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Recent Incarceration Among Individuals Infected With Hepatitis A Virus During Person-to-Person Community Outbreaks, United States, 2016-2020

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Abstract

Objectives: Although many people who are incarcerated have risk factors for hepatitis A virus (HAV) infection, the proportion of hepatitis A cases among people with a recent incarceration is unknown. We examined the relationship between recent incarceration and HAV infection during community-based, person-to-person outbreaks to inform public health recommendations.

Methods: The Centers for Disease Control and Prevention surveyed health departments in 33 jurisdictions reporting person-to-person HAV outbreaks during 2016-2020 on the number of outbreak-associated cases, HAV-infected people recently incarcerated, and HAV-associated hospitalizations and deaths.

Results: Twenty-five health departments reported 18 327 outbreak-associated hepatitis A cases during January 11, 2016–January 24, 2020. In total, 2093 (11.4%) HAV-infected people had been recently incarcerated. Of those with complete data, 1402 of 1462 (95.9%) had been held in a local jail, and 1513 of 1896 (79.8.%) disclosed hepatitis A risk factors. Eighteen jurisdictions reported incarceration timing relative to the exposure period. Of 9707 cases in these jurisdictions, 991 (10.2%) were among recently incarcerated people; 451 of 688 (65.6%) people with complete data had been incarcerated during all (n = 55) or part (n = 396) of their exposure period.

Conclusions: Correctional facilities are important settings for reaching people with risk factors for HAV infection and can also be venues where transmission occurs. Providing HAV vaccination to incarcerated people, particularly people housed in jails, can be an effective component of community-wide outbreak response.

Keywords

hepatitis A virus, incarceration, correctional facility, prison, jail

Person-to-person outbreaks of hepatitis A have been ongoing in the United States since 2016, with more than 42 000 cases, 26 000 hospitalizations, and 402 deaths in 35 states as of November 2021.[1] Hepatitis A is caused by the hepatitis A virus (HAV) and is a vaccine-preventable, communicable disease of the liver transmitted primarily via the fecal–oral route. HAV infection is usually mild and self-limited in healthy people but can be severe in those who are older, immunocompromised, or have chronic liver disease or other underlying health conditions.

HAV transmission during these person-to-person outbreaks is occurring primarily among people who use drugs and people experiencing homelessness, groups that may have difficulty accessing vaccination and other prevention services in the community. These groups are also disproportionately represented in US correctional and detention facilities.[2-4] These populations have substantial overlap, with estimates for lifetime history of incarceration ranging from 25% to 50% among people experiencing homelessness and as high as 80% among people who use drugs.[3,4] Because of this overlap, many opportunities for HAV transmission exist between correctional and detention facilities and their surrounding communities during person-to-person outbreaks, particularly in facilities with high rates of turnover, such as jails. Furthermore, congregate living conditions and hygiene constraints in correctional and detention facilities can facilitate HAV transmission among incarcerated populations once it is introduced. For these reasons, correctional and detention facilities can be key partners to reach people at risk for HAV infection.

Although incarceration is a common experience for many people with risk of HAV infection, the proportion of outbreak-associated cases occurring among people with a recent history of incarceration is unknown. In addition, data on HAV transmission in correctional and detention facilities are limited. This analysis examined the relationship between incarceration and HAV infection, HAV-associated hospitalization, and death occurring during ongoing person-to-person outbreaks in the United States.

Methods

In February 2020, the Centers for Disease Control and Prevention (CDC) used a cross-sectional survey to collect aggregate data from state and local health departments in US jurisdictions that had experienced person-to-person hepatitis A outbreaks since January 2016. Information collected included the number of outbreak-associated hepatitis A cases from the jurisdiction's outbreak start date through January 24, 2020, and, of those cases, the number of HAV-infected people incarcerated during their exposure period (15-50 days before symptom onset) or infectious period (2 weeks before through 2 weeks after symptom onset), referred to herineafter as "recent incarceration." Health departments identified incarceration status through case reports, medical records, and patient interviews.

