




Rapid Review: What factors increase the risk of COVID-19 outbreaks in congregate living settings? How do outcomes compare to outbreaks in community settings?



Prepared by: The National Collaborating Centre for Methods and Tools

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Executive Summary

Background

Congregate living settings have been the sites of outbreaks of COVID-19. Evidence of factors that increase the risks of outbreaks in these settings, and about the outcomes for affected individuals, has implications for prevention, control, and mitigation.

This rapid review was produced to support public health decision makers' response to the coronavirus disease (COVID-19) pandemic. This review seeks to identify, appraise, and summarize emerging research evidence to support evidence-informed decision making.

This rapid review includes evidence available up to June 23, 2020 to answer the question: **What factors increase the risk of COVID-19 outbreaks in congregate living settings? Do people who contract COVID-19 from outbreaks in congregate living settings have worse outcomes than community-dwelling persons?**

Key Points

- No evidence was found to directly address the question of specific factors in congregate living settings that may increase or reduce risk of a COVID-19 outbreak. The impact of factors such as crowding and shared facilities (e.g., washrooms, dining, communal space) is assumed in the studies, based on expert opinion, but has yet to be demonstrated in evidence.
- Very limited evidence was found that compared outcomes (i.e., cases, hospitalizations, fatalities) for congregate-living residents to community-dwelling residents. Two Canadian prevalence studies that reported a comparator found a higher rate of COVID-19 infection in congregate settings (shelter and prison) than in the general population (2 to 18 times higher). Given that many congregate settings are testing universally, the testing rate is also likely higher in these congregate settings than in the general population, potentially leading to a higher prevalence rate. Quality is high; findings are consistent.
- Prevalence studies appear to show higher rates of infection in congregate settings, although most do not provide comparative rates for community settings.
- A systematic review identified factors in prison settings that contribute to the spread of infections other than COVID-19. Recommended mitigation strategies, with relevance for COVID-19, include: health communication; reduction of overcrowding; limiting shared spaces when possible. Recommended public health measures such as hand hygiene, screening, testing, contact tracing, and isolation are challenging to implement in a prison context. Quality is moderate; findings are consistent.
- Mitigation strategies focus on infection prevention and control measures tailored to prison and shelter settings, and include: limiting visitors; limiting movement of staff and residents between locations; screening, testing, and isolating; providing on-site healthcare; enhanced sanitation; physical distancing and reduction of crowding when possible; cohorting of positive cases; PPE and hand hygiene measures. The effectiveness of these interventions has not been studied in these contexts; implemented practices are moderately consistent.

Overview of Evidence and Knowledge Gaps

- The evidence found for this review was limited to prisons/detention centres, homeless shelters, and migrant worker dormitories. The applicability of these findings to other congregate settings is not known.
- The extent to which identified infections were acquired in the congregate setting or from community contacts is not known. Community transmission into congregate living settings is possible through staff contacts, or in settings such as shelters and migrant worker dormitories where residents interact with community, or in prisons that accept new detainees or allow community interaction.
- A Toronto, Canada study found a lower case fatality rate among shelter residents than in the general population, based on three fatalities in the shelter; a Canadian prison study found a higher case fatality rate in prisons than in the general population, based on one case fatality. Quality is high; findings are not consistent. The number of case fatalities reported in these studies is low and the comparison to the general population is likely to be unreliable.
- One moderate quality study reported on the physical factors in settings associated with outbreak clusters. Two shelters with positive cases were in areas of higher population density and were accepting new residents, compared to three shelters without positive cases. The shelter with the highest rate of COVID-19 infection had the highest resident turnover and did not implement physical distancing in sleep areas.
- In terms of relationship between prison and community spread, one moderate quality study found a correlation between COVID-19 rates in the surrounding areas and rates of arrest and releases, and that jail cycling (moving in and out of correctional facilities during arrest and hearings) was a stronger predictor of local COVID-19 rate variance than race, poverty, transit use, or population density.
- Little is known about specific features of the physical environments that may contribute to increased spread of COVID-19, such as crowded sleeping quarters or shared living spaces, bathrooms, or dining areas.
- There is very limited evidence related to COVID-19 outcomes such as hospitalization or death for congregate living residents compared to community-dwelling counterparts.

