional and detention facilities, causing facilities' traditional priorities to shift when healthcare and public health needs temporarily drove many aspects of operations. During July–August 2022, we interviewed members of health departments and criminal justice organizations to document lessons learned from the COVID-19 response in correctional settings. Participants valued enhanced partnerships, flexibility, and innovation, as well as real-time data and corrections-specific public health guidance. Challenges included cross-sector collaborations, population density, scarcity of equipment and supplies, and mental health. Most participants reported improved relationships between criminal justice and public health organizations during the pandemic. Lessons from COVID-19 can be applied to everyday public health preparedness and emergency response in correctional facilities by ensuring representation of correctional health in public health strategy and practice and providing timely, data-driven, and partner-informed guidance tailored to correctional environments when public health needs arise.

During the COVID-19 pandemic, persons held in correctional and detention facilities in the United States experienced higher COVID-19 incidence and deaths than the general public (*1*,*2*). Dense housing conditions in those settings can increase the risk for rapid virus transmission among both persons held in and persons working in these facilities (*3*–*5*), and high prevalence of comorbidities among incarcerated persons can increase the risk for severe COVID-19 outcomes (*6*).

Author affiliations: Centers for Disease Control and Prevention, Atlanta, Georgia, USA (C. Waddell, A. Meehan, M. Schoonveld, Z. Kaplan, C. Bailey, E. Mosites, L.M. Hagan); CDC Foundation, Atlanta (M. Bien)

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Because of elevated COVID-19 risk, public health agencies recommended enhanced prevention strategies for correctional and detention facilities (*7*). However, some strategies were difficult to implement or produced unintended consequences. For example, limiting in-person visitation and implementing quarantine and medical isolation in restrictive environments negatively affected mental health among incarcerated persons (*8*,*9*). In addition, such restrictive conditions discouraged persons from reporting COVID-19 symptoms, sometimes resulting in further transmission and large outbreaks (*10*).

During the pandemic, many correctional and detention facilities shifted operations to address healthcare and public health needs in addition to traditional security and public safety priorities. Over the extended period that these public health measures were in place, facilities had to find ways to balance COVID-19 prevention with ongoing security, mental health, and programmatic needs. To maintain this balance, facilities and public health agencies collaborated in unprecedented ways, sharing information and developing cross-disciplinary relationships (*11*).

Numerous editorial articles have highlighted the need to prioritize confinement facilities in future public health responses (*10*,*12*–*15*). In addition, published review articles emphasized the importance of collaborative approaches among public health and correctional agencies to address infectious diseases in correctional and detention facilities broadly (*16*,*17*). Several existing qualitative analyses included perspectives from primarily individual carceral systems, from multiple carceral systems at the same governmental level (i.e., state prisons), and from incarcerated persons regarding their unique needs during the COVID-19 response (*11*,*18*–*21*). However, empirical evidence is limited providing perspectives from a different types and

levels of criminal justice organization types alongside viewpoints from healthcare organizations and health departments, all of whom play integral roles in infectious disease preparedness and response. In this analysis, we report findings from in-depth interviews with diverse public health and justice system organizations across the United States about the COVID-19 response in correctional settings. We identify and document common challenges, successful strategies, and actionable steps that public health practitioners can take to promote correctional health and to support correctional and detention facilities beyond COVID-19.

## Methods

### Participants

During July–August 2022, the Centers for Disease Control and Prevention (CDC) special populations team invited staff from criminal justice organizations and state health departments to participate in in-depth interviews related to their experiences responding to COVID-19 in correctional and detention facilities. The criminal justice organizations consisted of correctional and detention facilities, private correctional healthcare contractors, and federal agencies and professional organizations working within the US criminal justice system. Health department participants included staff assigned to respond to COVID-19 in correctional and detention facilities in their jurisdiction. We intentionally selected organizations (*22*) from an extensive list of governmental and nongovernmental organizations that the special populations team interacted with during the pandemic regarding COVID-19 response in correctional and detention facilities. To ensure that interviews included organizations without existing relationships with CDC, we supplemented the list with suggestions from leaders within prominent criminal justice organizations and agencies. The invited organizations were selected to maximize variation in geography, governmental level (federal, state, or local), facility size, population age, and role within the criminal justice system. Invited organizations could include ≤3 participants in the interview.

### Data Collection and Analysis

Two CDC staff (1 facilitator and 1 notetaker) conducted 1-hour virtual interviews. Interviewers stated that participation would not influence CDC funding or partnerships, and participants provided verbal informed consent. No incentives were provided. Interviewers used a semistructured questionnaire to explore challenges and successes during COVID-19 response in correctional and detention facilities, relationships between public health and criminal justice organizations, and ways public health agencies can support correctional health in the future.

Two reviewers analyzed the data using thematic analysis (*23*). Reviewers developed separate codebooks with a subset of interviews by using an inductive approach, compared findings, and grouped codes to identify broad themes (*24*). After coding all interviews, we synthesized responses into summaries of emergent themes. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy (45 C.F.R. part 46.102(l) (*2*), 21 C.F.R. part 56; 42 U.S.C. §241(d); 5 U.S.C. §552a; 44 U.S.C. §3501 et seq).

## Results

Of the 33 invited organizations, 26 (79%) organizations (51 persons in total) participated in interviews. Participants included 21 criminal justice organizations and 5 state health departments (Table 1). Criminal justice staff roles included healthcare (46%), administration (29%), custody (22%), and occupational health (2%). All public health staff had served in an emergency response role related to correctional and detention facilities during the pandemic.

We describe lessons learned by presenting themes that emerged from participant interviews. The themes relate to participants' views on facilitators and challenges to success in their COVID-19 response (Table 2; Figure; Appendix Table, https://wwwnc.cdc.gov/EID/article/30/13/23-0766-App1.pdf) and to opportunities for future collaboration between criminal justice and public health agencies.

### Facility-Level Factors and Operational Innovations

Participants reported that the population density inherent in correctional settings, limited isolation and quarantine space, and frequent movement of incarcerated persons between facilities and across jurisdictions complicated outbreak prevention and control. Given these constraints, participants stated that their response to COVID-19 was most successful when introducing operational innovation and flexibility into facility policies was possible and when leadership was strong and had previous experience in emergency planning.

The urgency of the pandemic enabled some criminal justice participants to develop innovative solutions to longstanding operational challenges and to gain support to continue them in the future. For example, some participants planned to expand medical screening at intake to include other infectious diseases or to continue

**Table 1.** Organization types and staff roles represented in COVID-19 lessons learned interviews, United States, July–August 2022

| Category | No. (%) |
|---|---|
| Organization type | |
| State departments of health | 5 (19%) |
| Criminal justice organizations | 21 (81%) |
| Federal agencies within the U.S. Department of Justice | 5 (24%) |
| State Departments of Corrections* | 4 (19%) |
| Local jails† | 4 (19%) |
| Youth detention and confinement facilities | 3 (14%) |
| Professional organizations representing the criminal justice system | 2 (10%) |
| Private healthcare contractors operating in correctional/detention facilities | 2 (10%) |
| Private prison operators | 1 (5%) |
| Total organizations interviewed | 26 (100%) |
| Participant staff roles | |
| State health department participants | 10 (20%) |
| Criminal justice organization participants | 41 (80%) |
| Healthcare | 19 (46%) |
| Administration | 12 (29%) |
| Custody | 9 (22%) |
| Occupational health | 1 (2%) |
| Total staff included in interviews | 51 (100%) |

*Includes 1 unified system operating a state's prisons and jails.
†Participating jails included 1 small jail (<250 beds), 2 medium jails (250–1,000 beds), and 1 large jail (>1,000 beds), in addition to the jails represented in the 1 unified state system.

using dedicated intake housing to improve uptake of rehabilitative programming and medical care at the beginning of confinement. Some participants (primarily from youth facilities and jails) planned to use diversion and decarceration strategies more intensively to avoid crowding and encourage community-based rehabilitation. Participants believed continuing to offer virtual services such as telehealth, virtual programming, and virtual visitation (originally implemented to maintain services amidst social distancing requirements) can increase access to rehabilitative programs and specialized healthcare going forward.

### Implementing COVID-19 Prevention Strategies in Correctional Settings

Criminal justice participants perceived testing and vaccination to be the most helpful COVID-19 prevention strategies, although they were difficult to implement. All facilities used testing to prevent introduction of COVID-19 into the population, and some used testing innovatively to maintain access to programming and education (test-to-program) during periods of the pandemic when testing supplies were sufficient. Although criminal justice participants believed masking and social distancing could prevent transmission, most felt implementation and enforcement were impractical in correctional environments, especially over long periods.

### Facility Healthcare Capacity

On-site healthcare capacity varied greatly across facilities. Larger facilities usually had sufficient healthcare services to manage most COVID-19 cases internally and conduct large-scale testing and vaccination programs. However, because those facilities are often not regarded as healthcare settings, their access to personal protective equipment and test kits was limited when supplies were constrained. For smaller facilities, especially jails, access to healthcare providers was limited or intermittent, increasing reliance on community hospitals and delaying testing and vaccination.

### Data Availability

Regardless of size and healthcare capacity, reliance on paper records was common and limited facilities' ability to track population health, conduct contact tracing, access real-time data for decision-making, and comply with information requests for public health reporting, litigation, and government oversight. All health department participants expressed difficulty tracking COVID-19 cases and trends in correctional and detention facilities, particularly at the jail level, and none had systematic disease surveillance systems that included those facilities. Entering individual point-of-care test results was time-intensive for facility staff with competing responsibilities, particularly during mass testing events, limiting the data available to health departments. Most health departments relied on electronic laboratory reports, which required manual matching to addresses and provider names known to be associated with correctional and detention facilities.

### Workforce Capacity

Criminal justice participants reported that the pandemic exacerbated staffing shortages because of

family care needs, fear of contracting COVID-19 in a congregate setting, and strict quarantine and isolation policies. Many facilities offered additional paid leave to encourage staff to stay home when sick and to allow for family care needs, but some expressed that abuse of those policies had been a challenge.

Health department participants reported that facilities' COVID-19 consultation requests exceeded their capacity, contributing to staff burnout. Although their health departments allocated staff to corrections-specific roles, those positions were funded through time-limited sources, such as the COVID-19 American Rescue Plan Act and health equity grants, and participants expressed concern about funding sustainability for correctional health work within their health departments.

### Mental Health

All participants were concerned about mental health and low morale among incarcerated persons and staff because of COVID-related stress and trauma. In particular, participants mentioned that prolonged

**Table 2.** Illustrative quotes on select themes from COVID-19 lessons learned interviews with criminal justice organizations and state health departments, United States, July–August 2022*

| Theme | Criminal justice participants | State health department participants |
|---|---|---|
| Operational innovations<br>Operational innovations that facilities implemented in response to the pandemic, with value beyond COVID-19 | "[COVID] Legitimized use of telehealth—before, payers didn't want to pay for it" | "Created library of addresses associated with correctional/detention facilities so we can match cases with addresses going forward… can reach out to facilities if cases pop up that haven't been reported, to fill in gaps in reporting" |
| Leadership<br>Role of leadership at multiple levels during pandemic response in correctional and detention facilities | "Clinical leadership is critical in these situations, and not often fostered in correctional settings." | "Making sure there was someone in leadership meetings to advocate for resources for congregate settings—to make sure they didn't get forgotten." |
| Mental health<br>Importance of mental health in public health emergency response; unintended consequences of COVID-19 prevention on the mental health of staff and people who were incarcerated | "Recognizing and appreciating staff - for wellness and burnout. Need to think about hazard pay, pay increases, recognizing the risks that staff face." | "Investing in staff and making sure they are taken care of—wellness, time off, being flexible based on their needs, helping them feel supported and connected." |
| Data capacity<br>Having data systems in place for COVID-19 and beyond | "Ahead of the curve on mpox because COVID helped [us] prepare… Knowing we have these tools available and just have to make minor changes for a new disease makes [us] feel less stressed/overwhelmed when something new comes" | "One challenge [to pandemic response] is siloed data systems." |
| Collaboration<br>Internal and external partnerships with other criminal justice agencies, community-based organizations, court systems, and public health agencies | "When facilities were able to turn things around, it was about collaboration—not just across facilities, but within facilities, with health department, etc. multidisciplinary team to help figure out how to handle things." | "Lots of opportunities to expand the relationships developed during COVID to other things. Working with the local jails now to become vaccination sites, training their nurses, getting grants to improve healthcare." |
| Communication<br>Internal and external communication, such as regular meetings, updates or education with colleagues and partners | "Close communication with local health department (don't just call them when there's an emergency) —keep maintaining that relationship, make sure you always have a contact" | "It's so important to take the time to have conversations to understand where facilities are coming from, why implementing public health recommendations was challenging, understanding why some recommendations are not feasible." |
| Public health support<br>Ways public health agencies can support correction and detention facilities in the future | "If public health understood life at a small city jail that would help. Everything seemed to flow well for the big jails, but small ones had it harder to make things work. Especially lack of on-site medical, no logistics section—these things have to be added to people's existing duties." | "The public health workforce needs to understand technical aspects of corrections—if scientists don't know these things, that chips away at trust. We need technical training on what it is like to work in prison and jail." |

*See Appendix (https://wwwnc.cdc.gov/EID/article/30/13/23-0766-App1.pdf) for an expanded version of this table.

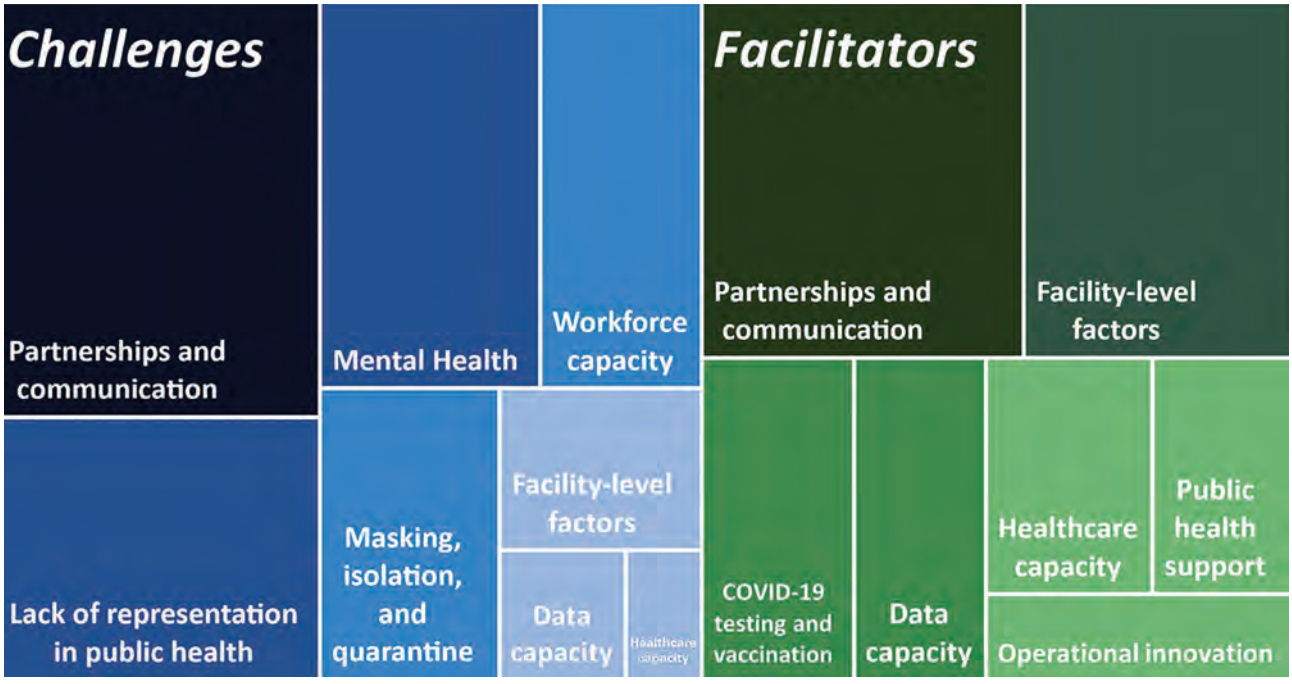


**Figure.** Facilitators and challenges to successful COVID-19 response in correctional and detention facilities, as reported by criminal justice organizations and state health departments, United States, July–August 2022.

quarantine periods limited access to rehabilitative programming, visitation, and education for persons held in correctional and detention facilities, and they reported that this limited access sometimes led to increased suicide attempts and unrest. As mentioned, some facilities were eventually able to balance access to in-person services with disease prevention priorities through innovative testing approaches, where incarcerated persons exposed to COVID-19 were tested regularly and able to maintain in-person activities if they tested negative (test-to-program). Respondents stated that those approaches were only possible when they could consistently access rapid tests at low or no cost.

### Partnerships and Communication

All participants reported that partnerships and communication were imperative for success in their pandemic response. Examples included providing frequent updates to staff and incarcerated persons about policy changes, having regular meetings with external partners (e.g., community-based organizations, courts, public health agencies), and offering one-on-one education to maximize COVID-19 vaccine uptake. Participants emphasized unprecedented cross-disciplinary collaboration between facility healthcare and custody staff, building trust and respect between 2 missions that can sometimes be perceived as conflicting. Some participants expressed concern that those relationships could weaken once COVID-19 was no longer the common enemy.

Before the pandemic, no participating health departments had staff dedicated specifically to correctional health. At the time of the interviews, however, each had assigned from 0.25 to 2 full-time employees to address COVID-19 in correctional settings or to support correctional health broadly. All health department participants felt that their relationships with facilities improved during the pandemic, noting that having corrections-specific public health staff built trust that could enable disease prevention in the future. However, public health responses to COVID-19 cases were sometimes limited by the strength of relationships with individual facilities and by concerns that providing tailored guidance could involve health departments in litigation.

Although critical to success, collaboration and communication were challenging, particularly with external groups, such as the media, families of incarcerated persons, courts, and community hospitals concerned about absorbing facility case surges. The continual evolution of COVID-19 science and policy, combined with politicization of the pandemic, made managing misinformation difficult. Participants stated that in future public health emergencies, expectations

should be set early that guidance will shift as understanding of the threat improves, especially for a novel disease like COVID-19.

### Participant Recommendations for Future Correctional Health Representation in Public Health

Although establishing productive collaborations and partnerships was one of the main challenges reported, most criminal justice participants also stated that their relationships with public health agencies improved during the pandemic, and some provided suggestions for actionable ways to expand and sustain them. Overall, participants believed that prioritizing and elevating correctional health within public health practice in future could reduce stigma that affects incarcerated persons and correctional staff. Specifically, criminal justice participants would like public health agencies at all levels of government to ensure that correctional health is represented within baseline strategy and operations, prioritize correctional and detention facilities when allocating resources, develop ways to track disease trends in correctional settings locally and nationally and share those data with the field, convene criminal justice partners to discuss shared health challenges, and disseminate information to the correctional health field early and consistently during public health emergencies. Participants believed that having a centralized point of contact and corrections-focused staff in public health agencies would support those needs.

In addition, participants cited corrections-specific public health guidance from CDC as a resource that supported their pandemic responses. However, many were frustrated that corrections-specific updates lagged behind guidance for other settings and that guidance was not written with front-line staff as an intended audience. Participants felt strongly that public health agencies should continue developing guidance and educational materials tailored for correctional settings and that such materials should include input from criminal justice partners and persons with lived experience of incarceration to improve their reach and relevance.

## Discussion

Interviews with criminal justice organizations and state health departments identified numerous lessons from the COVID-19 response in correctional and detention facilities, ranging from novel operational modifications to partnership strategies that expanded traditional ways of thinking within both sectors. Interviews with justice system organizations found that the pandemic response resulted in better communication and collaboration with nontraditional partners internally and externally, greater appreciation for public health data, and optimism about continued partnership with public health agencies. Participants reported that maintaining operational flexibility and openness to unique solutions enabled correctional and detention facilities of varying sizes and jurisdictional levels to overcome longstanding resistance to telehealth, virtual visitation, and population reduction. Those findings are consistent with a National Institute of Corrections report that included data from 31 state correctional agencies (*11*). Although innovative approaches such as regular testing to maintain access to programming (test-to-program) were available in some facilities represented here, a report by the Bureau of Justice Statistics found that most state correctional agencies suspended educational and visitation activities for extended periods of time during the pandemic, indicating the need for additional strategies to preserve access to those types of supports during future emergencies (*9*).

Key lessons for public health practitioners center on ensuring that correctional settings are better represented, prioritized for support during public health emergencies, and normalized as a major component of community health. Public health agencies can reach those goals by establishing and sustaining dedicated correctional health roles; those staff can work with criminal justice partners and persons who have been incarcerated to identify needs and codevelop corrections-specific public health tools for healthcare and nonhealthcare audiences. Greater public health awareness of correctional health should also lead to sustained investments in public health surveillance and data systems to include incarceration status and simplify facility case reporting. Public health participants voiced a need for more widely available funding for public health in correctional settings beyond time-limited emergency grants, noting that the success of future outbreak preparedness and response in those settings will depend on integrating correctional health into public health at all levels of government. Similar priorities for the future of infectious disease planning and response in correctional facilities have surfaced from other published literature as well; specifically, the need to include correctional health in everyday public health activities, including having staff and resources dedicated to these settings, developing tailored prevention strategies, and fostering proactive cross-sector collaborations (*11*,*12*,*18*).

The first limitation of our study is that, because CDC staff conducted the interviews, participants might have been hesitant to express critical views about CDC

or other public health agencies. Second, staff members of many of the organizations interviewed had previously interacted with members of the research team in the context of COVID-19 emergency response, introducing selection bias. The views of persons from organizations without existing relationships with CDC might be underrepresented. Third, interviews did not include persons with lived experience of incarceration during the pandemic or their family members. Fourth, interview participants did not represent every type of correctional or detention facility in the United States. However, this work was not designed to be nationally representative, and our findings cover a wide range of perspectives across local, state, and federal government, representing a variety of roles in emergency response within correctional environments, as well as healthcare and professional organizations supporting those settings. We selected the sample carefully to ensure representatives from many types of correctional and detention settings, as well as health departments from across the United States, were included.

In conclusion, lessons from COVID-19 can improve everyday public health preparedness and emergency response in correctional settings. However, translating the pandemic-era elevation of public health priorities within correctional settings to a lasting cultural shift will depend largely on the ability of criminal justice and public health practitioners to maintain the bridges they built during the pandemic and on the public health system's determination to dedicate sustained resources to correctional health.

## About the Author

Dr. Waddell is an Epidemic Intelligence Service Officer with the Centers for Disease Control and Prevention. She serves on the special populations team, conducting public health research on health topics affecting people experiencing homelessness or incarceration.

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Address for correspondence: Caroline Waddell, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop H21-4, Atlanta GA 30329-4018, USA; email: sbu6@cdc.gov

# Lessons Learned from Cross-Systems Approach to COVID-19 Pandemic Response in Juvenile Justice System, Colorado, USA

Ashley M. Tunstall, Shannon C. O'Brien, Deborah M. Monaghan, Alexis Burakoff, Renée K. Marquardt

The global COVID-19 pandemic illustrates the importance of a close partnership between public health and juvenile justice systems when responding to communicable diseases. Many setting-specific obstacles must be navigated to respond effectively to limit disease transmission and negative health outcomes while maintaining necessary services for youth in confinement facilities. The response requires multidisciplinary expertise and collaboration to address unique considerations. Public health mitigation strategies must balance the risk for disease against the negative effects of restrictions. Key aspects of the COVID-19 response in the juvenile justice system of Colorado, USA, involved establishing robust communication and data reporting infrastructures, building a multidisciplinary response team, adapting existing infection prevention guidelines, and focusing on a whole-person health approach to infection prevention. We examine lessons learned and offer recommendations on pandemic emergency response planning and managing a statewide public health emergency in youth confinement settings that ensure ongoing readiness.

The beginning of the COVID-19 pandemic in early 2020 challenged youth confinement facilities in the United States to quickly integrate public health response plans into practice to protect youth and personnel from widespread infection and negative health consequences (*1*,*2*). The Colorado Department of Human Services (CDHS) and Department of Public Health and Environment in the United States recognized the need to partner closely at the outset of the COVID-19 pandemic. The Colorado Division of Youth Services (DYS) within CDHS operates 15 youth services centers that serve youths 10–20 years of age who are temporarily detained or committed to DYS legal custody by district courts statewide and have varying lengths of stay (Table 1) (*3*,*4*).

Author affiliations: Colorado State University, Fort Collins, Colorado, USA (A.M. Tunstall); Colorado Department of Human Services, Denver, Colorado, USA (A.M. Tunstall, D.M. Monaghan, R.K. Marquardt); Colorado Department of Public Health and Environment, Denver (S.C. O'Brien, A. Burakoff); University of Colorado, Denver (R.K. Marquardt)

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This case study is a companion to 2 other articles in this supplement: a national perspective on lessons learned from the COVID-19 response in correctional and detention facilities (*5*) and a case study applying COVID-19 lessons to a tuberculosis outbreak in the prison system of Washington, USA (*6*). Collectively, the articles address a critical knowledge gap regarding the experiences of confined persons during the pandemic. We describe a collaborative and robust response to COVID-19 in the juvenile justice system (JJS) in Colorado that was initiated to ensure adherence to public health risk mitigation strategies while also maximizing healthy development and well-being among a vulnerable youth population.

## Unique Features of the Juvenile Justice Population

Many unique features exist among youth in the juvenile justice system (JJS) that distinguish them from youth in the community as well as from adults in confinement settings. Youth with complex trauma are overrepresented in the justice system and have higher rates of substance abuse and mental health concerns than youth in the general population (*7*). During 2020–2022, >50% of youth in DYS centers had

**Table 1.** Descriptive characteristics of juvenile justice system and youth populations during fiscal year 2021–2022 in case study of cross-systems approach to COVID-19 pandemic response in Colorado, USA*

| Characteristics | Juvenile justice system population† | | | Statewide youth population‡ |
|---|---|---|---|---|
| | Detained | Committed | Paroled | |
| Facilities in operation§ | 8 | 9 | NA | NA |
| Total youth population¶ | 1,751 | 622 | 326 | 829,175 |
| Average age, y (range) | 16 (10–18) | 17 (13–20) | 18 (14–20) | NA |
| Sex | | | | |
| F | 521 (20.6) | 19 (11.4) | 32 (15.9) | 402,260 (48.5) |
| M | 2,009 (79.4) | 148 (88.6) | 169 (84.1) | 426,682 (51.5) |
| Race/ethnicity | | | | |
| Anglo American | 1,007 (39.8) | 58 (34.7) | 74 (36.8) | 467,963 (56.4) |
| Hispanic/Latinx | 886 (35.0) | 67 (40.1) | 80 (39.8) | 259,991 (31.4) |
| African American | 534 (21.1) | 37 (22.2) | 42 (20.9) | 33,920 (4.1) |
| Admission statistics | | | | |
| New youths | 2,530 | 167 | 201 | NA |
| Average daily population | 158.5 | 284.4 | 110.3 | NA |
| Average length of stay | 22.3 d | 18.5 mo | 6.7 mo | NA |

*Values are no. (%) except as indicated. Descriptive terminology, including racial/ethnic categories, reflect official language of the Department of Youth Services (DYS) as of 2023. Specific definitions can be reviewed in the Terms and Definitions section of the DYS Statistical Report. NA, not applicable.
†Juvenile justice system data were retrieved from the Colorado DYS Statistical Report for fiscal year 2021–2022 (*3*).
‡Colorado statewide population estimates for 2021 were retrieved from the Colorado State Demography Office (*4*).
§Two facilities are multipurpose and are included in both detained and committed facility counts.
¶Youth populations were 10–20 years of age.

co-occurring needs, including formal mental health intervention services and treatment level services for substance abuse.

Although the youth population overall might be healthier and at lower risk for severe outcomes from COVID-19 than adults in confinement settings, additional historic and active life stressors can increase health disparities among confined youth compared with their community counterparts (*8*). Exposure to persistent environmental stressors in a confinement setting might negatively affect youth development and increase traumatic stress responses (*9*). In addition, although a group confinement environment provides a rehabilitative structure for youth justice settings, it also creates infection control challenges. Combined with the social and developmental needs of youth compared with adults, access to social, education, and treatment programming within an environment that is already highly restrictive must be weighed when considering quarantine and isolation protocols. When applied in a confinement setting, protocols written collectively for adults and youth might dramatically limit activities more than necessary for youth alone, creating disproportionate burden. Protocols within JJS must also consider the well-being of adult staff who typically have higher risk for severe COVID-19 disease and must balance the approach to address conflicting needs. Those challenges required rapid application of COVID-19 prevention and control protocols, a communication infrastructure across multiple levels of state government that had centralized oversight and geographically diverse locally-provided services, and a system of resource allocation to meet ongoing demands.

## Whole-Person Health Approach to Infection Prevention

In the absence of JJS-specific national guidelines (*10*), a nuanced risk-benefit analysis of infection prevention recommendations was necessary in this unique setting. Specifically, a whole-person health approach (*11*) to infection prevention was used to conceptually guide the development and ongoing consideration of protocols and strategies to manage the pandemic response.

### Guidelines

Some COVID-19 mitigation measures, such as distancing, quarantine, and isolation, have unique effects in youth confinement sites; ramifications of seclusion are known for critical development and well-being of youth. For example, mitigation measures protect against infection of both youth and staff but might also negatively affect mental health when key developmental interactions are interrupted. Many unknowns existed at the start of the pandemic, creating an immediate need to establish an information and communication structure across and within departments. The cadence of published guidance lagged, yet the developmental needs of youth required timely adjustments. In addition, existing guidance lacked the nuance to capture the unique needs within the JJS setting. For example, strict quarantine guidelines aimed at protecting adults are created according to a risk-benefit analysis that is different from that which is applied to youth. Youth have a lower overall risk for severe health consequences from infection but have a higher likelihood of negative social and developmental effects from

prolonged isolation and quarantine. This shifted risk-benefit analysis reinforces the need to intentionally modify universal corrections guidance to best suit the unique needs of the youth population.

### Multidisciplinary Response Team Communication

Multidisciplinary response teams enabled real-time advocacy for diverse aspects of whole-person health within the youth services system. The resultant COVID-19 pandemic response measures were more representative of a holistic approach to health and well-being for youth and enabled more timely adjustments according to youth and staff needs. Persons within the youth services system, including CDHS medical leadership, DYS behavioral health and medical services providers and leadership, youth center security staff and administration, education leadership, dining services professionals, facilities management leadership, Colorado Department of Public Health and Environment epidemiologists, and others, were invited to convene on short notice as needed to review individual case details and determine the application of facility protocols. Although the personnel time investment for this approach was substantial, it created a systematic approach statewide and enabled feedback from critical youth and frontline staff when considering modifications.

### Youth Development Considerations

Adolescence is a time of exploration whereby normative developmental tasks include building and maintaining healthy relationships and skills to promote adaptive coping (*12*). The extended restrictions of the COVID-19 pandemic rendered young persons worldwide particularly vulnerable to the negative psychosocial effects of nonpharmaceutical interventions regardless of setting (*13*). Development and emotional maturation are dependent on life experience; stepping out of this process is not just lost time but lost capacity to attend to development demands. For youth in confinement, the effects of COVID-19 pandemic restrictions was further compounded because the confinement setting is already an environment with limited choice and autonomy. The necessity of restricting interactions disrupted programming designed to address treatment needs. To mitigate those negative effects, adjustments were made to maintain opportunities for skill building, education, and interactions with family and various stakeholders. Risk mitigation strategies comprised reallocating staffing resources and technology to deliver telehealth services and education, as well as providing virtual visitations with family members to maintain support networks.

### Resources

An essential foundational element for success in the Colorado JJS setting was adequate resource allocation for personnel time across multiple roles dedicated to health-centered policies, data and tracking systems, consultation, and equipment and supplies to adequately address needs statewide. A centralized system was required for tracking and ordering inventory across entities and ongoing monitoring as specific guidance from the Centers for Disease Control and Prevention changed. The use of high-quality masks and N95 respirators by staff working among youth with variable masking behaviors enabled more youth activity and movement. Robust testing supplies aided precision infection control decisions, minimizing restrictions. As the pandemic progressed and vaccines, therapeutics, and greater knowledge about the virus became available, a quarantine-alternative method using daily antigen testing of exposed youth enabled continuation of regular education, programming, and activities.

## Conclusions

COVID-19 exacted a large toll on whole-person health across the globe, and youth in the JJS were no

**Table 2.** Key lessons learned and recommendations from case study of cross-systems approach to COVID-19 pandemic response in the juvenile justice system, Colorado, USA, 2020–2023

| Lessons learned | Recommendations |
|---|---|
| Critical need exists for facility-level advocacy and multidisciplinary collaboration to appropriately consider unique facility-level and individual-level requirements. | Identify diverse stakeholders to partner in decision-making. |
| Rapid application of response protocols requires timely communication and consultation with subject matter experts to address barriers as they arise. | Establish robust communication pathways and infrastructure for real-time expert consultations. |
| Youth in confinement settings require diverse services and are often more vulnerable to service disruptions. | Develop juvenile justice–specific response plans. |
| Risk-benefit analyses can change over time and should use a whole-person health approach. | Respond to needs by using a dynamic and holistic risk assessment strategy. |
| Adult staff may have divergent risk profiles and access to vaccination and therapeutics compared with youths. | Be aware of vulnerable populations and create plans to mitigate risk by using a hierarchy of controls approach (*14*). |

exception. The pandemic response in this vulnerable population in a confinement setting required novel approaches and strengthened interdepartmental relationships with public health. The lessons learned in Colorado and resulting recommendations can inform future responses to identify priorities in preparedness activities (Table 2). Those lessons can also be applied to establishing protocols in other settings to activate adaptive response efforts, incentivize protocol adherence, and aid in a coordinated and rapid response to emerging infectious disease threats.

### Acknowledgments

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## About the Author

Ms. Tunstall is a PhD candidate in social work at Colorado State University and the director of Behavioral Health and Medical Services for the Colorado Department of Human Services, Division of Youth Services, in Denver, Colorado. Her research interests focus on violence prevention and the intersection of trauma, aggression, and trauma-responsive environments in school and juvenile justice settings.

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Address for correspondence: Ashley M. Tunstall, Colorado Department of Human Services, Division of Youth Services, 4255 S Knox Ct, Denver, CO 80236, USA; email: ashley.tunstall@state.co.us

# Lessons Learned from Public Health and State Prison Collaborations during COVID-19 Pandemic and Multifacility Tuberculosis Outbreak, Washington, USA

Sixtine O. Gurrey, Lara B. Strick, Lana K. Dov, James S. Miller, Monica Pecha, Randy M. Stalter, David L. Miller, Brandon Marshall, Alonso Pezo Salazar, Laura P. Newman

The large COVID-19 outbreaks in prisons in the Washington (USA) State Department of Corrections (WADOC) system during 2020 highlighted the need for a new public health approach to prevent and control COVID-19 transmission in the system's 12 facilities. WADOC and the Washington State Department of Health (WADOH) responded by strengthening partnerships through dedicated corrections-focused public health staff, improving cross-agency outbreak response coordination, implementing and developing corrections-specific public health guidance, and establishing collaborative data systems. The preexisting partnerships and trust between WADOC and WADOH, strengthened during the COVID-19 response, laid the foundation for a collaborative response during late 2021 to the largest tuberculosis outbreak in Washington State in the past 20 years. We describe challenges of a multiagency collaboration during 2 outbreak responses, as well as approaches to address those challenges, and share lessons learned for future communicable disease outbreak responses in correctional settings.

The prison environment is often conducive to the spread of various infectious conditions because of factors such as overcrowding, poor ventilation, and increased barriers to accessing timely healthcare (*1*). The higher prevalence of underlying conditions among the incarcerated population compared with the general public puts many persons living in such settings at an increased risk for severe health outcomes (*1*). The large COVID-19 outbreaks in prisons in the Washington (USA) State Department of Corrections (WADOC) system in 2020 highlighted the need for a new public health approach to prevent and control COVID-19 transmission in the system's 12 facilities and to reduce severe health outcomes. WADOC and the Washington State Department of Health (WADOH) responded to those outbreaks by strengthening partnerships through dedicated corrections-focused public health staff, improving cross-agency outbreak response for coordinating resources (e.g., masks, testing supplies, isolation settings, and staff), implementing and developing corrections-specific public health guidance, and establishing collaborative data systems.