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Table 1. Outbreak-associated hepatitis A virus (HAV) infections, hospitalizations, and deaths among people with and without a recent history of incarceration,[a] 25 state and local jurisdictions, United States, January 11, 2016–January 24, 2020[b]

Characteristic	With recent incarceration documented, no. (%)[a]	Without recent incarceration documented, no. (%)[a]	*P* value[c]
No. of hepatitis A outbreak–associated cases	2093	16 234	—
Hepatitis A–associated hospitalizations	1033 (49.4)	11 490 (70.8)	<.001
Hepatitis A–associated deaths	10 (0.5)	199 (1.2)	.003

[a] Recent history of incarceration was defined as incarceration during a person's hepatitis A exposure period (15-50 days before symptom onset) or infectious period (2 weeks before through 2 weeks after symptom onset). All 25 jurisdictions reported data on this measure. Health departments identified incarceration status using case reports, medical records, and patient interviews.
[b] The following jurisdictions responded to the survey: Arizona; Arkansas; San Diego, California; Colorado; Delaware; Florida; Georgia; Illinois; Louisiana; Massachusetts; Michigan; Minnesota; Mississippi; Southern Nevada Health District; New Hampshire; New Mexico; New York (excluding New York City); North Carolina; Ohio; Philadelphia, Pennsylvania; Tennessee; Utah; Vermont; Virginia; and Washington State.
[c] Proportions were compared using a 2-sided *z* test; $P < .05$ was considered significant.

For HAV-infected people who were recently incarcerated, the survey requested information on incarceration setting (local jail, state prison, federal prison) and hepatitis A risk factors (drug use, homelessness, and identification as men who have sex with men [MSM]). To estimate the proportion of people who were potentially infected while incarcerated, the survey requested the number of HAV-infected people who were incarcerated during all, part, or none of their HAV exposure period (a subset of those who were defined as recently incarcerated).

The survey also requested the number of HAV-infected people with and without recent incarceration history who had a hepatitis A–associated hospitalization or hepatitis A–associated death. We compared population proportions using a 2-sided *z* test, with $P < .05$ considered significant. We performed data analysis in Microsoft Excel. CDC determined that this analytic project using aggregate data did not constitute research involving human subjects, and institutional review board review was not required.

In this article, *incarceration* refers to the state of being held in a correctional facility (ie, state and federal prisons, which primarily hold people who have been tried for a crime, convicted, and sentenced, typically for a duration >1 year) or a detention facility (ie, locally administered jails, which hold people awaiting trial or sentencing, as well as those who have been tried, convicted, and sentenced for a short duration). The survey did not specify immigration detention facilities as a separate category.

Results

Of the 33 health departments surveyed (30 state, 3 local), 25 (76%) responded (Arizona; Arkansas; San Diego, California; Colorado; Delaware; Florida; Georgia; Illinois; Louisiana; Massachusetts; Michigan; Minnesota; Mississippi; Southern Nevada Health District; New Hampshire; New Mexico; New York [excluding New York City]; North Carolina; Ohio; Philadelphia, Pennsylvania; Tennessee; Utah; Vermont; Virginia; Washington State). All 25 health departments collected data on recent incarceration status. Responding health departments reported 18 327 outbreak-associated hepatitis A cases, including 2093 (11.4%) among recently incarcerated people (Table 1). Across jurisdictions, the proportion of HAV-infected people who were recently incarcerated ranged from 0% to 30%.

Of 2093 HAV-infected people who were recently incarcerated, 1462 (69.9%) disclosed data on facility type. Of those, 1402 (95.9%) were held in a local jail, 40 (2.7%) in a state prison, 4 (0.3%) in a federal prison, and 16 (1.1%) in multiple facility types (Table 2).

Information about hepatitis A risk factors was available for some HAV-infected people who were recently incarcerated. Of people with data on risk factors, 1513 of 1896 (79.8%) disclosed drug use, 560 of 1700 (32.9%) disclosed homelessness, and 27 of 1092 (2.5% of people identifying as male) identified as MSM (Table 2). The proportion with missing data on history of drug use, homelessness, and identification as MSM were 9.4%, 18.8%, and 24.1%, respectively.