Methods

Research Questions

What factors increase the risk of COVID-19 outbreaks in congregate living settings?

How do outcomes compare to outbreaks in community settings?

Search

On June 22 and 23, 2020, the following databases were searched:

- Pubmed's curated COVID-19 literature hub: [LitCovid](#)
- [Trip Medical Database](#)
- World Health Organization's [Global literature on coronavirus disease](#)
- Joanna Briggs Institute [COVID-19 Special Collection](#)
- [COVID-19 Evidence Alerts](#) from McMaster PLUS™
- [Public Health +](#)
- [COVID-19 Living Overview of the Evidence \(L-OVE\)](#)
- [McMaster Health Forum](#)
- Cochrane Rapid Reviews [Question Bank](#)
- [Prospero Registry of Systematic Reviews](#)
- NCCMT [COVID-19 Rapid Evidence Reviews](#)
- [MedRxiv preprint server](#)
- NCCDH [Equity-informed Responses to COVID-19](#)
- NCCEH [Environmental Health Resources for the COVID-19 Pandemic](#)
- NCCID [Public Health Quick Links](#)
- NCCID [Disease Debrief](#)
- NCCHPP [Public Health Ethics and COVID-19](#)
- NCCIH [Updates on COVID-19](#)

A copy of the search strategy is available on request.

Study Selection Criteria

The search results were first screened for recent guidelines and syntheses. Single studies were included if no syntheses were available, or if single studies were published after the search was conducted in the included syntheses. English-language, peer-reviewed sources and sources published ahead-of-print before peer review were included. Surveillance sources were excluded. When available, findings from syntheses and clinical practice guidelines are presented first, as these take into account the available body of evidence and, therefore, can be applied broadly to populations and settings.

	Inclusion Criteria	Exclusion Criteria
Population	Residents of: <ul style="list-style-type: none"> • Prisons • Detention centres • Shelters (e.g., for people experiencing homelessness, women’s shelters) • Supportive housing • Group homes (including adolescents) • Halfway houses/transitional homes • School residences • Migrant worker dormitories 	Community-dwelling individuals, residents of: <ul style="list-style-type: none"> • Facilities that provide medical care, e.g., <ul style="list-style-type: none"> - Long-term care homes - Hospitals - Medical rehab facilities • Buildings with no shared living space, e.g., <ul style="list-style-type: none"> - Apartment buildings - Hotels - Retirement homes • Locations that house young children, e.g., <ul style="list-style-type: none"> - Overnight camps
Intervention/Exposure	Congregate living settings	
Comparisons	Community settings	
Outcomes	COVID-19 infection, hospitalization, death	

Data Extraction and Synthesis

Data relevant to the research question, such as study design, setting, location, population characteristics, interventions or exposure and outcomes were extracted when reported. We synthesized the results narratively due to the variation in methodology and outcomes for the included studies.

We evaluated the quality of included evidence using critical appraisal tools as indicated by the study design below. Quality assessment was completed by one reviewer and verified by a second reviewer. Conflicts were resolved through discussion. For some of the included evidence a suitable quality appraisal tool was not found, or the review team did not have the expertise to assess methodological quality. Studies for which quality appraisal has not been conducted are noted within the data tables.

Study Design

Synthesis
Case Report
Cross Sectional
Prevalence

Critical Appraisal Tool

Health Evidence™ [Quality Appraisal Tool](#)
Joanna Briggs Institute (JBI) [Checklist for Case Reports](#)
Joanna Briggs Institute (JBI) [Checklist for Analytical Cross Sectional Studies](#)
Joanna Briggs Institute (JBI) [Checklist of Prevalence Studies](#)

Completed quality assessments for each included study are available on request.