The urgent demands of the COVID-19 response required redirection of limited resources away from other WADOC health services, including tuberculosis (TB) surveillance. In late 2021, staffing shortages, challenges with TB diagnosis, especially amid a concurrent respiratory disease outbreak, and delayed annual TB screenings contributed to a TB outbreak within WADOC, the state's largest TB outbreak in 20 years. Details about the TB outbreak and Centers for Disease Control and Prevention (CDC) on-site assistance are described elsewhere (*2*). Building on years of partnership and trust

Author affiliations: Washington State Department of Health, Tumwater, Washington, USA (S.O. Gurrey, L.K. Dov, J.S. Miller, M. Pecha, R.M. Stalter, D.L. Miller, L.P. Newman); University of Washington, Seattle, Washington, USA (L.B. Strick); Washington State Department of Corrections, Tumwater (L.B. Strick, B. Marshall, A. Pezo Salazar); Centers for Disease Control and Prevention, Atlanta, Georgia, USA (R.M. Stalter)

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between WADOC and WADOH before and during the COVID-19 pandemic, the agencies adapted approaches from the COVID-19 outbreak response to strengthen the TB outbreak response.

To improve responses to future outbreaks and protect the health of persons who are incarcerated and correctional staff, we describe challenges of a multiagency collaboration during an outbreak response, approaches to address those challenges, and share lessons learned. This case study is a companion piece to 2 other articles: a national perspective on lessons learned from the COVID-19 response in correctional and detention facilities (*3*), and a case study on interdisciplinary COVID-19 response in Colorado youth confinement facilities (*4*).

## Strengthening Partnerships through Dedicated Corrections-Focused Public Health Staff

### Challenge

WADOC clinicians and WADOH have long worked together to respond to communicable diseases in Washington state prisons before the COVID-19 pandemic; however, depending on the pathogen, WADOC needed to communicate with the disease-specific WADOH team. Thus, WADOC clinicians needed to identify a new WADOH team with which to work, and a WADOH epidemiologist unfamiliar with correctional settings had to quickly learn about transmission dynamics specific to the prison, prison logistics (e.g., movement tracking), and how to adapt guidance meant for the general public in this complex setting.

### Approach

Given the risk and frequency for COVID-19 outbreaks in correctional facilities, WADOH designated an epidemiologist and clinician to focus on corrections as part of a specialized Outbreak Response in Non-Healthcare Congregate Settings (NHCS) team. This team co-coordinated the COVID-19 outbreak response with WADOC, guided the implementation of outbreak prevention protocols, and helped track case data. During the TB outbreak, the NHCS team used its familiarity with WADOC's prisons and data systems, and its relationships with WADOC staff, to assist WADOH's TB team with data collection and contact tracing. That process helped identify >3,000 persons who were considered potentially exposed to someone with contagious TB disease based on time spent in the same airspace, which guided testing recommendations and resource prioritization.

### Lessons Learned

Corrections-focused public health staff can support relationships between agencies during any outbreak by understanding operational challenges in corrections facilities and systems. Those public health staff can assist in developing corrections-specific outbreak-response priorities and feasible control efforts.

## Improving Cross-Agency Outbreak Response Coordination

### Challenge

The complexities of custody operations and staffing limit the feasibility of outbreak control measures in correctional settings. Before the COVID-19 pandemic, WADOH primarily partnered with WADOC clinical leadership, and WADOC custody and operations leadership had limited involvement. During early COVID-19 outbreaks in prisons, that approach created operational barriers in outbreak responses.

### Approach

WADOH and WADOC established weekly COVID-19 coordination meetings beginning in mid-2020 to align cross-agency outbreak response strategies, resources, and communications in a rapidly changing pandemic. In addition to epidemiology and clinical teams, meetings included WADOC emergency operations and custody leadership, which improved coordination between agencies and within WADOC and established a shared understanding of outbreak response approaches and constraints. That coordination also helped with efficient planning and scale-up of new disease prevention processes, including implementation of medical isolation and quarantine areas and expanded COVID-19 testing. That meeting model was adapted for the TB response; WADOC and WADOH weekly meetings similarly assisted in cross-agency communications to address TB-specific operational needs. Those needs included arranging large testing events, determining isolation locations, securing medical equipment and medications, and providing education to staff, residents, and their families.

### Lessons Learned

In large-scale, multifacility outbreaks, frequent coordination meetings with epidemiology, clinical, custody, and operations teams across both agencies helped establish a cohesive response strategy. That coordination enabled WADOC and WADOH to arrange resources for outbreak response, including

resources for isolation, testing, and education for staff, residents, and family.

## Following and Developing Corrections-Specific Public Health Guidance

### Challenge

WADOH and WADOC used CDC COVID-19 guidance as a framework for outbreak response in prisons (*5*). Adapting broad recommendations to each prison's unique operation and built environment and to the rapidly changing knowledge on COVID-19 was challenging. Similar issues with guidance arose when implementing CDC's recommendations for TB prevention and control in correctional facilities (*6*), including implementing effective infection control and contact tracing, having clear definitions of exposure for airborne pathogens in prisons, managing disincentives for staff and patients to report symptoms, addressing refusals of testing or treatment, determining isolation duration, and identifying alternative isolation spaces when negative pressure rooms were unavailable (*7*).

### Approach

During both outbreaks, WADOH and WADOC, with help from CDC subject matter experts, tailored guidance implementation based on available resources, physical layout, and operational constraints. Solutions included adopting location-based contact tracing and providing incentives for testing, isolation, and treatment in a noncoercive manner rather than by using punishment for persons who refused testing or treatment.

### Lessons Learned

Tailoring disease control guidance toward the needs of a specific correctional system can help to address unique facility needs, educate staff and residents, and prevent the spread of misinformation. Public health and corrections agencies can work together to implement and adapt standard CDC guidance to their needs.

## Establishing Collaborative Data Systems

### Challenge

Because WADOC lacks an electronic medical record (EMR) system, medical data are only accessible by paper charts and non-EMR electronic databases. Reporting of notifiable conditions mainly occurs manually by telephone or fax. During COVID-19 outbreaks, manual case reporting quickly became unmanageable for WADOC, WADOH, and local health jurisdictions. Because TB testing and diagnosis involves tracking multiple clinical results over time, during the TB outbreak, the absence of an EMR system overwhelmed internal data management and created bottlenecks in information sharing with local partners.

### Approach

First, WADOC designated nonclinical staff to collect and manage COVID-19 data electronically. Second, with support from WADOH, WADOC developed technical expertise in database creation and data management to share information electronically across agencies, including case data and test results. Finally, WADOC and WADOH collaborated on new data management and sharing systems. For example, WADOC developed a COVID-19 website dashboard to provide public transparency. The agencies created a shared Research Electronic Data Capture (REDCap) database to track TB exposures in WADOC prisons as new infectious TB cases were identified and as postexposure screening and diagnostic testing were conducted.

### Lessons Learned

Clinical and public health data collection, management, and dissemination require dedicated staff with a shared understanding of public health and corrections agencies' capabilities and limitations. Securing high-level leadership support and funding to implement modern data systems for both public health and corrections agencies would improve outbreak data surveillance and management.

## Conclusions

The cross-agency, cross-department collaboration and lessons learned from 2 communicable disease outbreak responses in Washington state prisons can serve as a guide to future communicable disease outbreak responses in correctional facilities. Despite the successes of this partnership, institutional barriers and the prison environment itself limited the effect of the efforts of both agencies to reduce the risk for disease transmission. Without an overhaul of the prison system's physical environment and the criminal legal system, airborne transmission of communicable diseases will continue to be a threat in correctional settings. We highlight the need for sustained resources for public health and corrections partnerships and for tailored communicable disease guidance to support the health of incarcerated persons and correctional staff.

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## About the Author

Ms. Gurrey is a correctional health epidemiologist in the Washington State Department of Health's Office of Communicable Disease Epidemiology based in Shoreline, WA, USA. Her research interests include building stronger public health surveillance systems to reduce the burden of communicable diseases among incarcerated persons and correctional staff and understanding effective outbreak response protocols in correctional settings to improve public health action.

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Address for correspondence: Sixtine O. Gurrey, Washington State Department of Health, 1610 NE 150th St, Shoreline, WA 98155, USA; email: sixtine.gurrey@doh.wa.gov

# Correlation of SARS-CoV-2 in Wastewater and Individual Testing Results in a Jail, Atlanta, Georgia, USA

Lindsay B. Saber, Shanika S. Kennedy, Yixin Yang, Kyler N. Moore, Yuke Wang, Stephen P. Hilton, Tylis Y. Chang, Pengbo Liu, Victoria L. Phillips, Matthew J. Akiyama, Christine L. Moe, Anne C. Spaulding

Institution-level wastewater-based surveillance was implemented during the COVID-19 pandemic, including in carceral facilities. We examined the relationship between COVID-19 diagnostic test results of residents in a jail in Atlanta, Georgia, USA (average population ≈2,700), and quantitative reverse transcription PCR signal for SARS-CoV-2 in weekly wastewater samples collected during October 2021–May 2022. The jail offered residents rapid antigen testing at entry and periodic mass screenings by reverse transcription PCR of self-collected nasal swab specimens. We aggregated individual test data, calculated the Spearman correlation coefficient, and performed logistic regression to examine the relationship between strength of SARS-CoV-2 PCR signal (cycle threshold value) in wastewater and percentage of jail population that tested positive for COVID-19. Of 13,745 nasal specimens collected, 3.9% were COVID-positive (range 0%–29.5% per week). We observed a strong inverse correlation between diagnostic test positivity and cycle threshold value ($r = -0.67$; $p<0.01$). Wastewater-based surveillance represents an effective strategy for jailwide surveillance of COVID-19.

Jails, which are short-term carceral institutions, experienced numerous factors during the COVID-19 pandemic that can lead to SARS-CoV-2 transmission, including crowding, mask shortages, and difficulty implementing sufficient quarantine and isolation practices (*1*,*2*). In 2020, 7% of US jails were operating over capacity, despite total admissions decreasing from 10.3 million in 2019 to 8.7 million in 2020 (16%) (*3*). Although the Centers for Disease Control and Prevention published guidelines for COVID-19 management in carceral settings (*4*), COVID-19 incidence exceeded that of surrounding communities up to 5-fold (*5*–*7*). In addition, there are logistical challenges to regularly screening jail residents for asymptomatic disease, especially in large jails that house thousands of persons (*5*,*8*–*12*).

Wastewater-based surveillance (WBS) might detect SARS-CoV-2 before onset of clinical symptoms and could serve as a sensitive, noninvasive early warning tool both regionally and at an institutional level (*13*–*19*). WBS might also limit biases that arise from residents avoiding testing or medical care. If implemented in jails, WBS could potentially save time, resources, and lives. This study examined WBS for monitoring SARS-CoV-2 infection in a large jail in Atlanta, Georgia, USA.

## Methods

### Setting and Population

The Emory University Institutional Review Board determined that this study constituted non–human subject research. The study was set in the Fulton County (Georgia) Jail, which has a 2,600-person capacity (*20*). The mean ± SD population during our study period, October 20, 2021–May 4, 2022, was 2,700 ± 133 persons. The main complex has north and south towers, each with 7 floors, and 6 housing units per floor. People entering move into housing units within 24 hours, predominantly to 1 designated floor of the south tower. Housing units typically hold 40 persons maximum, in 20 two-person cells. When volume exceeds capacity, residents sleep

Author affiliations: Emory University, Atlanta, Georgia, USA (L.B. Saber, S.S. Kennedy, Y. Yang, K.N. Moore, Y. Wang, S.P. Hilton, P. Liu, V.L. Phillips, C.L. Moe, A.C. Spaulding); Zucker School of Medicine at Hofstra/Northwell, Hempstead, New York, USA (T.Y. Chang); Albert Einstein College of Medicine, Bronx, New York, USA (M.J. Akiyama)

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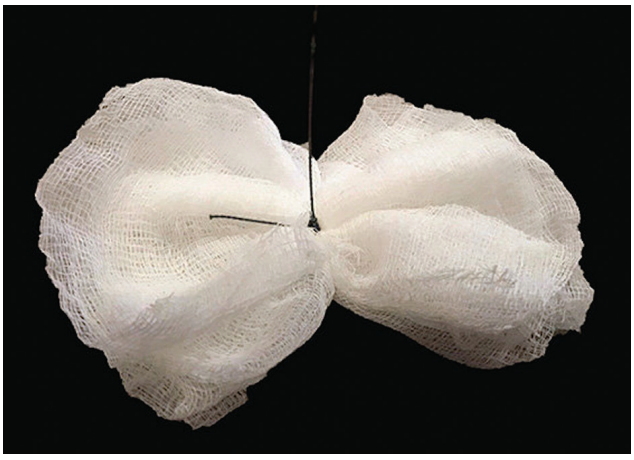

**Figure 1.** Moore swab: 4-in by 4-in cotton gauze squares tied together with nylon fishing line (*21*).

on mattresses on the floor. The population of this study was jail residents, who on average outnumber correctional officers 15-fold.

### Wastewater Monitoring

A sampling team from Emory University in Atlanta collected weekly wastewater samples from the jail throughout the project period. Moore swabs (Figure 1) were suspended overnight in manhole sites around the jail property (Figure 2) (*21*,*22*). Eluted wastewater from the swabs was tested by using quantitative real-time reverse transcription PCR (qRT-PCR) at the Center for Global Safe Water, Sanitation, and Hygiene Laboratory at Emory University, as described (*21*,*23*). The amount of SARS-CoV-2 viral RNA present in a sample was measured by qRT-PCR cycle threshold (Ct) value, which is inversely related to the concentration of SARS-CoV-2 in the Moore swab eluate. Positive samples were defined as those with qRT-PCR results in both duplicate wells ≤40 Ct and within 2 Ct of each other. For this analysis, wastewater data originated from a single, downstream collection point, site 3 (Figure 2), which contained a mixture of wastewater from the south and north towers (Appendix, https://wwwnc.cdc.gov/EID/article/29/13/23-0775-App1.pdf). We used those data as proxy for wastewater concentration of SARS-CoV-2 for the entire jail. Samples were not collected during 3 holiday weeks in November–December 2021.

### COVID-19 Individual Diagnostic Testing

Healthcare staff routinely offered residents opt-out, rapid antigen testing at intake, as part of the jail's entry protocol (BinaxNOW, Abbott Laboratories, https://www.abbott.com, through January 31, 2022; QuickVue; Quidel Corporation, https://www.quidel.com, starting February 1, 2022). After intake, antigen testing was available if residents exhibited COVID-19 symptoms, or upon request.

An Emory University team offered opt-out mass screening to a subset of jail residents on a weekly basis. Residents opting in provided self-collected nasal specimens, which were tested by RT-PCR. Insufficient staffing precluded offering mass screening to the entire resident population at any single timepoint. Each week, areas of the jail screened by RT-PCR were either randomly selected or targeted on the basis of known ongoing outbreaks.

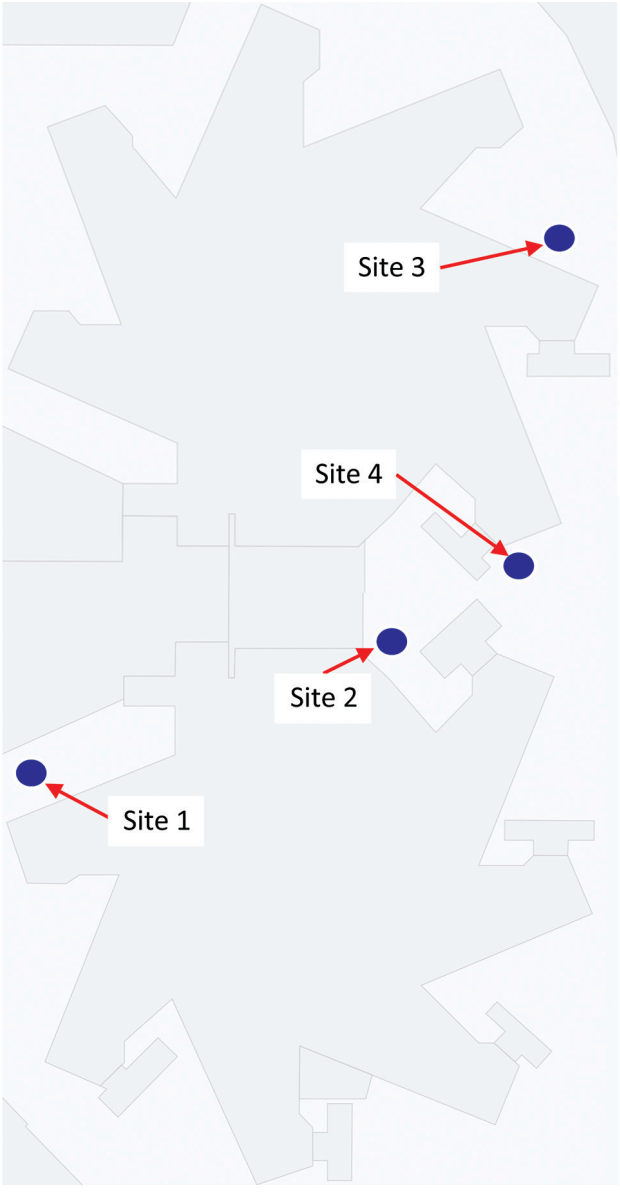


**Figure 2.** Outline of the Fulton County Jail, Atlanta, Georgia, USA, showing wastewater-based surveillance collection sites. Site 3 was used for final analysis as a proxy for wastewater-based surveillance results of the entire jail.

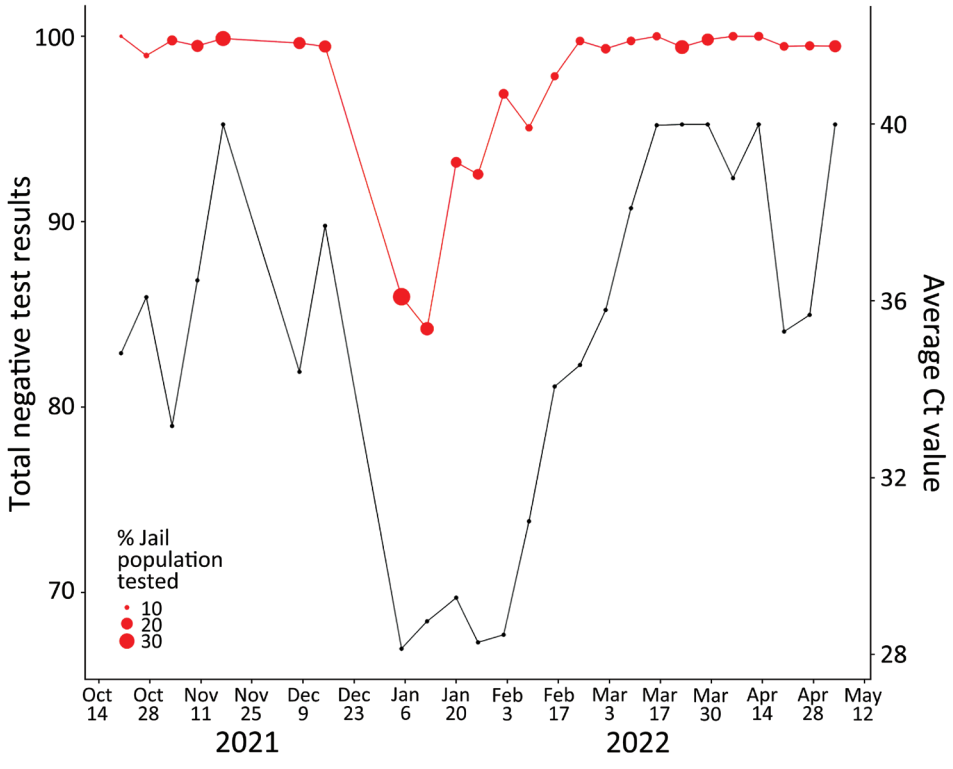


**Figure 3.** Average Ct values of wastewater samples (black lines) versus total percentage of negative COVID-19 diagnostic test results (red lines), Fulton County Jail, Atlanta, Georgia, USA, October 2021–May 2022. Dot sizes are proportional to the percentage of the jail population undergoing a COVID-19 diagnostic test for the corresponding week. Ct, cycle threshold.

### Data Analysis

We stored, managed, and analyzed all data in Excel software (Microsoft, https://www.microsoft.com) and R software (The R Foundation for Statistical Computing, https://www.r-project.org). We aggregated the PCR data with results of intake antigen testing to calculate the percentage of diagnostic tests with positive results at each timepoint. First, we analyzed diagnostic test results and wastewater RT-PCR results separately to examine temporal trends. We then compared those trends through time-matched results from the COVID-19 diagnostic tests and WBS. We calculated the Spearman correlation coefficient (r) for the relationship between Ct values of wastewater samples and percentage of the COVID-19 diagnostic tests that had positive results. Last, we performed a logistic regression analysis of the presence or absence of SARS-CoV-2 in wastewater samples and the percentage of positive COVID-19 diagnostic tests matched by week. We assigned a Ct value of 40 when the RT-PCR result for a wastewater sample was negative.

## Results

The jail population during the study period ranged from 2,497 to 2,904 residents. Most (98.4%) persons in the jail during this period were male; 88.8% were Black.

### Wastewater Monitoring

A total of 79 wastewater samples were collected from 4 manhole sites (Figure 2). Spearman correlation coefficients showed strong correlations between Ct values of wastewater samples collected from different sites on the same day (Appendix Table 2, Figure 2), confirming that results from 1 site (site 3) sufficed as a jailwide proxy.

SARS-CoV-2 was detected in 20 (80%) of 25 Moore swab samples of wastewater from site 3 during the study period. Of the 20 positive samples in the study period, the mean Ct value was 33.94 (SD 3.74).

There was considerable temporal variability in the wastewater Ct values during the study period (Figure 3). The wastewater Ct value decreased sharply between the samples collections during the week of December 15, 2021, and during the week of January 5, 2022. This decrease was followed by the lowest Ct value during the study period (28.1 on January 5, 2022, which was during the Omicron virus surge in Atlanta). The wastewater Ct values were in that range for 5 consecutive weeks of the surge (Figure 3). No SARS-CoV-2 RNA was detected in wastewater samples from 1 sampling date in November 2021 or from 4 sampling dates in March–April 2022.

### COVID-19 Diagnostic Testing

A total of 17 mass diagnostic PCR testing events resulted in 3,770 total self-collected swab specimens

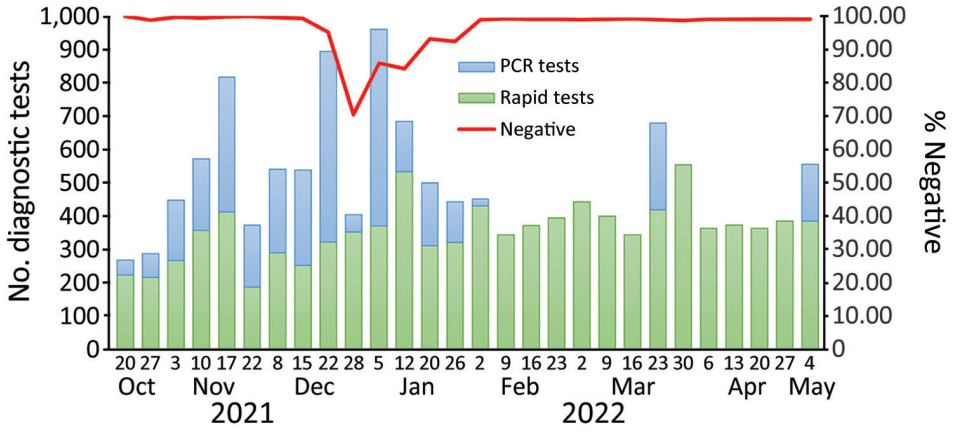


**Figure 4.** PCR and rapid COVID-19 diagnostic test results, Fulton County, Jail, Atlanta, Georgia, USA, October 2021–May 2022. The percentage of the combined negative diagnostic results is overlaid, showing peak in positive results (i.e., nadir of negative results) in late December 2021.

tested by RT-PCR. A total of 9,975 rapid COVID-19 diagnostic tests were conducted at intake over 28 weeks (Table 1).

The median number of diagnostic tests conducted each week was 443 (Table 2). Most were rapid antigen tests (median = 363) rather than PCR diagnostic tests (median = 186). The weekly percentage positivity for PCR tests and for rapid antigen tests were highly correlated (r = 0.91) (Table 3). We aggregated the PCR test and rapid antigen test results to calculate the weekly diagnostic test positivity rate during October 20, 2021–May 4, 2022. The combined test positivity averaged 3.9% (SD 6.6%) over the study period. We compiled the number of weekly COVID-19 diagnostic tests administered and the percent positivity over the study period (Figures 3, 4). The percentage positivity fluctuated but increased as the study progressed (Figure 3).

PCR tests consistently had a higher percent positivity than the routine rapid antigen tests. During the midwinter surge, there was a much higher proportion of positive PCR tests (e.g., week of December 28, 2021, 63.5%) compared with positive rapid antigen test results (24.4%). Nonetheless, the positivity rates for the PCR test and rapid antigen test were correlated during weeks when both tests were administered (r = 0.65; p = 0.004).

**Table 1.** Demographic characteristics of residents in the Fulton County Jail Main Complex, Atlanta, Georgia, USA, October 20, 2021–May 4, 2022*

| Characteristic | % Jail population |
|---|---|
| Reported sexual assignment | |
| M | 98.4 |
| F | 1.6 |
| Race/ethnicity | |
| Black, non-Hispanic | 88.8 |
| White, non-Hispanic | 10.3 |
| Hispanic | <1 |
| Other | <1 |
| Charges | |
| Misdemeanor only | 6.8 |
| Felony | 93.2 |

*Source: Fulton County Jail.

### Wastewater and Diagnostic Comparison

When the percent positivity for diagnostic tests was low for several weeks (e.g., March 9, 2022–April 13, 2022), the Ct values for the wastewater samples were high (38.1–40) or negative, indicating little or no detection of SARS-CoV-2 RNA in the wastewater samples. Low Ct values were measured in the wastewater samples during the weeks when the COVID-19 diagnostic test percent positivity was high (e.g., early January 2022). Overall, the total COVID-19 diagnostic test percent positivity had a strong negative correlation with the wastewater Ct values combined over time (r = −0.67; p<0.01) (Table 3).

We used logistic regression to analyze the relationship between percent positivity in diagnostic testing and WBS results as a dichotomous outcome (presence/absence of SARS-CoV-2). Holding all other predictors constant, we found that the odds of a positive WBS reading increased by 4.773 (95% CI 3.701–5.845) for each percentage point increase in diagnostic test percent positivity (Appendix Figure 3).

## Discussion

Percent positivity of COVID-19 diagnostic testing among jail residents correlated with SARS-CoV-2 detection in the jail wastewater during the same time periods, which provides evidence that WBS can serve as an indicator of viral infection within the jail. The study team's inability to gather self-collected specimens from all jail residents in a single week supports the need for an aggregate indicator of population infection. Overall, our data indicate that WBS was a sensitive signal for COVID-19 cases in the jail population and of surges in infection (*6*,*10*,*24*,*25*).

The experience in this jail indicates that WBS can detect the beginning of an outbreak before

**Table 2.** Summary of COVID-19 diagnostic testing results at the Fulton County Jail, Atlanta, Georgia, USA, October 2021–May 2022*

| COVID-19 diagnostics weekly | Mean (SD) per week | Median per week | Minimum–maximum per week | Totals over entire study |
|---|---|---|---|---|
| No. diagnostic tests | 491 (176) | 443 | 267–961 | 13,745 |
| No. rapid tests | 356 (84) | 363 | 186–554 | 9,975 |
| No. PCR tests | 222 (167) | 186 | 20–591 | 3,770 |
| % Jail population tested† | 18.3 (7.1) | 16 | 9.7–38.2 | NA |
| Overall percentage positivity‡ | 3.39 (6.56) | 0.55 | 0–29.5 | NA |

*NA, not applicable.
†Numerator is the number of positive test results in a given week, denominator is the jail population for the week.
‡Numerator is the number of positive test results in a given week, denominator is the total tests for the same week

clinical signs appear. The spike in COVID-19 cases in the jail (January 5, 2022) occurred 8 days before a community surge in Fulton County and aligned with COVID-19 case surges in Atlanta and nationwide caused by the Omicron variant (*24*). Therefore, jails might serve as an early warning signal for community spikes for COVID-19 and other infectious diseases detectable in wastewater. This study also demonstrated the efficiency and feasibility of conducting WBS for SARS-CoV-2 on a regular basis in a jail setting. Although the median number of rapid (n = 363) and PCR (n = 186) tests differed during the study period, the strong correlation between the positivity rate of the 2 different tests ($r = 0.65$; $p<0.01$) suggests relatively accurate results from both forms of diagnostic tests. Over the fall of 2021, the portion of the jail population that participated in the mass testing events (Figure 3) trended upward because of efficiencies introduced (Appendix).

As previous WBS studies on university campuses have noted, collecting and processing a few Moore swab samples in this study was faster and much less expensive than individual diagnostic testing of all jail residents (*26*). Because of this finding, there are still several functioning WBS programs, with potential to expand to other infectious diseases. A report on costs of WBS in this study is pending. Future work will examine the use of WBS to detect other pathogens present in the jail population, and possibly sequencing COVID-19 strains that are detected in the wastewater to contribute to molecular surveillance.

Strengths of this study include sufficient numbers of diagnostic tests and WBS samples to enable weekly comparisons between the 2 testing methods, and close collaboration with jail officials that provided the opportunity to conduct the study over a full 6-month period that captured temporal trends, including the entirety of the Omicron variant peak. Over the fall of 2021, the portion of the jail population that participated in the mass testing events for this study (Figure 3) trended upward because of efficiencies introduced (Appendix).

The first limitation of this study is that jail size precluded diagnostic testing of the entire jail population in any single week; percentage positivity from the portion tested for COVID-19 was used as a proxy. In addition, individual PCR tests were run outside of mass testing events as needed for the purposes of the jail's infection control program, not conducted simply for populationwide surveillance. Nonetheless, testing was never confined to jail areas known to have high or low COVID-19 prevalence. Second, the qRT-PCR results (Ct values) for the Moore swab samples are a semiquantitative indicator of SARS-CoV-2 concentration in wastewater because of the unknown volume of wastewater that passes through the swab (*16*). Third, a jail is not a closed system; many residents enter and leave daily. A resident who sheds fecal matter containing SARS-CoV-2 might leave the jail before the next round of individual COVID-19 screening and would therefore only be represented in the wastewater results. Fourth, only COVID-19 tests among residents were included in our analyses. However, because there are ≈15 times as many jail residents

**Table 3.** Spearman correlation coefficients (r) for percentage positivity of diagnostic tests and wastewater Ct values within and between variable groupings, Fulton County Jail, Atlanta, Georgia, USA, October 20, 2021–May 4, 2022*

| Diagnostic test | r (p value) PCR | Rapid antigen | Total |
|---|---|---|---|
| PCR | Referent | 0.91 (<0.01) | 0.78 (<0.01) |
| Rapid antigen | | Referent | 0.97 (<0.01) |
| Total | | | Referent |
| Wastewater and diagnostic correlation¶ | | | |
| Wastewater Ct values | −0.54 (0.048) | −0.64 (<0.01) | −0.67 (<0.01) |

*Percentage positivity for each category was computed by dividing the number of positive test results in 1 week by the total number of tests administered for the same week. Each datapoint is correlated with all other datapoints; none are grouped based on date or other variables. Ct, cycle threshold.
†Based on wastewater Ct values.

than staff, fecal material from staff probably had a negligible effect on the WBS results.

WBS was an efficient and accurate approach for tracking trends in SARS-CoV-2 infection in this jail population. Its most useful role might be as a sentinel surveillance tool when the signal switches from negative to positive, indicating a need for diagnostic testing in specific areas of the jail. Even under ideal circumstances with adequate resources, administering individual weekly COVID-19 diagnostic tests to the entire Fulton County Jail was not a feasible COVID-19 surveillance strategy. The WBS results aligned well with the percentage positivity of COVID-19 diagnostic tests among jail residents and could serve as a sensitive and economical surveillance tool for COVID-19 for this jail. In addition, because residents of the jail come from a wide geographic range in a large county, our results suggest that WBS at the jail could be useful for understanding COVID-19 trends in the jail itself to guide primary prevention and response to mitigate transmission and that jails could serve as a valuable sentinel site for monitoring trends in COVID-19 cases and genetic variants in the wider community.

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## About the Author

During this study, Ms. Saber was a project manager at Emory University, Atlanta. She is currently a Fulbright Research/Study grant recipient working in Kenya. Her primary research interests are understanding how use of water, sanitation, and hygiene interventions can prevent and survey for infectious disease on a global scale.

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Address for correspondence: Anne C. Spaulding, Emory University, 1518 Clifton Rd, Atlanta, GA 30322, USA; email: aspauld@emory.edu

# Development and Evaluation of Surveillance System for Identifying Jail-Associated COVID-19 Cases in Minnesota, USA, 2022

Leah J. Porter,[1] Erica Rapheal,[1] Rebecca Huebsch, Tiana Bastian, Trisha J. Robinson, Hanna Chakoian, Karen G. Martin,[2] Jennifer Zipprich[2]

Confinement facilities are high-risk settings for the spread of infectious disease, necessitating timely surveillance to inform public health action. To identify jail-associated COVID-19 cases from electronic laboratory reports maintained in the Minnesota Electronic Disease Surveillance System (MEDSS), Minnesota, USA, the Minnesota Department of Health developed a surveillance system that used keyword and address matching (KAM). The KAM system used a SAS program (SAS Institute Inc., https://www.sas.com) and an automated program within MEDSS to identify confinement keywords and addresses. To evaluate KAM, we matched jail booking data from the Minnesota Statewide Supervision System by full name and birthdate to the MEDSS records of adults with COVID-19 for 2022. The KAM system identified 2,212 cases in persons detained in jail; sensitivity was 92.40% and specificity was 99.95%. The success of KAM demonstrates its potential to be applied to other diseases and congregate-living settings for real-time surveillance without added reporting burden.

Confinement facilities are high-risk settings for the spread of infectious diseases and were hotspots during the COVID-19 pandemic (*1*). Confinement facility design prioritizes security and space efficiency, creating inherent challenges to implementing disease mitigation strategies such as distancing, isolation, and quarantine (*1*–*3*). Spatial limitations can even disincentivize symptom reporting because of the use of solitary confinement spaces for medical isolation (*4*,*5*). Detained populations have limited autonomy to adopt prevention measures and are more vulnerable than the general population to severe disease resulting from higher rates of comorbidities and lower vaccine uptake (*6*–*10*). Frequent population turnover complicates contact tracing, generates continual infection introductions, and increases disease spread within and between confinement facilities (*3*,*11*). During the COVID-19 pandemic, US confinement facilities experienced increased staff turnover and strained staff capacity because of illness, especially during outbreaks (*12*,*13*).

The 82 jails in Minnesota, USA, are independently operated and vary greatly in size, technology, and healthcare infrastructure, unlike prisons, which are centrally operated (*14*). Jail capacity to implement COVID-19 mitigation strategies and deal with staffing shortages during outbreaks also varies widely between facilities (*15*). Rural and small jails in particular are more likely to have limited access to healthcare services and to lack electronic record systems because of funding constraints (*7*,*16*,*17*).

Public health practitioners at the Minnesota Department of Health (MDH) worked closely with confinement facility staff on COVID-19 surveillance and response, critical for ensuring access to testing, personal protective equipment, and therapeutics (*15*). In 2022, results of all professionally administered COVID-19 tests were reportable to the state as electronic laboratory reports (ELRs) and maintained in the Minnesota Electronic Disease Surveillance System (MEDSS). Therefore, confinement facilities were responsible for 2 types of COVID-19 public health reporting: ELRs for all tests they conducted (positive

Author affiliation: Minnesota Department of Health, Saint Paul, Minnesota, USA

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[1]These first authors contributed equally to this article.
[2]These senior authors contributed equally to this article.

and negative results) and case reports for the persons working or detained in their facilities for whom test results were positive.