The proportion of HAV-infected people who were hospitalized was lower among recently incarcerated people (49.4%; 1033 of 2093) than among people without a recent incarceration history (70.8%; 11 490 of 16 234; $P < .001$; Table 2). We found a similar trend in the proportion of HAV-infected people who died, with fewer deaths among recently incarcerated people (0.5%; 10 of 2093) than among people without a recent incarceration history (1.2%; 199 of 16 234; $P = .003$).

Eighteen jurisdictions provided information on the timing of incarceration relative to people's HAV exposure period specifically (as opposed to incarceration during people's exposure or infectious period) as an indication of potential exposure during incarceration. These jurisdictions reported a total of 9707 outbreak-associated cases, accounting for 53.0% of cases reported in all 25 participating jurisdictions. Of these 9707 cases, 991 (10.2%) were among recently incarcerated people. Data on timing of incarceration relative to exposure period (as opposed to timing relative to exposure or infectious period) were available for 688 of 991 (69.4%)

Table 2. Hepatitis A risk factors and exposure period reported by people with hepatitis A virus infection and a recent history of incarceration (N = 2093),[a] 25 state and local jurisdictions,[b] United States, January 11, 2016–January 24, 2020.

Characteristic	No. (%)[a]
Type of correctional or detention facility (n = 1462)[c]	
Local jail only	1402 (95.9)
State prison only	40 (2.7)
Federal prison only	4 (0.3)
Multiple facility types	16 (1.1)
Reported hepatitis A risk factors	
Drug use (n = 1896)[c]	
Yes	1513 (79.8)
No	383 (20.2)
Homelessness (n = 1700)[c]	
Yes	560 (32.9)
No	1140 (67.1)
Men who have sex with men[d] (n = 1092)[c]	
Yes	27 (2.5)
No	1065 (97.5)
Portion of hepatitis A exposure period overlapping with incarceration (18 jurisdictions reporting)[e] (n = 688)[c]	
Entire hepatitis A exposure period	55 (8.0)
Part of hepatitis A exposure period[f]	396 (57.6)
None of hepatitis A exposure period	237 (34.4)

[a] Recent history of incarceration was defined as incarceration during a person's hepatitis A exposure period (15-50 days before symptom onset) or infectious period (2 weeks before through 2 weeks after symptom onset). All 25 jurisdictions reported data on this measure. Health departments identified incarceration status using case reports, medical records, and patient interviews.
[b] The following jurisdictions responded to the survey: Arizona; Arkansas; San Diego, California; Colorado; Delaware; Florida; Georgia; Illinois; Louisiana; Massachusetts; Michigan; Minnesota; Mississippi; Southern Nevada Health District; New Hampshire; New Mexico; New York (excluding New York City); North Carolina; Ohio; Philadelphia, Pennsylvania; Tennessee; Utah; Vermont; Virginia; and Washington State.
[c] Data were missing for the following variables: type of correctional facility (631 missing), drug use (197 missing), homelessness (393 missing), men who have sex with men (346 missing), and portion of hepatitis A exposure period overlapping with incarceration (303 missing).
[d] A total of 1438 people identified as male, of whom 303 were missing data on identification as men who have sex with men.
[e] Seven states did not report data on timing of incarceration relative to hepatitis A virus exposure period specifically (as opposed to incarceration during exposure or infectious period). The 18 jurisdictions reporting on this measure reported a total of 9707 outbreak-associated hepatitis A cases, including 991 among recently incarcerated people. Information on overlap between hepatitis A exposure period and incarceration was available for 688 of 991 people.
[f] Defined as the number of HAV-infected people who spent time in both the community and a correctional or detention facility during their hepatitis A exposure period.

recently incarcerated people, of whom 451 (65.6%) were incarcerated during all or part of their exposure period; 55 (8.0%) were incarcerated during all of their exposure period and 396 (57.6%) were incarcerated during part of their exposure period (Table 2).

