Outbreaks in Dormitories: Literature Search as of November 4, 2020
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Methods

A broad search of the literature was conducted and updated using Pubmed, preprint servers and Google Scholar. The search focused on outbreaks, disease, and infections in dormitory like settings such as college dormitories, residential halls, apartment complexes, barracks, and cruise ships. Relevant findings are summarized below.

Review

In general, the literature on disease outbreaks and infections in dormitories, apartments, cruises, etc. focuses mainly on the description of the epidemic and tracing to an index person/exposure. Very little has been done with possible interventions to decrease infection and transmission of disease within dormitories. Of the few studies that have been conducted, most are observational in nature, comparing the risk of disease after an outbreak versus implementing an intervention to stop the spread of a disease.

Also, of particular note, is that most studies look at multiple possible explanations for increased risk of transmission, ie: ventilation, building age, room density, cleanliness, all at once. This makes it difficult to assign actual values to the reduction in risk by performing a single change within a dormitory building. In general, the following have been found to be sufficient at reducing risk of infection or shortening a disease outbreak.

Ventilation and Air Filters

Multiple studies have found that increasing ventilation has reduced the incidence of disease within buildings. When incidence of disease is compared between two buildings, generally the building with a higher ventilation rate has lower disease rates, on average. While most studies have focused on ventilation using HVAC systems, some have also explored natural ventilation via opening of windows, which seems to be almost as effective as increased ventilation from an HVAC system. That said, natural ventilation is thought to have intensified an outbreak of SARS during the 2003 pandemic at an apartment complex in China due to strong wind from infected persons towards uninfected. Additionally using appropriate air filters in HVAC systems could also reduce disease. Within multiple settings, such as hospitals, airplanes, and daycares, HEPA filters have been shown to best filter influenza droplets. While HEPA filters are expensive and can restrict air flow, less expensive filters such as MERV 13-16 have shown nearly the same efficacy. Notably, the CDC’s guidance for shared housing recommends working with maintenance staff to increase outdoor air if possible, as well ensuring good ventilation in shared rooms.
**Room/Floor Density**

In investigations of outbreaks at dormitories where multiple people live in limited space, the rate of infection is much higher than those with more individual space. Studies that compared rates of disease among rooms with single, double, or triple or more occupancy rooms all found that those within single rooms had the least risk, and double occupancy rooms had less risk than triples or higher. Simulations also suggest that limiting the number of students in a room can help prevent the spread of disease. The total number of people living on a particular floor must also be considered. Fewer people living on one floor appears to be lower disease risk. Currently, there are no recommendations on how much reduction should occur nor minimum square footage per occupant, room furniture arrangement, or physical barriers between roommates. CDC guidance on shared living spaces recommends cleaning shared bathrooms twice per day if possible.

**Case Isolation**

Few studies have investigated isolating cases within living quarters when disease occurs. There is evidence to show that removing cases from barracks helped to shorten an outbreak of norovirus in a military base. Simulations have also confirmed that removing and isolating cases will shorten an outbreak. What is less clear is where cases or quarantined individuals should be moved, as simulations just remove cases from their modeling. Recommendations for this are not given in any of the studies. Simulation studies of the Diamond Princess cruise ship COVID-19 outbreak, though a significantly different population than a university dorm, showed isolation and quarantine reduced the number of total infections, but that isolation within rooms may have contributed to spread between rooms. Other studies of previous SARS outbreaks on campuses in Asia in 2003, found that isolating known cases was also effective at reducing incident cases.

**Cleaning**

While not an intervention, there is evidence suggesting that those in rooms that are cleaner tend to have fewer reported flu-like symptoms. In studies where there were shared toilet facilities, more routine cleaning of the facilities was also related to lower rates of disease. CDC guidance suggests cleaning shared bathrooms twice daily.

**Hand Hygiene**

One trial found that dormitories that received the hand sanitizing stations had significantly decreased illness rates compared to those that did not receive the stations. A hand hygiene educational program significantly increased self-reported hand hygiene overall. Meta-analysis also suggests that paper towels may be more effective than hand dryers at reducing the amount of bacteria on hands after washing, although this may exacerbate other issues with fomite transmission.
There have been some case studies on COVID-19 spread and containment in settings similar to dormitories. Some of these studies, such as those focusing on prisons in the United States and migrant worker housing in Singapore, have shown that COVID-19 can spread rapidly throughout the entire living area, even when some mitigation techniques are applied such as testing or quarantine. This may be due to asymptomatic spread and the delayed implementation of the previously described interventions. Other case studies, such as those on military bases, have shown that when proper transmission mitigation has been implemented, the incidence of COVID-19 is greatly reduced. This was specifically seen at the Joint Base San Antonio-Lackland in Texas. Over 10,000 new trainees reported between March and April 2020. Interventions included quarantining, social distancing, early screening, and isolation, and even though these trainees slept in barracks similar to dormitories, there were only 5 incident cases detected.

Numerous COVID-19 outbreaks at summer camps have been reported, where close living quarters are common. At a Georgia summer camp, testing found that 260 of 344 campers tested positive for COVID-19, equating to an attack rate of 44%. Other outbreaks at overnight camps in Michigan, Oregon, and Wisconsin have also been reported. Of note in these outbreaks is the high attack rates seen among young persons, which suggests that this rapid spread in a dorm like setting is possible even among the young adults.