Case reports alert public health authorities of diseases occurring in specific, high-risk settings (e.g., healthcare facilities and congregate settings including confinement, school, or childcare), and ELRs contain test results with identifying information for the patient, ordering provider, and performing laboratory. MEDSS used ELRs to create or update a person-level record that could be manually matched with a case report. However, there was no systematic method to associate MEDSS cases with confinement facilities from ELRs alone. MDH relied on facility-submitted case reports for situational awareness, and its ability to provide effective case response was affected by confinement facilities' capacity for timely reporting.

In the fall of 2020, MDH staff began developing keyword and address matching (KAM) tools to identify COVID-19 cases among persons working or detained in confinement facilities directly from ELRs. By the fall of 2021, the complete system had been deployed, consisting of SAS code (SAS Institute Inc., https://www.sas.com) and an automated program within MEDSS that flagged cases for review by epidemiologists.

MDH used KAM to identify cases associated with all confinement settings, but the greatest effect was for jails. Cases associated with prisons were verified daily by using line lists from the Minnesota Department of Corrections. However, the same could not be done for jails because of the lack of a centralized testing and reporting system and varied reporting technology. We filled that gap by conducting a comprehensive evaluation of the KAM system for identifying COVID-19 cases among persons detained in jails.

## Methods

### KAM Surveillance System

The KAM surveillance system involved 2 steps. The first step was using KAM tools to search MEDSS ELR data and flag COVID-19 cases potentially associated with jails, and the second step was manually reviewing each case to verify confinement information and classify cases.

For step 1, a SAS program was used to clean addresses and phone numbers from ELR data and then identify records that matched any addresses or phone numbers of confinement facilities. The SAS program was later updated to identify keywords within addresses, case notes, and vaccination fields (Table 1). The SAS program was run on extracts of MEDSS data 2–5 times per week or as needed, depending on the daily volume of cases, and produced line lists of flagged cases for review in step 2.

The automated keyword matching program within MEDSS was created to enable better coordination among MDH staff and more rapid responses. It updated every 15 minutes and had access to all ELRs associated with a COVID-19 case. The program could not perform address matching but searched for keywords within the ELR fields of ordering provider and performing laboratory. Records containing keywords were funneled into a MEDSS workflow for MDH staff to review.

For step 2, MDH staff reviewed each case flagged by KAM tools in step 1. They then compared them with public jail and prison rosters, case reports, previous ELRs, and other MEDSS records to verify dates of incarceration, facility information, and to determine the person's case type (i.e., whether the person was detained or a staff member).

### KAM System Evaluation

To evaluate the KAM system for detecting (step 1) and classifying (step 2) COVID-19 cases among persons detained in jail, we matched all COVID-19 cases in MEDSS that occurred in 2022 with jail detention data from the Minnesota Statewide Supervision System

**Table 1.** Keywords used by the Minnesota Department of Health to identify COVID-19 cases associated with confinement facilities, Minnesota, USA, 2022*

| Keyword | Definition |
|---|---|
| Jail | |
| Correction | |
| Detention | |
| Prison | |
| ACF | Adult correction facility |
| ADC | Adult detention center |
| FCI | Federal correction institution |
| FPC | Federal prison camp |
| JDC | Juvenile detention center |
| JHS | Jail health services |
| Juvenile Center | |
| Juvenile Detention | |
| MCF | Minnesota correctional facility |
| Workhouse | |
| Intake | |
| DOC | Department of Corrections |
| Secure | |
| Work Release | |
| Reentry | |
| Sheriff | |

*Blank cells indicate no definition necessary.
†The keyword and address matching tools searched for variations of these keywords in several fields within COVID-19 electronic laboratory reports. Searches were case insensitive and allowed for variations in spacing and punctuation. Keywords listed refer to other types of confinement facilities but have removed those that identify individual facilities.

(MSSS). COVID-19 case data from MEDSS included full name, birthdate, specimen date, and confinement information documented by MDH staff during KAM step 2. Cases were included in this analysis if they met the criteria of a specimen date between January 1, 2022, and December 31, 2022, and if the person was ≥18 years of age at time of positive COVID-19 test (Figure 1).

With regard to jail detention data, MSSS is a statewide information system that stores data on persons who are or have been on probation, in detention, or imprisoned. Jails report these data to MSSS to create a centralized repository. Detention data include name, birthdate, detention dates, and facility name and were included in our analysis if they met the criteria of being detained during January 1, 2022–December 31, 2022; being detained in a Minnesota jail (excluding police departments and other nonjail facilities); and being ≥18 years of age at the time of detention (Figure 1).

We matched COVID-19 case data by full name and birthdate to MSSS detention data for persons with specimen dates that fell within their recorded detention period. We used an inexact match threshold to account for clerical errors, nicknames, and aliases. We manually reviewed low-confidence matches and subsequently excluded 20 records from analysis (Figure 1). Persons who were classified as jail detained by the KAM system but did not have an initial detention record match were reviewed for clerical errors and then rematched. For those remaining after the second match, we attempted to determine if their jail association could be verified with other records (e.g., criminal records and case

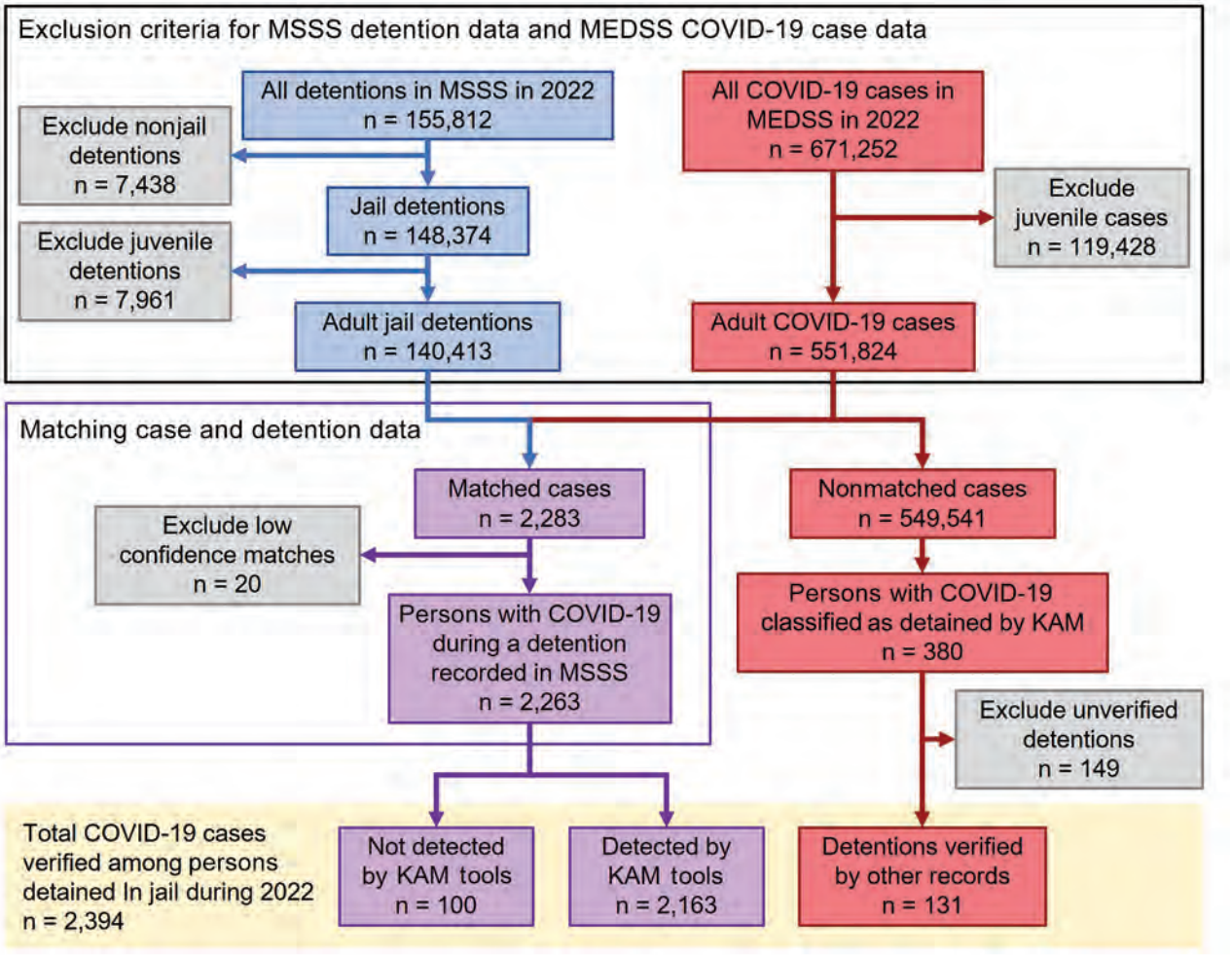


**Figure 1.** COVID-19 case data from MEDSS and jail detention data from MSSS. Exclusions were made before matching case and detention data by using an inexact matching threshold. A total of 380 unmatched cases had been flagged by KAM and classified as persons being detained in jail; further review verified 131 of those detentions, for a total of 2,394 COVID-19 cases among adults detained in jail. KAM, keyword and address matching; MDH, Minnesota Department of Health; MEDSS, Minnesota Electronic Disease Surveillance System; MSSS, Minnesota Statewide Supervision System; SAS, SAS Institute Inc., https://www.sas.com.

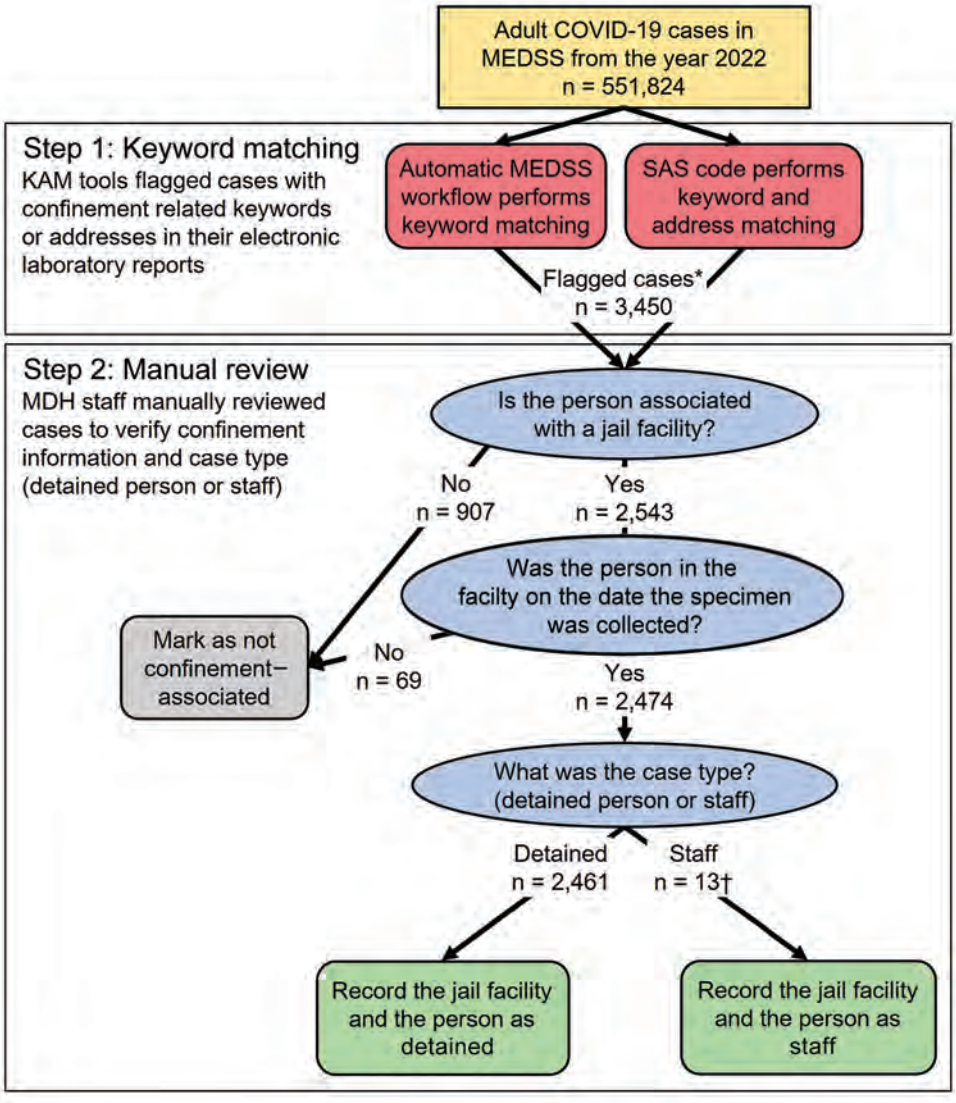


**Figure 2.** KAM surveillance system parts, process, and resulting unverified jail-associated COVID-19 case counts, Minnesota, USA, 2022 (cases among confirmed jail staff have been excluded from case counts). KAM consisted of KAM tools to flag COVID-19 cases potentially associated with jails and manual review to verify confinement information (e.g., facility name, dates incarcerated) and to classify the person as detained or facility staff (case type). Cases among persons confirmed to be jail staff have been excluded. Thirteen cases classified as staff were confirmed to have been for persons detained in jail by matching COVID-19 case data to detention data from MSSS. KAM, keyword and address matching; MEDSS, Minnesota Electronic Disease Surveillance System; MSSS, Minnesota Statewide Supervision System.

investigation notes). We performed all analyses by using SAS 9.4.

## Results

### KAM System Results

Throughout 2022, KAM step 1 (matching within MEDSS records) flagged 3,450 COVID-19 cases as being among persons potentially detained in jail (cases among known jail staff were excluded from this analysis). After manual review (KAM step 2), 2,461 (71%) persons were classified as detained at the time of their specimen collection (Figure 2).

### KAM Step 1 Evaluation Results

After excluding juvenile records, we included 551,824 COVID-19 cases from MEDSS and 140,413 detention records from MSSS in the matching analysis to match cases to detention records by full name and birthdate (Figure 1). After we excluded 20 low-confidence matches, 2,263 (0.4%) of the 551,824 COVID-19 cases had a detention documented in MSSS; 2,163 (95.6%) had been detected by KAM step 1, and 100 (4.4%) had not been detected. Of the 549,541 cases from MEDSS without a detention documented in MSSS, 380 (0.07%) had been classified by the KAM system as occurring in persons detained in jail. Further review of the records for those 380 persons confirmed that 131 (34.5%) of them were detained on the date of their specimen collection. In total, there were 2,394 COVID-19 cases among adults with verified detentions in a Minnesota jail in 2022. The matching tools in KAM step 1 had flagged 95.8% (2,163 + 131 = 2,294) of them (Figure 1). Despite substantial variance in case volume throughout the year, the monthly percentage of those cases flagged by KAM step 1 remained

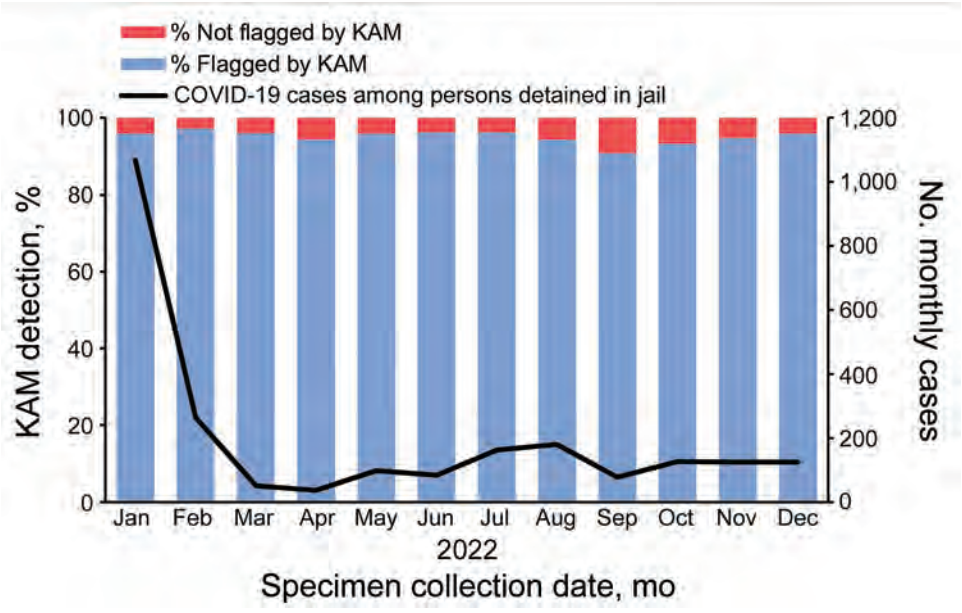


**Figure 3.** Monthly COVID-19 cases in persons detained in jail, Minnesota, USA, 2022, and the percentage detected by KAM surveillance tools and flagged for review. The figure includes 2,263 COVID-19 cases matched with a Minnesota Statewide Supervision System record of detention and 131 cases without a match that were confirmed as in persons detained at time of test (n = 2,394). KAM, keyword and address matching.

consistent (maximum 1,068 cases/month, 96% detected; minimum 36 cases/month, 94% detected) (Figure 3).

### KAM Step 2 Evaluation Results

Next, we evaluated the complete KAM surveillance system (steps 1 and 2). Throughout 2022, the KAM system detected and correctly classified 2,212 of 2,394 cases among adults detained in jail, for a sensitivity of 92.4%; it misclassified 249 of the 549,430 cases among adults not detained in jail, for a specificity of 99.95% (Table 2).

Several factors contributed to false positives (false matches/classifications) and false negatives (missed matches/classifications) by the KAM system, including issues with detecting jail-associated cases in step 1 and misclassifications during the manual review process in step 2 (Table 3). More than half (n = 131) of false positives were attributed to persons previously detained but not in custody on the date of their specimen collection (however, 50% had positive test results within 7 days of intake or release); another 80 persons were jail staff misclassified as detained. Similarly, just under half of false negatives resulted from misclassifying persons detained in jail as not being jail associated (n = 69) or as jail staff members (n = 13). However, 100 cases (55.0% of false negatives) were not flagged by KAM in step 1.

Last, 2,094 cases assigned to a jail during KAM step 2 matched with a detention record for comparison. Of those, ≈93% (n = 1,950) were recorded with the correct jail facility.

## Discussion

The sensitivity of the MDH KAM surveillance system for identifying COVID-19 cases among adults detained in Minnesota jails in 2022, without relying on case-based reporting from jails, was 92.4%. Despite KAM step 1 flagging ≈907 cases that were not jail-associated (Figure 2), manual record review during KAM step 2 contributed to an overall robust specificity for the surveillance system of 99.95%. Effective surveillance requires that cases can be associated with an individual facility, and the system was able to do this correctly 93.1% of the time.

Jurisdictional knowledge of jails and their testing practices was essential for determining the jail and case type (staff or detained person) of cases flagged by KAM tools. MDH staff used publicly available jail rosters, case reports from facilities, previous ELRs, and other MEDSS records for context, when

**Table 2.** Comparison of true detention status of persons with COVID-19 to the classifications made with KAM surveillance system, Minnesota, USA, 2022*

| Classification | True detention status of persons with COVID-19† | | |
|---|---|---|---|
| | Detained | Not detained | Total |
| Detained | 2,212 | 249 | 2,461 |
| Not detained | 182 | 549,181 | 549,363 |
| Total | 2,394 | 549,430 | 551,824 |

*KAM, keyword and address matching.
†Sensitivity 92.40%, specificity 99.95%.

**Table 3.** False-positive and false-negative classifications made by the KAM surveillance system while detecting and classifying COVID-19 cases among persons detained in jail, Minnesota, USA, 2022*

| Category | No. (%) cases |
|---|---|
| False positives: KAM positive, true detention negative; 249 cases | |
| Detention did not overlap with specimen date | 131 (52.6) |
| Jail staff mistaken as detained | 80 (32.1) |
| Not jail-associated, erroneous identification in step 1† | 38 (15.3) |
| False negatives: KAM negative, true detention positive; 182 cases | |
| Not identified in step 1† | 100 (55.0) |
| Erroneously classified not jail-associated in step 2† | 69 (37.9) |
| Detained person classified as jail staff | 13 (7.1) |

*KAM, keyword and address matching.
†During KAM step 1, keyword and address matching tools flagged COVID-19 cases as potentially associated with jails; during step 2, Minnesota Department of Health staff manually reviewed each flagged case to verify confinement information and classify cases by jail facility and case type (detained person of staff) (Figure 2).

available. Yet, interpreting ELRs can be complicated because of substantial variations by reporter and absence of case type indicators. In addition, ELRs may not include any confinement indicators if a person is tested outside the jail (e.g., hospital emergency room while in custody) or by a third-party vendor that does not indicate the ordering jail in the ELR. Most of the 69 cases erroneously marked as not jail-associated were in persons with a negative test result at the time of jail intake but who later had a positive test result while at an emergency department and still in custody. For those cases, keywords in ELRs for the previous intake tests were flagged, but the ordering provider and reporting laboratory (lack of keywords) in the ELR suggested that the person had been released from custody. Often, public detention data can clarify those situations, but they vary widely. Some jails do not publish any detention data, none publish data for youth, and many rosters list only current detentions, making retrospective review impossible. Timeliness and knowledge of local testing practices were often crucial for verifying a flagged case.

Keyword selection was also improved by jurisdictional knowledge and relationships. For example, many hospitals provided laboratory processing services to nearby jails and other institutions, which obscured the jail-associated tests. For one hospital, however, we learned that their billing department was already including an abbreviation in the ordering provider field, which we could also use for our purposes. Later, MDH coordinated with a state-sponsored testing vendor, which provided services to many facilities, to include keywords in their ELRs that would be identifiable and specific. The ability to easily update the KAM keywords enabled us to maintain real-time surveillance despite changes in testing vendors and reporting methods.

A weakness of the KAM system is that it relies on the assumption that all positive test results are promptly reported to the public health authority. Unreported results and over-the-counter test results (which do not produce ELRs) are undetectable without case-based reporting or other input. Jails may struggle most with reporting during an outbreak when staff capacity is most strained and reporting is arguably most important (*18*–*20*). Facilities operating with paper records or with limited on-site healthcare face additional challenges (*17*). Electronic health record systems can streamline documentation for reporting, benefiting the jail and the public health authority (*17*,*21*). Alternatively, outsourcing laboratory processing of tests transfers the reporting burden to the laboratory vendor. Maximizing the success of KAM may require supporting facilities in their reporting efforts.

Our assessment is limited by the nature of our input data, the quality of our matching process, and the inherent limitations of a retrospective study. MEDSS case data and MSSS detention data were vulnerable to clerical errors, aliases, and incomplete entries. Despite our accounting for some of those vulnerabilities with an inexact matching process, erroneous or missed matches in our dataset are possible. Our analysis identified 131 persons who had been detained

**Table 4.** Results of investigating the 380 COVID-19 cases classified by KAM as persons detained in jail who did not have a detention recorded in MSSS for their specimen date, Minnesota, USA, 2022*

| Category | No. (%) cases |
|---|---|
| Detention confirmed with other records | 131 (34.5) |
| Specimen date outside of detention period | 131 (34.5) |
| Jail staff misclassified as detained | 80 (21.1) |
| Unable to determine | 38 (10.0) |

*KAM, keyword and address matching; MSSS, Minnesota Statewide Supervision System.
†After matching COVID-19 case data with jail detention data, 380 cases remained that had been flagged by KAM tools during 2022 and classified as persons detained in jail. Those cases were individually reviewed to determine their correct classifications.

but MSSS did not have a record of their detention (Table 4). Many were confirmed to have been held in jail by federal jurisdiction (i.e., the jurisdiction of the Federal Bureau of Prisons, Immigration and Customs Enforcement, or US Marshals), suggesting a systematic gap; however, most are probably accounted for by expected limitations in our datasets. Last, MDH did not keep thorough records of cases flagged by KAM that were not jail associated. Although we used a variable to denote cases as not confinement associated, the variable was used for functional purposes only and was probably not comprehensive; therefore, we cannot precisely quantify the total number of cases flagged in 2022.

Infectious disease surveillance in jails is complex but essential, and KAM seems to be an effective tool for filling the gaps without increasing the reporting burden for the jail. MDH used KAM to provide situational awareness through early outbreak detection and case trends. It enabled public health practitioners to proactively connect with facilities experiencing new or continued outbreaks. MDH has also successfully applied KAM to identifying cases of COVID-19 among persons associated with homeless service sites, assisted living facilities, long-term care facilities, and higher education. Newer efforts have been successful in adapting KAM SAS code for other infectious diseases (e.g., group A *Streptococcus* in assisted living and long-term care facilities). We expect that those tools can be most successfully applied to other residential or congregate settings with somewhat stable populations or with on-site healthcare for diseases that are routinely tested for and reportable to public health authorities.

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The authors do not declare any competing interests.

### About the Author

Ms. Porter is an epidemiologist at MDH, where she supports the COVID-19 response in correctional facilities and at homeless service sites. Her experience spans the public, private, and academic sectors and has focused on novel data systems, enhanced surveillance strategies, and infectious disease. Her professional interests include minimizing the reporting burden of surveillance, modernizing data systems, and data equity.

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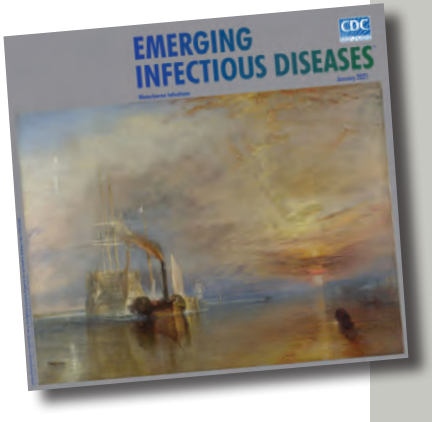
Address for correspondence Leah J. Porter, Minnesota Department of Health, 625 Robert St N, PO Box 64975, St. Paul, MN 55164, USA; email: leah.porter@state.mn.us

# etymologia revisited

## Petri Dish
[pe'tre 'dish]




The Petri dish is named after the German inventor and bacteriologist Julius Richard Petri (1852–1921). In 1887, as an assistant to fellow German physician and pioneering microbiologist Robert Koch (1843–1910), Petri published a paper titled "A minor modification of the plating technique of Koch." This seemingly modest improvement (a slightly larger glass lid), Petri explained, reduced contamination from airborne germs in comparison with Koch's bell jar.

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# *Candida auris* in US Correctional Facilities

Ian Hennessee, Kaitlin Forsberg, Jalysa Erskine, Argentina Charles, Barbara Russell, Juliana Reyes, Chantel Emery, Nickolas Valencia, Adrienne Sherman, Jason Mehr, Hannah Gallion, Brandon Halleck, Caleb Cox, Marcie Bryant, Deborah Nichols, Magdalena Medrzycki, D. Cal Ham, Liesl M. Hagan, Meghan Lyman

*Candida auris* is an emerging fungal pathogen that typically affects patients in healthcare settings. Data on *C. auris* cases in correctional facilities are limited but are needed to guide public health recommendations. We describe cases and challenges of providing care for 13 patients who were transferred to correctional facilities during January 2020–December 2022 after having a positive *C. auris* specimen. All patients had positive specimens identified while receiving inpatient care at healthcare facilities in geographic areas with high *C. auris* prevalence. Correctional facilities reported challenges managing patients and implementing prevention measures; those challenges varied by whether patients were housed in prison medical units or general population units. Although rarely reported, *C. auris* cases in persons who are incarcerated may occur, particularly in persons with known risk factors. Measures to manage cases and prevent *C. auris* spread in correctional facilities should address setting-specific challenges in healthcare and nonhealthcare correctional environments.

*Candida auris* is an emerging, frequently drug-resistant pathogen that is becoming more common in the United States (*1*). It typically affects patients in healthcare settings who have chronic illness, indwelling medical devices, and frequent or prolonged healthcare exposures (*2*,*3*).

The first known *C. auris* case in an incarcerated patient was reported to the Centers for Disease Control and Prevention (CDC) in 2020. Twelve additional cases were reported in 2022, including 8 cases from the same correctional facility. Correctional facilities in many states provide high-acuity long-term care onsite, and incarcerated persons can have frequent or prolonged stays in onsite and offsite healthcare facilities (*4*). Certain incarcerated patients may therefore be at risk for *C. auris* infection or colonization.

The multiple reports of *C. auris* in incarcerated patients raised questions from state health departments and departments of corrections about how to appropriately manage *C. auris* cases and mitigate transmission in correctional settings, especially given prior experiences with rapid spread of other infectious diseases in jails and prisons (*5*,*6*). Most, if not all, experience with *C. auris* is from noncorrectional healthcare facilities where *C. auris* cases have previously been detected (*3*), and information about transmission risk and prevention measures for *C. auris* or other novel or targeted multidrug-resistant organisms (MDROs) in correctional settings is lacking (*7*). To help fill this information gap, we describe *C. auris* cases reported in US patients who were incarcerated and summarize the challenges of managing patients and implementing prevention measures in correctional settings.

## Methods

Incarceration status is not a part of routine *C. auris* reporting, but health departments often notify CDC of cases with unusual epidemiology, such as cases in correctional facilities. We included in this report all *C. auris* cases in incarcerated patients that had previously been reported to CDC. We also conducted proactive outreach to state health departments and the Federal Bureau of Prisons to identify any additional cases that had not previously been reported to CDC.

Author affiliations: Centers for Disease Control and Prevention, Atlanta, Georgia, USA (I. Hennessee, K. Forsberg, M. Medrzycki, D.C. Ham, L.M. Hagan, M. Lyman); Florida Department of Health, Tallahassee, Florida, USA (J. Erskine, A. Charles, B. Russell, J. Reyes, C. Emery, N. Valencia); New Jersey Department of Health, Trenton, New Jersey, USA (A. Sherman, J. Mehr); Indiana Department of Health, Indianapolis, Indiana, USA (H. Gallion, B. Halleck, C. Cox, M. Bryant); Indiana Department of Correction, Indianapolis (D. Nichols)

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We investigated all reported clinical and screening cases of *C. auris* among patients who transferred to or resided in a jail, state prison, or federal prison in the United States after having a positive *C. auris* specimen during January 2020–December 2022. We used established CDC case definitions for clinical and screening cases (*8*). We collected epidemiologic information for each case and calculated basic descriptive statistics for *C. auris* case type, type of healthcare facility where the positive specimen was collected, patient age, patient health conditions at the time of transfer to a correctional facility, type of correctional facility where the patient was transferred, and type of housing arrangements. Through emails and phone calls, we provided open-ended questions to health departments, departments of corrections, and the Federal Bureau of Prisons about challenges with patient management and infection control and prevention for *C. auris* that they encountered or that were reported by correctional facilities.

## Results

### Patient and Facility Characteristics

During January 2020–December 2022, a total of 13 patients who had a positive *C. auris* specimen were transferred to or resided in a correctional facility (Table). Eleven patients had screening specimens, and the other 2 had clinical *C. auris* specimens from urine. All patients were under the custody of a state or federal prison when they had their first positive specimen. Twelve patients were receiving inpatient medical care at offsite healthcare facilities (i.e., in the community), and one patient was receiving inpatient care in an onsite prison medical unit. None of the patients were under the custody of a jail. The healthcare facilities were in Texas, Florida, New Jersey, and Indiana, and all were in geographic areas where *C. auris* is commonly reported (*9*).

Median patient age was 55 years (range 26–66 years) (Table). Twelve of 13 patients were men. At the time of transfer, 3 patients were on mechanical ventilation, and 5 had ≥1 indwelling medical device, such as central venous catheters and tracheostomy tubes. All but 1 patient had chronic health conditions, including chronic kidney disease, diabetes, chronic cardiovascular disease, and chronic wounds; chronic kidney disease (n = 8) and diabetes (n = 7) were the most common chronic health conditions.

Patients were transferred from offsite healthcare facilities to prisons in Texas, Florida, New Jersey, In-

**Table.** Characteristics of 13 patients who were discharged to correctional facilities after having a positive *Candida auris* specimen, January 2020–December 2022*

| Characteristic | Value |
|---|---|
| Case information | |
| *C. auris* case type | |
| Screening | 11 (85) |
| Clinical | 2 (15) |
| Healthcare facility type where positive specimens were collected | |
| Acute care hospital | 10 (77) |
| Long-term acute care hospital | 3 (23) |
| Demographic information, medical devices, and underlying conditions at the time of transfer | |
| Age, y, median (range) | 55 (26–66) |
| Sex | |
| M | 12 (92) |
| F | 1 (8) |
| Mechanical ventilation | 3 (23) |
| Indwelling medical devices | 5 (38) |
| Central venous catheter | 2 (15) |
| Urinary catheter | 2 (15) |
| Tracheostomy | 2 (15) |
| Feeding tube | 2 (15) |
| Underlying chronic conditions | 12 (92) |
| Chronic kidney disease† | 8 (62) |
| Type 2 diabetes | 7 (54) |
| Cardiovascular disease | 5 (38) |
| Chronic wounds | 2 (15) |
| Correctional facility where patient was transferred | |
| State prison | 12 (92) |
| Federal prison | 1 (8) |
| Transfer location within correctional facility | |
| Onsite medical unit | 9 (69) |
| Onsite medical unit, then to general population unit | 1 (8) |
| General population unit | 1 (8) |
| Unknown | 2 (15) |

*Values are no. (%) except as indicated.
†Including end-stage renal disease (n = 4).

diana, and Missouri. Among 11 patients for whom detailed transfer or residence information was available, 1 was transferred directly to a general population housing unit within a prison and housed with roommates, and 10 were initially transferred to or resided in onsite medical units located within prisons. Among those initially transferred to a medical unit, 1 patient was housed in a single-patient room in the medical unit and died approximately 1 week after transfer, although it was not known whether the death was caused by *C. auris* infection. One was initially housed in a single-patient room in a medical unit for 2 months before being transferred to a general population unit and housed with roommates. The remaining 8 patients remained in onsite medical units as of last follow-up because of continuing medical needs unrelated to *C. auris* colonization.

### Challenges Encountered and Public Health Responses for Managing *C. auris* Cases

Correctional facility staff reported several challenges in managing *C. auris* cases and implementing infection prevention and control (IPC) and response measures in prisons. Staff reported difficulties isolating patients in onsite medical units because of a lack of individual medical isolation rooms and concerns for patient well-being during prolonged isolation. Three facilities reported working with health departments to conduct colonization screening for patients at high risk with overlapping stays in the units. One additional C. auris case was identified through these screening efforts, although information about the scope and completeness of screening was not available. Facilities that conducted screening also noted concerns about ensuring voluntary consent for screening participation, given that incarcerated patients might not feel that refusal was an option. Some facilities also noted that nonmedical staff and incarcerated workers who perform environmental cleaning and disinfection in medical units did not have adequate training in IPC and the proper use of personal protective equipment.

Facilities also reported concerns about how to minimize risk to roommates or other close contacts of patients with *C. auris* in general population units and concerns about patients with *C. auris* experiencing stigma or threats from other incarcerated persons or staff. Facilities addressed those concerns by housing patients with roommates who did not have medical risk factors for *C. auris* colonization and providing education about *C. auris* to roommates and others assigned to housing in close proximity to the patient. Facilities reported challenges providing soap and alcohol-based hand sanitizer (ABHS) to patients and other incarcerated persons because of internal policies restricting providing those items for security reasons.

State health departments reported difficulties coordinating across multiple jurisdictions and agencies (e.g., coordinating colonization screening with the department of corrections, prison management, and contracted medical providers). One state health department reported overcoming these challenges by leveraging a preexisting relationship between the state health department and the department of corrections, which enabled rapid information sharing and decision-making between departments. Facilities also noted challenges in ensuring that patients' *C. auris* status was consistently communicated to relevant staff within the facility and during transfers to other correctional facilities or to offsite healthcare settings.