Discussion

Across 25 state and local jurisdictions experiencing person-to-person hepatitis A outbreaks, 11.4% of outbreak-associated cases, and up to 30% in some jurisdictions, were among people who spent time in a correctional or detention facility during their exposure or infectious period. Most (95.9%) were held in a local jail. Among those with data available on hepatitis A risk factors, 79.8% disclosed drug use and 32.9% reported experiencing homelessness. The proportion reporting drug use in this survey is notably higher than the proportion in a previous report among overall outbreak-associated cases (48.5%), highlighting the need to include correctional and detention facilities in public health response activities during person-to-person hepatitis A outbreaks.[5]

Of all recently incarcerated HAV-infected people for whom exposure and incarceration dates were available, approximately two-thirds had been incarcerated for at least part of their exposure period, including 55 (8.0%) who had been incarcerated for the entire duration. These results suggest that while a substantial proportion of HAV transmission likely occurred in the community, some transmission occurred inside correctional and detention facilities, a dynamic that has not been well documented in previous literature.

The CDC Advisory Committee on Immunization Practices (ACIP) has recommended hepatitis A vaccination for people who use drugs since 1996 and for people experiencing homelessness since 2019, in any setting regardless of outbreak conditions.[6] In 2020, ACIP published guidance specifying that public health officials should consider recommending the administration of hepatitis A vaccine in close congregate settings that provide services to people at high risk for infection who are in the vicinity of a person-to-person hepatitis A outbreak, such as correctional and detention facilities, without the need for prevaccination serologic testing or risk factor determination. Our findings support this guidance update. The evidence of HAV transmission in correctional and detention facilities in our findings suggests that vaccinating people inside correctional and detention facilities could help prevent facility-based transmission and contribute to community mitigation. Nearly all recently incarcerated HAV-infected people in this analysis with a documented facility type had been held in a jail, indicating that vaccinating in local jails could be particularly effective.[7] Quantifying the potential reductions in community transmission that could be achieved by vaccinating in different types of correctional and detention facilities during outbreaks will require further investigation.

In this analysis, hospitalizations and deaths from hepatitis A were less common among people who were recently incarcerated than among those without a recent incarceration history, consistent with an earlier study.[8] Further investigation should explore possible reasons for this effect, such as younger average age in incarcerated versus community populations or the potential impact that on-site health

care services in some facilities could have on early clinical intervention for people with HAV infection. In addition, missing data on incarceration could be more common among people with severe outcomes because of their potentially limited ability to participate in case interviews.

Limitations

This study had several limitations. First, the proportion of hepatitis A cases that had missing data on recent incarceration was unknown. Variations in health departments' ability to conduct case interviews, which were the primary source of data used to determine recent incarceration, likely resulted in underascertainment of incarceration status and a conservative estimate of the proportion of infected people who were recently incarcerated. Even among people who were interviewed, incarceration status was likely underreported because of stigma. Second, data on facility type, risk factor disclosure, and incarceration relative to exposure period were not available for all recently incarcerated people. We were unable to determine whether data for these variables were missing systematically, which could have produced biased estimates. Third, because facility type was categorized broadly (ie, local jails, state prisons, federal prisons), we could not discriminate among more specific facility types. For example, youth detention facilities were not categorized separately and may be reflected in multiple categories depending on jurisdiction. Fourth, variations in jurisdictions' outbreak case definitions could have influenced their determinations of which cases were associated with an outbreak. Finally, these results might not be generalizable to outbreak-affected jurisdictions that did not participate in the survey.