Findings

Quality of Evidence

This document includes one completed synthesis, eight single studies and four case reports, for a total of 13 publications included in this review. The quality of the evidence included in this review is as follows:

	Total	Quality of Evidence
Syntheses	1	1 Moderate
Single Studies	8	1 Low 5 Moderate 2 High
Case Reports	4	1 Low 3 Moderate

Warning

Given the need to make emerging COVID-19 evidence quickly available, many emerging studies have not been peer reviewed. As such, we advise caution when using and interpreting the evidence included in this rapid review. We have provided a summary of the quality of the evidence as low, moderate, or high to support the process of decision making. Where possible, make decisions using the highest quality evidence available.

Table 1: Syntheses

Reference	Date Released	Description of Included Studies	Summary of Findings	Quality Rating: Synthesis	Quality Rating: Included Studies
<p>Beaudry, G., Zhong, S., Whiting, D., Javid, B., Frater, J., & Fazel, S. (2020). Managing outbreaks of highly contagious diseases in prisons: a systematic review. <i>Preprint</i>.</p>	<p>May 19, 2020 (Search completed March 26, 2020)</p>	<p>This systematic review included quantitative research in English published after 2000 on outbreaks of contagious diseases in correctional facilities and interventions used to respond. There were 27 included studies, covering tuberculosis, influenza, varicella, measles, mumps, and adenovirus type 14p1. Countries where these prison outbreaks occurred were US, Australia, Canada, China, Italy, and Switzerland. All but one took place in adult facilities. All studies were observational.</p>	<p>Outbreaks in prison settings can have implications for prisoners, staff and the general population. Prisons have been shown to be important reservoirs of disease. Prisoners often move between facilities during their detention and have been shown to spread infection from one facility to another. Some prison disease strains have been shown to be indistinguishable from strains circulating in the community. Especially in low security settings, prisoners often have community contact through short stays followed by release, court appearances, and transfers. The findings considered most applicable to COVID-19 were:</p> <ul style="list-style-type: none"> • Screening of new entrants, at minimum, is recommended. Selective or universal screening, (sometimes including family members of staff), has been employed, although movement between facilities creates challenges to a universal approach. • Contact tracing has also been used but is complicated by difficulties contacting prisoners. • Isolation and quarantine have been employed as health measures, although these can be challenging in a prison context, partly given that isolation is associated with punishment, and that prisoners will not be motivated to disclose symptoms. Exclusion of symptomatic staff has also been employed. • Reduction of overcrowding is desirable, by reducing new arrivals when possible. • Targeted health communication within prisons is emphasized, given the limited external information available to prisoners. • Multi-agency collaboration is important for managing outbreaks, including prisons (and prison health facilities), public health and hospital services. 	<p>Moderate</p>	<p>Not done</p>

Table 2: Single Studies

Reference	Date Released	Study Design	Type of Setting	Location	Summary of findings	Quality Rating:
Wang, L., Ma, H., Yiu, K.C.Y., Calzavara, A., Landsman, D., Luong, L., Chan, A.K., Kustra, R., Kwong, J.C., Boily, M., Hwang, S., Straus, S., Baral, S.D., & Mishra, S. (2020). Heterogeneity in risk, testing and outcome of COVID-19 across outbreak settings in the Greater Toronto Area, Canada: an observational study . <i>Preprint</i> .	Jun 13, 2020	Prevalence study with comparator	Shelter for people experiencing homelessness	Toronto, Canada	<p>This study analyzed surveillance data for COVID-19 cases in shelters, long-term care homes and the general population over 4 months.</p> <p>The number of COVID-19 cases per 100,000 was 18 times higher in shelter residents (3797) than in the general population (208).</p> <p>Among shelter residents with COVID-19, there were 3 (0.7%) deaths. This case fatality rate is lower than that in the general population (3.6%), although the effect of potentially higher shelter testing rates on prevalence rates is not known.</p> <p>This study did not report on physical characteristics of the shelters or any infection prevention and control measures.</p>	High
Blair, A., Parnie, A., & Siddiqi, A. (2020). Testing lags and emerging COVID-19 outbreaks in federal penitentiaries: A view from Canada . <i>Preprint</i> .	May 8, 2020	Prevalence study with comparator	Correctional and detention facilities	Canada	<p>This study reports the prevalence of COVID-19 in correctional facilities across Canada up to April 21 and compares these rates with surrounding communities. COVID-19 testing and case numbers for each federal facility have been made publicly available by Correctional Services Canada (CSC).</p> <p>Data from 50 facilities were analyzed. Compared to the general population of the province, the prevalence of COVID-19 cases within federal prisons was 10-times higher in Quebec, 6-times higher in British Columbia and 2-times higher in Ontario.</p> <p>Among the 189 cases of COVID-19 in federal prisons across Canada, there was 1 death (0.5%), which is higher than the reported general population case fatality rate (0.3%).</p> <p>The rate of COVID-19 tests completed was higher in federal prisons than the general population in Quebec, British Columbia, and Ontario, although there was wide variability, with several prisons reporting no testing. The timing of these tests</p>	High

