Global Health & Medicine. 2021; 3(3):125-128.
DOI: 10.35772/ghm.2021.01066

Behavioral changes adopted to constrain COVID-19 in Japan: What are the implications for seasonal influenza prevention and control?

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Abstract: Respiratory disease deaths associated with seasonal influenza are estimated to be 290,000 to 650,000 per year globally. In Japan, seasonal influenza affects more than 10 million people per year, and especially children, the elderly, and patients with underlying medical conditions, and seasonal influenza can cause severe illness. As SARS-CoV-2 continues to spread, the combined risk of concurrent influenza epidemics and the COVID-19 pandemic are a concern. When the status of influenza virus infections during the 2020-2021 flu season was compared to the 2011 to 2020 flu seasons, data indicated the absence of seasonal influenza outbreaks in Japan during the COVID-19 pandemic. The number of flu patients was roughly estimated to be 14,000 nationwide from September 2020 to March 2021, which marks the first sharp decrease since national influenza surveillance started in 1987 in conjunction with National Epidemiological Surveillance of Infectious Diseases (NESID). Moreover, approximately 500 sentinel sites (designated medical facilities) nationwide reported only 112 patients with severe influenza who required hospitalization. Since prevention and control measures amidst the COVID-19 pandemic have become the "new normal", one can reasonably assume that the absence of a seasonal influenza outbreak is related to prevention and control measures implemented in response to the COVID-19 pandemic. Basic infection prevention measures were thoroughly implemented, such as wearing masks, handwashing, and avoiding confined spaces, crowded places, and close-contact settings. More importantly, the behavioral changes adopted to constrain COVID-19 during three declared states of emergency reduced population density and contact with people, including closing schools, asking restaurants to reduce their business hours, teleworking, curbing the flow of people during vacation week, *etc*. These behavioral changes will serve as a valuable reference to reduce the spread of seasonal influenza in the future.

***Keywords*:** COVID-19, influenza, new normal, behavioral pattern, Japan

Introduction

Seasonal influenza is an acute respiratory illness mainly caused by influenza virus types A or B. Annual influenza epidemics result in substantial mortality, especially among adults aged 65 years and older. Globally, an estimated 291,243–645,832 influenza-associated respiratory deaths (4.0–8.8 per 100,000 individuals) occurred annually from 1999-2015 (*1*).

In Japan, seasonal influenza affects more than 10 million people each year, and especially children, the elderly, and patients with underlying medical conditions, and seasons influenza can cause severe illness (*2-4*). As SARS-CoV-2 continues to spread, the combined risk of concurrent influenza epidemics and the COVID-19 pandemic are a concern (*5*).

Seasonal influenza in Japan during the 2011-2021 flu season

Effective surveillance and monitoring of influenza outbreaks are critical to evaluating the impact of the disease on the community and to devising disease management policies. In Japan, the major national influenza surveillance systems include nationwide sentinel-based surveillance of influenza-like illness (based on 5,000 sentinel sites), virological surveillance (based on 500 designated sentinel sites), influenza-associated hospitalizations (based on 500 designated sentinel sites), surveillance of student absences and school closures, and national epidemiological surveillance of vaccine-preventable diseases (NESVPD).

In 1999, Japan established a system of 5,000 influenza surveillance sentinel sites (60% pediatrics and 40% internal or general medicine clinics) throughout the country; the number of patients is estimated nationwide on a weekly basis starting in September, when flu season commences (*6*). During the 2020-2021 flu season (from September 2020 to March 2021), the estimated number

of flu patients was roughly 14,000 nationwide, based on reports from sentinel sites (*7*). Moreover, approximately 500 sentinel sites (designated medical facilities) nationwide reported only 112 patients with severe influenza who required hospitalization (*8*).

In comparison to influenza virus infections during the previous flu seasons from 2011 to 2020 (Figure 1), data indicated the absence of seasonal influenza outbreaks during the 2020-2021 flu season in Japan amidst the COVID-19 pandemic. In addition, outbreaks of seasonal influenza did not occur, so weekly reports stopped after Week 9 (March 1-7) of 2021 (*7,9*). Seasonal influenza previously affected more than 10 million people per year in Japan, but there has been an absence of outbreaks and a sharp decrease in flu patients during the 2020-2021 flu season. This marks the first time such a situation has occurred since national influenza surveillance started in 1987 in conjunction with National Epidemiological Surveillance of Infectious Diseases (NESID).

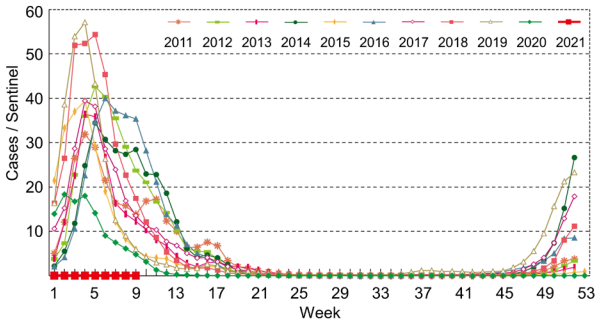

Figure 1. The number of flu patients according to reports from influenza sentinel sites during the 2011-2021 flu seasons in Japan. Data Source: *https://www.niid.go.jp/niid/ja/data.html*

What are the reasons for the absence of seasonal influenza outbreaks during the COVID-19 pandemic?

