

Trends in managing COVID-19 from an emerging infectious disease to a common respiratory infectious disease: What are the subsequent impacts on and new challenges for healthcare systems?

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SUMMARY Targeting the 9 countries with the highest cumulative number of newly confirmed cases in the past year, we analyzed the case fatality ratio (CFR) among newly confirmed cases and the vaccination rate (two or more doses of vaccine per 100 people) in the United States of America (USA), India, France, Germany, Brazil, the Republic of Korea, Japan, Italy, and the United Kingdom (UK) for the period of 2020-2022. Data reveal a decrease in the CFR among newly confirmed cases since the beginning of 2022, when transmission of the Omicron variant predominates, and an increase in vaccination rates. The Republic of Korea had the lowest CFR among newly confirmed cases (0.093%) in 2022 and the highest vaccination rate (86.27%). Japan had the second highest vaccination rate (83.12%) and a decrease in the CFR among newly confirmed cases of 1.478% in 2020, 1.000% in 2021, and 0.148% in 2022; while the average estimated fatality ratio for seasonal influenza from 2015-2020 was 0.020%. Currently, most countries are now easing COVID-19-related restrictions and are exploring a shift in management of COVID-19 from an emerging infectious disease to a common respiratory infectious disease that can be treated as the equivalent of seasonal or regional influenza. However, compared to influenza, infection with the Omicron variant still has a higher fatality ratio, is more transmissible, and the size of future outbreaks cannot be accurately predicted due to the uncertainty of viral mutation. More importantly, as countries shift their response strategies to COVID-19, there is an urgent need at this time to clarify what the subsequent impacts on healthcare systems and new challenges will be, including the clinical response, the dissemination of scientific information, vaccination campaigns, the creation of future surveillance and response systems, the cost of treatments and vaccinations, and the flexible use of big data in healthcare systems.

Keywords COVID-19, healthcare system, case fatality ratio (CFR), newly confirmed cases, vaccination, influenza

The COVID-19 global pandemic of the past three years has changed the way humans behave, the way governments respond to crises, and it has placed a heavy burden on the healthcare systems of the countries in question (1). In response to the global pandemic, countries have adopted different strategies based on the conditions in those countries, such as herd immunity, lockdowns, and "dynamic zero-COVID".

With the improved ability to detect the virus, accumulated experience with clinical treatment, advances in drug development, promotion of vaccination campaign, and especially the less virulent Omicron variant than earlier variants at the current stage (2-5), most countries are now easing COVID-19-related

restrictions and are exploring a shift in the management of COVID-19 from an emerging infectious disease to a common respiratory infectious disease. For example, there is currently extensive discussion on whether COVID-19 can be treated as the equivalent of seasonal or regional influenza.

Targeting the 9 countries with the highest cumulative number of newly confirmed cases in the past year, we analyzed the case fatality ratio (CFR) among newly confirmed cases and the vaccination rate (two or more doses of vaccine per 100 people) in the United States of America (USA), India, France, Germany, Brazil, the Republic of Korea, Japan, Italy, and the United Kingdom (UK) for the period of 2020-2022.

Data reveal a decrease in the CFR among newly confirmed cases since the beginning of 2022, when transmission of the Omicron variant predominates, and an increase in vaccination rates. In 2022, the CFR among newly confirmed cases for the 9 countries, from lowest to highest, was 0.093% in the Republic of Korea, 0.115% in France, 0.130% in Germany, 0.136% in Japan, 0.226% in Italy, 0.350% in the UK, 0.480% in India, 0.507% in the USA, and 0.536% in Brazil (Figure 1). As of December 2022, the vaccination rates (two or more doses of vaccine per 100 people) for the 9 countries, from highest

to lowest, are 86.27% in the Republic of Korea, 83.12% in Japan, 81.26% in Italy, 80.9% in Brazil, 78.33% in France, 76.18% in Germany, 75.19% in the UK, 68.86% in the USA, and 67.09% in India (Figure 2).