## Discussion

This report describes cases of *C. auris* reported among patients in US correctional facilities. Cases occurred among patients in geographic areas with high *C. auris* prevalence and with recent hospital admissions, consistent with prior reports that *C. auris* is predominantly transmitted and acquired in healthcare environments (*2*,*3*). Although underlying conditions were common, not all patients had typical risk factors for *C. auris* at the time of transfer back to the correctional facility. However, data about risk factors were not collected systematically and did not necessarily reflect possible risk factors present at the time of *C. auris* acquisition. Although all but one patients in this report had their first positive C. auris specimens identified at offsite hospitals, transmission in onsite medical units was not fully assessed because comprehensive screening of healthcare contacts was not conducted for all cases. In the future, comprehensive screening in response to cases in correctional medical units could help determine whether transmission is occurring in these settings.

This report highlights unique challenges to *C. auris* patient management and IPC in correctional medical settings. Although no setting-specific guidance for *C. auris* response in correctional facilities exists, strategies outlined in MDRO containment guidance for healthcare settings would apply (*10*,*11*). Those guidelines focus on ensuring adherence to recommended IPC practices, conducting screening of healthcare contacts or new admissions on the basis of the local epidemiology, and communication about patients' *C. auris* status during transfers to other facilities. Specific guidance for different facility types (e.g.,

nursing homes, long-term acute care hospitals, and dialysis clinics) should be adapted for correctional facility medical units on the basis of the type of unit and acuity of care provided (*10*–*12*). Strong communication and collaboration between public health agencies and correctional facilities can increase awareness about resources needed to implement IPC policies and facilitate timely response to MDROs. Facilities could work with local health departments to proactively assess their IPC practices and plan *C. auris* response activities after a case is identified (*13*). Health departments can also share local epidemiologic information to guide practices in correctional medical units, such as screening.

Risk for *C. auris* transmission in nonhealthcare settings is not completely understood, but persons in nonhealthcare settings generally lack typical risk factors for *C. auris* (*3*). No evidence exists to suggest that incarcerated patients colonized with *C. auris* should not be discharged to the facility's general population. Disposition and decisions to discharge patients from medical units should be based on clinical criteria and healthcare need, not on *C. auris* status alone (*10*). Management for patients in general population units could draw from methicillin-resistant *Staphylococcus aureus*, tuberculosis, and other corrections-specific infectious disease guidance, which focus on routine health education and providing soap or ABHS to patients and close contacts, such as roommates (*5*,*6*,*14*–*16*). ABHS was provided in many facilities during the COVID-19 pandemic, and such policies could be adapted to ensure access to ABHS (*17*). Screening of contacts, such as those with frequent inpatient healthcare exposures, could be considered in specific situations, such as those outlined in MDRO containment guidance for residential care settings (*11*). Housing patients in general population units with low-risk roommates, such as those without underlying medical conditions or indwelling medical devices, could further reduce infection risk. Communication of MDRO status should always occur when a patient is transferred to offsite healthcare facilities or to different correctional facilities. To reduce the risk for stigma, knowledge of a patient's MDRO status should be restricted to staff who need this information to ensure that the patient is housed and receives medical care according to recommended IPC principles.

One limitation of this report is that all cases in incarcerated patients may not have been included because *C. auris* case detection and reporting may be incomplete and incarceration status is not a part of routine case reporting. Data on patient medical conditions also were collected in a nonsystematic manner and only for those present at the time of transfer, not at the time *C. auris* was acquired; some patients may have had risk factors for *C. auris* that were not reported (*3*). Information about onsite medical units (e.g., bed counts, acuity of care, and infection control compliance) also was not systematically collected but could improve characterization of potential facility-level risk factors for *C. auris* transmission. Furthermore, assessing where transmission occurred was not possible because persons can be colonized for a prolonged period, *C. auris* screening information was not available for offsite hospitals, and comprehensive screening was not conducted in all onsite medical units.

Although uncommon, *C. auris* colonization or infection may occur in persons who are incarcerated, particularly persons with known *C. auris* risk factors and recent healthcare encounters in geographic areas with high *C. auris* prevalence. Measures to manage cases and prevent *C. auris* spread in correctional facilities should account for the unique challenges of implementing recommended IPC and response measures and caring for patients with *C. auris* in healthcare and nonhealthcare environments within correctional settings.

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We gratefully acknowledge the interdisciplinary teams that managed and responded to the *C. auris* cases described in this report. We thank Arif Mahmud and Ellen Smith for sharing detailed information for this report. The Antimicrobial Resistance Laboratory Network provided clinical specimen identifications and colonization screening swab testing. We also thank Jeremy Gold for his feedback on the manuscript.

## About the Author

Dr. Hennessee is an Epidemic Intelligence Service Officer with the Mycotic Diseases Branch, Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, Georgia, USA. His research focuses on the epidemiology, prevention, and control of emerging infectious diseases.

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Address for correspondence: Ian Hennessee, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop H24-10, Atlanta, GA 30329-4018, USA; email: xye0@cdc.gov

# Outbreak of Invasive *Serratia marcescens* among Persons Incarcerated in a State Prison, California, USA, March 2020–December 2022

Amanda Kamali, Donna Ferguson, Heather Dowless, Nancy Ortiz, Rituparna Mukhopadhyay, Cassandra Schember, Rawni Lunsford, Justine Hutchinson, Marlena Scherer, John Crandall, Heidi Bauer, Alexander Yu, Akiko Kimura

*Serratia marcescens* is an environmental gram-negative bacterium that causes invasive disease in rare cases. During 2020–2022, an outbreak of 21 invasive *Serratia* infections occurred in a prison in California, USA. Most (95%) patients had a history of recent injection drug use (IDU). We performed whole-genome sequencing and found isolates from 8 patients and 2 pieces of IDU equipment were closely related. We also identified social interactions among patients. We recovered *S. marcescens* from multiple environmental samples throughout the prison, including personal containers storing Cell Block 64 (CB64), a quaternary ammonium disinfectant solution. CB64 preparation and storage conditions were suboptimal for *S. marcescens* disinfection. The outbreak was likely caused by contaminated CB64 and propagated by shared IDU equipment and social connections. Ensuring appropriate preparation, storage, and availability of disinfectants and enacting interventions to counteract disease spread through IDU can reduce risks for invasive *Serratia* infections in California prisons.

*Serratia marcescens*, a gram-negative environmental bacterium (*1*,*2*), is an opportunistic pathogen that in rare cases causes invasive diseases, including bacteremia and endocarditis (*1*,*3*–*7*). Reported outbreaks have been linked to contaminated environmental sources, such as water, soap, intravenous fluids, and compounded drugs (*8*–*16*) in nosocomial settings (*17*–*19*). Invasive *S. marcescens* infections have occurred among persons who inject drugs (*5*,*6*,*20*–*22*). Given the high prevalence of injection drug use (IDU) in prisons and lack of access to sterile needles (*23*–*25*), risks for transmission of bloodborne pathogens are higher than among the general population (*25*). Cell Block 64 (CB64) solution, produced by California Prison Industry (CALPIA, https://www.calpia.ca.gov), is a quaternary ammonium concentrate (https://catalog.calpia.ca.gov/custom/assets/Files/view-current-sds-information-16.pdf) used as the primary disinfectant in prisons in California, USA. However, *S. marcescens* can survive in improperly prepared disinfection solutions, including quaternary ammonium disinfectants (*18*,*19*,*26*).

We describe a multiyear outbreak of invasive *S. marcescens* infections driven by widespread environmental contamination, improperly prepared and maintained disinfection solution, IDU, and social connections at a California state prison. Prison A is a maximum-security state prison housing ≈3,000 male incarcerated persons. In October 2020, the primary hospital affiliated with prison A notified the California Correctional Health Care System (CCHCS) that multiple incarcerated persons had been admitted with invasive *S. marcescens* infections. CCHCS, Monterey County Public Health Laboratory (MCPHL), and California Department of Public Health (CDPH) began a multidisciplinary investigation to identify additional cases, determine risk factors for infection, and provide recommendations for mitigation and

Author affiliations: California Correctional Health Care Services, Elk Grove, California, USA (A. Kamali, H. Dowless, J. Hutchinson, M. Scherer, H. Bauer); California Department of Public Health, Richmond, California, USA (A. Kamali, N. Ortiz, R. Mukhopadhyay, C. Schember, J. Crandall, A. Yu, A. Kimura); Monterey County Public Health Laboratory, Salinas, California, USA (D. Ferguson, R. Lunsford); Centers for Disease Control and Prevention, Atlanta, Georgia, USA (N. Ortiz, C. Schember)

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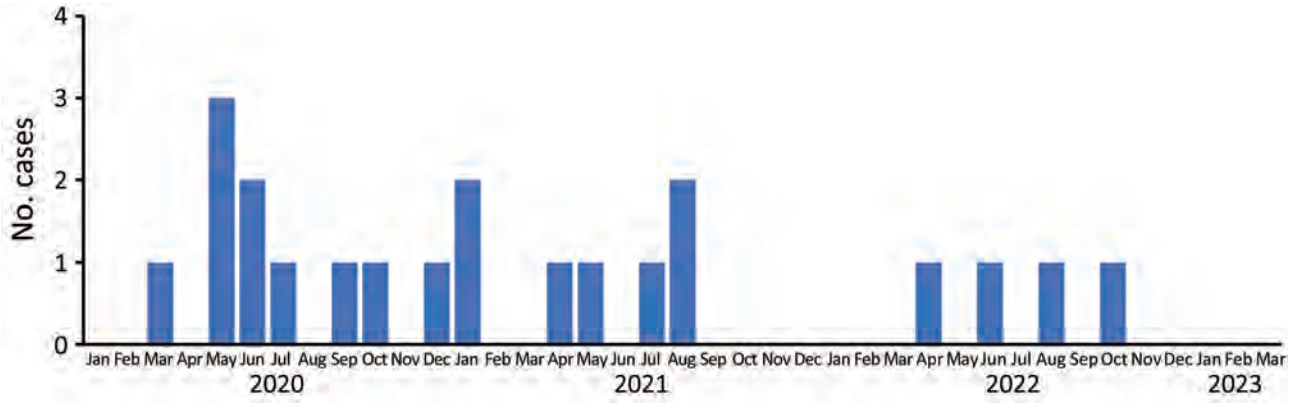


**Figure 1.** Epidemiologic curve of patients hospitalized with invasive Serratia marcescens infections at prison A, by sampling month of positive isolate, California, USA, January 2020–March 2023.

prevention. This project was determined to be nonresearch by the Centers for Disease Control and Prevention because it involved public health surveillance.

## Materials and Methods

### Epidemiologic Investigation

We defined a case-patient as a person diagnosed with an invasive *S. marcescens* infection who resided at prison A for ≥1 month before symptom onset during January 1, 2020–December 31, 2022. We defined infections as invasive if occurring at normally sterile body sites or in a case-patient manifesting critical illness with severe soft tissue infection. We reviewed patient hospitalization and prison medical records, including social histories, for IDU and other risk-elevating behaviors. We interviewed patients using a standardized questionnaire that included questions about cell cleaning practices, IDU, and other risk factors.

**Table 1.** Demographic data and other characteristics of 21 patients infected with invasive *Serratia marcescens* at prison A, California, USA, 2020–2022*

| Characteristic | Value |
|---|---|
| Median age, y (range) | 44 (22–66) |
| Race and ethnicity | |
| White | 9 (43) |
| Black | 2 (10) |
| Hispanic | 8 (38) |
| Other | 2 (10) |
| *Serratia* diagnosis† | |
| Bacteremia | 11 (52) |
| Endocarditis | 2 (10) |
| Epidural abscess | 9 (43) |
| Osteomyelitis | 6 (29) |
| Pseudoaneurysm | 1 (5) |
| Severe soft tissue infection | 4 (19) |
| Type of injection drug used,† n = 21 | |
| Heroin | 18 (86) |
| Suboxone | 12 (57) |
| Methamphetamine | 8 (38) |
| Opiates (by hospital urine toxicology screen) | 5 (24) |

*Values are no. (%) patients except as indicated.
†Not mutually exclusive.

### Environmental Investigation

Prison A public health and infection control, CCHCS public health, CDPH, and MCPHL staff evaluated the water system and cleaning practices and procedures at prison A. In 2020 and 2021, MCPHL tested water from different sources at prison A, including holding tanks and wells. MCPHL also tested sinks and communal showers, faucets in patients' cells, personal items, hand-rinsate from a cellmate, 2 syringes used for injecting drugs, objects used for mixing, storing, or applying disinfectant, dilution machines, reused containers, and commercial bottles.

### Laboratory Investigation

MCPHL streaked swabs onto *Serratia* CHROMagar (https://www.chromagar.com) MacConkey and blood agar plates and incubated them in brain heart infusion broth for up to 5 days. Needles and syringes were placed directly into brain heart infusion broth. Cultures with growth were subcultured on CHROMagar plates. Liquids, including water, disinfectant cleaning solutions, and rinsates, were filtered onto 47 mm 0.45 μm–pore sized mixed cellulose ester membranes and placed onto CHROMagar plates. MCPHL forwarded *S. marcescens* isolates to CDPH Center for Laboratory Science Microbial Diseases Laboratory for whole genome sequencing (WGS) using the validated in-house protocol with Illumina MiSeq (https://www.illumina.com) (Appendix, https://wwwnc.cdc.gov/EID/article/30/13/23-0801-App1.pdf) (*27*).

## Results

### Epidemiologic Investigation

As of December 2022, we had identified 21 cases: 17 identified during March 2020–August 2021 and 4 during April–October 2022 (Figure 1). All 21 case-patients were hospitalized and recovered; however, 1 patient later died of a cause unrelated to *S. marcescens*. Median patient age was 44 years (range 22–66 years). We grouped patients by race/ethnicity as non-Hispanic White (9 [43%]), non-Hispanic Black (2 [10%]), Hispanic (8 [38%]), or other (2 [10%]). Diagnoses were not mutually exclusive and included bacteremia in 11 (52%) patients; endocarditis in 2 (10%); epidural abscess in 9 (43%); osteomyelitis in 6 (29%); pseudoaneurysm in 1 (5%); and soft tissue infections in 4 (19%), including 2 (10%) with muscle abscess (Table 1). Of the nonbacteremic patients, 2 had polymicrobial cultures, including viridans streptococci (*1*), *Staphylococcus aureus* (2), and *Raoutella panticola* (*1*).

Twenty (95%) patients had a history of IDU <6 months before infection and one >6 months before infection. Of patients with recent IDU, 18/20 (86%) had injected heroin, 12 (57%) suboxone, and 8 (38%) methamphetamines. Among patients who had urine toxicology performed at admission, 4/9 were positive for opiates. Nine patients reported consuming >1 drug; 5 patients used 2 and 4 patients used 3 drugs. Of patients interviewed, 5/16 (31%) used CB64 to clean IDU equipment. Of PWID patients, 9/21 (43%) were enrolled in the prison A substance use disorder treatment (SUDT) program before *S. marcescens* infection occurred.

Although some patients resided throughout the 4 physically separated yards at the facility, 11 (52%) were housed in yard 1; 2 patients in other yards at time of illness onset had previously been housed in yard 1. Interviews identified social connections among >9 patients. We used WGS to identify the predominant *S. marcescens* outbreak strain as the cause of infection in 6 (66%) patients and a different strain in 1 patient; we had no isolates available for 4 patients (Figures 2, 3). Among patients who revealed social connections, 6 shared needles, 4 shared cells, 3 had attended the urgent care clinic at the same time, and

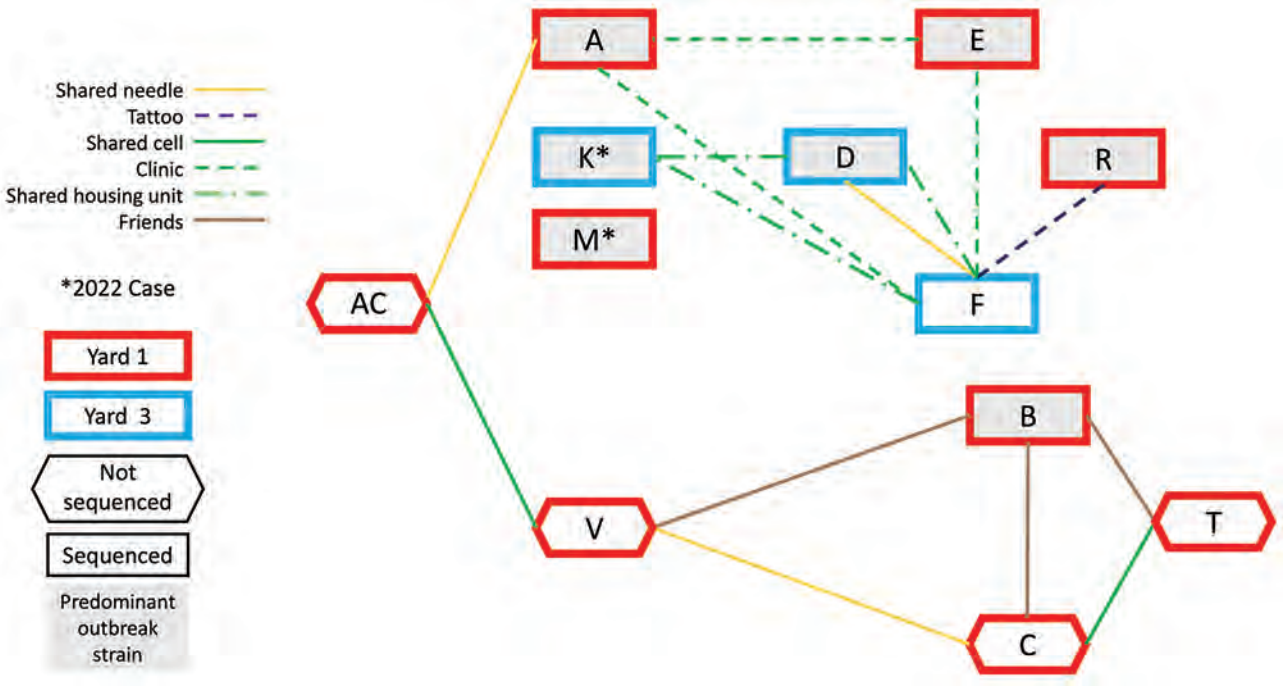


**Figure 2.** Social network analysis of patients and whole genome sequencing results for patients hospitalized with invasive *Serratia marcescens* infections at prison A, California, USA, January 2020–March 2023. All patients were identified in 2021, except patients K and M, identified in 2022. Patients A, B, D, E, R, K, and M all had isolates in the predominant outbreak strain. Patients D, F, and K were in yard 3, all others in yard 1. Patients C, T, and V did not have isolates available for sequencing. Patient AC had a *S. marcescens* infection in 2019 outside of the outbreak period; however, he had multiple social connections with case-patients and so is included in this figure. Patient F shared a housing unit with D and K, was in the clinic at the same time as A and E, reported sharing needles with D, and might have been tattooed by R. Patient D also shared a housing unit with K. Patient A was in the clinic the same time as E and reported sharing a needle with AC. Patient V shared a cell with AC, was friends with D, and reported sharing needles with C. Patient T shared a cell with C and was friends with B. Patients B and C were also friends.

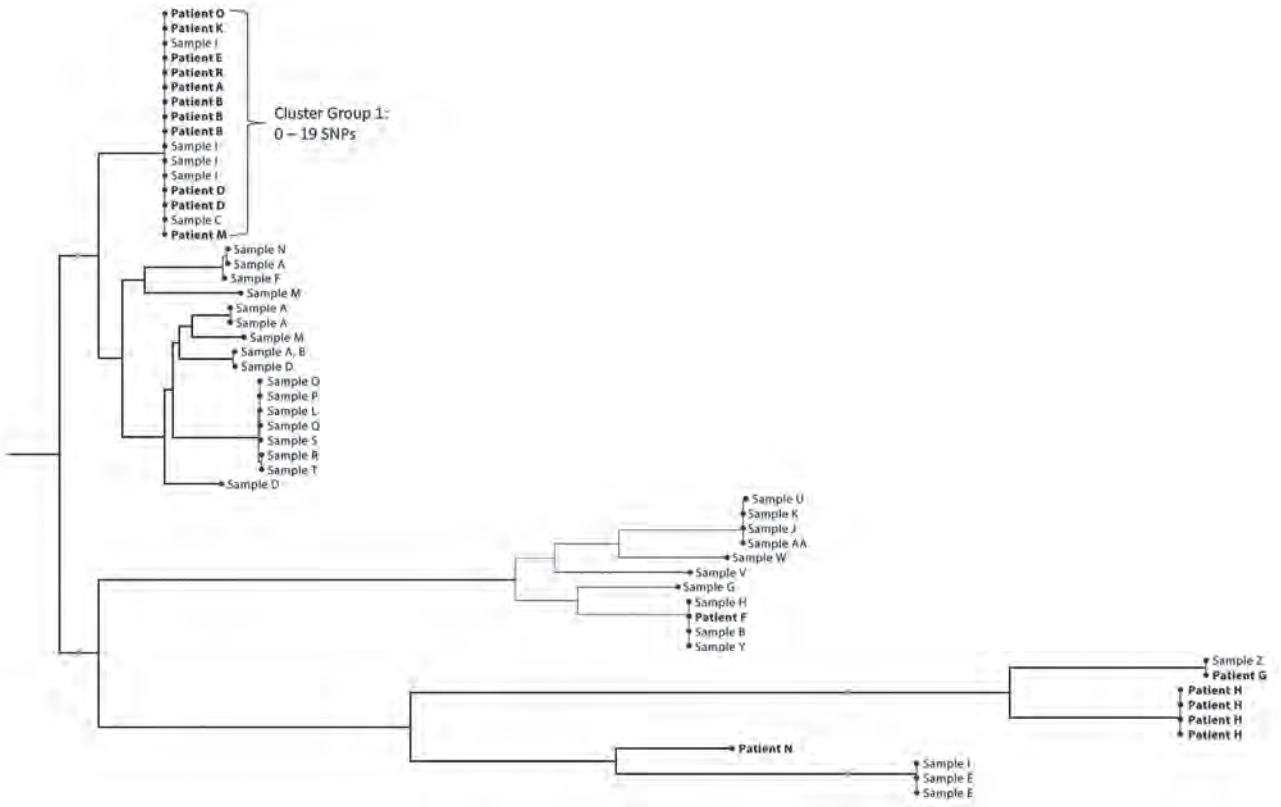


**Figure 3.** Phylogenetic tree representing patients hospitalized with invasive *Serratia marcescens* infections and whole-genome sequencing for environmental and clinical isolates at prison A, California, USA, January 2020–March 2023. The predominant outbreak cluster included patients A, B, D, E, K, M, O, and R and environmental samples C (needle/syringe) and sample I (nasal spray bottle) from patient D. These sequences had 0–19 single-nucleotide polymorphism (SNP) differences. Patient F, sample B (coffee cup) found in patient D's cell, sample H (hand rinsate) from the cellmate of patient D, and sample Y (doorway swab) from the cell occupied at different times by both patient A and AC are grouped together within a 11–17 SNP range.

2 might have shared tattoo needles (Figure 2). Patient AC, diagnosed with an invasive *S. marcescens* infection at a different prison in 2019 and later transferred to prison A, was found to have multiple social connections with patients identified in 2020 and beyond but we did not include him in the outbreak cohort (Figure 2).

### Environmental Investigation

Inspection of the potable water system at prison A did not identify any deficiencies or areas of concern, and we found large-volume water samples negative for *Serratia.* Each housing unit has a machine for diluting the CB64 solution (Figure 4). Machines in multiple units had exposed tubing touching the machine surface, maintenance schedules were not documented, and dilution of CB64 occurred in large containers outside the dilution machines. Prison A allowed incarcerated persons to keep CB64 in their cells after the COVID-19 pandemic started. Some incarcerated persons described using their own repurposed containers (e.g., shampoo bottles) to scoop diluted CB64 from the large containers.

### Laboratory Investigation

Eleven patients had isolates available for WGS; 8 (73%) patients, including 3 identified in 2022, had isolates that differed from one another by 0–19 single-nucleotide polymorphisms (SNPs) on WGS. Those isolates clustered within the predominant strain group (Figure 3). Of 152 environmental samples collected and analyzed, 27 (18%) were positive for *S. marcescens*, including a needle and syringe combination (sample I) and a reused nasal spray bottle (sample C) storing methamphetamines from patient D (Table 2). Both specimens matched the predominant outbreak strain (Figure 3). The *S. marcescens* isolate from patient F grouped within 11–17 SNPs with isolates from a coffee cup (sample B) found in patient D's cell, hand-rinsate (sample H) from patient D's cellmate, and a doorway swab (sample Y) from a cell occupied at different times

by patients AA and AC (Table 2; Figure 3). All other isolates differed from the predominant strain by thousands of SNPs (Figure 3). We sequenced multiple isolates from some samples. Samples from all unopened bottles of CB64 tested negative for *S. marcescens*.

## Discussion

During March 2020–December 2022, a total of 21 persons incarcerated at prison A required hospitalization for invasive *Serratia* infections. Factors contributing to this outbreak included widespread environmental contamination with *Serratia,* including in CB64, the sole disinfectant used within the prison, and complex social networks that involved IDU.

Of note, 5 environmental samples that tested positive for *Serratia* were associated with diluted CB64. CB64 is used throughout California state prisons as a disinfectant because it is less caustic than other disinfectants (e.g., bleach). Quaternary ammonium compounds like CB64 have previously been linked to outbreaks (*18*,*19*,*26*). Prison A had documented nonadherence to CB64 manufacturer dilution and storage protocols. In addition, incarcerated persons stored diluted CB64 in cells after the COVID-19 pandemic began, a change in procedure occurring at approximately the same time as initial cases. Repeatedly finding *Serratia* in CB64 indicates that improper use and storage of the disinfectant likely contributed to the spread.

The invasive nature of the *Serratia* infections, including manifestations such as bacteremia and severe soft-tissue infection, suggests introduction of the bacteria directly into the bloodstream or soft tissues, highlighting the role of IDU in the prison outbreak. The predominant outbreak strain of *Serratia* was recovered from a needle obtained from 1 patient. In prisons, there is no access to new needles; some patients reported sharing needles, and most reported reusing needles multiple times themselves. Some patients reported using CB64 to clean their needles.

In August 2021, prison A implemented mitigation measures, including extensive staff training, instituting maintenance logs, recalibrating dilution machines, ensuring regular changing of tubing in dilution devices, and providing dedicated bottles of CB64 for incarcerated persons to check out and return within 24 hours for in-cell cleaning. Additional education on IDU risks and SUDT (begun in 2020) were also provided to incarcerated persons. No new cases were identified until spring 2022, at which time lapses in staff and resident education on use, maintenance, and storage of CB64 solution and dilution devices were recognized.

WGS results for 3 patient isolates identified at the prison in 2022 were closely related to 2021 patient isolates, indicating that the predominant outbreak strain of *S. marcescens* persisted >1 year. Given the diversity of *S. marcescens* strains in the environment, the predominance of a single strain suggests the likely existence of a persistent, but unknown, nidus of the outbreak strain. A single contaminated drug or CB64 source is unlikely to account for the persistence. An incarcerated person colonized with this strain or an unrecognized fomite in the environment are possible sources. Although *S. marcescens* is not a normal part of human flora, colonization of skin and gut has been documented (*10*,*27*). In addition, the hand-rinsate from a patient's cellmate yielded *S. marcescens*, indicating the potential for persistence on skin. After identification of additional cases in 2022, intervention included reeducating staff and incarcerated persons on proper use of CB64, including performing dilution within dilution devices only, and education on risks for *S. marcescens* infection through IDU equipment. No further cases had been documented as of July 2023, 8 months after the last identified case. Additional education has been provided to institutions throughout the state (Appendix).

One limitation of this study is that, given drug use is prohibited in prison, patients might have

**Figure 4.** Device calibrated to dilute Cell Block 64 solution and other cleaners to correct concentrations. Device pictured shows dangling tubing touching the machine surface, a possible route of contamination in outbreak of invasive *Serratia marcescens* infections at prison A, California, USA, January 2020–March 2023

**Table 2.** Environmental specimens positive for *Serratia marcescens* associated with patients hospitalized with invasive *Serratia marcescens* infections at prison A, California, USA, January 2020–March 2023

| Identifier | Sample description | Sample location, yard no. | Matched a patient isolate |
|---|---|---|---|
| A | Swab of water pooled in Cell Block 64 solution dilution machine tubes | 2 | No |
| B | Coffee from plastic cup | 3 | Yes |
| C | Nasal spray bottle | 3 | Yes, patients B and D |
| D | Scrub pad 1: porter closet | 1 | No |
| E | Scrub pad 2: used to clean cell | 1 | No |
| F | Scrub pad 3: beside toilet | 1 | No |
| G | Shower floor swab | 1 | No |
| H | Hand rinsate of cellmate to patient D (sterile saline) | 3 | No |
| I | Used needle or syringe 1 | 1 | Yes, patients A and B |
| J | Water and laundry detergent from body wash bottle | 1 | No |
| K | Cleaner stored in hand sanitizer bottle | 1 | No |
| L | Diluted cell block 64 solution in spray bottle | 1 | No |
| M | Mop bucket | 1 | No |
| N | Cell Block 64 solution stored in shampoo bottle | 1 | No |
| O | Cell Block 64 solution stored in chili sauce bottle | 2 | No |
| P | Cell Block 64 solution stored in coffee container | 2 | No |
| Q | Empty bottle, used to store Cell Block 64 solution | 1 | No |
| R | Diluted breakout from trash can 1 | 1 | No |
| S | Doorway 4 floor swab | 1 | No |
| T | Doorway 3 floor swab | 1 | No |
| U | Drinking water in bottle | 2 | No |
| V | Breakout from container originally used to store Cell Block 64 solution | 2 | No |
| W | Doorway 2 floor swab | 1 | No |
| Y | Doorway 1 floor swab | 1 | Yes |
| Z | Plastic sports drink bottle, used to store water | 1 | No |
| AA | Plastic bottle used as urinal | 1 | No |
| AB | Diluted breakout from trash can 2 | 1 | No |

provided incomplete information regarding drug preparation and sharing, and therefore some common sources of drugs or drug equipment may not have been identified. In addition, only 2 needles or syringes were available for testing. A comprehensive environmental sampling survey of the entire prison population and structure was unfeasible, so we focused testing on areas where cases were identified. Additional sources of environmental contamination, including water sources such as cell toilet water and shower and sink drains and traps, where biofilm may have formed, were unable to be tested. A limited number of patient isolates from 2021 and 2022 were available for WGS; testing of all isolates might have further clarified patient connections. Patients might have been infected with >1 *S. marcescens* strain. Most environmental isolates positive for *S. marcescens* did not match patient strains, and so direct correlation between environmental contamination and patient illness was not possible. Finally, our investigation focused on invasive infections and excluded milder illness.

Beginning in January 2020, screening and referral for SUDT became available in California prisons to all newly incarcerated persons, those transitioning into the community, and patients with IDU-related complications (*28*). As of January 2022, >64,600 incarcerated persons had been screened for SUD and medication-assisted treatment provided to >22,500 patients, leading to a significantly decline in overdoses and infectious disease complications since the program started (*29*).

After this outbreak, queries have identified additional cases of invasive *S. marcescens* infections in other California prisons. Similar concerns related to disinfection, including improper storage, device calibration, and usage, and IDU practices have been reported. Environmental mitigation through extensive cleaning and strict adherence to disinfectant guidelines might not eliminate all environmental sources of *Serratia* but might decrease the environmental microbial burden, thereby decreasing potential exposures to *S. marcescens* and other pathogens. IDU among incarcerated persons should be addressed through promotion of harm reduction practices and education, including access to appropriate disinfection supplies and sterile needles, and referral to SUDT programs.

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## About the Author

Dr. Kamali is a medical epidemiologist and infectious disease physician with California Correctional Health Care Services and California Department of Public Health whose interests include outbreak investigation.

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Address for correspondence: Amanda Kamali, California Correctional Health Care Services, 8260 Longleaf Dr, Elk Grove, CA 95758, USA; email: amanda.kamali@cdcr.ca.gov

# Health Belief Model to Assess Mpox Knowledge, Attitudes, and Practices among Residents and Staff, Cook County Jail, Illinois, USA, July–August 2022

Rashida Hassan, Ashley A. Meehan, Sarah Hughes, Amy Beeson, Hillary Spencer, Jourdan Howard, Lauren Tietje, Morgan Richardson, Anne Schultz, Chad Zawitz, Isaac Ghinai, Liesl M. Hagan

In summer 2022, a case of mpox was confirmed in a resident at the Cook County Jail (CCJ) in Chicago, Illinois, USA. We conducted in-depth interviews with CCJ residents and staff to assess mpox knowledge, attitudes, and practices; hygiene and cleaning practices; and risk behaviors. We characterized findings by using health belief model constructs. CCJ residents and staff perceived increased mpox susceptibility but were unsure about infection severity; they were motivated to protect themselves but reported limited mpox knowledge as a barrier and desired clear communication to inform preventive actions. Residents expressed low self-efficacy to protect themselves because of contextual factors, including perceived limited access to cleaning, disinfecting, and hygiene items. Our findings suggest correctional facilities can support disease prevention by providing actionable and tailored messages; educating residents and staff about risk and vaccination options; and ensuring access to and training for hygiene, cleaning, and disinfecting supplies.

In May 2022, mpox cases were identified in several nonendemic countries, including the United States, predominately among gay, bisexual, and other men who have sex with men (*1*–*4*). During the outbreak, transmission frequently occurred from contact with mpox lesions on the skin or mucosal surfaces during sexual activity (*5*). In summer 2022, vaccination campaigns began for persons exposed to or at higher risk for mpox (*6*,*7*).

Persons living in congregate settings, such as correctional and detention facilities, are at increased risk for many infectious diseases. Monkeypox virus (MPXV) transmission has been linked to communal housing and types of activities common in correctional facilities, including sharing clothing, linens, and personal items (*8*). In addition, access to hygiene and sanitation supplies in such facilities is sometimes limited (*9*). Mpox outbreaks were identified in correctional facilities in Nigeria, but the mode of transmission was not identified (*10*,*11*). At the time of this investigation, little was known about the acceptability and feasibility of mpox vaccination in correctional facility settings.

On July 22, 2022, mpox was confirmed in a person detained in Cook County Jail (CCJ) in Chicago, Illinois, USA (*12*), the first mpox case identified in a US correctional or detention facility. The Chicago Department of Public Health (CDPH) and the Centers for Disease Control and Prevention (CDC) investigated and found no higher-risk exposures or additional cases. CDPH and CDC determined that transmission in similar settings might be limited in the absence of higher-risk exposures, such as sexual contact (*12*). We conducted interviews at CCJ to assess mpox knowledge, attitudes, and practices among residents and staff; evaluate the acceptability and feasibility of vaccination for postexposure prophylaxis for mpox among residents; and identify information to include in mpox education materials for persons living and working in similar facilities.

Author affiliations: Centers for Disease Control and Prevention, Atlanta, Georgia, USA (R. Hassan, A.A. Meehan, S. Hughes, A. Beeson, H. Spencer, L.M. Hagan); Chicago Department of Public Health, Chicago, Illinois, USA (H. Spencer, J. Howard, L. Tietje, M. Richardson, A. Schultz, I. Ghinai); Cermak Health Services of Cook County and Cook County Health, Chicago (C. Zawitz)

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## Methods

### Study Participants

During August 2–4, 2022, we conducted in-depth interviews with CCJ residents and staff. Among 57 potentially exposed residents who had shared a dormitory-style housing unit with the mpox case-patient, 19 were still residing in CCJ at the time of the investigation. We invited all 19 residents to participate, in addition to a purposeful convenience sample of 13 staff member who worked in various roles at CCJ during our investigation. Staff provided verbal consent; residents provided written consent by making a nonidentifying mark on a document that included details of the interview process, voluntary nature of participation, and confidentiality protections. This investigation was part of a public health response to an ongoing outbreak. It was reviewed and approved by CDC and conducted consistent with applicable federal law and CDC policy (*13*–*17*).

### Data Collection

We developed a semistructured interview guide with questions on knowledge, attitudes, and practices regarding mpox and postexposure prophylaxis, hygiene and cleaning practices, and behaviors in jail that could lead to mpox transmission. Resident interviews were conducted in semiprivate spaces, far enough away from other residents and staff to provide audio privacy. A custody officer remained nearby, maintaining visual contact. Staff interviews were conducted in private spaces. All resident interviews were conducted by 2 interviewers, 1 leading the interview and 1 taking detailed notes. Some staff interviews were conducted by a single interviewer because of time constraints. All interviewers were trained on in-depth interview techniques, and interviews lasted ≈30–45 minutes.

