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Bias in Reporting Location of New Coronavirus Cluster Outbreaks



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ABSTRACT

Infections caused by the novel coronavirus disease (COVID-19) increase significantly due to the occurrence of clusters. A COVID-19 cluster refers to the simultaneous occurrence of multiple infections, caused by the same agent, in a specific group. Japan has reported several COVID-19 cases in its welfare and nursing care facilities. However, to the best of our knowledge, the occurrence of clusters has not been observed yet in public transportation, where they are likely to occur more frequently. This study aims to examine the reasons why COVID-19 clusters occur in some places and do not in others.



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INTRODUCTION

The novel coronavirus disease (COVID-19) pandemic was confirmed as such by the World Health Organization in March 2020. In Japan, COVID-19 infections started rising at the beginning of 2020. Until July 2022, the number of new infections shot up and came down several times, and by August, inoculation for containment had been carried out everywhere worldwide. Various global pharmaceutical companies are currently developing therapeutic drugs, but these have not yet been able to treat all COVID-19 symptoms or produce a drug that all types of patients can use.

Vaccination is voluntary in several countries. Thus, one can decide whether to get inoculated or not. In Japan, the vaccination rate among young people is sluggish due to concerns about side effects.¹⁾ In some individuals, injecting vaccines may lead to anaphylaxis; additionally, it is difficult to force vaccination. Furthermore, there is little information on the side effects of COVID-19 vaccines on children; pharmaceutical companies and the government are uncertain whether it is possible to vaccinate children under a certain age.²⁾

The spread of COVID-19 can be easily prevented in case of direct contact if the individuals are vaccinated. In addition, if 70–80% of the total population (with the possibility of contact in daily life) have been vaccinated, at least one individual will likely be vaccinated when two individuals come in contact. Consequently, the spread of infection would be unlikely. We have not yet reached a point where the majority of the population has been vaccinated.³⁾ Even now, concerns about the spread of the disease among children, parents, and nursery teachers, whose work requires close contact at home and in nursery schools, remain. It is difficult for family members to avoid close contact in situations such as while sharing meals or sleeping with infants.⁴⁾ consequently, infections have not come down significantly. Furthermore, situations like these can occur in the workplace as well (Table 1).

In Japan, due to the insufficient supply of vaccines since 2020, those who wanted to be vaccinated could not get it. Therefore, even now, in 2022, the government recommends avoiding the 3Cs (closed spaces, crowded places, close-contact settings) and insists that people continue wearing masks in public places.⁵⁾

It is known that the occurrence of COVID-19 clusters leads to a dramatic increase in infections. A cluster originally means a mass or group, that is, how a group or one thing grows by forming a group.⁶⁾ In the case of COVID-19, it refers to multiple people getting

infected people in a specific group simultaneously due to the same reason (Ministry of Health, Labor and Welfare defines the number of people as five or more.)⁷⁾ Some populations in Japan have reported cases of COVID-19 cluster outbreaks.⁸⁾ For example, many clusters occurred in welfare and nursing care facilities, and medical institutions, such as hospitals, and schools. However, to the best of our knowledge, these clusters have not been observed yet in places such as public transportation, where they are more likely to happen. In addition, the number of certified cluster outbreaks in homes is not very large. In this study, we examine the occurrence of clusters and the reasons why they do not occur at some places where they are more likely to occur.

Mechanism of cluster generation and locations where clusters are likely

The pathogenesis of COVID-19 is not completely clear even in mid-2022. Currently, in Japan, countermeasures are being taken based on the infection route—contact or droplet infection. However, the possibility of airborne infection remains. Vaccines are not medicines intended to completely cure the infection; they work to prevent aggravation of the condition, but do not stop the occurrence of an infection. Therefore, it is believed that the infection can be prevented mainly by avoiding the 3Cs.⁹⁾

Closed spaces (sealing) means to create a state in which the room is closed and the ventilation is inadequate. If a room has a person who tested positive for the virus, we believe that appropriate ventilation can prevent others from getting infected via droplets or patient's breathe. Crowded means that the distance between people is narrow. By narrowing the distance between people, it becomes easier to capture the droplets. The mask prevents saliva droplets from flying in front of the COVID-19-positive person when s/he talks. It prevents those around the patient from taking in the infected droplets. Close contact denotes a situation in which the hands and feet are in direct contact. Viruses remain infectious for a certain period after being released into the air as droplets.⁵⁾ additionally, it is believed that it will stick to things in the room as well as the skin of those sharing it. Therefore, it is necessary to avoid direct contact with others and touching things that others may have touched. It is important to disinfect one's hands and mouth before and after touching potentially infected objects. People are obliged to use disinfectants to wipe objects that others may have touched in public places.