The country with the second highest vaccination rate is Japan. As of December 15, 2022, the total number of vaccine doses administered has reached 361,774,386. Nationwide, 80.4% of the total population has received the second dose of the vaccine and 67.4% has received the third dose; 92.4% of the population age 65 or older received the second dose of the vaccine and 90.9% of

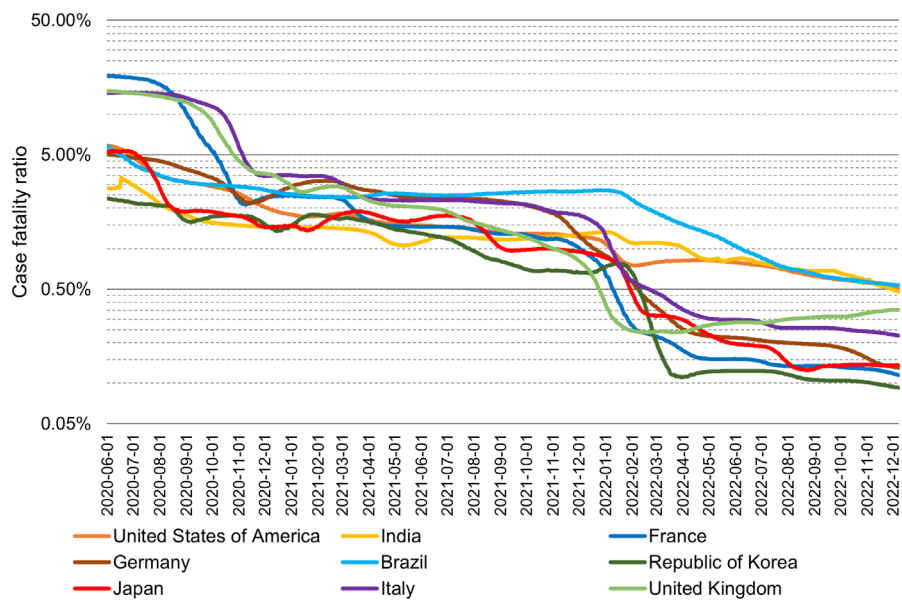


Figure 1. The case fatality ratio (CFR) among newly confirmed cases in 9 countries from 2020-2022*. Data reveal a decrease in the CFR among newly confirmed cases since the beginning of 2022, when transmission of the Omicron variant predominates. *Data are as of December 7, 2022. Data source: <https://covid19.who.int/WHO-COVID-19-global-data.csv>

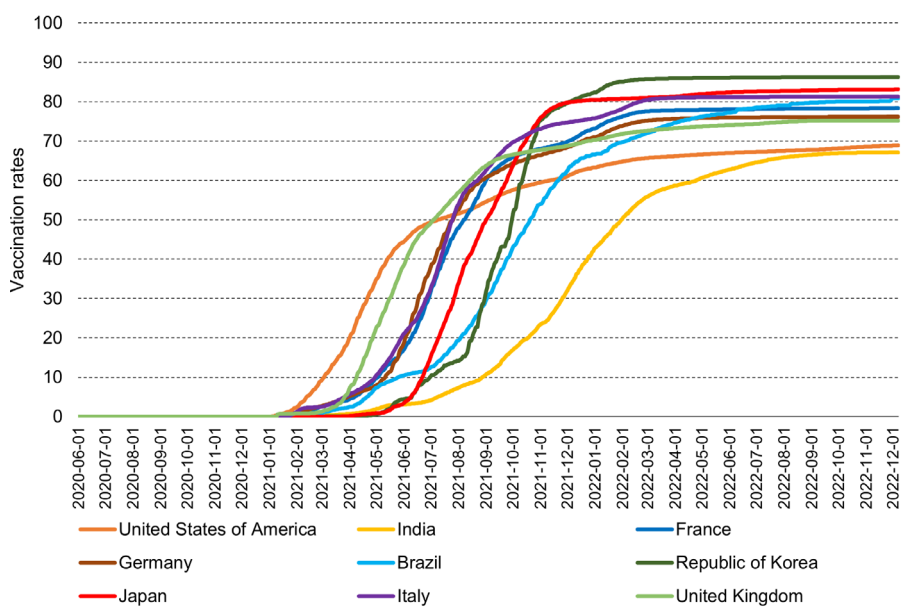


Figure 2. The number of people vaccinated in 9 countries from 2020-2022*. Data reveal an increase in vaccination rates (two or more doses of vaccine per 100 people) in 9 countries. *Data are as of December 7, 2022. Data source: <https://github.com/owid/covid-19-data/tree/master/public/data/vaccinations>

that population received the third dose (6).