**Table 1.** Characteristics of 16 resident qualitative interview participants in study assessing mpox knowledge, attitudes, and practices among residents and staff, Cook County Jail, Illinois, USA, July–August 2022*

| Characteristics | Value |
|---|---|
| Median age, y (range) | 43 (21–62) |
| Median no. nights potentially exposed (range) | 5 (1–7) |
| Male sex | 16 (100) |
| Race or ethnicity | |
| Black or African American, non-Hispanic | 9 (56) |
| White or Caucasian, non-Hispanic | 4 (25) |
| Hispanic or Latino | 2 (13) |
| Asian, non-Hispanic | 1 (6) |
| Sexual orientation | |
| Heterosexual or straight | 16 (100) |
| Ever accepted mpox PEP† | 9 (56) |

*Values are no. (%) participants except as indicated. PEP, postexposure prophylaxis.
†Includes residents who accepted mpox PEP initially and when reoffered. Acceptance rates were higher among persons offered PEP in individual or small group sessions compared with those offered PEP in a large group. Information on the number receiving a second dose of PEP was unavailable.

### Data Analysis

We analyzed data in 2 phases. First, we developed an a priori matrix to organize and analyze findings (*18*–*20*) to make evidence-based recommendations to improve immediate mpox response activities (*12*). Columns included predetermined topics aligned with interview questions. We entered participant responses into each row and summarized responses across row and topic, enabling rapid identification of findings. Key themes were compiled by reviewing the matrix entries, interview notes and summaries, and organizing findings and common themes. The study team discussed themes to summarize and reach consensus.

We later reassessed those data using the health belief model, a framework used to understand health behaviors and develop strategies to motivate behavior change (*21*,*22*). The model includes predictors for human behavior, such as perceived susceptibility to a disease or condition, perceived severity of illness, perceived benefits to taking action, perceived barriers to action, cues to action, and self-efficacy (*21*,*22*). Organizing the data around that framework further informed health promotion efforts in CCJ and similar settings.

## Results

Of 19 eligible residents, 16 (84%) consented to participate; all 13 staff consented. Residents ranged in age from 21 to 62 (median 43) years; all identified as male and as heterosexual/straight (Table 1). Nine (56%) identified as non-Hispanic Black, 4 (25%) non-Hispanic White, 2 (13%) Hispanic/Latino, and 1 (5%) non-Hispanic Asian. Participants spent 1–7 (median 5) nights in the same housing unit as the resident with mpox. Among the 13 staff, 7 (54%) worked in healthcare, 4 (31%) in custody, and 2 in other roles (Table 2). Interview themes were organized within the health belief model constructs (Table 3).

### Perceived Susceptibility to Mpox

Residents reported varied levels of concern about mpox, from not concerned at all to very concerned, and felt that residing in CCJ heightened their risk. Some residents reported keeping to themselves and therefore felt their risk was low. However, most residents were concerned about factors outside their control, such as communal housing, that could increase their risk. For some residents, their heightened sense

of susceptibility led to more conservative behaviors, such as frequent handwashing and avoiding social interactions or recreational activities.

Similarly, although staff thought their risk for MPXV infection was low, they perceived working in a jail inherently increased their risk for contracting infectious diseases. Some staff expressed confidence in their knowledge of infection prevention and control practices, such as using personal protective equipment, but others understood those tools might not guarantee protection.

#### Perceived Severity of Potential Mpox Illness

Residents and staff were unsure how severe illness would be if they contracted mpox. However, some drew connections to COVID-19 and wondered if persons with weakened immune systems or underlying conditions would have more severe illness.

#### Perceived Benefits of Behavior Change to Prevent Mpox

Residents and staff described several benefits to mpox prevention behaviors, including preventing transmission to their families. Residents were concerned that quarantining or isolating because of mpox exposure or MPXV infection could delay their release from jail. Those concerns motivated residents to want to protect themselves, but they felt they did not have sufficient knowledge about prevention options. Several residents felt they did not receive adequate information about the vaccine when it was offered, including information on safety and side effects (*12*). However, some residents reported they chose to get vaccinated, relying on previous knowledge that vaccination reduces risk for other illnesses.

#### Perceived Barriers to Mpox Preventive Actions

##### Limited Knowledge and Rumors about Mpox

Most residents and some nonhealthcare staff described limited knowledge about mpox symptoms, prevention, or vaccines as a barrier to preventive action. Many residents reported they first heard about mpox while detained in CCJ, after news about the mpox case in CCJ was reported to the public. Many residents did not remember being notified by staff about possible exposure or reported that the information was difficult to understand because it was provided to the entire housing unit at once. Residents wanted more information about the vaccine and other prevention options.

At the time of interviews, healthcare staff had recently completed an online mpox training, covering transmission, prevention, and vaccines, which they felt provided knowledge to protect themselves. Nonhealthcare staff had varying levels of mpox knowledge. Like residents, most staff reported their mpox-related information came from the news or others in CCJ, including information about the mpox case at CCJ; they had not received mpox training, and they felt unsure how to protect themselves.

**Table 2.** Characteristics of 13 staff qualitative interview participants in study assessing mpox knowledge, attitudes, and practices among residents and staff, Cook County Jail, Illinois, USA, July–August 2022*

| Staff role | No. (%) |
|---|---|
| Healthcare | 7 (54) |
| Custody | 4 (31) |
| Other | 2 (15) |

Several residents and staff reported hearing rumors that mpox was a "gay disease." They reported being hesitant to believe the rumors and did not describe rumors as a barrier to taking preventive action. However, residents and staff mentioned those rumors spreading within CCJ and were concerned the rumors might act as a barrier for others.

##### Challenges Accessing Healthcare and Supplies

Many residents were willing to report potential mpox symptoms to healthcare staff but felt that follow-up on requests for healthcare services in general was inconsistent. Residents felt they had inadequate access to cleaning, disinfecting, and hygiene supplies. Residents were issued bar soap at no cost, but many reported quickly running out of soap because they used it for handwashing, showering, and washing dishes and clothes. Most residents felt there was not enough soap available, especially if they were unable to purchase additional soap from the commissary. Residents believed supplies provided to clean and disinfect their living spaces were ineffective because the disinfectant was unlabeled and smelled like vinegar. Residents also described challenges accessing brooms, mops, and buckets. Staff believed the disinfectant was in line with guidance for disinfectants for viral pathogens but felt residents were unsure how to use it.

#### Cues to Action to Engage in Mpox Prevention

The mpox case within CCJ was the cue to action for residents and staff to protect themselves; however, many residents and nonhealthcare staff did not feel they had the information or resources to do so. Participants desired timely, clear communication about possible mpox exposure and prevention options, which they felt they had not received. Participants felt

**Table 3.** Summary of findings and illustrative quotes from study assessing mpox knowledge, attitudes, and practices among residents and staff, Cook County Jail, Illinois, USA, July–August 2022*

| Construct | Residents | Staff |
|---|---|---|
| Perceived susceptibility to mpox | Moderate to high. Residents perceived increased risk for infection due to structural factors of being in a correctional/detention setting. | Moderate to low. Staff perceived trust in the effectiveness of PPE but acknowledged increased risk due to the nature of correctional/detention settings. |
| | "I'm a clean freak type, constantly disinfecting and I stay away from a lot of people, but I'm not sure about things outside of my control." (CCJ resident) | "I think it's unlikely that I will get monkeypox, but my concern is heightened because of the environment I work in." (CCJ staff, nurse) |
| Perceived severity of potential mpox illness | Uncertain. Residents and staff were not sure how severe mpox illness would or could be, or how severity might differ based on the presence of underlying conditions. | |
| | "I'm a diabetic…does it affect me? With COVID they said people with diabetes and older people need to be concerned…yeah, it may mess me up especially because I got diabetes." (CCJ resident) | "I'm not sure how sick I would get. I don't know how severe this is." (CCJ staff, custody officer) |
| Perceived benefits of behavior change to prevent mpox | Some residents had previous knowledge about other vaccines and felt that receiving vaccination for mpox would protect their health. Residents also wanted to avoid bringing mpox home to their families once released from CCJ. | Staff described wanting to engage in mpox prevention behaviors to protect themselves and to avoid bringing mpox home to their families after work. |
| | "Is there any way to get tested [for mpox]? Cause it's a lot of people in my cell and I just want to make sure…and I don't want to take it back to my family." (CCJ resident) | "We have grandkids and kids at home we don't want to take it home to." (CCJ staff, other role) |
| | "The medical officers offered vaccine and I accepted. I was given no information, but I said let me get protected before anything gets out of hand…I just want to be safe." (CCJ resident) | |
| Perceived barriers to mpox preventive actions | Residents described barriers to preventive actions related to lack of knowledge and information about mpox and mpox PEP. They also described rumors about mpox that could be a barrier for others. Residents also perceived limited availability and insufficient quality of cleaning supplies and personal hygiene items (especially soap), which acted as a barrier for them. | Staff described primarily knowledge and information barriers to mpox prevention. Staff also described rumors about mpox that could be a barrier for others. |
| | "I don't know how [the vaccine] works or what's in it. If I were to take it, I would have to learn more about it." (CCJ resident) | "As long as I follow PPE protocol, I'll be ok." (CCJ staff, nurse) |
| | "I was told it's from Boystown† and it's a homosexual disease, I'm not sure if that info is true…Other inmates are pretty upset and homophobic, saying wild stuff." (CCJ resident) | "I'm not sure if this is real, but people say it's largely among the homosexual community. I don't know that I agree." (CCJ staff, custody officer) |
| | "The facility doesn't keep disinfectant on the deck [dormitory]. They're supposed to bring them every day, but it's variable." (CCJ resident) | |
| Cues to action to engage in mpox preventive actions | A confirmed mpox case within CCJ served as the cue to residents and staff to engage in preventive actions. Both residents and staff expressed the need for timely, clear communication to inform these actions. | |
| | "If I was in charge of telling people, I would tell them flat out the truth and not leave anything out." (CCJ resident) | "Let people know what's going on in real time, not a day or two later. Rumors will start to spread." (CCJ Staff, custody officer) |
| Self-efficacy to engage in mpox preventive actions | Residents felt limited self-efficacy to protect themselves from mpox in the jail setting due to limited mpox knowledge, perceived limited access to healthcare and cleaning and hygiene supplies, perceived insufficient communication, and facility factors like communal housing. | Healthcare staff had higher levels of self-efficacy because of their medical training, availability and knowledge of recommended PPE, and experience caring for patients with other infectious diseases. Staff in custody roles expressed more limited self-efficacy, due to a closer physical proximity to residents, limited knowledge of mpox and prevention methods, and perceived insufficient communication. |
| | "There's no way to protect yourself… 'stay 6 feet from other people' which is hard because the bunks are not 6 feet apart from each other." (CCJ resident) | "COVID-19 has opened our eyes and we've gotten used to taking care of these things as they come…The nurses here have been trained to handle this." (CCJ staff, healthcare provider) |
| | | "I don't know how likely it is that I would get [mpox], every now and again I have to go hands on with [a detainee]…Whenever they leave the tier, we always have to pat them down." (CCJ staff, custody officer) |

*Categories are organized according to the health belief model construct (*21*,*22*). CCJ, Cook County Jail; PEP, postexposure prophylaxis; PPE, personal protective equipment.
†Boystown, also known as Northalsted, is a historical LGBTQ+ neighborhood in Chicago, Illinois.

clear communication would help quell rumors, enable persons to better protect themselves and others, and improve relationships among staff in different roles and between staff and residents.

### Self-Efficacy to Engage in Mpox Preventive Actions

Self-efficacy to engage in mpox preventive actions varied. Many residents expressed low self-efficacy because of limited mpox knowledge, perceived limited access to healthcare and cleaning and hygiene supplies, perceived insufficient communication about their risk, and facility factors such as communal living. Healthcare staff reported greater self-efficacy because of medical training, knowledge and availability of personal protective equipment, and experience caring for patients with other infectious diseases. However, staff in other roles described limited self-efficacy because of more extended physical proximity to residents, including contact that was unpredictable and outside their control, limited knowledge of mpox and prevention methods, and perceived insufficient communication about their risk.

## Discussion

Our findings highlight the perspectives of jail staff and residents on communication, infection prevention, and vaccination after an mpox case was confirmed in CCJ. The rapid data analysis enabled us to provide real-time, stakeholder-informed recommendations to enhance mpox prevention and control efforts in CCJ and to create a toolkit to make those recommendations available to other correctional and detention facilities nationally (*12*,*23*–*25*).

Staff and residents at the jail described several barriers to engaging in mpox preventive actions: limited knowledge about mpox, risk, and postexposure prophylaxis; perceived insufficient communication about the mpox case and potential exposures; perceived inadequacy of cleaning and hygiene supplies among residents; and reported limitations in healthcare access among residents. Staff and residents had varied levels of self-efficacy but shared the need for clearer and more timely communication to prevent the spread of misinformation and empower them to make informed decisions.

Because of unique contextual factors related to disease transmission in correctional and detention facilities, providing tailored education and messages for residents and staff during public health emergencies and specific guidance about preventive actions available in these settings are critical (*24*,*25*). Previous studies have described the challenges of health promotion within correctional settings, including the influence of social networks and norms on health behaviors and the need to build rapport and trust to promote behavior change (*26*–*28*). In addition, ensuring residents and staff have access to sufficient hygiene supplies and that they know what cleaning and disinfecting supplies are available, how to request them, and how to properly use them is essential. Lessons learned from our findings and from past health education efforts in correctional settings, including during the COVID-19 pandemic (*29*–*31*), can inform strategies for future public health efforts.

The first limitation of our analysis is that interviews were limited to staff and residents in CCJ at the time of our investigation, and we were unable to speak to residents who had already left CCJ or staff not working during our investigation. Another limitation is that residents were within eyesight of custody officers during interviews, and some residents might have been uncomfortable disclosing sensitive information. Finally, our analysis was limited to a small sample and 1 facility; findings might not be generalizable to other settings.

In conclusion, correctional and detention facilities can support prevention of mpox and other infectious diseases by providing exposure notification and prevention messages that are destigmatizing, actionable, and tailored to the population and setting; by educating residents and staff about their infection risk and vaccination options; and by ensuring residents have access to sufficient hygiene, cleaning, and disinfecting supplies and training on how to use them. Including rapid qualitative analyses as part of the mpox case investigation helped accomplish timely development of setting-specific disease prevention tools that were informed by the residents and staff living and working in the affected facility. Rapid qualitative approaches, together with the inclusion of behavioral scientists and communication specialists to response teams, could be valuable additions to outbreak investigations of emerging infectious diseases in correctional settings. These tools can highlight population-specific challenges and barriers and provide actionable information for correctional settings to inform tailored prevention materials during future disease responses.

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## About the Author

Ms. Hassan is an epidemiologist at the Centers for Disease Control and Prevention. Her research interests focus on infectious disease outbreak response and technical assistance to local, state, and tribal public health agencies.

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Address for correspondence: Rashida Hassan, Centers for Disease Control and Prevention, 1600 Clifton Road NE, Mailstop H21-6, Atlanta, GA 30329-4018, USA; email: rhassan1@cdc.gov

# RISE-Vac—Co-Production of Vaccine Education Materials with Persons Persons Living in Prison

Femi Laryea-Adekimi, Jemima D'Arcy, Angela Bardelli, Aurélie Mieuset, Vlad Busmachiu, Irina Barbiros, Fadi Meroueh, Svetlana Doltu, Niall Walsh, Paula Harriott, Lara Tavoschi, Emma Plugge, Alicia Roselló

Increasing vaccination knowledge is effective in addressing hesitancy and is particularly important in populations deprived of liberty who may not routinely have access to health information, ensuring health equity. RISE-Vac is a European Union–funded project aiming to promote vaccine literacy, offer, and uptake in prisons in Europe. We consulted persons living in prisons in the United Kingdom (through the Prisoner Policy Network), France, and Moldova to determine their vaccination knowledge gaps, the information they would like to receive, and how they would like to receive it. We received 344 responses: 224 from the United Kingdom, 70 from France, and 50 from Moldova. Participants were particularly interested in learning about the effectiveness, side effects, and manufacturing of vaccines. Their responses guided the development of educational materials, including a brochure that will be piloted in prisons in Europe. Persons with experience of imprisonment were involved at every stage of this project.

Incarcerated persons have a higher prevalence of infectious diseases than the general community (*1*). This disparity can be linked to many factors, including contextual factors of the prison setting, such as overcrowding, delays in diagnosis and treatment, and high population turnover (*2*), and population characteristics, including higher prevalence of smoking cigarettes and engaging in commercial sex work (*3*,*4*). However, some diseases with higher prevalence among prison populations, such as human papillomavirus, influenza, and viral hepatitis (*5*,*6*), can be prevented through vaccination. Vaccination remains one of the most cost-effective public health interventions in the community; in the prison context, vaccination could help control infectious disease transmission and outbreaks, reducing illness and death among persons living in prison as well as protecting prison staff and the rest of the community (*7*,*8*). However, global data on vaccination in prisons is inadequate; a recent study examining COVID-19 vaccination rates found that, in the 6 countries that had prison vaccination data, rates were lower than for the general population (*9*).

RISE-Vac (Reaching the hard-to-reach: increasing access and vaccine uptake among prison populations in Europe) is a 3-year project funded by the European Union's Health Programme (*10*). RISE-Vac is led by the University of Pisa in Pisa, Italy, and consists of 8 further consortium partners based in Cyprus, France, Germany, Italy, Moldova, and the United Kingdom. The project seeks to increase vaccine access and uptake in prison populations across Europe. In this context, prisons include both pretrial and postadjudication facilities. One such intervention is the development and implementation of educational tools aimed at increasing vaccine knowledge in persons living in prison. Educational interventions, including knowledge dissemination through posters, pamphlets, or brochures, have previously been implemented in the prison context and have been shown to increase vaccine literacy and uptake of screening programs (*11*). Although the COVID-19 pandemic raised awareness of the importance of vaccination in controlling infectious

Author affiliations: Prison Reform Trust, London, UK (F. Laryea-Adekimi, P. Harriott); United Kingdom Health Security Agency, London (J. D'Arcy, E. Plugge, A. Roselló); University of Pisa, Pisa, Italy (A. Bardelli, L. Tavoschi); Centre Pénitentiaire, Villeneuve-lès-Maguelone, France (A. Mieuset); National Administration of Penitentiaries, Chișinău, Moldova (V. Busmachiu, I. Barbiros); University Hospital of Montpellier, Montpellier, France (F. Meroueh); State University of Medicine and Pharmacy "Nicolae Testemiţanu," Chișinău (S. Doltu); Pathways Centre, Dublin, Ireland (N. Walsh); University of Southampton, Southampton, UK (E. Plugge)

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diseases and the problems of vaccine hesitancy, this project is not focusing on a specific vaccine but vaccination in general, acknowledging that acceptability differs according to the vaccine and the infection.

Persons who have been or are currently imprisoned are too often left out of the development of interventions targeting prison populations (*12*). The perspective of those who have this direct experience is likely to be key to increasing the effectiveness and relevance of these interventions. Although robust evidence for engagement of incarcerated populations in co-production is lacking, the World Health Organization advocates for this approach in patient populations, stating that "resources may be better used if they are aligned with patients' priorities" (*13*). The RISE-Vac project partnered with persons who had been imprisoned but were now working for the Prison Reform Trust (PRT), a charity in England, to coproduce educational tools on vaccination for persons currently imprisoned across Europe. In this article, we present this co-production methodology and the resulting educational tool, developed with the input of persons who have been imprisoned and those who are currently imprisoned in the United Kingdom, France, and Moldova.

## Methods

To direct the development of the educational materials, in early 2022, the United Kingdom Health Security Agency (UKHSA), the United Kingdom partner, set up an advisory group consisting of experts in the field of prison health with knowledge of vaccination in prisons, experts in developing educational materials for persons living in prison, and persons with lived experience of imprisonment from across Europe (Appendix, https://wwwnc.cdc.gov/EID/article/30/13/23-0812-App1.pdf). We aimed for a minimum of 1 person per country participating in RISE-Vac to ensure the context of all participating countries was represented; each country did not provide an expert in each area, but we ensured that the advisory group as a whole had experts in all relevant areas.

The PRT has a network called the Prisoner Policy Network (PPN) comprising >700 persons living in all prisons across the 4 countries of the United Kingdom and persons now back in the community. PPN membership is open to anyone who has been in or is currently in prison in the United Kingdom. During the last 6 months of 2022, PRT consulted members of the PPN to obtain their views on vaccines and determine what further information they would like to receive about vaccination. All PPN members were eligible to participate regardless of their vaccination status or views. Integrating feedback from the advisory group, PRT produced a set of 7 questions to draw out the views of those living in prison. PRT piloted those questions in His Majesty's Prison (HMP) Rye Hill with a group of 10 incarcerated persons who extended this pilot to their social network. PRT received 30 written responses from HMP Rye Hill and oral feedback on the questions asked. In response, PRT adjusted the order of the questions and included 2 additional questions regarding family views of vaccines (Table).

In early 2023, PRT set out to consult persons from all RISE-Vac partner countries with the questions translated into Romanian, French, and Italian. The RISE-Vac leads in Moldova and France distributed the translated questions to all persons living in prison in 2 prisons in each of those countries. Data were not collected on the demographics of those who responded. At this time PRT ran a focus group in the community in the United Kingdom consisting of 4 persons who had been imprisoned and who identified as vaccine hesitant and 1 moderator with experience of incarceration. The same questions were asked to these participants.

All written responses were translated into English if necessary, collated, and analyzed by using thematic analysis to determine the key concepts (*14*). After familiarization with the data, initial codes were developed (open coding) by a person from PRT and

**Table.** Consultation questions to elicit views on vaccination among those living in prison or with lived experience of prison part of the European Union's RISE-Vac project*

| Question no. | Question |
|---|---|
| 1 | Have you had any vaccines in your life? |
| 2 | Tell us your opinion about vaccination and vaccines general (not only COVID-19 vaccines). |
| 3 | What do you already know about vaccines? |
| 4 | What more would you like to know about vaccines |
| 5 | Are you confident you have enough reliable information about vaccines? |
| 6 | Who do/would you trust to give you that reliable information? |
| 7 | What is the opinion of your friends and family abo vaccination and vaccines in general (not only COV 19 vaccines)? |
| 8 | Does the opinion of your family and friends abou vaccination matter in your decision to vaccinate? so, how? |
| 9 | How would you like to receive the information yo want about vaccines? (verbally, short leaflet, detail manual, video, audio, discussion groups) |

*RISE-Vac, Reaching the hard-to-reach: increasing access and vaccine uptake among prison populations in Europe.

2 members of UKHSA who had with expertise in qualitative methods. The data were coded independently and then agreed upon in an initial meeting and subsequently refined by a series of discussions. Those discussions led to the organization of the codes into conceptual categories, themes, and subthemes. This process guided the development of a brochure designed to be distributed in all prisons in Europe to enable vaccine learning.

The RISE-Vac project received ethics approval from the Committee on Bioethics of the University of Pisa (approval no. 0049433/2022). This specific piece of work did not require ethics approval because it was a consultation exercise as part of a health improvement initiative. No personal identifiers (e.g., demographic information) were recorded on the response form. No incentives for participation were provided.

## Results

PRT received 224 responses from incarcerated persons in the United Kingdom, 50 from Moldova, and 70 from France. Responses were received from both male and female prisons, but data on respondent demographics were not collected at an individual level. It was not possible to establish how many persons had been approached and therefore the number of persons who refused to participate.

Although this convenience sample was not selected on the basis of vaccination status, all respondents had received ≥1 vaccine in their lifetime. The key themes were common across the 3 participating countries: views of vaccination, prior knowledge about vaccines, areas of appetite for learning, availability of reliable information, and preferred mechanism for information sharing.

### Views on Vaccination

Despite a generally positive view of vaccines from the United Kingdom respondents, some were not as convinced about the benefits of vaccines as others:

> "They're not 100% but they help persons and save lives."

> "I have a certain amount of trust in vaccines, but you can never be 100% about them as after all it is a foreign body going into your own body."

Similarly, some respondents in Moldova expressed doubts about the effectiveness of vaccines:

> "My opinion is that the vaccine is not the best method for protecting your own health."

> "All vaccines do not inspire confidence in me. My opinion is that these vaccines are tests for the population."

In France, respondents were more positive about vaccines in general but were particularly skeptical about COVID-19 vaccines:

> "I believe in traditional vaccines, because they have been researched for years. I have no confidence in COVID-19 vaccines; how come we haven't been able to find vaccines against AIDS since 1985, and just like that we found vaccines for COVID in 2 years."

> "It could be good for preventing diseases but the anti-vax discourse also has good arguments."

In the focus group, participants expressed skepticism about the rapid production of the COVID-19 vaccines and the perceived pressure put on the public to take the vaccines. They were more comfortable with established vaccines including vaccines required for tropical diseases when traveling.

### Prior Knowledge about Vaccines

Respondents expressed a desire and a need for more information than the basic knowledge they already had regarding vaccines. In the United Kingdom, incarcerated persons reported having the following information about vaccines:

> "Nothing scientific really, I try to pick up on any advice and guidance out there. But it can be confusing or misleading."

> "They build or prepare your immune system to effectively fight the virus, allegedly."

Respondents in Moldova expressed these thoughts:

> "Thanks to them, I can get immunity to diseases."

> "We practically do not have any information to confirm that these vaccines help."

In France, some respondents said they didn't know anything, or only very little. However, others said that they were aware vaccines aided with immunity and protection from diseases.

### Areas of Appetite for Learning

When asked what additional information they wanted to receive about vaccines, many respondents in the United Kingdom felt they already had enough information to make decisions on vaccination. However,

most wanted access to more information, particularly about side effects of vaccines:

> "[Nothing] especially. I think I know the basics."

> "Possible side effects. Effectiveness against different viruses. Basic make up and formulation."

Respondents in Moldova repeatedly asked for detailed information about vaccines:

> "Detailed information (where the vaccine is produced, in which laboratory, the consistency of the vaccine)"

> "Everything possible: vaccine types, possible side effects, why do I need them?"

In contrast many respondents in France did not want any more information. However, some participants asked for more information on vaccine efficacy, vaccine production processes, contents of vaccines, and side effects of vaccines.

#### Availability of Reliable Information

Many respondents in the United Kingdom felt they did not have access to reliable information while in prison. However, most respondents felt they already had enough information to make a decision.

Most respondents in Moldova did not feel they had enough information to make an informed decision. This sentiment was echoed in France, where most respondents felt they did not have enough information.

#### Trusted Source for Reliable Information

Most incarcerated persons expressed that they would trust medical professionals to deliver vaccine information more than other sources, such as custodial staff. The respondents' thoughts regarding family views varied across the countries consulted. In Moldova, respondents' families' views emerged as an important factor affecting their decision, in contrast to respondents from the United Kingdom and France, who did not cite family views as important factors.

#### Preferred Mechanism for Information Sharing

In the United Kingdom, a short leaflet was the delivery mode most incarcerated persons preferred, followed by verbal delivery, then video. In Moldova, discussion groups with medical professionals were the most favored delivery mechanisms, followed by a detailed manual. In France, verbal delivery was most popular, although a short leaflet and video also were favored mechanisms.

#### Materials Developed

In line with the findings of the consultation, we produced an illustrated brochure (Appendix). This initial draft of the brochure is undergoing review by the international advisory committee and UKHSA vaccination experts before wider dissemination.

## Discussion

The results of the consultation demonstrate the desire from incarcerated persons to be equipped with accurate information to make informed decisions about vaccines. Many reported the lack of information they have access to in prison and felt limited by this lack. We were in a position to remedy this by producing materials that can be made accessible to persons living in prison and thereby encourage vaccine uptake in prisons.

Incarcerated persons, those who have been imprisoned, or both were involved at all stages of development of this brochure, including the leadership of the work, consultation, and drafting of the brochure and this article. The advisory group and immunization experts provided support, ensuring the robustness of content from a scientific perspective. This true co-development approach is necessary for the development of relevant and ethical materials. Although this approach is not yet widely piloted, we hope that the process of development will ensure that incarcerated persons will engage with the materials that have been informed by their peers. This aspect is important given that a recent scoping review examining COVID-19 vaccination in prisons found high levels of vaccine hesitancy among incarcerated persons and that a lack of educational materials about vaccines increased any concerns, potentially leading to feelings of apathy or beliefs in conspiracy theories (*15*). The impact of these educational resources will be evaluated during the RISE-Vac study by using a questionnaire survey examining knowledge, attitudes, and behaviors before and 1–3 months after implementation. Longer-term and more extensive evaluation is not possible given restraints on study resources and timeframes.

One limitation of this study is that the consultation process may have been exclusionary to certain cohorts. By using a written format, we may have excluded those with low literacy. We also may have discouraged some persons with negative views of vaccines to participate just by asking them to respond on the subject at a time where some sensitivity

regarding vaccination choices exists, especially in prison. In addition, whereas PPN in the United Kingdom does include women and younger incarcerated persons, its members are overwhelmingly adult men. Therefore, the needs of those with low literacy, those who are vaccine resistant, women, and younger incarcerated persons may have not been captured. Because we did not collect data on the demographic characteristics of respondents and nonrespondents, we cannot be certain about whose views were not gathered. Furthermore, we were unable to collect denominator data and therefore cannot be sure of the response rate, nor how that rate differed by demographic characteristics.

All materials used in this study will be piloted and translated into the languages of all RISE-Vac partner countries and additional languages as relevant to their prison context. In addition, a video animation covering the brochure content will be developed and dubbed. These materials then will be disseminated across Europe through RISE-Vac. Study funding limits meant that there were not resources to develop materials to support discussion groups with medical professionals (the preferred option of respondents) but this aim should be considered as a priority in the future. Similarly, this work demonstrates that participants might benefit from information about specific vaccines, and although it has not been possible to undertake within RISE-Vac, this focus should be a key development for the future. Creators of such materials will be able to build on this work, whether in response to pandemics and outbreaks or for routine vaccination.

Through this consultation process, we recognized a need for vaccine information in prison; incarcerated persons should have access to this resource to make informed decisions. Prisons do not exist outside of society, and so prison healthcare is connected to and impacts public health; prison health is public health (*16*). We have aimed to address the educational and information needs of incarcerated persons about vaccination to enable them to make informed decisions, ultimately improving vaccine uptake in prisons and aiding society as a whole to improve protection from vaccine-preventable diseases.

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### About the Author

Mr. Laryea-Adekimi is a Network Coordinator at the Prison Reform Trust, based in London, and helps manage the Prisoner Policy Network. His research interests include prison education and health and lived experience of imprisonment.

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Address for correspondence: Femi Laryea-Adekimi, Prison Reform Trust, 15 Northburgh St, London, EC1V 0JR, UK; email: femi@prisonreformtrust.org.uk

# Screening for Chlamydia and Gonorrhea in Youth Correctional Facilities, Utah, USA

Cara Wolf, Jennifer Clifton, Xiaoming Sheng

We reviewed data obtained in October 2021–May 2023 from youth who reported a history of sexual activity upon admission to 1 of 12 juvenile justice facilities in Utah, USA, that offered screening for *Chlamydia trachomatis* and *Neisseria gonorrhoeae*. Urinalysis revealed *C. trachomatis* positivity of 10.77%, *N. gonorrhoeae* positivity of 1.08%, and coinfection *C. trachomatis N. gonorrhoeae*) of 0.90%. Prevalence of infection was similar for youths in rural and urban facilities. A total of 12.01% of those identifying as male and 14.01% of those identifying as female tested positive for *C. trachomatis*, *N. gonorrhoeae*, or coinfection. Of young adults who tested positive, 74.65% received their results while incarcerated, all of whom accepted treatment. Our research underscores the feasibility of providing prompt *C. trachomatis*/*N. gonorrhoeae* screening and treatment in juvenile correctional facilities. The pervasiveness of infection emphasizes the urgent need for early identification and treatment for *C. trachomatis* and *N. gonorrhoeae* in incarcerated youth nationwide.

In the United States, adolescents and young adults 15–24 years of age account for ≈50% of new sexually transmitted infections (STIs) annually (*1*). *Chlamydia trachomatis* is the most common bacterial STI nationwide (*2*). In Utah, USA, where our research was conducted, in 2021, two thirds of all incident *C. trachomatis* cases occurred in persons 15–24 years of age (*3*). The same year, persons 15–19 years of age experienced a higher *C. trachomatis* burden (1,399 cases/100,000 population for those identifying as female and 394 cases/100,000 population for those identifying as male) than Utah's general population (322 cases/100,000 population overall; 426 cases/100,000 population for those identifying as female and 248 cases/100,000 population for those identifying as male) (*3*).

Author affiliation: University of Utah, Salt Lake City, Utah, USA

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*Neisseria gonorrhea* is the second-most reported bacterial STI in the United States, and its incidence has increased over the past decade (*2*). Although the incidence of *N. gonorrhoeae* in Utah remains lower than the national average, *N. gonorrhoeae* rates have increased by 1,009% from 2012 to 2021 (16 cases/100,000 population in 2012 to 108 cases/100,000 population in 2021) (*3*). In 2021, the incidence of gonorrhea in Utah was relatively low among persons 15–19 years of age (152 cases/100,000 population for those identifying as female and 97 cases/100,000 population for those identifying as male) (*3*). Those rates contrast with those in other age groups in Utah, in which the male population typically has twice the incidence of gonorrhea infections compared with the female population (*3*). The Centers for Disease Control and Prevention (CDC) recommends that STI surveillance statistics within the 2020–2021 timeframe warrant careful interpretation, taking into account disruptions in STI screening and prevention during the COVID-19 pandemic (*4*).

Both *C. trachomatis* and *N. gonorrhoeae* are pathogens of public health concern because of antibiotic resistance, rising community spread, and their effects when left untreated (*5*–*7*). In female patients, untreated *C. trachomatis* and *N. gonorrhoeae* can cause pelvic inflammatory disease, which can result in infertility and chronic pelvic pain (*5*–*7*). In male patients, *C. trachomatis* and *N. gonorrhoeae* can result in epididymitis, prostatitis, and infertility (*5*–*7*). In both sexes, the sequelae of *C. trachomatis* and *N. gonorrhoeae* include reactive arthritis, proctitis, conjunctivitis, and a higher risk for acquiring more serious infections such as HIV (*7*,*8*).

A 2022 systematic review showed that adolescents in juvenile detention centers are at a higher risk for STIs than for the general population and that STI screening in correctional settings is cost-saving, is feasible, and should be performed immediately upon intake as an

opt-out screening (*9*). Adolescents are at a higher risk for acquiring *C. trachomatis* and *N. gonorrhoeae* than adults for various physical, psychosocial, and behavioral reasons. The cervical mucosa in adolescent females is more susceptible to infection than in older women (*10*). Incomplete prefrontal cortex development in adolescents can lead to risky and impulsive sexual behaviors, such as unprotected sexual intercourse (*11*). In addition, adolescents may receive varied education on sexual health, which can result in a lack of knowledge regarding safe sex practices and STI prevention (*12*).

The CDC recommends that, in correctional settings, all female inmates ≤35 years of age and all male inmates <30 years of age be screened for *C. trachomatis* and *N. gonorrhoeae* upon intake (*13*). Youth in correctional facilities have a higher prevalence of both infections compared with their nonincarcerated peers, making screening vital (*13*). The National Commission on Correctional Healthcare's 2022 Standards for Health Services in Juvenile Detention and Confinement Facilities recommends screening for STIs (chlamydia, gonorrhea, HIV, syphilis, and trichomoniasis) on arrival or within 24–48 hours of admission, basing screening decisions on local prevalence data and consultation with health departments (*14*). Our study aimed to investigate the prevalence of *C. trachomatis* and *N. gonorrhoeae* among sexually active youth in juvenile correctional facilities in Utah and the feasibility of providing timely treatment for positive cases before youth were released into the community. The University of Utah and the Department of Human Services Institutional Review Boards deemed this program exempt.