					<p>indicate that testing was reactive, with systematic testing only after outbreaks were identified.</p> <p>This study did not report on physical characteristics of the facilities or any infection prevention and control measures.</p>	
Reinhart, E., & Chen, D. (2020). Incarceration and its disseminations: COVID-19 pandemic lessons from Chicago's Cook County Jail. <i>Health Affairs</i> . Epub ahead of print.	Jun 4, 2020	Prevalence study	Correctional and detention facilities	Chicago, USA	<p>This study analyzed surveillance data for COVID-19 cases in Cook County Jail, the largest jail in the USA, in March.</p> <p>There were more than 500 cases of COVID-19 among over 3000 detainees and over 100 cases among staff. The report does not provide exact numbers of cases, detainees, or staff.</p> <p>This study did not report on physical characteristics of the facilities or any infection prevention and control measures.</p> <p>There was significant correlation between COVID-19 in surrounding areas and rates of arrests and released detainees. Jail cycling (moving in and out of facilities as cases are tried) was a stronger predictor of COVID-19 rate variance than race, poverty, transit use and population density.</p>	Moderate
Koh, D. (2020). Migrant workers and COVID-19. <i>Occupational and Environmental Medicine</i> . Epub ahead of print.	Jun 8, 2020	Prevalence study	Migrant worker dormitory	Singapore	<p>This study analyzed surveillance data for COVID-19 cases in migrant worker dormitories over 3 months.</p> <p>There were 17 758 cases of COVID-19 among migrant workers living in dormitories. One dormitory housing 13 000 workers had 2526 cases. There were no deaths and no hospitalizations resulting from these infections.</p> <p>Infection prevention and control measures were implemented at a national level, including:</p> <ul style="list-style-type: none"> • Active symptom screening and testing of workers • Isolation of workers with COVID-19 • Establishing on-site healthcare • Translating screening forms to Bengali and Tamil, recruiting volunteer interpreters 	Moderate