Japan experienced its highest level of COVID-19 to date during a six-week period from July 20 to August 31, 2022, with an average of nearly 200,000 newly confirmed cases per day nationwide (7). This was followed by a decline to 13,053 new cases on October 10, 2022 and the number has now risen to 168,494 new cases on December 15, 2022 (8). Although the number of new cases has increased more than before, mainly because of the enhanced transmissibility of the Omicron variant, few patients in critical condition needed specialized urgent care, such as intubation and extracorporeal membrane oxygenation (9).

To explore trends in COVID-19 among newly confirmed cases, we analyzed the CFR among new cases in Japan from 2020-2022 based on monthly, bimonthly, and annual data. Data reveal a decrease in the CFR among newly confirmed cases of 1.478% in 2020, 1.000% in 2021, and 0.148% in 2022 (Figure 3). For comparison, the average estimated fatality ratio for seasonal influenza in Japan for 2015-2020 was 0.020% (Figure 4).

In Japan, the Infectious Diseases Control Act classifies infectious diseases into five categories, Category I to V, based on how contagious the pathogens are and the severity of the disease they cause, and seasonal

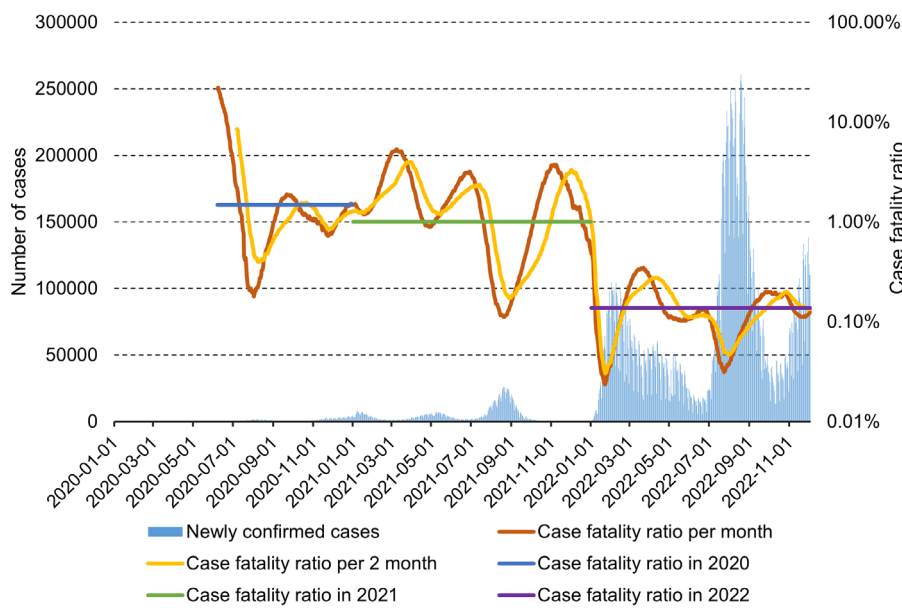


Figure 3. The case fatality ratio (CFR) among new infections in Japan from 2020-2022 based on monthly, bimonthly, and annual data*. Data reveal a decrease in the CFR among new infections of 1.478% in 2020, 1.000% in 2021, and 0.148% in 2022. *Data are as of December 3, 2022. Data source: <https://www.mhlw.go.jp/stf/covid-19/open-data.html>