## Methods

### Setting

During October 2021–May 2023, youth who self-reported having ever engaged in sexual intercourse were offered urine screening for *C. trachomatis* and *N. gonorrhoeae* during the routine medical intake process at 12 youth correctional facilities in Utah. Before that period of data collection, *C. trachomatis* and *N. gonorrhoeae* screening had been in place since 2015, with different protocols (*15*).

According to Utah Code 26B-7-214, minors can consent to medical care for the diagnosis and treatment of STIs without a parent or legal guardian's consent; however, a minor must believe themselves to be afflicted by an STI to consent to screening (*16*). Thus, we offered screening to minors who self-reported ever having been sexually active. The 12 correctional facilities from which data were collected were classified by the state as rural (n = 4) or urban (n = 8) (*17*). The nurse and nurse practitioner project leads helped each facility order supplies, including urine testing kits (Aptima Inc, https://www.aptima.com), prefilled laboratory forms, and mailing supplies. Facilities also were provided with a detailed manual that included stepwise instructions for the nurses involved with this provision of care. State appropriations supported this screening program.

### Exclusion Criteria

The only exclusion criterion was youth reporting never engaging in sexual intercourse. Youth under the influence of drugs or alcohol were excluded from the intake *C. trachomatis* and *N. gonorrhoeae* screening because of their inability to consent; they were later offered screening if they were still present in the facility, not intoxicated, and not undergoing withdrawal symptoms.

### Screening Process

A routine medical intake process in Utah's juvenile correctional facilities, which involves a nurse asking youth about their health history, current illnesses, and medications, also involves screening for STIs within 24 hours of admission. In the context of our research, this nurse-led process occurred after the new inmate was admitted into the facility's living quarters and occurred in the privacy of the medical office. Nurses inquired about history of sexual activity and assault and then offered *C. trachomatis* and *N. gonorrhoeae* urine screening for all youth who reported a history of sexual intercourse.

Nurses verbally explained the following:

1. Chlamydia and gonorrhea are common infections in persons in adolescents and young adults. Those infections often show no symptoms, leaving many persons unaware of infection. The medical team recommends screening for all persons who have ever had sexual intercourse.
2. Urine testing for chlamydia and gonorrhea is free of charge, and medical personnel keep results confidential. The urine test is not a drug test.
3. If a person tests positive for infection, they receive oral or injectable antibiotics at the facility. If a person is released before receiving their test results, the facility's health department will contact them to arrange treatment if test results are positive for infection (nurses obtained a phone number on a written consent form).

**Table 1**. Results of testing for chlamydia and gonorrhea among newly incarcerated youth, Utah Juvenile Justice & Youth Services, Utah, USA, October 2021–May 2023*

| Test results | No. (%) |
|---|---|
| Negative | 486 (87.25) |
| Positive for chlamydia | 60 (10.77) |
| Positive for gonorrhea | 6 (1.08) |
| Positive for chlamydia and gonorrhea | 5 (0.90) |

*Total sample size = 557.

After written consent was obtained, new inmates were given a specimen cup to provide a urine sample in a restroom near the medical office. Nurses sent specimens to a single state laboratory, and results were known within 48–72 hours in urban facilities and within 6 days in rural facilities. The extended turnaround times in rural areas were a result of the increased distance for specimen transport to the state laboratory. Youth who screened positive were either treated by the nursing staff onsite or, if they had been released, were referred to their local health department for follow-up. Nurses used standing orders to treat positive test results within the facility.

## Data Analysis

We analyzed data obtained from October 2021–May 2023. We used $\chi^2$ or Fisher exact tests to assess the associations and statistical significance between categorical variables. We set statistical significance at $p<0.05$.

## Results

We reviewed results from 557 collected urine samples. The average age of the participants who provided urine samples was 15.87 years. Of those, 69.13% were male and 28.34% were female; the remaining population identified as transgender or other gender identities. The combined positivity rate for *C. trachomatis* and *N. gonorrhoeae* was 12.75% (Table 1). Positivity for *C. trachomatis* was 10.77%, for *N. gonorrhoeae* was 1.08%, and for coinfection was 0.90%. There were no significant differences in *C. trachomatis* and *N. gonorrhoeae* infection positivity between the 8 urban (12.19%) and 4 rural (13.85%) facilities ($p = 0.5762$) (Table 2).

**Table 2**. Combined frequency chlamydia and gonorrhea infection among newly incarcerated youth in rural versus urban locations, Utah Juvenile Justice & Youth Services, Utah, USA, October 2021–May 2023*

| | County classification, no. (%) patients† | |
|---|---|---|
| Test results | Rural | Urban |
| Negative for chlamydia and gonorrhea | 168 (86.15) | 317 (87.81) |
| Positive for chlamydia or gonorrhea | 27 (13.85) | 44 (12.19) |
| Total | 195 (100.00) | 361 (100.00) |

*Total sample size = 556; $p = 0.5762$ by $\chi^2$ test.
†Missing location data from 1 case.

### Treatment for Positive Results

A total of 74.65% of youth testing positive were treated in correctional facilities, and 25.35% were released before the results were known. There were no treatment refusals within the correctional facilities, and all youth testing positive were treated by nursing staff within 2 days of receiving results. We found no significant difference in the completion of on-site treatment between urban and rural locations, despite differences in turnaround time (Table 3). Data on postincarceration treatment by the Utah Health Department were not available; thus, the proportion of positive results treated after release is unknown.

### Gender Identity and STI Positivity

We found no significant difference in STI prevalence (*C. trachomatis, N. gonorrhoeae*, or coinfection) between female and male participants ($p = 0.5242$). Female inmates experienced slightly higher positivity (14.01%) than did male inmates (12.01%). Conclusions cannot be drawn for gender-diverse persons because of insufficient sample sizes (Table 4).

## Discussion

Our findings substantiate previous findings that incarcerated adolescents have a high prevalence of STIs (*11*,*13*). The high infection burden underscores the urgent need for early detection and treatment, particularly considering the vulnerability of incarcerated youth. This research also demonstrates the feasibility of providing prompt STI screening and treatment in carceral settings and reveals that youth were amenable to receiving this treatment. Expeditious treatment has the potential to reduce the community burden of STIs and prevent health sequelae of untreated infections.

Justice-involved youth often have various physical and mental health needs because of the lack of care received in their communities (*18*). Ideally, the time spent in incarceration could help address acute, chronic, and preventative care needs, including sexual health. Although sexual health resources exist in communities, many youth underutilize them for such reasons as embarrassment, anonymity concerns, transportation, and cost. Moral concerns among communities in Utah regarding the dissemination of sexual health education materials to adolescents is another challenge affecting the availability

of such materials for this population. The state's abstinence-only education policy is a potential contributor to this gap. To fill those educational and care gaps, healthcare providers must be comfortable discussing sexual health with adolescents and young adults.

Barriers to the implementation of this screening program in 2015 included the initial reluctance of correctional administrators to support screening for and treating asymptomatic infections, low sexual health literacy and distrust among youth, and the need to train nurses on age-appropriate interview skills (*15*). Although support for such programs is expanding among correctional administrators, nurses continue to face challenges in counseling youth with low sexual health literacy. Nurses participating in our screening efforts received education from various sources, including a Title X Family Planning Program clinic educator, on providing information to youth in an age-appropriate and trauma-informed manner. Training developed by the US Department of Health and Human Services' Title X program, a federal program dedicated solely to family planning and related preventive health services, includes an overview of STIs, common symptoms and complications of untreated infections, STI treatment, STI prevention, and strategies for counseling youth about sexual health.

A notable limitation of this program is that we could not offer universal *C. trachomatis* and *N. gonorrhoeae* screening to all minors because of state law preventing minors from consenting to STI screening and treatment unless they suspect that they are infected, potentially hindering early STI detection and prevention. To address those constraints, nurses questioned youth about their sexual activity and recommended *C. trachomatis* and *N. gonorrhoeae* screening for persons who have ever been sexually active. This approach could have introduced a response bias, because young persons may have felt shame or embarrassment, leading to underreporting of sexual activity. In addition, the possibility of asymptomatic infection may go beyond the cognitive abilities of minors. Such limitations potentially result in missed screenings. Advocating for changes to current laws in Utah that would both protect minors' rights and ensure access to essential healthcare services, including universal STI screening, could help address this limitation.

**Table 3.** Chlamydia and gonorrhea treatment among newly incarcerated youth in rural versus urban locations, Utah Juvenile Justice & Youth Services, Utah, USA, October 2021–May 2023*

| | County classification, no. (%) patients† | |
|---|---|---|
| Treatment | Rural | Urban |
| Treatment provided | 19 (70.37) | 34 (77.27) |
| No treatment provided | 8 (29.63) | 10 (22.73) |
| Total | 27 (100.00) | 44 (100.00) |

*Total sample size = 71; p = 0.5163 by $\chi^2$ test.
†Missing location data from 1 case

Our program excluded extragenital (pharyngeal and rectal) *C. trachomatis* and *N. gonorrhoeae* screening at the time of intake. For the general US population, the CDC recommends screening for *N. gonorrhoeae* pharyngeal infections and for *C. trachomatis* and *N. gonorrhoeae* rectal infections in men who have sex with men and consideration of extragenital screening for females <25 years of age; however, no guidelines exist for extragenital testing specific to the context of correctional facilities (*19*). To enhance the detection and timely treatment for extragenital infections, future iterations of the screening program we implemented at these facilities will prioritize expanding intake screening based on behavior and sites of exposure. Within 2 weeks of admission, a routine physical examination was conducted by each facility's lead nurse practitioner in the medical office's examination room. After gathering a detailed sexual history and identifying pertinent sexual health risks, the nurse practitioners selectively ordered extragenital *C. trachomatis* and *N. gonorrhoeae* screening, along with screening for other STIs, such as trichomoniasis, HIV, syphilis, hepatitis C, and hepatitis B.

The initial decision to perform urine testing over testing vaginal swab specimens among female youth was based on patient convenience and not wanting to contribute to sexual trauma in this population. Vaginal swab specimens offer higher sensitivity compared with urine screening in detecting both *C. trachomatis* and *N. gonorrhoeae*, with sensitivities reaching 94.1% (*C. trachomatis*) and 96.5% (*N. gonorrhoeae*) for vaginal swab specimens and 86.9% (*C. trachomatis*) and 90.7% (*N. gonorrhoeae*) for urine specimens. (*20*). Program modifications are underway to offer the option of

**Table 4.** Chlamydia and gonorrhea positivity among newly incarcerated youth by self-reported gender identity, Utah Juvenile Justice & Youth Services, Utah, USA, October 2021–May 2023*

| | Gender identity, no. (%) patients | | | | |
|---|---|---|---|---|---|
| Test results | Male | Female | Transgender | Nonbinary | Other |
| Negative for chlamydia and gonorrhea | 337 (87.99) | 135 (85.99) | 4 (100.00) | 2 (100.00) | 7 (87.50) |
| Positive for chlamydia or gonorrhea | 46 (12.01) | 22 (14.01) | 0 | 0 | 1 (12.50) |

*Self-report of gender identity was optional. Total sample size = 554.

vaginal screening for *C. trachomatis* and *N. gonorrhoeae* to female youth entering Utah correctional facilities, as well as to offer intake screening for trichomoniasis to female youth and screening for HIV in both sexes.

A final limitation was the unknown treatment completion for youth who were released before receiving positive results. Efforts are underway to improve communication with community providers and the health department regarding treating young persons testing positive after release; this system will aid in identifying barriers to sexual healthcare within the community.

## Conclusions

This research demonstrates that identifying and promptly treating *C. trachomatis* and *N. gonorrhoeae* infections in youth confinement settings is feasible. The high prevalence of infection in this vulnerable population emphasizes the importance of screening programs, timely treatment for young persons testing positive, and expansion of sexual health education for young persons both in and outside of correctional facilities. Future endeavors should focus on tracking incarcerated youth who test positive after release and identifying barriers to community-based treatment. Collaboration between correctional administrators and healthcare providers is pivotal in expanding and sustaining programs aimed at improving the well-being of justice-involved youth.

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## About the Author

Dr. Wolf is a family nurse practitioner and an adjunct assistant professor at the University of Utah College of Nursing. Her professional interests include sexually transmitted infections, adolescent medicine, and LGBTQIA+ healthcare. Dr. Clifton is a family nurse practitioner and professor at the University of Utah College of Nursing who has practiced juvenile corrections since 2005. She is a member of the National Commission on Correction Health (NCCHC) Board of Representatives and vice chair of the NCCHC Juvenile Health Committee.

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Address for correspondence: Cara Wolf, University of Utah College of Nursing, 10 S 2000 E, Salt Lake City, UT 84112, USA; email: cara.wolf@nurs.utah.edu

# HIV Risk and Interest in Preexposure Prophylaxis in Justice-Involved Persons

Ank E. Nijhawan, Zoe Pulitzer, Brynn Torres, Natalie Noreen, Alysse Schultheis, Cynthia Frank, Richard Colon, Ralph Brooks, Randi Proffitt, Jennifer Pankow, Ahrein Bennett, Maverick Salyards, Irene Kuo, Kevin Knight, Sandra A. Springer

Preexposure prophylaxis (PrEP) is underused in persons who use drugs and justice-involved persons. In an ongoing randomized controlled trial in 4 US locations comparing patient navigation versus mobile health unit on time to initiation of HIV medication or PrEP for justice-involved persons who use stimulants or opioids and who are at risk for or living with HIV, we assessed HIV risk factors, perceived HIV risk, and interest in PrEP. Participants without HIV (n = 195) were 77% men, 65% White, 23% Black, and 26% Hispanic; 73% reported a recent history of condomless sex, mainly with partners of unknown HIV status. Of 34% (67/195) reporting injection drug use, 43% reported sharing equipment. Despite risk factors, many persons reported their risk for acquiring HIV as low (47%) or no (43%) risk, although 51/93 (55%) with PrEP indications reported interest in PrEP. Justice-involved persons who use drugs underestimated their HIV risk and might benefit from increased PrEP education efforts.

In 2021, 6.7 million persons cycled through United States jails (*1*), 443,700 persons were released from state and federal prisons (*2*), and 3.7 million persons were on probation or parole (*3*). During this transition and while under community supervision, those persons are disproportionately affected by health threats such as drug overdose and increased risk for acquiring HIV, sexually transmitted infections (STIs), and hepatitis C (*4*–*9*). Despite successful interventions focused on medications for opioid use disorder (*10*,*11*), implementation of integrated, evidence-based interventions that include HIV prevention has been limited.

HIV preexposure prophylaxis (PrEP) can reduce HIV acquisition by 99% in persons who have sexual exposures (*12*,*13*) and by 74% in persons who inject drugs (PWID) (*14*). However, a considerable unmet need for PrEP exists in highly affected groups, including PWID and justice-involved persons (*15*–*17*). Justice-involved refers to persons who are currently incarcerated (in jail or prison), have a history of being in jail or prison, or are currently or previously on probation/parole. Indications for PrEP include condomless sex with a partner who has HIV or unknown HIV status, recent bacterial STIs, and sharing injection equipment (*18*), all of which are common among justice-involved persons (*19*,*20*), although studies outside those of persons currently incarcerated are limited. Awareness of PrEP is generally low among currently incarcerated persons, ranging from 4% to 25% (*17*,*21*,*22*). Even among persons who have PrEP indications, HIV risk perception is low (*17*,*21*,*23*).

PrEP is not available in most jails and prisons because sex and drug use are prohibited behind bars and providing PrEP might be viewed as condoning or encouraging those behaviors (*24*,*25*). Despite lack of access to PrEP, data from Arkansas, Connecticut, and Rhode Island identified that many justice-involved persons have indications for and express interest in PrEP; noted barriers include individual costs, access to PrEP care, and concerns about side effects (*21*,*23*,*26*). However, limited data exist about PrEP implementation for justice-involved populations, including those in jails or prisons or under community supervision.

In this study, we measured HIV risk with regard to sexual exposures and substance use and describe HIV prevention needs in a diverse justice-involved population enrolled in an ongoing, multisite, randomized

Author affiliations: University of Texas Southwestern Medical Center, Dallas, Texas, USA (A.E. Nijhawan, Z. Pulitzer, B. Torres, N. Noreen); Yale School of Medicine, New Haven, Connecticut, USA (A. Schultheis, C. Frank, R. Colon, R. Brooks, S.A. Springer); Texas Christian University, Fort Worth, Texas, USA (R. Proffitt, J. Pankow, A. Bennett, M. Salyards, K. Knight); George Washington University, Washington, DC, USA (I. Kuo)

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controlled trial. Specifically, we assessed sexual and injection drug use risk for HIV acquisition (and their overlap), current self-reported HIV risk, and PrEP awareness, interest, and preferences.

## Methods

A reliance agreement was executed to enable Texas Christian University (TCU) to be the single Institutional Review Board (IRB) of record for all project sites. All project protocols have been reviewed and approved (IRB# 1920-275). Protocol modifications were communicated to TCU IRB, clinicaltrials.gov (NCT05286879), and participants (when appropriate) by site project coordinators and site principal investigators. Additional protections include obtainment of a Certificate of Confidentiality and review and approval of the study protocol by the Office of Human Research Protections at the Department of Health and Human Services. We obtained written informed consent from all project participants.

This study was a preliminary descriptive analysis of baseline assessments conducted for persons enrolled in a hybrid type 1 effectiveness-implementation randomized controlled trial comparing patient navigation to mobile health unit (MHU) for linking justice-involved persons to community-based HIV and substance use disorder (SUD) prevention and treatment services (*27*). Recruitment across 4 study sites in Texas and Connecticut began March 2022. Potential participants were referred by facility staff in jail, prison, court-mandated drug treatment, parole/probation, and the community on the basis of published processes (*27*). For persons in facilities, staff referred any persons who met eligibility criteria. Eligibility included age ≥18 years; currently in custody with upcoming release date (30 days), recently (previous 6 months) in custody, or currently under supervision (probation, parole); precustody stimulant or opioid use (previous 12 months); precustody history of condomless sex or injection drug use (previous 6 months); and willingness to learn about PrEP. All participants provided written informed consent and then underwent baseline assessments and randomization.

Baseline assessments were conducted face-to-face by research assistants and included demographics, current custody setting (if applicable), housing status, employment, income, and health insurance (precustody if applicable). Mental health disorders were self-reported, and substance use was assessed by using the TCU Drug Screen 5, including fentanyl (*28*). Risk assessment was conducted by using the HIV Risk Behavior Tool (*29*).

We confirmed HIV status chart review and point-of-care HIV testing (Oraquick Rapid HIV 1/2; Orasure Technologies, https://www.orasure.com) for all persons not known to have HIV. For this analysis, only HIV-negative persons were included. We also assessed history of hepatitis C, hepatitis B, gonorrhea, chlamydia, or syphilis.

We asked participants who tested negative for HIV multiple choice questions about self-reported current risk for HIV (no, low, medium or high risk)

**Table 1.** Baseline demographic characteristics of 195 participants without HIV in study of HIV risk and interest in preexposure prophylaxis for HIV-negative justice-involved populations in Texas (Dallas and Fort Worth) and Connecticut (northeast and southeast), USA, March 2022–May 2023*

| Characteristic | Value |
|---|---|
| Sex | |
| M | 150 (77) |
| F | 44 (23) |
| Sex nonconforming | 1 (<1) |
| Mean age, y (SD) | 41 (10.3) |
| Race | |
| White | 127 (65) |
| Black | 40 (21) |
| Other/unknown | 22 (12) |
| American Indian | 4 (2) |
| Asian | 2 (1) |
| Hispanic ethnicity | 51 (26) |
| Marital status | |
| Married | 16 (8) |
| Divorced/separated/widowed | 61 (31) |
| Never married | 118 (61) |
| Men who have sex with men | 5 (3) |
| Injection drug users | 67 (34) |
| Housing | |
| Homeless/shelter | 43 (23) |
| Single occupancy hotel/residential facility | 28 (15) |
| Staying with family/friends | 61 (31) |
| Rent or own home | 55 (28) |
| Education | |
| Less than high school | 46 (24) |
| High school/GED | 78 (40) |
| Some college/associates/bachelor/graduate degree | 71 (36) |
| Employment | |
| Full or part time | 90 (46) |
| Unemployed | 87 (45) |
| Disabled/other | 18 (10) |
| Insurance | |
| Private | 16 (8) |
| Medicaid only | 72 (37) |
| Medicare with or without Medicaid | 6 (4) |
| Other | 21 (11) |
| None | 80 (41) |
| Annual income, US$ | |
| <2,500 | 79 (41) |
| 12,500–30,000 | 48 (24) |
| 30,001–50,000 | 30 (16) |
| >50,001–100,000 | 31 (16) |
| Receive public assistance | 104 (53) |
| Current controlled setting | 99 (51) |
| Recruitment site | |
| Connecticut (both sites) | 78 (40) |
| Fort Worth, Texas | 42 (22) |
| Dallas, Texas | 75 (38) |

*Values are no. (%) except as indicated. GED, general educational development test.

(*30*), awareness of and interest in PrEP, and if they had ever been prescribed PrEP. All participants were provided standardized education about PrEP from research assistants. If interested in PrEP, participants were asked about preferences, including oral versus injectable and preferred provider location to receive PrEP. They were also instructed to discuss how to get PrEP with an interventionist (patient navigator/community health worker on MHU). If not interested in PrEP, persons provided reasons they were not interested through short free-form answers for reason not interested and preferred location. PrEP indications included self-reported bacterial STI in the previous 6 months, condomless sex with a partner with unknown HIV status or living with HIV within the previous 6 months, and sharing injection equipment.

We entered data into a centralized REDCap database according to study protocol (*27*). We summarized binary and categorical variables by using frequencies and assessed continuous variables by using means. We conducted data cleaning and analyses by using Microsoft Excel R (https://www.microsoft.com) and SAS Studio (SAS Institute Inc., https://www.sas.com).

**Table 2.** Clinical characteristics of 195 participants without HIV in study of HIV risk and interest in preexposure prophylaxis for HIV-negative justice-involved population in Texas (Dallas and Fort Worth) and Connecticut (northeast and southeast), USA, March 2022–May 2023*

| Characteristic | No. (%) |
|---|---|
| Hepatitis C | |
| >1 y ago | 36 (18) |
| 4–12 mo ago | 6 (3) |
| 1–3 mo ago | 4 (2) |
| Unknown | 2 (1) |
| Hepatitis B | |
| >1 y ago | 4 (2) |
| Gonorrhea | |
| >1 y ago | 32 (16) |
| 4–12 mo ago | 4 (2) |
| Unknown | 2 (1) |
| Chlamydia | |
| >1 y ago | 3 (19) |
| 4–12 mo ago | 3 (2) |
| 1–3 mo ago | 1 (<1) |
| Unknown | 1 (<1) |
| Syphilis | |
| >1 y ago | 10 (5) |
| 4–12 mo ago | 7 (4) |
| 1–3 mo ago | 1 (<1) |
| Unknown | 1 (<1) |
| Mental health | |
| Any issue | 142 (73) |
| Depression | 96 (49) |
| Anxiety | 81 (42) |
| ADHD | 37 (19) |
| PTSD | 63 (32) |
| Bipolar | 46 (24) |
| Schizophrenia | 13 (7) |
| OUD† | |
| Mild | 4 (2) |
| Moderate | 4 (2) |
| Severe | 87 (45) |
| Stimulant use disorder (cocaine, methamphetamines)† | |
| Mild | 7 (4) |
| Moderate | 12 (6) |
| Severe | 106 (56) |
| Polysubstance use | |
| OUD and stimulant use disorders | 55 (28) |
| OUD and AUD | 9 (5) |
| Stimulant use disorder and AUD | 13 (7) |
| OUD/stimulant use disorder/AUD | 10 (5) |

*ADHD, attention deficit hyperactivity disorder; AUD, alcohol use disorder; OUD, opioid use disorder; PTSD, posttraumatic stress disorder.
†Severity of OUD and stimulant use were based on Texas Christian University drug screen scores: mild, 2–3; moderate, 4–5; severe, ≥6.

## Results

Overall, 195 persons without HIV were included. More than three quarters (77%) identified as cisgender male; mean age was 41.4 years; self-reported race/ethnicity was 65% White, 21% Black, and 26% Hispanic. Most (68%) persons reported unstable or temporary housing; completed high school or less (64%); and were either unemployed or on d isability (50%) (Table 1).

There were 16 cases of self-reported STIs in 14 persons within the previous 12 months. 2 (7%) persons had both gonorrhea and chlamydia. Mental health disorders were common (142/195, 73%), as was SUD; 95/195 (49%) had opioid use disorder and 125/195 (64%) had stimulant use disorder (Table 2).

At baseline, the mean number of reported sexual partners in the previous 30 days (before custody if applicable) was 2.9 (SD 14.5). One fifth (20%) reported no sexual partners, 39% reported 1 partner, 20% reported 2 partners, and 21% reported ≥3 partners. Most reported having sex with someone of the opposite sex, although 5 men reported sex with other men; 2 reported transgender partners. Nearly all (91%) who were recently sexually active reported condomless sex; 111 reported vaginal intercourse and 30 both vaginal and anal sex. Of those reporting vaginal sex, 4/141 (3%) had a sexual partner infected with HIV and 74/141 (52%) had partners with unknown HIV status. Most (120/141, 85%) used drugs or alcohol during vaginal sex. Of those reporting anal sex, 1/30 (3%) reported having a partner infected with HIV and 18/30 (60%) reported partners of unknown HIV status. Most (27/30, 90%) reported drug or alcohol use during sex. In the previous 30 days, 67 (34%) of 195 reported injecting drugs and 29 (43%) of /67 (15% of overall cohort) reported sharing equipment. Overlap in substance use and sexual risk was common; 68 (48%) of 141 reported substance or alcohol use during sex with ≥1 partner infected with HIV or with unknown HIV status.

Of 195 participants, 93 (48%) had indications for PrEP (Figure 1), but 90% reported low or no self-perceived risk for HIV, including 13/14 (93%) who had a recent STI and 22/29 (76%) who reported sharing drug equipment (Figure 2). Overall, 113 (58%) of 195 reported being aware of PrEP, 82 (42%) of 195 reported being interested in PrEP, and 1 person had been previously prescribed PrEP. In Texas, 55% were interested versus 23% in Connecticut. Of those recruited while in custody, 53 (53%) of 100 reported interest in PrEP, compared with 29 (31%) of 95 of those recruited from the community. Of those aware of PrEP, 41 (36%) of 113 were interested in taking it, compared with 41 (50%) of 82 who had not heard of PrEP before. Those with PrEP indications were more likely to report interest in PrEP (51/93, 55%) than those without PrEP indications (31/102, 30%; $p<0.05$).

Of the 82 interested in PrEP, nearly two thirds (62%) preferred injectable PrEP over daily oral PrEP (38%). Preferred locations to receive PrEP were MHU (44%), primary care provider's office (32%), telemedicine (10%), emergency department (4%), infectious diseases provider (2%), and substance use treatment programs (1%).

Of those not interested in PrEP, 68% believed that they were not at risk for HIV, 11% did not know enough about PrEP, and 9% reported concerns about side effects. Other responses included "do not like taking medicine," "wanting to focus on primary health needs first," HIV "was not a death sentence anymore," and "I'm not gay."

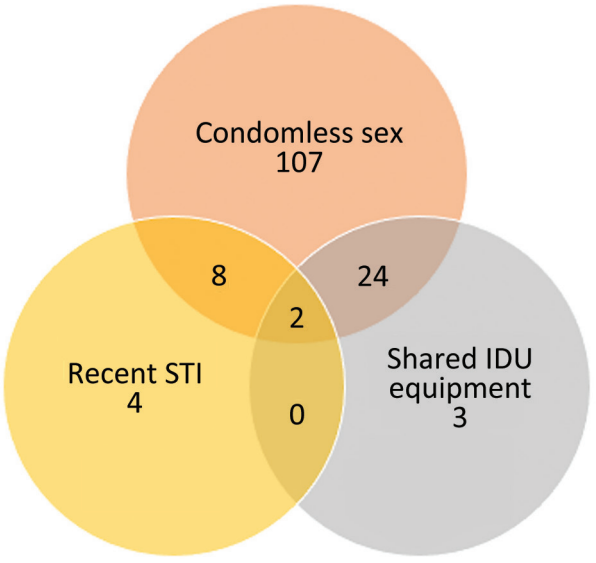


**Figure 1.** Venn diagram showing indications for preexposure prophylaxis among participants in study of HIV risk and interest in preexposure prophylaxis for HIV-negative justice-involved populations in Texas (Dallas and Fort Worth) and Connecticut (northeast and southeast), USA, March 2022–May 2023. Condomless sex and shared IDU equipment are based on baseline responses with 30-day lookback; recent STI is based on self-report at baseline for STIs diagnosed during the past year. IDU, injection drug use; STI, sexually transmitted infection.

## Discussion

In a diverse sample of justice-involved persons at risk for HIV who had a history of stimulant or opioid use that were enrolled in an ongoing multicenter randomized controlled trial, participants reported high rates of condomless sex with a partner of unknown HIV status, recent STIs, and sharing injection drug use equipment. Furthermore, approximately half reported overlapping sexual and substance use related risk factors. However, those high rates of HIV risk factors did not correlate with self-perceived risk for HIV; 90% reported low or no risk for HIV, including 93% (13/14) of those who reported recent STIs and 76% (22/29) of those who reported sharing injection drug use equipment. Our findings corroborate others' findings among persons in jail and prison (*21*,*23*,*26*,*31*), and our study also included community-recruited justice-involved persons.

There are potential reasons for the mismatch between perceived and actual HIV risk in this population. First, when surveyed, persons were often in or recently released from a controlled setting, separated from their sexual and substance use network, and might therefore have assessed their present HIV risk to be lower than their risk when not in custody (*26*,*32*). Second, given the high incidence of HIV among men who have sex with men and messaging from PrEP advertisements and public health campaigns focused on that group, persons in other risk groups (PWID, heterosexual) might believe that they are not at risk for HIV. Third, patients might not be aware of associations between recurrent STIs and HIV (*33*) or the increased HIV prevalence in justice-involved persons and communities disproportionately affected by incarceration (*34*). Our findings reinforce the need for education about HIV risk and PrEP availability in jails, prisons, and community supervision, as well as programs for linkage to PrEP and sexual healthcare.

Only 55% of participants with PrEP indications and 42% overall were interested in PrEP, whereas previous studies reported a range of PrEP interest (23%–90%) (*21*,*23*) among justice-involved groups. PrEP awareness did not correlate with interest, and the main reason for not wanting PrEP was persons believing that they were not at risk, although some also expressed concerns about side effects or not knowing enough about PrEP.

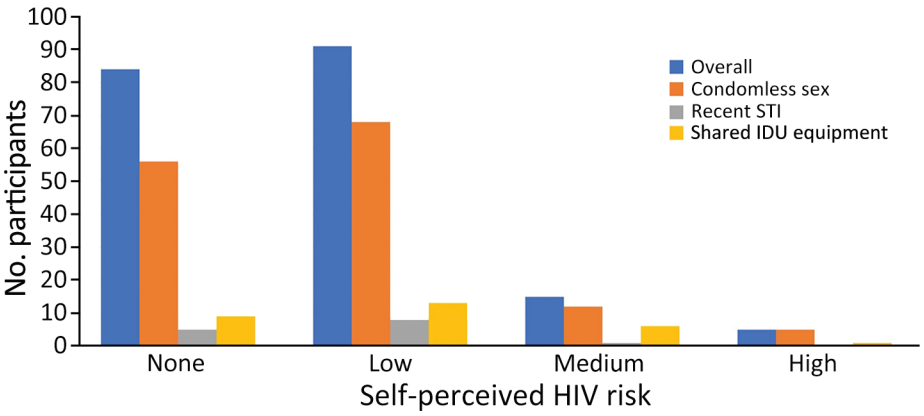


**Figure 2.** Self-perceived HIV risk overall and by reported risk factors among participants without HIV enrolled in study of HIV risk and interest in preexposure prophylaxis for HIV-negative justice-involved populations in Texas (Dallas and Fort Worth) and Connecticut (northeast and southeast), USA, March 2022–May 2023. Participants answered "what is your current risk for HIV acquisition (no, low, medium or high risk)?" Condomless sex and shared IDU equipment are based on baseline responses with 30-day lookback; recent STI is based on self-report at baseline for STIs diagnosed during the past year. IDU, injection drug use; STI, sexually transmitted infection.

Among those who expressed interest in PrEP, a preference for injectable over oral medications and certain locations for PrEP access (MHU, primary care, or telehealth vs. infectious diseases or substance use treatment clinics) was evident. Some of those preferences (injectable, primary care) might indicate a need for more confidential and less stigmatizing approaches that are also less burdensome to the patient.

Our findings have major implications for HIV prevention initiatives for justice-involved populations, including emphasizing the role substance use might play in sexual risk taking (*35*–*37*), associations between STIs and HIV acquisition, and PrEP indications among PWID. During the time period after custody, recently released persons often have increased substance use (*38*) and increased sexual risk-taking, amplifying the possibility of HIV acquisition (*6*,*7*). Additional multilevel barriers exist to successful PrEP implementation for this group, including competing priorities for meeting basic needs (housing instability, food insecurity), health needs (physical, mental health, SUDs), and other family and legal obligations. Carceral facilities might face competing priorities, limited resources, and lack of experience in implementing PrEP or PrEP education. Furthermore, HIV risk is dynamic in this population (*39*) and requires comprehensive and adaptable healthcare delivery models.

HIV prevention is not limited to PrEP. The role of harm reduction, such as medications for opioid use disorder, syringe exchange, reducing overall substance use, and testing and treatment for STIs, is critical to comprehensive HIV prevention. Although national policies provide a useful framework for reducing HIV incidence (*40*), the omission of SUD screening and treatment as a vital component of HIV prevention will undermine the ability to reduce new HIV infections in the United States, especially for vulnerable populations (*41*,*42*).

Limitations of this analysis include use of cross-sectional baseline data from an ongoing study. Changes over time in HIV risk, attitudes toward PrEP, or PrEP receipt could not be assessed. However, participants will complete follow-up visits at 1, 3, 6, and 12 months, which provides a future opportunity to assess dynamic HIV risk and PrEP uptake. Given the population studied (recent substance use, HIV risk factors, broad criteria for justice-involvement) our findings might not be generalizable to other settings.

In this diverse sample of justice-involved persons who had current or previous substance use, we identified multiple risk factors for HIV acquisition, including sexual and substance use risks. However, participants had low overall self-perceived HIV risk. Less than half were interested in PrEP, and those who were showed preferences for injectable over oral formulations and PrEP delivery preferred through a MHU or primary care, options that might not be widely available. Longitudinal data from this ongoing trial on HIV risk, SUD outcomes, and PrEP interest and initiation in this population will inform future comprehensive HIV prevention approaches.

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## About the Author

Dr. Nijhawan is a professor in the Department of Internal Medicine, Division of Infectious Diseases and Geographic Medicine, University of Texas Southwestern Medical Center, Dallas, Texas. Her primary research interests are improving the HIV care cascade for underserved populations, including persons who have substance use disorders and those involved in the criminal legal system.

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Address for correspondence: Ank E. Nijhawan, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, TX 75390-9169, USA; email: ank.nijhawan@utsouthwestern.edu

# HIV Care Continuum and Preexposure Prophylaxis Program in Federal Bureau of Prisons, United States

Xiao Hong Huang, Elizabeth Thompson, Tami Rodriguez

In 2019, the US Department of Health and Human Services launched the Ending the HIV Epidemic in the US initiative (EHE) with the goal of reducing new HIV infections by 90% by 2030. This initiative identifies 4 pillars (diagnose, treat, prevent, and respond) to address the HIV epidemic in the United States. To advance the EHE goals, the Federal Bureau of Prisons (FBOP) has implemented interventions at all points of the HIV care continuum. The FBOP has addressed the EHE pillar of prevention through implementing preexposure prophylaxis, developing a strategy to decrease the risk of new HIV infection, and providing guidance to FBOP healthcare providers. This article describes the implementation of programs to improve the HIV care continuum and end the epidemic of HIV within the FBOP including a review of methodology to implement an HIV preexposure prophylaxis program.