Welfare and nursing care facilities are currently the most frequently observed places for cluster outbreaks (Fig.1).⁸⁾ This classification includes elderly nursing homes, nursing care facilities for the elderly, elderly group homes, paid nursing homes, day service facilities, disabled facilities, and so on (Fig. 2). In all these cases, the elderly and disabled patients who are cared for and medical professionals are inevitably close to each other. Many who are in the position of being cared for are not highly conscious of preventing the 3Cs themselves (Table 1). Because crowding and close contact tends to continue, it is thought that people would be more likely to contract COVID-19. Subsequently, the number of patients increases in a chain reaction, making clusters more likely.

Following welfare and nursing care facilities, hospitals and other medical institutions, kindergartens, nursery schools, orphanages, and schools are the most common hotspots for cluster outbreaks. We think that the places where the clusters are likely to occur are the places that the elderly or children often frequent. The elderly and children possess a low awareness of avoiding the 3Cs, and may not be able to act on their own. Those around and in contact with children can be careful, but it is highly likely that the degree of caution is insufficient, which may lead to cluster outbreaks.

Additionally, clusters may occur inside homes; however, this has not been confirmed. In Japan, the proportion of home cluster outbreaks is considered to be potentially high. The primary infection may originate from a parent or child who caught the virus in kindergarten or nursery school. It is difficult to control close contact between infants and their parents, and even if one of them tests positive or is recognized as close contact, it is difficult to separate them. It is believed that individual treatment will make recovery faster and easier. If the child is a toddler or an infant, it may be difficult to take care of him or her. However, reports of such cases are not many; such cases from children's homes are few, and measures are taken accordingly. In addition, symptoms in children may be mild and difficult to notice due to suspicion of another illness, such as a cold. As will be discussed in the next section, it may be difficult to implement countermeasures, which may why it is difficult to certify and publicize them.

Reasons for suppressing the occurrence of clusters and locations where they do not occur

The previous section showed that welfare and nursing care facilities have experienced many cluster outbreaks. However, clusters do not uniformly occur at all similar facilities. It is recognized that clusters may be avoided by taking certain measures at these facilities, even if people are likely to come in direct contact with each other. This point is different from parent-child contact. Therefore, facilities, where clusters have occurred in the past, have resumed their original activities, while preventing recurrence by implementing countermeasures (Table 1). Typical examples of countermeasures include ensuring ventilation and installing air purifiers and taking action to prevent airtightness. Furthermore, to reduce the crowding rate and time, measures such as staggering mealtimes and limiting the number of people entering the recreation room need to be considered. Efforts to prevent recurrence through disinfection should be made.

There are places where clusters are likely to occur; however, no cases of occurrence have been observed there. These places include dental clinics and public transportation. In a dental clinic, a patient removes a mask and opens his or her mouth while seeking treatment. The dentist or dental assistant must treat the patient by placing his or her face close to the patient's orifice while the patient is unmasked. Similar to places where clusters occur frequently, situations arise where people are nearby. Since many therapeutic instruments are not disposable, and the same instrument is used for multiple patients, there is indirect but close contact. One reason why clusters do not occur at dental clinics is the short stay time. Furthermore, many dental clinics try to limit the number of people who can gather at a time by reducing the waiting time. They do so by treating patients only if they have an appointment. Unlike general hospitals with other medical departments, there are usually no or few inpatients in dental departments, so it is easy to limit the number of people in a hospital building. In addition, many instruments used in the process are subject to thorough hygiene control. Instruments that cannot be disposed of are sterilized with an autoclave after each application so that there is no virus transfer from previous users. Gargle cups and aprons have been replaced with paper ones and are disposable. Patients do not wear masks for a long time, but dentists and dental assistants wear masks, face guards, goggles, and so forth.¹⁰⁾