					<ul style="list-style-type: none"> • Decongestion of dormitories by vacating workers to vacant public housing, military camps and exhibition centres • Distribution of reusable masks and hand sanitizer 	
Chew, M., Koh, F.H., Wu, J., Ngaserin, S., Ng, A., Ong, B., & Lee, V.J. (2020). Clinical assessment of COVID-19 outbreak among migrant workers residing in a large dormitory in Singapore . <i>Journal of Hospital Infection</i> . Epub ahead of print.	May 31, 2020	Prevalence study	Migrant worker dormitory	Singapore	<p>This study describes screening for COVID-19 in a large dormitory housing 5977 foreign workers.</p> <p>Symptomatic workers were tested for COVID-19, identifying 1264 (21%) cases.</p> <p>The dormitory's rooms slept 12 workers each. The report does not describe infection prevention or control measures in the facility.</p>	Moderate
Wallace, M., Hagan, L., Curran, K.G., Williams, S.P., Handanagic, S., Bjork, A., Davidson, S.L., Lawrence, R.T., McLaughlin, J., Butterfield, M., James, A. E., Patil, N., Lucas, K., Hutchinson, J., Sosa, L., Jara, A., Griffin, P., Simonson, S., Brown, C. M., ... Marlow, M. (2020). COVID-19 in Correctional and Detention Facilities - United States, February-April 2020 . <i>Morbidity and Mortality Weekly Report</i> , 69(19), 587–590.	May 15, 2020	Prevalence study	Correctional and detention facilities	USA	<p>This study analyzed surveillance data for COVID-19 cases in correctional and detention facilities from 37 states over 3 months.</p> <p>There were 4893 cases of COVID-19 among prisoners, leading to 491 (10%) hospitalizations and 88 (2%) deaths. There were 1778 cases among staff, leading to 79 (3%) hospitalizations and 15 (1%) deaths.</p> <p>The number of tests completed was not reported. These data were not compared to the general population.</p> <p>This study did not report on physical characteristics of the facilities or any infection prevention and control measures.</p>	Low
Baggett, T.P., Keyes, H., Sporn, N., & Gaeta, J.M. (2020). Prevalence of SARS-CoV-2 infection in residents of a large homeless shelter in Boston . <i>JAMA</i> , 323(21), 2191–2192.	Apr 27, 2020	Prevalence study	Shelter for people experiencing homelessness	Boston, USA	<p>This study is based on a cohort of residents at a large shelter for people experiencing homelessness. A total of 408 residents were tested, of which 147 (36.0%) were positive for COVID-19. Most (87.8%) of these positive cases were asymptomatic.</p> <p>It is unclear from this report whether there were any shared spaces, such as washrooms or eating areas.</p>	Moderate

					The report also does not provide any information on whether there was secondary spread of infection within shelters.	
Samuels, E.A., Karb, R., Vanjani, R., Trimbur, C., & Napoli, A. (2020). Congregate Shelter Characteristics and Prevalence of Asymptomatic SARS-CoV-2 . <i>Preprint</i> .	May 24, 2020	Cross-sectional study	Shelter for people experiencing homelessness	Rhode Island, USA	<p>This report describes the screening of residents across 5 shelters for COVID-19 and collection of data regarding shelter characteristics that may contribute to transmission of COVID-19.</p> <p>35 of 299 (11.7%) residents tested positive for COVID-19. These cases were residents of 2 of the 5 shelters; 3 shelters had no positive cases.</p> <p>The shelters with positive cases were in areas with higher population densities and also accepted new residents. The shelter with the highest proportion of positive cases did not implement physical distancing in sleep spaces. This shelter also had the highest turnover of residents, with only 58% staying for more than 14 days.</p> <p>It is unclear from this report whether there were any shared spaces, such as washrooms.</p>	Moderate

Table 3: Case Reports

Reference	Date Released	Setting	Location	Key infection control measures implemented	Quality Rating:
Baggett, T.P., Racine, M.W., Lewis, E., De Las Nueces, D., O'Connell, J.J., Bock, B., & Gaeta, J.M. (2020). Addressing COVID-19 among people experiencing homelessness: Description, adaptation, and early findings of a multiagency response in Boston . <i>Public Health Reports</i> . Epub ahead of print.	Jun 9, 2020	Shelter for people experiencing homelessness	Boston, USA	<p>This report describes the implementation of infection prevention and control measures across multiple shelters. The initial approach included symptom screening upon entry to the shelter. Asymptomatic people were then housed in a quarantine tent, while symptomatic people were housed in an isolation tent while awaiting COVID-19 test results. Over time, this strategy was de-implemented in favour of assuming exposure and testing and isolating all people while awaiting results.</p> <p>Shelter residents were kept separate in pods lined with heavy vinyl. Some residents were sent to vacated university dormitories to prevent congestion.</p>	Moderate