In 2020, the Centers for Disease Control and Prevention (CDC) reported 30,635 new HIV diagnoses in the United States (*1*) and estimated that, for 13% of persons living with HIV (PLWH) in the United States, the HIV infection has not been diagnosed (*2*). In 2019, the US Department of Health and Human Services launched the Ending the HIV Epidemic in the United States initiative (EHE); the goal of EHE is to reduce new HIV infections by 90% by 2030. When used together, the 4 pillars of this initiative—diagnosis, treatment, prevention, and response—can end the HIV epidemic in the United States (*3*).

The Federal Bureau of Prisons (FBOP) supports the 4 pillars of EHE through HIV screening, offering antiretroviral treatment to all PLWH, effectively treating PLWH, and implementing an HIV preexposure prophylaxis (PrEP) program. When taken as prescribed, PrEP reduces the risk for new HIV infections through sexual exposure by 99% and risk for new infection through intravenous drug use by 74% (*4*); however, PrEP is still highly underused (*5*). CDC recommends PrEP for persons who are HIV negative and might be at risk for HIV infection, including those who have had anal or vaginal sex in the previous 6 months and have a sexual partner with HIV, have not consistently used a condom, or have had a diagnosis of a sexually transmitted infection (STI) in the previous 6 months (*5*). Persons with a history of incarceration have higher rates of many of those risk factors compared with the general public (*6*–*8*), making PrEP a key intervention to reduce the risk for HIV infection after release from custody. In this article, we describe the FBOP HIV testing and treatment program and explore the implementation of the FBOP PrEP program.

## FBOP HIV Program Description

### HIV Testing and Treatment Program, 2004–2023

FBOP HIV Clinical Practice Guidelines were established to treat PLWH. Since 2016, FBOP guidelines have recommended an opt-out strategy for HIV screening, in which all adults in custody (AICs) are informed that an HIV test will be performed as part of the standard laboratory screening upon entry into custody. If the AIC choses to opt-out of voluntary testing, a refusal is documented. Current guidelines recommend initiating treatment as soon as the patient is willing and able to start and provides scenarios when rapid initiation (i.e., same day as diagnosis) might be indicated (*9*). In December 2004, FBOP created an HIV Clinical Pharmacist Consultants program to enhance patient management. Currently, 15 pharmacist

Author affiliation: US Public Health Service, Federal Bureau of Prisons, Washington, DC, USA

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consultants with specialized HIV training assist with managing all PLWH in FBOP custody, including reviewing laboratory findings, clinical encounters, and prescription profiles to ensure appropriate HIV care. Consultants also serve as a resource for providers seeking expert consultation in HIV management.

### PrEP Program, 2021–2023

Although rates of new HIV infections during incarceration are low (*10*), >95% of AICs will return to their communities (*11*), where they might engage in behaviors that place them at risk for HIV infection, including intravenous drug use and unprotected sex (*6*–*8*). Recognizing the opportunity to decrease the risk for HIV transmission, FBOP updated its HIV Clinical Practice Guidelines in April 2021 to include guidance for oral PrEP (*9*).

Under the FBOP PrEP program, providers can identify patients with HIV risk factors or patients may self-refer for evaluation for PrEP. FBOP guidance identifies the following risk factors that might indicate an HIV-negative patient is at high risk for HIV infection upon release: vaginal or anal sex 6 months before or at any time during incarceration and partner with HIV, inconsistent use of condoms with partner(s) of unknown HIV status or at high risk for HIV, sex while using drugs, and/or >1 sex partner; sexually transmitted infection 6 months before or at any time during incarceration; shared needles for intravenous drug use 6 months before or at any time during incarceration, or might engage in intravenous drug use upon release. Working under a collaborative practice agreement, pharmacists can also perform patient assessments and prescribe PrEP. Although obtaining a detailed sexual activity and drug use history is a major part of the assessment, patients might be hesitant to disclose high-risk behaviors because of fear of discipline or stigma. Consequently, and consistent with CDC PrEP guidelines (*5*), confirmed high-risk behavior is not a requirement to provide PrEP to any releasing AIC who requests it.

To ensure adequate time to assess response to treatment and coordinate continuity of care before release, PrEP is initiated ≈30 days before release from custody, and a social worker creates a customized release plan to include scheduling a follow-up appointment for the patient in the community. Patients are also given a Release Resources for PrEP handout to assist with obtaining PrEP access should they be unable to complete their scheduled appointment. Upon release, a 90-day supply of PrEP medication is sent with the patient to allow ample time for linkage to care.

### Promoting the PrEP Program within FBOP

FBOP uses a multi-modal strategy to educate providers about the PrEP guidance and to encourage uptake among AICs. HIV Clinical Pharmacist Consultants developed a webinar for healthcare providers discussing harm-reduction strategies including PrEP. To educate AICs, HIV Clinical Pharmacists developed a PrEP Fact Sheet reviewing the basics of how PrEP works, how to start PrEP within the FBOP, and how to access medication. In addition, Clinical Pharmacists developed a bulletin that was posted nationally through the FBOP internal computer system available to all AICs in both English and Spanish. This bulletin informs AICs that PrEP is available for any person who is at risk for HIV infection and will soon be releasing to the community and encourages self-referral to Health Services providers for more information. The bulletin also states a 90-day supply of medication will be sent upon release and provides information about programs that might help pay for PrEP in the community.

Individual FBOP institutions have also developed strategies to increase PrEP uptake. For example, the United States Medical Center for Federal Prisoners in Springfield, Missouri, developed a pharmacist-led Harm Reduction Clinic. This clinic began in 2021 and initially focused on providing nasal naloxone to reduce overdose deaths after release from custody. In June 2022, the clinic was expanded to offer PrEP as well. To identify potentially eligible patients, every month the clinic generates a roster of AICs due to be released from custody within 90 days and schedules patients for an appointment with a pharmacist. Providers can also refer patients to the clinic, and self-referrals are encouraged. If a patient with a release date >90 days in the future is referred to the clinic, they receive harm reduction education and are rescheduled for evaluation for PrEP 90 days before their projected release date.

During the Harm Reduction clinic, pharmacists and patients discuss HIV risk factors, prevention methods, and resources, as well as information about what PrEP is, PrEP indications, and possible and anticipated side effects. PLWH are provided education about promoting PrEP use for existing or future HIV-negative partners. Pharmacists also perform medication reconciliation and discuss the patient's overall health conditions to improve health literacy and continuity of care upon reentry. If PrEP is indicated, the pharmacist will order appropriate laboratory tests, provide monitoring and follow-up with the patient after initiation, and assist the patient with continuity of care coordination with a FBOP social worker.

To ensure all necessary components of a harm reduction visit are included and to standardize the workflow and documentation process, the HIV Clinical Pharmacists developed a notes template for visits.

## Methods

We used the FBOP electronic medical record to determine the number and percentage of persons who entered custody since the beginning of the PrEP program (April 1, 2021–March 25, 2023) who reported HIV risk factors (including potential indications for PrEP) during the intake process. In addition, we used electronic medical records to calculate the FBOP HIV care continuum for the FBOP population as of June 2, 2023. HIV care continuum steps include the number of AICs who have been offered ≥1 HIV test during their incarceration, the number who had a positive test result, the number who are on treatment, and the number who have an undetectable viral load.

## Results

### FBOP Population and HIV Risk Factors

During April 1, 2021–March 25, 2023, a total of 303,817 intakes were completed for persons who newly entered FBOP custody or transferred between FBOP facilities. The most common self-reported HIV risk factor was infrequent condom use (146,665 [48.3%]), followed by never using a condom (111,592 [36.7%]) (Table).

### HIV Care Continuum

An evaluation of FBOP electronical medical record data for AICs in FBOP custody for ≥90 days showed that as of June 2, 2023, there were 139,789 AICs. Of those, 117,950 (89.6%) had been offered ≥1 HIV test. Of those, 1,208 (1.0.%) had a positive test result, 100% of PLWH had been offered antiretroviral treatment, and 1,199 (99.3%) had initiated treatment. As of the end of the study period, 1,110 patients had been on treatment ≥90 days; of those, 1,060 (95.5%) had an undetectable viral load (Figure).

### Preliminary Data for PrEP Initiation

In 2022, a total of 28 patients from 24 institutions initiated PrEP within 90 days of release from FBOP custody. As of June 2023, a total of 41 patients from 29 institutions had initiated PrEP. To enable further analysis, the FBOP is developing a dashboard to include the number of AICs screened for PrEP eligibility, the number offered PrEP, and the percentage who accepted.

## Discussion

The HIV care continuum among AICs has improved substantially over the past 20 years; in 2003, only 32% of PLWH were virally suppressed (*12*), whereas 96% were virally suppressed in 2023. In addition, AICs now have access to PrEP to prevent HIV infection after release from custody.

Advances in HIV care within the FBOP coincide with the implementation of the FBOP Clinical Pharmacist Consultant Program. Given their extensive training and expertise in medication management, pharmacists are well equipped to manage HIV and PrEP. An evaluation of pharmacy-based initiatives to increase PrEP use in the community has shown that patients supported pharmacist-based PrEP programs, and further implementation of similar programs might improve PrEP use in the United States overall (*13*,*14*). Many states have passed legislation enabling pharmacists to independently initiate PrEP under collaborative practice agreements with physicians or a local public health department.

**Table.** Prevalence of self-reported HIV risk factors during intake screening in study of HIV care and preexposure prophylaxis program in the Federal Bureau of Prisons, April 1, 2021–May 25, 2023*

| Risk factors† | No. (%) reporting a risk behavior |
|---|---|
| History of STI‡ | 40,139 (13.2) |
| Intravenous drug use | 20,287 (6.7) |
| IV drug use with needles | 7,693 (2.5) |
| Sexual risk factors | 259,843 (85.5) |
| Condom use | |
| Sometimes | 146,665 (48.3) |
| Never | 111,592 (36.7) |
| Sexual contact with HIV-positive person | 1,586 (0.5) |

*Total number of intakes was 303,817. Intake screening is performed each time an adult in custody enters a new facility. Because persons in Federal Bureau of Prisons custody often move between facilities, an intake might have been completed for the same patient >1 time during this period. IV, intravenous; STI, sexually transmitted infection.
†Federal Bureau of Prisons guidance identifies risk factors that might indicate an HIV-negative patient is at high risk for HIV infection upon release, such as vaginal or anal sex 6 months before or at any time during incarceration and HIV-positive partner, inconsistent use of condoms with partner(s) of unknown HIV status or at high risk for HIV, sex while using drugs, >1 sex partner, STI diagnosis 6 months before or at any time during incarceration, and shared needles for IV drug use 6 months before or at any time during incarceration or might engage in IV drug use upon release.
‡Includes syphilis, genital warts, chlamydia, gonorrhea, and herpes.

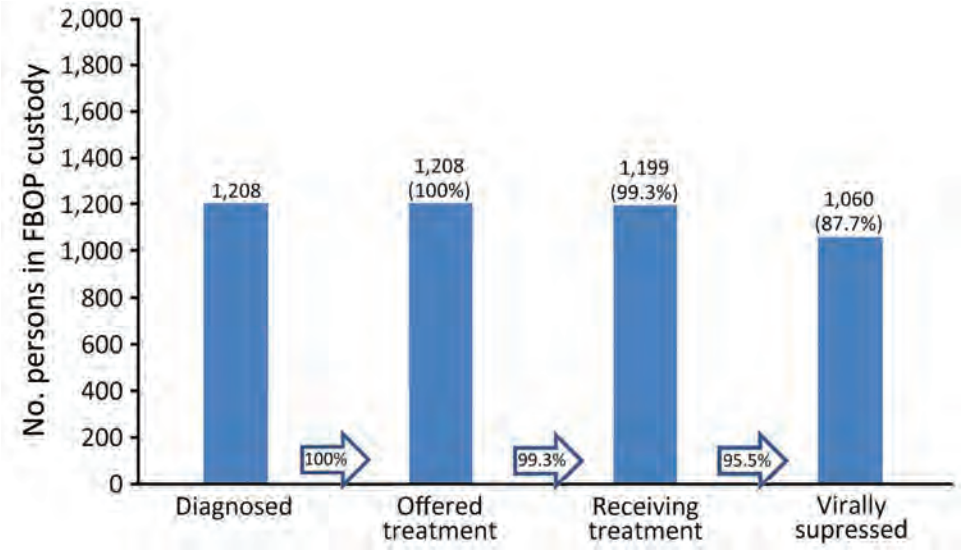


**Figure.** Number and percentage of adults in custody of the US FBOP for ≥90 days as of June 2, 2023, who had been diagnosed with HIV, offered treatment, accepted treatment, or were virally suppressed. Virally suppressed was defined as CD4 <200 copies/mL on the most recent test. FBOP, Federal Bureau of Prisons.

Support from FBOP leadership has helped to build the PrEP program, and provider trainings and patient education have helped drive patient assessments. In addition, allowing PrEP assessment without requiring patients to report a specific HIV risk behavior has helped to avoid the fear of stigma or disciplinary action for prohibited activities such as sexual activity and drug use. Provider training to avoid stigmatizing language and thereby encourage patient participation and PrEP uptake is essential for success (*15*,*16*).

Challenges to program implementation include adequate staffing (e.g., providers to prescribe medication, social workers to coordinate care upon release from custody). Allowing patients to self-refer for PrEP evaluation has helped to increase access despite staffing shortages. Although FBOP's PrEP guidance was released in 2021, many facilities had to prioritize healthcare resources for the COVID-19 pandemic response at that time. A review of 46 studies suggests the COVID-19 pandemic disrupted continuity of PrEP care in a variety of settings (*17*). As FBOP transitions out of pandemic response and returns to routine care, integrating evaluation for PrEP as part of a holistic approach to preparing AICs for release back to their communities will enable improved access to care and harm reduction.

The first limitation of this study is that intake screening does not include all HIV risk factors (e.g., history of sex work) and does not assess an AIC's predicted risk upon release from custody. Because screening is conducted at first intake and each time an AIC transfers to a new FBOP facility, risk factor data from intake screening might include duplicate records for some AICs.

FBOP will continue to educate employees and AICs to promote awareness of PrEP availability and reduce stigma. AIC education developed with the input of persons who are currently or previously incarcerated will help to ensure messaging is realistic and applicable to the incarcerated population. Efforts to address literacy barriers are being evaluated, such as verbally discussing harm reduction strategies to include PrEP and nasal naloxone at admission and orientation programs and during prerelease counseling. To assess progress and identify opportunities to increase the provision of PrEP, the FBOP is developing a dashboard to enable collection and evaluation of data at the national and institution level to include the number of AICs screened for PrEP eligibility, the number offered PrEP, and the percentage who accepted. In addition, FBOP will continue to involve pharmacists in HIV medication management and patient care activities, drawing on the successes and improved patient outcomes demonstrated to date.

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## About the Author

Dr. Huang is a staff pharmacist at USMCFP Springfield. Her primary clinical focus is harm reduction and HIV.

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Address for correspondence: Tami Rodriguez, Federal Bureau of Prisons, Health Services Division, 320 1st St NW, Washington, DC 20534, USA; email: t1rodriguez@bop.gov

# Advancing Hepatitis C Elimination through Opt-Out Universal Screening and Treatment in Carceral Settings, United States

Maeve McNamara, Nathan Furukawa, Emily J. Cartwright

Incarcerated persons are infected with hepatitis C virus (HCV) at rates ≈10 times higher than that of the general population in the United States. To achieve national hepatitis C elimination goals, the diagnosis and treatment of hepatitis C in incarcerated persons must be prioritized. In 2022, the Centers for Disease Control and Prevention recommended that all persons receive opt-out HCV screening upon entry into a carceral setting. We review recommendations, treatments, and policy strategies used to promote HCV opt-out universal HCV screening and treatment in incarcerated populations in the United States. Treatment of hepatitis C in carceral settings has increased but varies by jurisdiction and is not sufficient to achieve HCV elimination. Strengthening universal HCV screening and treatment of HCV-infected incarcerated persons is necessary for HCV elimination nationwide.

Hepatitis C virus (HCV) infection is the most commonly reported bloodborne infection in the United States; the estimated prevalence was 2.2 million cases during 2017–2020 (*1*). According to 2023 estimates, HCV infection prevalence among incarcerated persons was 10 times that of the general US population (*2*). The United States Bureau of Justice Statistics estimated that >5 million persons were under the supervisionof US adult carceral systems in 2020 (*3*,*4*). Cumulatively, ≈600,000 persons were released from state and federal prisons in 2020, and another 9 million persons cycled through local jails (*3*,*4*). Black men are 4.8 times more likely and Latino men are 1.3 times more likely to be incarcerated than White men in US prisons (5).

Injection drug use and, to a lesser degree, tattooing are the primary risk factors for HCV transmission during incarceration (*6*). Partly because of drug use criminalization, persons who inject drugs experience high rates of incarceration (*7*). Many persons are infected with HCV before incarceration, and continued injection drug use during incarceration is common. Tattooing rates during incarceration have been reported to be 8.7%–19.3% in the United States (*6*). Taken together, nonsterile injection practices during incarceration create opportunities for HCV infection and reinfection (*8*). Furthermore, cycles of reincarceration compound the risk for continued HCV transmission between previously incarcerated and nonincarcerated persons (*8*).

Left untreated, HCV can cause cirrhosis, liver cancer, and death; 13,895 deaths were attributed to HCV in the United States in 2021 (*9*). HCV infection alone contributes to a 61% increased risk for 2-year mortality among incarcerated persons (*10*). Fortunately, hepatitis C is curable in >95% of cases by using specific direct-acting antiviral (DAA) medications, approved by the Food and Drug Administration beginning in 2012 (*11*). Treatment can prevent liver damage, liver failure, and cancer; furthermore, DAA treatment can prevent ongoing HCV transmission (*12*–*17*). However, inequities exist in accessing DAA medications; DAA treatment is 30% less likely to be initiated among insured non-Hispanic Black persons than among non-Hispanic White persons (*18*). Furthermore, non-Hispanic Black persons are 3.2 times more likely and American Indian/Alaskan Native persons are 1.8 times more likely to die from HCV infection sequelae than non-Hispanic White persons (*9*).

Author affiliations: Emory University, Atlanta, Georgia, USA (M. McNamara, E.J. Cartwright); Centers for Disease Control and Prevention, Atlanta (N. Furukawa, E.J. Cartwright); Veterans Affairs Atlanta Health Care System, Decatur, Georgia, USA (E.J. Cartwright)

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We review policy strategies to implement HCV opt-out universal screening and treatment in incarcerated populations. Strengthening HCV elimination policies and practices in carceral settings is critical to achieving national HCV elimination.

## Hepatitis C Screening Evolution and Current Recommendations

Guidelines for testing and screening for HCV in the United States have evolved since the original recommendations were first published by the Centers for Disease Control and Prevention (CDC) in 1991 (Figure). Although risk-based HCV testing was recommended in 2003, it missed a substantial proportion of persons with HCV (*19*). During 2019–2020, the American Association for the Study of Liver Diseases (AASLD), Infectious Diseases Society of America (IDSA), US Preventive Services Task Force, and CDC recommended universal HCV screening for all adults at least once during a lifetime (*15*,*20*,*21*). CDC (2022) and AASLD/IDSA (2023) recommended universal opt-out HCV intake screening of incarcerated and detained persons (*22*,*23*).

Models estimate that universal opt-out screening in US prisons would diagnose >122,000 HCV infections and prevent ≈13,000 new prison-associated infections, ≈2–3 times more than would be possible with risk-factor based assessments (*24*). Implementing universal opt-out HCV screening and associated treatment costs would increase state prison healthcare budgets by an estimated 12.4% (*24*). Thus, budgetary constraints might limit the broader adoption of universal opt-out HCV screening and treatment.

## HCV Screening in Carceral Settings: Real-World Examples

During 2004–2012, the Pennsylvania Department of Corrections (DOC) successfully began a universal opt-out screening program resulting in 93% of incarcerated persons screened for HCV at intake (*19*). Similarly, the Washington DOC successfully screened 83% of its incarcerated population during 2012–2016 (*25*). The Pennsylvania and Washington screening programs identified 18%–20% HCV seropositivity rates (Table 1) (*19*,*25*).

Partnerships between carceral facilities and departments of health are promising strategies to enact universal opt-out HCV testing. The Indiana Department of Health embedded an epidemiologist in the Indiana DOC and began universal HCV screening at intake, which ultimately identified a 12% intake viremia prevalence (*26*). The collaboration between Indiana's Department of Health and DOC resulted in a transition to universal treatment, the creation of a

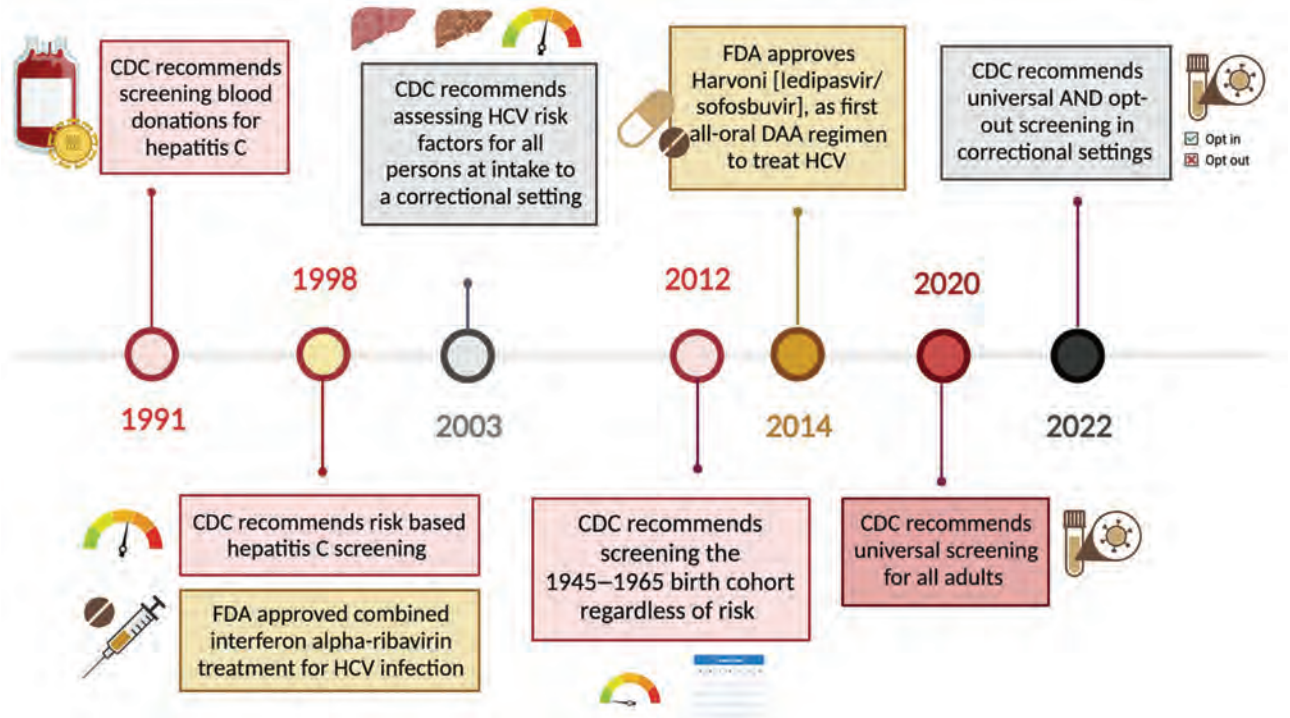


**Figure.** Timeline of hepatitis C virus screening recommendations and treatments that advance hepatitis C elimination in carceral settings, United States. Colored circles on the timeline indicate the year certain recommendations were made or hepatitis C treatments were approved. Other symbols are pictorial representations. CDC, Centers for Disease Control and Prevention; DAA, direct-acting antiviral; FDA, Food and Drug Administration; HCV, hepatitis C virus.

**Table 1.** Real-world examples of opt-out screening for hepatitis C virus in prisons and jails used to advance hepatitis C elimination in carceral settings, United States*

| Reference | Institution | Years | Population | Policy | Outcome |
|---|---|---|---|---|---|
| (*19*)† | Pennsylvania state prisons | 2004–2012 | 101,727 persons entering state prison | Universal opt-out testing at intake; diagnostic testing offered to persons with positive screening tests and subsequent evaluation for HCV therapy (only seropositivity rates reported). | A total of 101,727 persons were tested for HCV; of those, 18,454 (18.1%) were HCV positive. |
| (*25*) | Washington state prisons | 2012–2016 | 24,567 persons entering state prison | Universal opt-out, laboratory-based HCV testing | A total of 24,567 (83%) persons were screened for HCV; of those, 4,921 (20%) were HCV positive. Of the 4,921 HCV-positive patients, 2,403 (49%) had hepatitis C virus RNA testing; 1,727 of 2,403 (72%) had HCV viremia. |
| (*51*)‡ | NYC jails | 2014–2017 | 121,371 persons with >1 admission to the NYC jail system | Opt-out HCV testing for a subset of jail entrants | A total of 40,219 (33%) persons were tested for HCV; of those, 4,665 (12%) were positive for HCV viremia and 248 (5%) were treated. |
| (*52*) | Durham County, NC, jail in collaboration with Durham Department of Public Health | Dec 2012–Mar 2014 | 669 persons entering local jail (5.6% of all entrants) | Opt-out HCV testing for a subset of jail entrants | A total of 669 (5.6%) persons were tested for HCV; of those, 88 (13.2%) were HCV positive. Of those 88 patients, 81 (92.0%) were tested for HCV RNA; 66 of 81 (81.5%) had HCV viremia. Of the 66 with viremia, 18 (27.3%) were referred to post-release medical care, 10 (55.6%) of whom attended their first appointment. |

*HCV positive refers to a positive or reactive test for HCV antibodies, indicating current or prior exposure to HCV. Viremia is defined as a positive serum HCV RNA test. HCV, hepatitis C virus; NYC, New York, NY.
†Does not include any data on RNA testing or HCV viremia.
‡Excluded persons who completed DAA treatment, started DAA treatment in the community, or who did not complete medical intake; this study only includes data for RNA testing and HCV viremia and excludes information on HCV antibody testing.

peer education program, a community care transition program, and development of data tracking capabilities to generate HCV care cascades (*26*).

## Hepatitis C Treatment Evolution and Current Recommendations

During 1998–2014, interferon-based therapies were the gold standard for hepatitis C treatment but were ineffective, poorly tolerated, and unsafe for many persons (*27*). The approval of sofosbuvir in 2013 shifted the treatment paradigm toward safe, highly efficacious, oral DAA therapies that had >95% sustained virologic response (SVR) rates and few contraindications (*15*,*28*). SVR is defined as no detectable HCV RNA in blood after completing treatment. Attaining SVR after treatment with DAAs reduced all-cause mortality, end-stage liver disease, and hepatocellular carcinoma among Medicare beneficiaries during 2014–2016 (*14*). In 2019, the AASLD/IDSA recommended treating all patients with current HCV infection except those who had a short life expectancy that cannot be remediated by HCV therapy (*15*). Although treatment remains expensive, manufacturer competition and negotiated pricing have substantially driven down DAA costs.

Considerable costs associated with chronic liver disease can be prevented by treating HCV infection. In 2019, the estimated annual cost of sequelae from chronic HCV infections ranged from $17,500 per year for nonadvanced fibrosis to $262,000 within the year after a liver transplant (*29*). Cost-benefit analyses show that universal opt-out screening in prisons is cost-effective, reducing ongoing HCV transmission, the incidence of advanced liver diseases, and death from liver disease (*24*). A 2020 study found that a test all, treat all, and linkage to care at release model would cost prisons $1,440 per person and result in a 23% increase in lifetime SVR and 54% reduction of cirrhosis cases (*30*).

## HCV Treatment in Carceral Settings—Real-World Examples

Financial and other barriers continue to limit access to HCV treatment in US carceral settings (Table 2). However, some initiatives have demonstrated promising outcomes.

### Innovative Payment Models

Despite recent cost reductions, DAA treatment remains expensive; an average wholesale price is $26,000–$90,000 per treatment course (*31*). Innovative payment models were launched by Louisiana and Washington in 2019 to reduce the cost of

expensive medications. In Louisiana, DAAs purchased by Medicaid or the Department of Public Safety and Corrections count toward an expenditure cap, after which subsequent prescriptions receive rebates that have a nominal incremental cost. In Washington, a similar program was negotiated for Medicaid recipients. Washington also introduced a separate payment model where their DOC receives a discount off the wholesale acquisition cost of direct purchases, which does not have an expenditure cap. Although increased HCV treatment among Medicaid recipients has been shown in Washington and Louisiana, the effects of those innovative payment models on HCV treatment among incarcerated persons has not been reported (*32*).

### Decentralized HCV Care

The Extension for Community Healthcare Outcomes model, first piloted in New Mexico in 2003, uses telehealth consultations between HCV experts and on-site correctional health professionals to train primary care providers to treat hepatitis C (*33*). The model program also established a peer education program that trains incarcerated persons to educate their peers about risk factors for HCV infection, the consequences of infection, and benefits of treatment and enables persons who previously refused testing or treatment the opportunity to reconsider. The New Mexico Corrections Department began universal screening in 2018 and had a hepatitis C prevalence of 40%–45% in their carceral population (*34*). In 2020, New Mexico allocated $22 million over 5 years for hepatitis C testing and treatment; >2,100 persons were treated during 2021–2023 (*35*,*36*).

### Litigation and State Policy

Recent court rulings have shown that the threat of HCV-related litigation can expand access to treatment, expediting progress toward HCV elimination in carceral settings. Arguments primarily assert that denial of treatment violates the 8th Amendment of the US Constitution prohibiting cruel and unusual punishment (Table 3) (*37*,*38*). According to a seminal 1976 ruling in Estelle v. Gamble, carceral facilities must avoid deliberate indifference to patient health needs (*39*,*40*). Although AASLD/IDSA guidelines established universal hepatitis C treatment as a standard of care, carceral settings have used prioritization criteria to limit DAA treatment on the basis of liver fibrosis stage or other clinical manifestations. Courts have ruled differently on whether prioritization criteria used in some carceral settings constitute deliberate indifference (*41*).

A federal class action suit representing persons with HCV infection who were denied treatment during incarceration was filed against the Tennessee DOC (Atkins v. Parker, 2016). In response to the lawsuit, the Tennessee legislature provided the Tennessee DOC with new funding for hepatitis C treatment ($25 million by 2019), even though the DOC's prioritization policy was ultimately found to be lawful, and the ruling was affirmed on appeal (*42*). This investment increased the number of incarcerated persons receiving DAA treatment in the Tennessee DOC system from 1 in 2016 to 956 in 2021 (*43*).

**Table 2.** Real-world examples of direct-acting antiviral treatment in prisons and jails that advance hepatitis C elimination through opt-out universal screening and treatment in carceral settings, United States*

| Reference | Institution | Years | Population | Policy | Outcome |
|---|---|---|---|---|---|
| (*53*) | Vermont Department of Corrections | 2018–2020 | HCV-infected patients (n = 217) in Vermont state prisons; 76% had opioid use disorder, 67% had a psychiatric comorbidity, and 9% had cirrhosis. | DAA treatment was initiated for all persons with positive HCV antibody and RNA tests. | A total of 217 (59%) persons started DAA treatment; of those, 129 (92%) completed treatment and 182 (84%) achieved documented SVR. Presence of psychiatric comorbidity and receipt of MOUD was not significantly associated with achieving SVR12. |
| (*51*) | NYC jails, services provided by Correctional Health Services | Jan 2014–Oct 2017 | HCV-infected patients (n = 269) who were treated with DAA therapy while in NYC jail. | DAA treatment was initiated in all persons with sentence lengths greater than anticipated duration of therapy. Treatment was continued for all persons who were on DAAs in the community at the time of entry. A 7-day supply of medication was given to persons returning to the community before treatment completion. | Of 269 persons, 88 (33%) persons continued DAA treatment started in the community and 118 (67%) persons started DAA treatment prescribed in jail. SVR data is available for 195 (72%) persons; of those, 172 (88%) achieved SVR12. |

*DAA, direct-acting antiviral; HCV, hepatitis C virus; MOUD, medications for opioid use disorder (such as naltrexone or buprenorphine); NYC, New York, NY; SVR, sustained virologic response; SVR12, sustained virologic response 12 months after completing treatment (no detectable HCV RNA in blood).

**Table 3.** Litigation supporting HCV treatment of incarcerated persons that advances hepatitis C elimination through opt-out universal screening and treatment in carceral settings, United States*

| Case | Court | Claims | Rulings |
|---|---|---|---|
| Estelle v. Gamble, 1976 | US Supreme Court | Plaintiff was subjected to cruel and unusual punishment in violation of the 8th Amendment for inadequate treatment of a back injury sustained while he was engaged in prison work. | Judge ruled that correctional facilities cannot display deliberate indifference to known healthcare needs of incarcerated individuals. |
| Stafford v. Carter, 2018 | US District Court, Indianapolis Division | 98.8% of incarcerated people with chronic HCV infection were withheld DAAs per prison treatment allocation protocol, violating 8th Amendment to the US Constitution, the Americans with Disabilities Act, and the Rehabilitation Act. | Judge ruled that the prison's policy of relying on APRI scores to determine treatment eligibility amounted to deliberate indifference in this class action suit. |
| Postawko v. Missouri Department of Corrections, 2020 | US District Court, Western District of Missouri, Central Division | Class action suit sought prospective relief for denial of rights endowed to plaintiffs by 8th Amendment to the US Constitution and the Americans with Disabilities Act, for systemic denial of treatment for individuals with chronic HCV infection. | Private settlement agreement to enforce universal opt-out screening at intake, perform reflex testing within 3 days of positive antibody result, invest $7 million annually to purchase DAAs and enforce treatment of all individuals at highest risk for complications or disease progression. |

*Reflex testing describes the process by which the lab performs HCV antibody testing and, if reactive, uses the same sample to automatically perform HCV RNA testing. APRI, aspartate transaminase to platelet ratio Index; DAA, direct-acting antiviral; HCV, hepatitis C virus.

## Intersection of HCV Elimination and Substance Use Treatment

Proponents of expanded DAA treatment to prevent chronic HCV infection in incarcerated persons must also contend with substance use disorder and the overdose crisis among persons who inject drugs (PWID). Although robust evidence exists indicating that providing sterile injecting equipment reduces HCV transmission, no carceral facility currently provides sterile injection equipment. Persons released from prisons or jails are 10–40 times more likely to die from an overdose than are persons in the general population; the greatest risk for death is 3–4 weeks after release (*44*,*45*). Medications for opioid use disorder (MOUD), such as methadone, naltrexone, and buprenorphine, are highly safe and efficacious. Exposure to MOUD during incarceration is associated with 85% reduction in all-cause mortality and 75% reduction in overdose-related deaths in persons after reentry into the community (*45*).

MOUD is a critical component of HCV prevention because it decreases unsafe injecting practices in PWID; MOUD alone can reduce the risk for HCV infection by 50% and reinfection by 73% among PWID (*46*). Initiating HCV treatment also increases the uptake of MOUD (*47*). As of 2022, a total of 15 laws across 12 US states had expanded access to MOUD in prisons and jails for substance use treatment (*45*).

## Linkage to Care

Lack of insurance coverage and lack of coordinated handoff between carceral and community healthcare systems complicate healthcare transitions for incarcerated persons after release (*48*). California was the first state to apply for Section 1115 waivers of the Medicaid Inmate Exclusion Policy to secure payment coverage for substance use treatment for persons who would otherwise lose coverage during incarceration under that Medicaid policy (*49*). Although DAAs are included, waivers are unlikely to directly increase DAA treatment because many persons are treated during incarceration. However, the waivers can substantially improve linkage to care for MOUD and mental health treatment to prevent new or recurrent HCV infection after release.

## Future Directions

National data on the incidence and prevalence of HCV in carceral settings is required to improve HCV surveillance efforts and monitor progress across the country. Collaboration between US public health organizations and DOCs is essential both for data collection and improved control of HCV transmission in the carceral setting. Identifying facility-specific barriers and allocating data-driven resources are critical to improve HCV surveillance and treatment.

The US Congress is currently considering funding for a National Hepatitis C Elimination Initiative. This $11.3 billion initiative would enhance screening, testing, treatment, prevention, and monitoring of hepatitis C for all Americans; the goal is to reach elimination targets within a 5-year period (*50*). Of note for incarcerated persons, the plan includes point-of-care HCV RNA testing, provider training and technical assistance for implementation, and a national drug procurement plan that would cover incarcerated or detained persons. Carceral facilities can make considerable steps toward elimination now by using

universal opt-out screening and providing DAA and MOUD treatment, improving linkages to community care, and building data infrastructure to track progress toward HCV elimination.