Further, clusters have not been found in public transportation, such as trains, buses, and airplanes. This has been likely because of strict mask-wearing enforcement. It is believed that while talking, a person lets out only a few saliva droplets; therefore, infection is unlikely to occur. Further, many short-distance trains have windows open for ventilation. Moreover, it is thought that the risk of infection is not as high on commuter trains because the boarding time is short. However, there are limitations to these reasons. One, vehicles such as bullet trains and airplanes have windows that cannot be opened. No matter how frequently ventilation is ensured, considering that heating and cooling processes function properly, the ventilation capacity is not that high in such vehicles. In addition, commuters stay in the same place for several hours in vehicles for long-distance travel. If a COVID-19-positive person is in such a situation, a dense and closed environment may increase risk of infection for others. Although it is one of our hypotheses, the facility where the outbreak of the cluster was first recognized can perform the original role of the facility by taking countermeasures afterward (Table 1). Even if there was a factor that caused the problem, it was possible to reduce or eliminate the cause by individual measures. Since the method has been published and visualized, it has been avoided from reoccurring. Many of these countermeasures are possible for each facility. Even if a cluster occurs in public transportation, it will be difficult to take countermeasures. It is also difficult to prevent the 3Cs and individually handle each vehicle. There are common situations that can fundamentally be clustered. Limited express trains, such as Shinkansen and airplanes have reserved seats; by setting the seats sparsely or by fixing the seats, people can be spaced apart, and the congestion and close contact can be alleviated to some extent. However, this type of seating will make it difficult for the company to survive. It is difficult for short-distance trains and buses to reduce the number of passengers, as it is not possible to designate seats. In Japan, the occupancy rate, which indicates the ratio of the number of passengers to the capacity of each vehicle (the capacity is the sum of the seating capacity and the standing capacity, and the standing capacity is calculated from the floor area) often exceeds 200%. Eliminating it is difficult; it will be necessary to prepare more vehicles and revise operating times significantly. Additionally, shifting commuting hours is a challenge. Clusters may likely have occurred in crowded trains, although the same has not been confirmed. Even if a COVID-19-positive person was in a crowded train, it cannot be known for sure that s/he may have spread it unless s/he was on the train for a long time. Even if one has been riding for a long time, the pick-up/drop-off location is different for each person, so it is unlikely to be the place where the infection started. Further, it is difficult to recognize people as close contacts; in the current situation, where fundamental measures cannot be

taken, it is difficult to recognize it as a site where a cluster occurred. Moreover, even if it is recognized as such, there is no way to take measures. Consequently, it is believed that a few infections occurred due to unknown causes.

CONCLUSION

The 3Cs help locate COVID-19 cluster outbreaks, as long as we verify the cluster location and the effect of subsequent countermeasures. In contrast, public transportation cannot be recognized as a place where cluster outbreaks take place because there is no way to take measures (the operating company is taking measures based on its own judgment, but it cannot be considered that government and local governments have objectively taken measures and have completely prevented this). In our opinion, one should investigate if clusters can occur on public transport and stop using them if the findings are affirmative. Alternatively, the ways to use public transportation to reduce the probability of occurrence should be scientifically verified. Otherwise, the hotbeds of infection will be left unchecked, and the containment of COVID-19 will not be possible. This may cause economic damage, but we think this is inevitable. Perhaps, if the outbreak of clusters in such a place remains unexplained, and treatments are developed earlier, COVID-19 disease may become endemic like influenza and one will not necessarily fear it in the future. However, it cannot be said that other new infectious diseases will not spread in the same way in the future; so, it is important to verify it. We believe that this will allow humanity to overcome the ongoing pandemic and prepare for new infectious diseases that may appear in the future.

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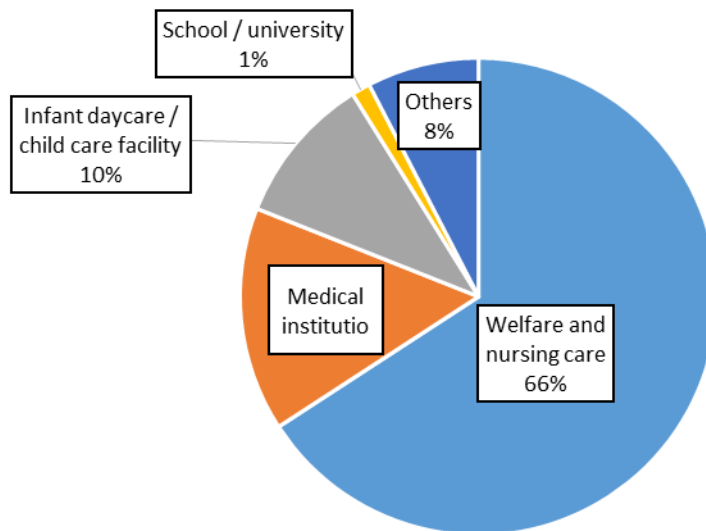


Fig. 1 Status of unterminated clusters

As of May 16, 2022, there were 79 unfinished cluster facilities in Kanagawa Prefecture.

Non-terminated means that <20 days have passed since the last case occurred.