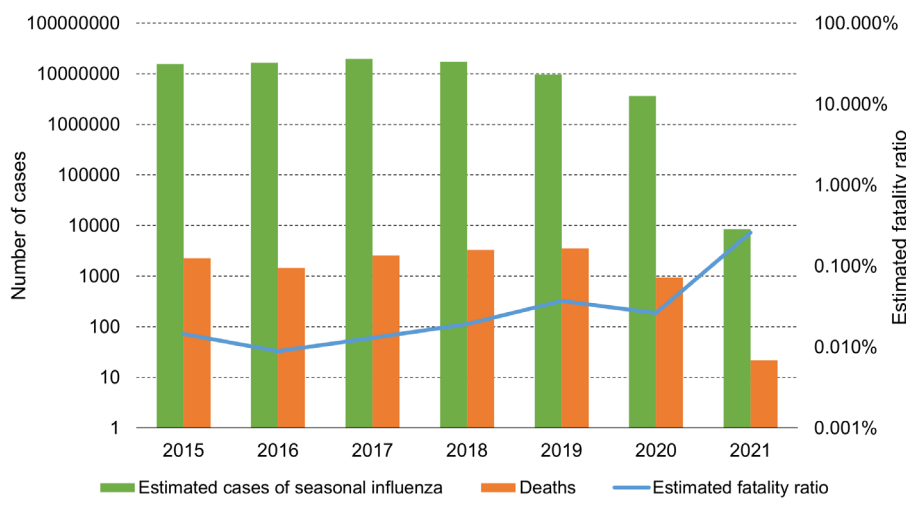


Figure 4. The estimated fatality ratio for seasonal influenza in Japan from 2020-2021. Data show that the estimated fatality ratio for seasonal influenza in Japan was 0.015% in 2015, 0.009% in 2016, 0.013% in 2017, 0.019% in 2018, 0.037% in 2019, 0.026% in 2020, and 0.259% in 2021. Data source: <https://www.mhlw.go.jp/toukei/list/81-1a.html>, <https://www.niid.go.jp/niid/ja/component/search/?searchword=iasr%20%E3%82%A4%E3%83%B3%E3%83%95%E3%83%AB%E3%82%A8%E3%83%B3%E3%82%B6%20%E3%82%B7%E3%83%BC%E3%82%BA%E3%83%B3>

influenza is classified as a Category V infectious disease. Since February 2020, COVID-19 was classified as a legally designated infectious disease (10), and medical expenses for hospitalization were basically covered by public funds. Currently, COVID-19 is classified under "novel influenza and other infectious diseases" that are equivalent to "Category II", and patients with COVID-19 are hospitalized in designated hospitals for specified infectious diseases. However, since November 30, 2022, the Japanese Government has started discussions on the classification of COVID-19 from Category II to Category V (11), which is equivalent to seasonal influenza. If COVID-19 is classified as a Category V infectious disease, patients with COVID-19 will be able to be treated in general medical facilities rather than in designated hospitals, which will help to alleviate the pressure on medical supplies during the peak of the epidemic. But on the other hand, the government will not be able to declare a state of emergency in relation to COVID-19 during the peak of the epidemic and take measures such as restricting travel and requiring the infected to isolate themselves.

Currently, there is an extensive discussion on whether COVID-19 can be treated as the equivalent of seasonal or regional influenza, not only in Japan but also in many countries such as China. Starting in December 2022, China's response strategy has shifted from "dynamic zero-COVID" to widespread easing of restrictions (12), such as the elimination of nationwide PCR testing, the elimination of the "Mobile Itinerary Card" (a nationwide mobile tracking application that collects data on users' travel activity). However, a point worth noting is that compared to influenza, infection with the Omicron variant still has a higher fatality ratio, is more transmissible, and the size of future outbreaks cannot be accurately predicted due to the uncertainty of viral mutation.

More importantly, as countries shift their response strategies to COVID-19, there is an urgent need at this time to clarify what the subsequent impacts on healthcare systems and new challenges will be. At least the following 6 important issues need to be carefully addressed: *i*) Developing response guidelines for current epidemics based on the coordination of national medical resources to ensure timely treatment of critically ill patients while avoiding hospital overcrowding; *ii*) Facilitating the dissemination of scientific information to avoid public panic and guiding the thorough implementation of basic infection control measures during an outbreak including wearing masks, handwashing, and avoiding confined spaces, crowded places, and close-contact settings; *iii*) Continuing to promote vaccination campaigns to reduce the overall amount of virus that can spread to the whole population, and especially to reduce the risk of infection among the elderly and vulnerable populations; *iv*) If COVID-19 is equated with seasonal or regional influenza, will it be incorporated into a national or even global influenza

surveillance and response system? Will the COVID-19 vaccine be administered as regularly as the flu vaccine? *v*) Who will pay for future COVID-19 treatment and vaccination costs? In Japan, if COVID-19 is classified as a Category V infectious disease, treatment costs other than those covered by insurance and vaccinations other than those with special regulations will be paid for out-of-pocket; *vi*) Effective use of things that emerged during the COVID-19 response in the context of the rapid development of big data in healthcare, such as the joint development and use of point-of-care testing (POCT) and the Internet of Medical Things (IoMT) (13) to advance disease prevention and health maintenance.

In conclusion, after three years of the global COVID-19 pandemic, there appears to a trend from managing COVID-19 as an emerging infectious disease to managing it as a common respiratory infectious disease. As countries shift their response strategies to COVID-19, there is an urgent need at this time to clarify what the subsequent impacts on healthcare systems and new challenges will be, including the clinical response, the dissemination of scientific information, vaccination campaigns, the creation of future surveillance and response systems, the cost of treatments and vaccinations, and the flexible use of big data in healthcare systems.

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