Broadly implementing hepatitis C testing and treatment programs in US prisons and jails advances public health and health equity. HCV elimination in carceral settings not only profoundly affects a person's health but also improves community health. Only through screening and treating hepatitis C in carceral health settings can we achieve national HCV elimination goals.

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## About the Author

Ms. McNamara is a third-year medical student and Woodruff Scholar at Emory School of Medicine in Atlanta, Georgia, USA. Her primary research interests are hepatitis C treatment in underserved patient populations, successful aging in people living with HIV, women's health, and equity in medical education.

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Address for correspondence: Maeve McNamara, Emory School of Medicine, 100 Woodruff Cir, Atlanta, GA 30322, USA; email: msmcnam@emory.edu

# Infection Prevention and Control in Correctional Settings

Newton E. Kendig, Sarah Bur, Justin Zaslavsky

Correctional facilities house millions of residents in communities throughout the United States. Such congregate settings are critical for national infection prevention and control (IPC) efforts. Carceral settings can be sites where infectious diseases are detected in patient populations who may not otherwise have access to health care services, and as highlighted by the COVID-19 pandemic, where outbreaks of infectious diseases may result in spread to residents, correctional staff, and the community at large. Correctional IPC, while sharing commonalities with IPC in other settings, is unique programmatically and operationally. In this article, we identify common challenges with correctional IPC program implementation and recommend action steps for advancing correctional IPC as a national public health priority.

During 2021, ≈7 million persons were admitted to US jails across 2,848 jurisdictions; at year end, 1.2 million persons were incarcerated in state and federal prisons (*1*,*2*). The population dynamics of jails and prisons are different. Jails largely house persons awaiting trial or with sentences <1 year. In 2021, the average detention time for jail residents was 33 days; weekly population turnover was 42%. In contrast, prisons largely house persons with sentences >1 year; residents spend an average of 2.7 years in state prisons (*3*). Consequently, healthcare services for jail residents are mostly focused on screening diagnostics upon admission and short-term interventions for critical health care needs, whereas the prison setting allows for ongoing diagnostic assessments, chronic disease management, and comprehensive discharge planning. The populations residing in US jails and prisons present unique challenges and strategic opportunities for infection prevention and control (IPC) efforts. We review these challenges and conclude with recommended action steps to advance correctional IPC as a national public health priority.

Infectious disease transmission in the carceral setting is amplified by crowded living conditions (*4*), poor ventilation, and the incarceration of vulnerable patient populations. Those populations include persons with low socioeconomic status, migrant populations, aging patients with chronic diseases, patients with substance use disorders and serious mental illness, and those living with bloodborne-pathogen infections (*5*–*10*). Widespread transmission of pathogens can occur easily because incarcerated persons interact frequently with other residents, correctional staff, volunteers, and visitors, and upon release they engage with family and community social contacts. Infectious disease outbreaks in the correctional setting are well documented and most notably include influenza, COVID-19, tuberculosis, hepatitis B virus infections, methicillin-resistant *Staphylococcus aureus* (MRSA) infections, varicella, ectoparasite infections, and foodborne illnesses (*11*–*21*). Those outbreaks can pose significant threats to the health of incarcerated residents and correctional staff and can markedly impact correctional operations.

The COVID-19 pandemic illustrated that infectious disease outbreaks in correctional settings can occur nationwide from a single emerging pathogen, with dire consequences. Incarcerated persons and correctional workers were highly vulnerable to SARS-CoV-2 infection (*12*–*15*,*22*). Among residents of state and federal prisons, the COVID-19 incidence rate was 3.3 times higher than that of the US general population and the COVID-19 mortality rate was 2.5 times the US general population (*23*). Containing COVID-19 was challenged by the frequent movement of incarcerated persons and correctional workers into, between, and out of correctional facilities. In 1 large urban jail, a COVID-19 outbreak contributed substantially to local community spread of SARS-CoV-2 (*12*). However, in the same jail, implementing IPC measures of enhanced sanitation, social distancing, universal

Author affiliations: George Washington University, Washington DC, USA (N.E. Kendig, J. Zaslavsky); VitalCore Health Strategies, Topeka, Kansas, USA (S. Bur)

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masking, widespread diagnostic testing, medical isolation, and quarantine was highly effective in containing further outbreaks, highlighting the public health importance of correctional IPC efforts (*24*).

Beyond preventing and containing infectious disease outbreaks, effective correctional IPC programs can advance public health in multiple ways. Carceral settings can detect infectious diseases in patient populations who may not otherwise use health care services by implementing recommended screening strategies (*25*–*32*). Furthermore, residents diagnosed with communicable diseases such as HIV, syphilis, hepatitis C, and tuberculosis can be effectively treated while incarcerated (*33*–*38*). Finally, planning for residents transitioning to the community can include patient education on harm reduction strategies to prevent acquisition of infectious diseases, provision of HIV preexposure prophylaxis (PrEP) for patients with HIV risk factors, linkages to care for patients with communicable diseases who require treatment, and coordination with public health authorities when appropriate (*39*–*42*).

Despite its importance to public health, successful implementation of correctional IPC programs has been elusive in many jurisdictions. Amid competing priorities, correctional IPC programs must have strong engagement and support from facility leadership, dedicated personnel, and sufficiently allocated resources, including funding for IPC services in private-sector healthcare contracts. Such programs must also be highly adaptable and account for the diverse risk factors of residents; the wide range of housing situations, communal programming, and conditions of confinement; and the system-specific correctional policies and procedures that affect day-to-day operations.

Of note, US jails and prisons operate primarily as public safety institutions, not healthcare facilities. As a result, correctional systems may not prioritize support for IPC programs within their facilities. They also may fail to engage with relevant external stakeholders, such as public health authorities, the medical community, and academia, or may find those stakeholders unwilling to collaborate with them. The resulting isolation can lead to an inadequate exchange of useful surveillance and epidemiologic data on infectious diseases; a lack of technical support and consultation to inform IPC activities; and limited external research and evaluation to assess IPC programs and drive continuous quality improvement. Despite those challenges, partnerships between correctional systems and public health and academic medicine are feasible and have proven mutually beneficial (*43*–*45*).

An operational challenge for correctional IPC programs is identifying a qualified correctional infection preventionist (CIP) to manage the program with the oversight of an interdisciplinary IPC committee. An effective CIP must possess a rare combination of skills, including a thorough knowledge of highly technical and evolving IPC guidelines; the ability to translate this information into actionable policies and understandable educational messages for correctional leadership, staff, and patients; and the interpersonal skills to engage effectively with multiple internal and external stakeholders. The CIP is typically a registered nurse or licensed practical nurse who may or may not be assigned full-time to IPC duties. Their basic nursing education does not prepare them for the CIP role, and there is no formal healthcare professional training or certification for correctional IPC. Thus, CIPs must learn their discipline through mentorship, work experience, and general IPC educational offerings. This lack of formal recognition of the CIP profession is shortsighted, given its unique and important role in protecting public health.

Correctional IPC shares fundamental scientific principles with IPC in dedicated healthcare settings, but it is different programmatically and operationally (Table) (*46*). CIPs must manage a hand hygiene program that includes the use of alcohol-based hand sanitizer, which is a potential fire safety risk, and monitor facility sanitation that is often the responsibility of the residents, who may not be closely supervised nor adequately trained. CIPs must also develop facility-specific bloodborne pathogen exposure control plans, including procedures to minimize sharps exposures during security searches, as well as facility-specific tuberculosis control plans, including procedures for safely transporting patients with suspected tuberculosis in security vehicles. They coordinate the investigation and management of infectious-disease outbreaks, which are often complicated by dormitory housing, limited space for isolation of patients, the abrupt movement of residents within and between correctional facilities, and the reluctance of residents to disclose symptoms or behaviors because of stigma, medical co-pays, fear of disciplinary action, or fear of placement in medical isolation. CIPs must provide guidance on housing and disinfection to prevent the transmission of *Clostridioides difficile* and *Candida auris* from recently hospitalized residents. Their promotion of proven harm-reduction strategies, such as condom distribution, may be discouraged or prohibited. In some jurisdictions, CIPs may also manage occupational health programs such as tuberculosis screening, vaccinations, and personal protection equipment that may be complicated by challenging labor–management relations.

CIPs must also provide IPC guidance for highly unusual or complex infectious disease scenarios

unique to carceral settings. Examples include preventing and managing botulism cases from residents drinking illicitly made alcoholic beverages (*47*), preventing bloodborne pathogen transmission from unregulated tattooing, and managing foodborne outbreaks that result from residents sequestering and consuming inadequately stored perishable food. In addition, CIPs may be tasked with managing

**Table.** Correctional infection prevention and control challenges, United States*

| Infection prevention and control domains | Infection prevention and control challenges |
|---|---|
| Outbreak risk and management | Correctional facilities are high-risk congregate settings for infectious disease outbreaks, such as influenza, COVID-19, tuberculosis, norovirus, varicella, and ectoparasites.<br>Incarcerated residents may be more vulnerable to communicable diseases, including vaccine-preventable illnesses.<br>Outbreak management is complicated by limited isolation capacity and the frequent movement of residents within and between correctional facilities. |
| Admission screening | Implementing evidence-based screening recommendations for infectious diseases may be complicated by the high volume of new admissions, brief periods of detention, health literacy barriers to patient history taking, cursory physical examinations, and lack of rapid testing capabilities. |
| Social distancing | Overcrowding and dormitory housing of incarcerated resident populations facilitate disease transmission and limit the feasibility of social distancing. |
| Hand hygiene | Resident access to liquid or foam soap, running water, and disposable paper towels may be limited.<br>Access to flammable alcohol-based hand sanitizer may be restricted or prohibited due to fire safety concerns and risk of consumption by residents. |
| Sanitation and laundry | Cleaning of housing units is routinely performed by the residents themselves who may not have adequate training or supplies.<br>Cleaning of common areas and shared equipment may be inadequate, e.g., intake processing areas, programming spaces, telephones, computers, recreational equipment, and security restraints.<br>Residents commonly handwash and air dry their clothing which provides inadequate disinfection. |
| Bloodborne pathogen exposures | Resident access to bleach is routinely prohibited.<br>Correctional staff and residents may be unexpectedly exposed to blood and other potentially infectious materials through physical assaults and altercations.<br>Correctional staff may be exposed to sharps, such as tattoo needles and homemade shanks, during body searches of residents.<br>Residents may be exposed to bloodborne pathogens from sharing needles for tattooing and injection drug use and from having sexual exposures without barrier protections. |
| Harm reduction | Harm reduction strategies to reduce infectious disease transmission, such as condom distribution, certified tattooing for residents, and needle exchange programs, are largely prohibited for security or regulatory reasons. |
| Housing challenges | Airborne isolation units and medical isolation single cell capacity may be nonexistent or very limited in number.<br>Quarantining residents may be difficult due to overcrowding and lack of housing options.<br>The conditions of confinement associated with medical isolation, quarantine, and facility-wide lockdowns can negatively impact the mental health of residents and limits their access to correctional programs.<br>Long-term housing options, that are not socially isolating, may be unavailable for residents with healthcare-acquired infections, such as *C. auris.* |
| Resident transport | Security vehicles are not configured to prevent the transmission of infectious diseases.<br>Disinfection of security vehicles may be inadequate due to operational constraints and lack of evidence-based protocols. |
| Correctional operational factors | The movement of residents and correctional staff between correctional facilities, courts, and the community is highly dynamic and difficult to minimize.<br>Frequent personnel shortages of correctional staff negatively impact the implementation of infection prevention and control policies and procedures.<br>The carceral environment may discourage symptomatic residents with contagious diseases from seeking medical attention due to stigma, medical co-pays, fear of disciplinary action, or fear of placement in medical isolation.<br>Implementing occupational health recommendations for correctional staff, such as guidance on immunizations and personal protective equipment, may be complicated by challenging labor-management relations. |
| Discharge planning | Discharge planning of residents to prevent further transmission of communicable diseases may be complicated by a lack of continuity for antimicrobial treatments, insufficient medical insurance coverage, inconsistent access to harm reduction strategies, and difficulties securing substance use disorder treatments, safe housing, and psychosocial support. |

*Adapted from (*46*).

uncommon outbreaks of highly communicable diseases such as measles, mumps, and varicella, which have particularly affected immigrant detention facilities (*48*,*49*). Lastly, CIPs must develop and implement facility response plans for rapidly evolving emerging pathogens when initial public health guidance is limited, as was required with the COVID-19 pandemic and the recent mpox outbreak (*50*).

To be fully effective, CIPs must be supported by correctional staff across departments. The facility's leadership must convey the importance of IPC policies to all correctional staff and empower the CIP to advise department heads who supervise correctional programs for security, food services, recreation, and sanitation. The facility's clinical authority must provide sound medical guidance to the CIP and engage actively in IPC administrative meetings. In addition, the facility's healthcare administrator must support IPC policy issuance and assign IPC tasks to appropriate healthcare team members. Last, correctional management officials and healthcare team members are critically dependent on the strong support of public health authorities. Timely promulgation of corrections-focused and population health–based IPC guidance enables the effective response to emerging pathogens and adoption of best practices.

Implementing more effective IPC programs in US jails and prisons will require a concerted investment from correctional officials, policy makers, public health authorities, health care professional organizations, academia, and other key stakeholders. The input of frontline correctional staff and persons who have experienced incarceration should inform these efforts.

Action steps should include the following:

1. Train and deploy a capable IPC workforce
   - Provide sufficient and adequately resourced personnel to manage IPC programs in US correctional facilities
   - Recognize the CIP as a unique IPC professional discipline that is supported by a national online training curriculum with certification requirements
   - Develop correctional-specific tools and checklists to drive excellence and standardize IPC practice

2. Improve surveillance
   - Improve infectious disease surveillance within correctional facilities by standardizing reporting requirements across systems, linking infectious disease reporting to a history of confinement in correctional settings, and evaluating innovative strategies (such as correctional facility wastewater surveillance) to detect pathogens

3. Augment evidence-based guidance
   - Augment evidence-based IPC guidance developed specifically for correctional facilities by the CDC and other national public health authorities

4. Strengthen external stakeholder engagement
   - Allocate federal funding to state and local health departments that encourages strong partnerships with correctional facilities to support key IPC activities such as vaccination programs, screening, surveillance and treatment of infectious diseases, outbreak management, and discharge planning coordination with community partners
   - Strengthen the IPC programmatic requirements of national detention standards that are promulgated by the federal government and standards of national organizations that provide healthcare accreditation to US jails and prisons
   - Develop and fund a national research agenda to evaluate the implementation of IPC recommendations in the correctional setting to identify best practices

Establishing successful correctional IPC programs in thousands of US jails and prisons is no easy task. Key stakeholders must act now at the local, state, and federal levels. The lessons learned from COVID-19 must inform current correctional IPC practices as well as future pandemic planning. Such investments are vital to the well-being of incarcerated residents, to the safety of correctional workers, and to the public health of our communities.

## About the Author

Dr. Kendig is a professor of clinical medicine at George Washington University School of Medicine and Health Sciences. His professional interests include criminal-justice healthcare and infectious disease prevention and control.

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Address for correspondence: Newton E. Kendig, 2300 I St NW, Ross Bldg, Rm 733B, George Washington University School of Medicine and Health Sciences, Washington, DC 20052, USA, email: nek@gwu.edu

# Medicaid Inmate Exclusion Policy and Infectious Diseases Care for Justice-Involved Populations

Alysse G. Wurcel, Katharine London,[1] Erika L. Crable, Nicholas Cocchi, Peter J. Koutoujian, Tyler N.A. Winkelman

The Medicaid Inmate Exclusion Policy (MIEP) prohibits using federal funds for ambulatory care services and medications (including for infectious diseases) for incarcerated persons. More than one quarter of states, including California and Massachusetts, have asked the federal government for authority to waive the MIEP. To improve health outcomes and continuation of care, those states seek to cover transitional care services provided to persons in the period before release from incarceration. The Massachusetts Sheriffs' Association, Massachusetts Department of Correction, Executive Office of Health and Human Services, and University of Massachusetts Chan Medical School have collaborated to improve infectious disease healthcare service provision before and after release from incarceration. They seek to provide stakeholders working at the intersection of criminal justice and healthcare with tools to advance Medicaid policy and improve treatment and prevention of infectious diseases for persons in jails and prisons by removing MIEP barriers through Section 1115 waivers.

Rates of illness and death from infections among justice-involved populations are high. Infections disparately affect persons incarcerated in correctional settings because of the syndemic relationship of infectious diseases, racism, and incarceration (*1*–*4*). In the early 1980s, high rates of HIV infection, hepatitis, and tuberculosis in correctional settings drew attention to missed opportunities to offer infectious disease testing and treatment (*5*,*6*). Correctional healthcare accreditation organizations, correctional administrators, public health officials, and clinicians have collectively advanced infectious disease care in correctional settings through investment into tuberculosis and HIV testing as well as HIV treatment and postrelease linkage programs (*7*,*8*). However, gaps persist, especially during transition from incarceration to community (*9*,*10*). Minoritized persons (including those who are Black, Hispanic, Indigenous, or sexually minoritized) are disproportionately incarcerated and particularly affected by lack of infectious disease treatment and prevention services in correctional settings and at re-entry into the community (*11*–*13*).

Resources allocated for infectious disease treatment and prevention in correctional settings are well documented as inadequate (*14*). Policy and financing reforms are needed to improve infectious disease prevention and treatment among justice-involved populations. The Medicaid Inmate Exclusion Policy (MIEP) prohibits federal Medicaid reimbursement for healthcare services delivered to any incarcerated person, except for hospital stays of >24 hours. Many states have applied to the federal government to waive MIEP through a Section 1115 Medicaid demonstration (hereafter referred to as the 1115 MIEP waiver) (*15*). We outline the history of MIEP, reflect on facilitators of and barriers to infectious disease care in correctional settings, and use the cross-disciplinary collaboration supporting application for an MIEP waiver in Massachusetts to highlight how infectious disease care paradigms could be positively affected by an 1115 MIEP waiver.

Author affiliations: Tufts University School of Medicine, Boston, Massachusetts, USA (A.G. Wurcel); Massachusetts Sheriffs' Association, Boston (A.G. Wurcel, N. Cocchi, P.J. Koutoujian); University of Massachusetts Chan Medical School, Worcester, Massachusetts, USA (K. London); University of California San Diego, La Jolla, California, USA (E.L. Crable); Hampden County Sheriff's Office, Springfield, Massachusetts, USA (N. Cocchi); Middlesex County Sheriff's Office, Woburn, Massachusetts, USA (P.J. Koutoujian); Hennepin Healthcare Research Institute, Minneapolis, Minnesota, USA (T.N.A. Winkelman)

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[1]Current affiliation: Independent consultant.

## Creation and Restructuring of the MIEP

In 1965, the Social Security Act created Medicaid as an insurance program to support access to healthcare for persons with limited income. The Social Security Act established the Inmate and the Institutions for Mental Disease exclusion policies to prohibit Medicaid reimbursement for services delivered in institutions, but it also allowed states to test new ways of delivering care through application for an 1115 MIEP waiver. In 1965, healthcare services available to persons living in the community were not routinely offered to incarcerated populations (*16*). In 1976, the United States Supreme Court ruled in *Estelle v Gamble* that correctional settings that failed to provide incarcerated persons with adequate medical care commensurate with the community-standard was a violation of the Eighth Amendment of the US Constitution. Although access to healthcare in correctional settings has vastly improved since then, wide variability remains (*17*,*18*).

Before the Affordable Care Act Medicaid expansion in 2014 (*19*), many persons released from incarceration did not meet their states' Medicaid eligibility requirements, which often did not cover low-income adults without children. In states that expanded Medicaid under the Affordable Care Act, most persons became eligible for Medicaid at the time of release from incarceration; however, MIEP continued to prevent activation of Medicaid coverage during incarceration. In 1997, the Centers for Medicare & Medicaid Services (CMS) modified the scope of the MIEP by reinstating Medicaid coverage for incarcerated persons who are hospitalized >24 hours but continued to prohibit Medicaid coverage for outpatient services during incarceration (*20*).

## Barriers to Care Created by the MIEP

### Barriers to Infectious Disease Care during Incarceration

In 2011, an estimated one fifth of state department of corrections' operational budgets was spent on healthcare (*21*). Even so, correctional budgets have been insufficient to meet the need, and the MIEP prevents Medicaid from filling this gap. For example, offering hepatitis C treatment to everyone who needs it has been challenging because of the cost (>$80,000 per treatment), a recommended treatment period of 8–12 weeks, and high rates of hepatitis C virus infection in jails and prisons (*22*,*23*). Other challenges for correctional healthcare budgets are paying for long-acting injectable medications that treat or prevent HIV infection and adopting substance use disorder treatments in jails and prisons (*24*,*25*). Many jails and prisons in the United States now offer medications for treatment of opioid use disorder and substance use disorder to prevent the risk for medical complications (e.g., withdrawal and death). However, medication continuity for opioid use disorder and many infectious disease conditions during and after incarceration remains poor (*26*).

### Barriers to Continuity of Care during Transitions from Correctional to Community Healthcare

Because Medicaid coverage is suspended or terminated during incarceration, it needs to be reactivated for persons to receive care when they return to the community. Most persons incarcerated in the United States spend short periods (<30 days) in jail (*27*) and often cycle multiple times from jail to community, further fragmenting needed care. People leaving jail and prison face barriers getting Medicaid reactivated, making appointments, and getting medications (*28*,*29*). Another barrier, with its own set of challenges, is data sharing between correctional and community healthcare systems (*30*). Virus eradication (hepatitis C virus) and virus suppression (HIV) are needed to end the hepatitis C and HIV infection epidemics, yet persons who leave jail and prisons with those infections often encounter administrative, geographic, and financial hurdles blocking access to treatment, further complicated by competing priorities of housing, food insecurity, and unemployment (*31*–*35*). Persons with untreated HIV infection (*36*), viral hepatitis (*37*), and substance use disorder (*38*) are particularly at risk for disjointed care when transitioning to the community.

## Cross-Disciplinary Collaboration in Massachusetts to Promote Healthcare Access and Waive MIEP

As of January 2024, at least one quarter of states, including Massachusetts, had applied for an 1115 MIEP waiver. In 2023, CMS granted 1115 MIEP waiver requests to California and Washington to cover transitional care services provided to persons in the 90 days before their release from incarceration (*39*), and CMS issued guidance to help states understand what provisions might be waived (*40*). In December 2021, Massachusetts submitted an 1115 MIEP waiver request with input from many collaborators, including but not limited to the Massachusetts Sheriffs' Association and Department of Correction. As outlined in the waiver application, the major goals for Massachusetts are to improve prerelease and postrelease care management and connection to healthcare services, to improve healthcare outcomes, and to decrease outcome disparities (*41*,*42*). Incarcerated persons who meet Massachusetts Medicaid income eligibility criteria

would be able to receive Medicaid covered services during a prerelease period. To ensure that all persons incarcerated within a facility have equal access to healthcare services, correctional budgets would need to support provision of Medicaid-covered services for persons who do not meet Medicaid eligibility requirements. Massachusetts originally requested coverage during a prerelease period of 30 days (*43*); the recent CMS guidance allowed a prerelease period of up to 90 days (*40*), and Massachusetts resubmitted its waiver request on October 16, 2023, proposing coverage 90 days before release for all incarcerated persons (*43*).

### Operationalization of an 1115 MIEP Waiver to Improve Infectious Disease Care

An 1115 MIEP waiver would provide several opportunities for improving infectious disease care. High-cost, evidence-based medications (e.g., for treatment for hepatitis C and preexposure prophylaxis for HIV) could be initiated before release and supported by robust linkage to care programs after release. Medications and treatment for substance use disorder could be augmented, reimbursed, and continued seamlessly in the community, enhancing opportunities for successful re-entry. Intensified support for care coordination and for linkage to care at the time of re-entry has also been proposed in the newest application—a strategy that has been shown to increase continuation of care and improve infectious disease outcomes (*44*–*46*). Care coordination staff embedded within the jail or prison would assist with completion of health insurance paperwork, scheduling of clinician appointments, and other tasks at re-entry. Data sharing between the correctional health system and the community health system would be improved. An 1115 MIEP waiver could change the experience of a person with an infectious disease or substance use disorder transitioning from correctional to community healthcare (Table).

The 1115 MIEP waiver requested by Massachusetts would support a warm handoff, either through

**Table.** Case examples of potential impact of overturning MIEP on infectious disease care for eligible persons*

| Case | Before waiver approval | After waiver approval |
|---|---|---|
| 25-y-old man with HCV and opioid use disorder, incarcerated for 50 d, plans for release in the next month | • Short incarceration period and high medication cost are barriers to testing to confirm chronic HCV infection and to initiating HCV treatment.<br>• Gap in insurance coverage impedes transfer of OUD treatment to pharmacy after release.<br>• Interested in PrEP but no system to ensure follow-up by community clinician (community clinic requires active health insurance at time of appointment scheduling). | • HCV medications and PrEP initiated as soon as diagnoses are confirmed.<br>• Minimum of 30-d supply of medications provided upon release.<br>• With active insurance, appointment can be scheduled with community health center for day after release. |
| 55-y-old woman with HIV and bipolar disorder, Incarcerated for 10 y and preparing for community re-entry in the next 2–3 months | • HIV diagnosed while in prison; does not have ties to a clinician in the community.<br>• Bipolar disorder well managed in prison with medication; however, there are no systems to coordinate outpatient mental health care in the community.<br>• She would like to connect with a community health center that can manage HIV and bipolar disorder. She does not know where she will be living, and she does not know which community health center will be accessible by public transportation. | • Linkage to care specialist connects with case worker to advocate for specific living situation near community health center.<br>• Telehealth appointments scheduled with HIV clinician and mental health clinician before release to ensure warm handoff.<br>• Phone number and appointment time for post-release appointment given to the patient.<br>• 30-d supply of HIV medication and lithium delivered to living situation.<br>• Phone number for care coordination contact at prison in case she has issues with medications or needs to transfer her care to a different community health center. |
| 40-y-old trans woman receiving PrEP, incarcerated for 3 mo. Preparation for release began at intake. | • Has been receiving oral PrEP in the community, but PrEP not continued during incarceration.<br>• Has not received STI testing or treatment in the community. The jail can do oral and urine STI testing; however, rectal testing is not available.<br>• Interested in long-acting PrEP, but it was not on the jail formulary.<br>• 1st hepatitis B vaccine given in jail but no plan for next vaccine | • Resources allocated from waiver funding to support protocolization of long-acting injectable PrEP delivery to persons within 30 d of release.<br>• Infectious diseases nurse at the jails works with local clinicians and public health experts to coordinate testing for rectal gonorrhea and chlamydia.<br>• Hepatitis B vaccine series scheduled at local pharmacy after release.<br>• Records of vaccines and PrEP care transferred from jail to community health clinician. |

*HCV, hepatitis C virus; MIEP, Medicaid Inmate Exclusion Policy; OUD, opioid use disorder; PrEP, preexposure prophylaxis; STI, sexually transmitted infection.

in-person or telehealth meetings, in which the clinician who will be treating the person in the community can meet with the jail or prison clinician. Medicaid enrollment during incarceration would enable providers to schedule appointments for persons soon after their expected release date; in some cases, the community provider might meet with the patient in person or via telehealth visit before release (*47*). The process of such handoffs is intended to reduce apprehension about stigmatizing experiences in the community and to improve engagement in postrelease care. The approach used by the Transitions Clinic Network, with 48 clinics across the country, serves as a model for hiring, training, and supporting a workforce dedicated to health at the time of re-entry (*48*,*49*).

As states implement MIEP-related policy changes, they should develop monitoring systems to help identify potential delays in healthcare access that may occur during incarceration or at the time of re-entry into the community. Moreover, states should establish accountability processes to ensure that correctional settings do not delay healthcare delivery until 90 days before release, when Medicaid could reimburse services rendered. For example, persons with liver disease from hepatitis C should be prioritized for treatment as soon as possible. Collaborative systems of care and open communication between clinicians, correctional administrators, and public health agencies should ensure that appropriate healthcare is delivered throughout incarceration and at re-entry into the community.

## Conclusions

Building on 1115 MIEP waiver–associated successes and lessons in California, Washington, and, eventually, Massachusetts, state Medicaid agencies can request to waive the federal MIEP to positively affect eligible justice-involved persons and the broader public. Repealing MIEP at the federal level would eliminate the need for states to apply for MIEP waivers. The growing number of 1115 MIEP waiver applications signals the strength of cross-sector partnerships among public health, policy, healthcare, and correctional leaders that can be leveraged for more robust legislative change to improve continuity of healthcare for incarcerated persons.

## About the Author

Dr. Wurcel is an infectious diseases clinician working in jails and at Tufts Medical Center and is also a health services researcher. She is a consultant to the Massachusetts Sheriffs' Association.

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Address for correspondence: Alysse G. Wurcel, Tufts Medical Center, Infectious Diseases, 800 Washington St, Boston, MA 02118, USA; email: awurcel@tuftsmedicalcenter.org

**SkyART Just-Us. *Flying or Dying* (detail) (2020).** Acrylic paint, paint pen, and watercolor on canvas, 67 in x 54 in/170 cm x 137 cm.


# Art, Healing, and Carceral Health

Liesl Hagan, Andrew Durkin, Devon VanHouten-Maldonado, Byron Breedlove

People who are incarcerated are among the most marginalized groups in our society, and their lives—and their experiences with infectious diseases—are often unseen behind the walls of prisons and jails.

Author affiliations: Centers for Disease Control and Prevention, Atlanta, Georgia, USA; (L. Hagan, A. Durkin, B. Breedlove); SkyART, Chicago, Illinois, USA (D. VanHouten-Maldonado)

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*Flying or Dying*, the cover art for this supplement issue of *Emerging Infectious Diseases*, was created as part of a 2022 exhibit named "*Can You See Me*?" and organized by SkyART, a nonprofit organization that provides art programs and creative arts therapy for young artists in Chicago's South and West Side communities. Since 2018, SkyART has worked in youth detention centers in the Chicago area, including several facilities operated by the Illinois Department of Juvenile Justice.

*Flying or Dying* is a collaborative mural that was displayed in the Weinberg/Newton Gallery, Arts + Public Life, and SkyART studios in Chicago. The *Can You See Me?* exhibit featured works by more than 50 artists and organizations, including youth held in Chicago-area detention facilities. The objective of *Can You See Me?* was to highlight the humanity and potential of incarcerated youth and to demonstrate how art can be a tool for healing.

*Flying or Dying*, created by eight young artists over the course of several months, features many layers, evolving from graffiti to portraits, that tell many stories, both hopeful and harrowing. The white outline of a body that overlays most of the piece challenges the viewer to determine whether the figure is a chalk outline—another faceless and nameless victim of violence—or a person with their arms spread wide as they take flight and soar over the violence traumatizing their community. Are they fallen, or are they flying? Because state law protects the identity of minors who are detained or charged with crimes, the artists are not named. However, the outlines of their bodies on the canvas bring them physically into the exhibition space, reminding viewers that they are real people. The patterns, shapes, texts, and images create a more nuanced and complete portrait of these young men as full and complex individuals, more than the crimes for which they were confined.

SkyART's Just-Us programs are led by art therapists, social workers, and licensed counselors who use creative techniques to help young persons express, process, and heal from trauma they have experienced. Incarcerated youth are affected by an average of six adverse childhood experiences, often including gun violence, abuse, and neglect, which negatively affect their health outcomes. When young persons enter the criminal justice system, they are often required to participate in traditional cognitive behavioral therapy or talk therapy, which can be difficult for some youth. Alternative creative modalities such as art therapy offer young persons a different way to process emotions that can be difficult to put into words.

According to the Prison Policy Initiative, more than 48,000 youth are confined in the United States on any given day. The youth incarceration rate in the United States is higher than in any region of the world as defined by the United Nations and is 11 times higher than in western Europe or Asia. Data collected in 2019 by the US Department of Justice show that young persons of color are disproportionately represented; detention rates among Black youth are six times higher and among Latinx youth two times higher than among white youth. Confinement during adolescence has been associated with poorer mental and physical health (including higher prevalence of infectious diseases) during adulthood and a shorter life expectancy.

CDC data from 2019 show that rates of sexually transmitted infections, including chlamydia and gonorrhea, are higher among youth entering confinement facilities than among youth in the community. Youth in detention facilities also commonly report a history of sexual behavior associated with increased risk of acquiring HIV, including having had unprotected sex and multiple partners. However, HIV prevalence in this population is unclear because of variable screening practices at the time of entry, a common public health challenge associated with carceral health overall. Youth held in detention facilities are also at increased risk for respiratory diseases, including COVID-19, because of the congregate living environment. In addition to infectious diseases, mental health among youth who are confined is a serious concern. The 2016 US Bureau of Labor Statistics National Longitudinal Survey of Youth found that young persons confined for one year or longer were four times more likely to experience depression and two times more likely to have suicidal thoughts during adulthood compared with their peers who were not confined.

Similar to the objective of SkyART's *Can You See Me?* exhibit, this supplement in *Emerging Infectious Diseases* portrays the lives of persons who are incarcerated and brings them into greater prominence. Each article in the supplement illustrates ways in which the experiences of incarcerated persons, as well as staff working in carceral facilities, are critical components of infectious disease prevention and public health broadly. Within public health practice, the same question resonates: Can we "see" persons confined in carceral facilities, and do we see them as part of our work? Just as important, can persons living and working in these facilities see themselves in our public health and infectious disease prevention strategies? To build a future where people can be safe and access high-quality healthcare during confinement, and where they can live healthy lives afterward, the answer to "Can you see me?" must be "Yes."

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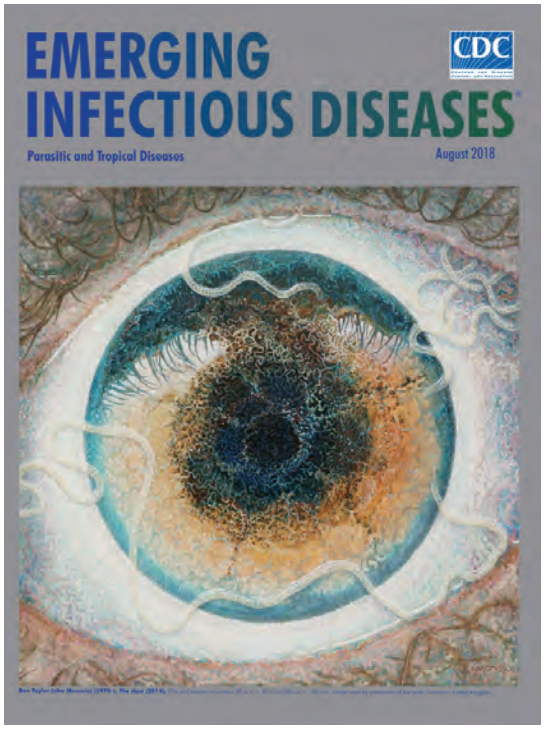
Address for correspondence: Andrew Durkin, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, Mailstop H21-4, Atlanta, GA 30329-4018, USA; email: sqn3@cdc.gov

# **EID Podcast** A Worm's Eye View




Seeing a several-centimeters-long worm traversing the conjunctiva of an eye is often the moment when many people realize they are infected with *Loa loa*, commonly called the African eyeworm, a parasitic nematode that migrates throughout the subcutaneous and connective tissues of infected persons. Infection with this worm is called loiasis and is typically diagnosed either by the worm's appearance in the eye or by a history of localized Calabar swellings, named for the coastal Nigerian town where that symptom was initially observed among infected persons. Endemic to a large region of the western and central African rainforests, the *Loa loa* microfilariae are passed to humans primarily from bites by flies from two species of the genus *Chrysops*, *C. silacea* and *C. dimidiate*. The more than 29 million people who live in affected areas of Central and West Africa are potentially at risk of loiasis.

Ben Taylor, cover artist for the August 2018 issue of EID, discusses how his personal experience with the *Loa loa* parasite influenced this painting.

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EMERGING INFECTIOUS DISEASES