Based on the data in reference 8).

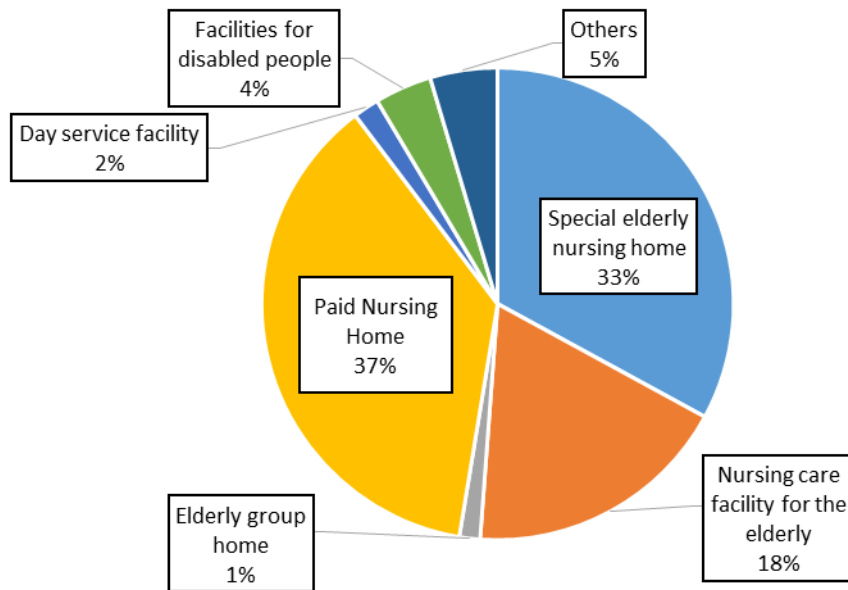


Fig. 2 Cumulative number of positive people (by welfare and nursing facility category)

Surveyed the situation until May 16, 2022, in Kanagawa Prefecture.

The total number of clusters is 844.

Based on the data in reference 8).

Table 1. Causes of clusters and ways to improve them

Facility Usage	Cause	Improvement
Hospital	<ul style="list-style-type: none"> -Staff infected due to inadequate infection control during treatment and rehabilitation -Infection in a crowded place with poor ventilation, such as rest room → Spread to another ward -Infected person discharged from the hospital → Infection spreads at the discharge destination 	<ul style="list-style-type: none"> -Standard precautions -Thorough implementation of route-specific infection prevention measures -Early detection of symptomatic persons -Ingenuity to reduce the 3Cs in the hospital -Information sharing at the time of hospital transfer and discharge

Restaurants with karaoke singing	<ul style="list-style-type: none"> -Several people sang for a long time without wearing a mask. -Multiple store users involved in the spread of infection to other stores -Infection of owners and employees → Increased number of infected people at stores with symptoms 	<ul style="list-style-type: none"> -Wear a mask -Avoid staying at restaurants for a long time -Refrain from going in and out of the store when you have symptoms
Face-to-face meeting at work	<ul style="list-style-type: none"> -Meetings at the workplace often happen in closed spaces that are often 3Cs (closed spaces, crowded places, and close contact). 	<p>Web conferencing is recommended.</p> <p>During a face-to-face meeting, ensure:</p> <ul style="list-style-type: none"> -Thorough ventilation -Sufficient intervals/breaks -Wearing a mask
Membership gym	<ul style="list-style-type: none"> -All patients are women. -A patient only used bedrock baths and spas. -The locker room emerged as a common place because most people used it during the day. 	<p>In places that get crowded easily, ensure:</p> <ul style="list-style-type: none"> -Thorough ventilation -Wearing a mask -Avoid using gyms for a long time
Restaurants with conversation such as entertainment	<ul style="list-style-type: none"> -Infection spread from customers from endemic areas to store clerks. -Three Cs when serving customers, spreading infection. -Clerks with symptoms continue to work and the infection spreads to store users and other clerks. 	<ul style="list-style-type: none"> -Refrain from using the store for people with symptoms. -Clerks will try to reduce the 3Cs as much as possible and manage their health, measure body temperature, and try to detect and respond to infectious diseases early.
Bus tour (long crowds in the bus)	<ul style="list-style-type: none"> -Infection spread by having a conversation with an infected person (wearing a mask) for several days with a person who did not wear a mask; or by sitting behind an infected person wearing a mask for a long time. 	<ul style="list-style-type: none"> -When sharing the same space with others during, say, in a bus, try to wear a mask regardless of whether you have symptoms.

Based on the data in reference 11)