Conclusions

This analysis provides evidence that people with HAV infection have passed through correctional and detention facilities during recent community person-to-person outbreaks and that some people may have become infected while incarcerated. Correctional and detention facilities hold a disproportionate number of people with hepatitis A risk factors, many of whom may have difficulty accessing prevention services in the community when they are not incarcerated. Therefore, the current ACIP consideration to vaccinate incarcerated people during community outbreaks—and to vaccinate incarcerated people with hepatitis A risk factors even in the absence of an outbreak—can be an effective hepatitis A mitigation strategy in correctional and detention facilities and for the wider community. Public health partnerships with local jails in particular, where high population turnover blurs the boundaries between facility and community, can make important contributions to community-wide outbreak control.[9-11]

Many correctional and detention facilities have insufficient health care resources on site to undertake a vaccination campaign and may welcome engagement with public health departments to meet this need. Strong partnerships between public health and correctional entities during hepatitis A outbreaks can continue serving the needs of incarcerated populations during future public health emergencies and routine programmatic operations.

Disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily reflect the official position of the Centers for Disease Control and Prevention or the authors' affiliated institutions.

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References

1. Centers for Disease Control and Prevention. Widespread person-to-person outbreaks of hepatitis A across the United States. Updated December 20, 2021. Accessed November 30, 2021. https://www.cdc.gov/hepatitis/outbreaks/2017March-HepatitisA.htm
2. Bronson J, Stroop J, Zimmer S, Berzofsky M. *Drug Use, Dependence, and Abuse Among State Prisoners and Jail Inmates, 2007-2009*. US Department of Justice, Bureau of Justice Statistics; 2017. Accessed August 24, 2020. https://www.bjs.gov/index.cfm?ty=pbdetail&iid=5966
3. Knopf-Amelung S. Incarceration and homelessness: a revolving door of risk. *Focus: A Quarterly Research Review of the National Health Care for the Homeless Council*. 2013;2(2):1-5. Accessed August 24, 2020. https://nhchc.org/wp-content/uploads/2019/08/infocus_incarceration_nov2013.pdf
4. Young AM, Havens JR. Transition from first illicit drug use to first injection drug use among rural Appalachian drug users: a cross-sectional comparison and retrospective survival analysis. *Addiction*. 2012;107(3):587-596. doi:10.1111/j.1360-0443.2011.03635.x
5. Foster M, Ramachandran S, Myatt K, et al. Hepatitis A virus outbreaks associated with drug use and homelessness—California, Kentucky, Michigan, and Utah, 2017. *MMWR Morb Mortal Wkly Rep*. 2018;67(43):1208-1210. doi:10.15585/mmwr.mm6743a3
6. Nelson NP, Weng MK, Hofmeister MG, et al. Prevention of hepatitis A virus infection in the United States: recommendations of the Advisory Committee on Immunization Practices, 2020. *MMWR Recomm Rep*. 2020;69(5):1-38. doi:10.15585/mmwr.rr6905a1

7. Zellmer L, Peters L, Silva RS. Hennepin County Adult Detention Center's response to a 2019 hepatitis A outbreak in Minnesota. *Am J Public Health*. 2021;111(5):839-841. doi:10.2105/ajph.2021.306159
8. Hofmeister MG, Xing J, Foster MA, et al. Hepatitis A person-to-person outbreaks: epidemiology, morbidity burden, and factors associated with hospitalization—multiple states, 2016-2019. *J Infect Dis*. 2021;223(3):426-434. doi:10.1093/infdis/jiaa636
9. Vong S, Fiore AE, Haight DO, et al. Vaccination in the county jail as a strategy to reach high risk adults during a community-based hepatitis A outbreak among methamphetamine drug users. *Vaccine*. 2005;23(8):1021-1028. doi:10.1016/j.vaccine.2004.07.038
10. Snyder MR, McGinty MD, Shearer MP, Meyer D, Hurtado C, Nuzzo JB. Outbreaks of hepatitis A in US communities, 2017-2018: firsthand experiences and operational lessons from public health responses. *Am J Public Health*. 2019;109(Suppl 4): S297-S302. doi:10.2105/AJPH.2019.305139
11. Skidmore S, Parry JV, Nottage P. An investigation of the potential risk of an HAV outbreak in a prison population following the introduction of cases from a community outbreak. *Commun Dis Public Health*. 2001;4(2):133-135.