				<p>It is unclear from this report whether there were any shared spaces, such as washrooms.</p> <p>The report also does not provide any information on whether there was secondary spread of infection within shelters.</p>	
<p>Bodkin, C., Mokashi, V., Beal, K., Wiwcharuk, J., Lennox, R., Guenter, D., Smieja, M., & O'Shea, T. (2020). Pandemic planning in homeless shelters: A pilot study of a COVID-19 testing and support program to mitigate the risk of COVID-19 outbreaks in congregate settings. <i>Clinical Infectious Diseases</i>. Epub ahead of print.</p>	<p>Jun 8, 2020</p>	<p>Shelter for people experiencing homelessness</p>	<p>Hamilton, Canada</p>	<p>This report describes the implementation of infection prevention and control measures at a shelter. Shelter residents and staff were screened daily for symptoms. Anyone who failed the screen was tested and isolated in single rooms. If the test was positive for COVID-19, the resident was transported by dedicated vehicle with enhanced infection prevention to a dedicated isolation centre for 14 days. Some residents were sent to vacated hotels to prevent congestion at the shelter.</p> <p>During the study period, 1 of 104 residents (1.0%) and 7 of 141 staff tested positive (5.0%).</p> <p>There was no detected secondary spread of infection within the shelter.</p> <p>It is unclear from this report whether there were any shared spaces, such as washrooms.</p>	<p>Moderate</p>
<p>Wallace, M., Marlow, M., Simonson, S., Walker, M., Christophe, N., Dominguez, O., Kleamenakis, L., Orellana, A., Pagan-Pena, D., Singh, C., Pogue, M., Saucier, L., Lo, T., Benson, K., & Sokol, T. (2020). Public Health Response to COVID-19 Cases in Correctional and Detention Facilities - Louisiana, March-April 2020. <i>Morbidity and Mortality Weekly Report</i>, 69(19), 594–598.</p>	<p>May 15, 2020</p>	<p>Correctional and detention facilities</p>	<p>Louisiana, USA</p>	<p>This study reports the prevalence of COVID-19 in correctional facilities in Louisiana state and measures to control spread of the virus.</p> <p>46 of 144 facilities provided reports (32%). There were 489 cases of COVID-19 among prisoners, leading to 37 (7.6%) hospitalizations and 10 (2.0%) deaths. There were 253 cases among staff, leading to 19 (7.5%) hospitalizations and 4 (1.6%) deaths.</p> <p>The number of tests completed was not reported. These data were not compared to the general population.</p> <p>Facilities suspended visitations, provided hand hygiene supplies, and screened new intakes for symptoms. Most facilities screened staff for</p>	<p>Low</p>

				symptoms. Prisoners who tested positive for COVID-19 were isolated, either individually or within a cohort of other prisoners with COVID-19.	
Tobolowsky, F.A., Gonzales, E., Self, J.L., Rao, C.Y., Keating, R., Marx, G.E., McMichael, T.M., Lukoff, M.D., Duchin, J.S., Huster, K., Rauch, J., McLeddon, H., Hanson, M., Nichols, D., Poposjans, S., Fagalde, M., Lenahan, J., Maier, E., Whitney, H., ... & Kay, M. (2020). COVID-19 Outbreak Among Three Affiliated Homeless Service Sites - King County, Washington, 2020 . <i>Morbidity and Mortality Weekly Report</i> , 69(19), 523–526.	May 1, 2020	Shelter for people experiencing homelessness	Seattle area, USA	<p>This report describes the implementation of infection control measures across three shelters in response to a detected outbreak of COVID-19. Staff members were assigned to one shelter and provided additional training for cleaning and disinfection. Sleeping mats were positioned so that residents' heads were $\geq 2\text{m}$ apart. Face masks were provided to all residents and staff.</p> <p>It is unclear from this report whether there were any shared spaces, such as washrooms.</p> <p>Subsequent testing found additional cases of COVID-19 in 31 of 195 residents (18.9%) and 6 of 38 staff (15.8%).</p> <p>Of residents with confirmed cases of COVID-19, 7 were hospitalized (20%). There were no deaths.</p>	Moderate

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