What are the reasons for the absence of seasonal influenza outbreaks during the 2020-2021 flu season in Japan amidst the COVID-19 pandemic? One can reasonably assume that the lack of such outbreaks is related to the prevention and control measures implemented in response to the COVID-19 pandemic. In addition to guaranteed medical care and tightened border controls (*10-12*), behavioral changes adopted to constrain COVID-19 are an essential approach to reducing the risk of disease transmission (*13-16*). Table 1 summarizes the government's prevention and control measures calling for behavioral changes among the general public during the

Table 1. The Government's prevention and control measures calling for behavioral changes among the general public during the three declared states of emergency in Japan

State of Emergency	First state of emergency (April 7 to May 25, 2020)	Second state of emergency (January 8 to March 21, 2021)	Third state of emergency (April 25 to June 20, 2021)
Purpose	Reduce contact with other people by at least 70%, or 80% if possible	Strategy targeting restaurants	Reduce the flow of people during vacation week
Regions	All prefectures	11 prefectures (Tokyo, Saitama, Chiba, Kanagawa, Tochigi, Gifu, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka)	10 prefectures (Tokyo, Hokkaido, Aichi, Kyoto, Osaka, Hyogo, Okayama, Hiroshima, Fukuoka, and Okinawa)**
Schools	School closures*	Open	Open (restrictions on after-school club activities)
Events	Cancellation	Event requirements (maximum number of people, capacity, no food or drink, *etc.*)	Reduce the capacity of the venue by 50% or more to a maximum of 5,000 people. Open until 9 PM
Restaurants	Reduced business hours (until 8 PM at the latest), alcohol served until 7 PM in Tokyo, *etc.*	Reduced business hours (until 8 PM at the latest) and alcohol served until 7 PM	Restaurants and bars that serve alcoholic beverages and offer karaoke were requested to suspend operations while other restaurants were asked to remain open no later than 8 PM
Businesses	Promotion of teleworking	Thorough implementation of teleworking (on-site employees reduced by 70%)	Thorough implementation of teleworking (status of implementation was asked to be disclosed)
Commercial facilities	Department stores, theaters, pachinko parlors, *etc.* were asked to suspend operations	Reduced business hours (until 8 PM)	Department stores, theaters, pachinko parlors, *etc.* were asked to suspend operations. After May 12, reduced business hours (until 8 PM)
Penalty	No	Amended legislation stipulates a fine of up to 300,000 yen	A fine of up to 300,000 yen
Transit/travel	Stay home as much as possible	Stay home, thoroughly implemented after 8 PM in particular; Public asked to refrain from traveling between prefectures	Stay home, thoroughly implemented after 8 PM in particular. Public asked to refrain from traveling between prefectures.

Data Source: *https://corona.go.jp/emergency.* *School closures starting 2 March, 2020 (*https://www.mext.go.jp/content/202002228-mxt_kouhou01-000004520_1.pdf*); **Pre-emergency measures were also implemented by 5 other prefectures.

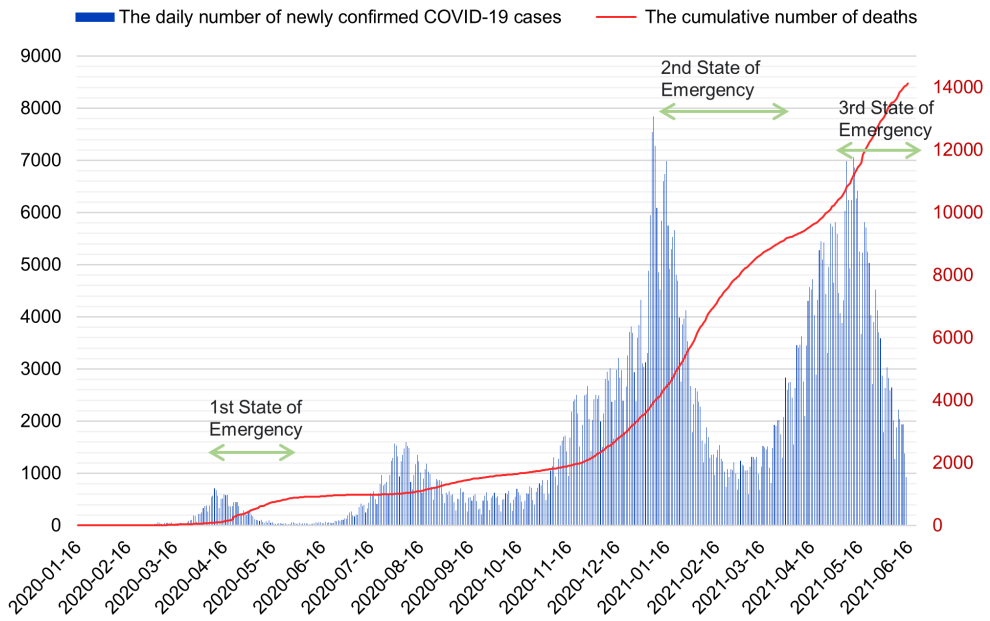

Figure 2. The daily number of newly confirmed COVID-19 cases and the cumulative number of deaths from January 2020 to June 2021 in Japan. Data Source: *https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000164708_00001.html*

three declared states of emergency in Japan.

Japan's first case of COVID-19 was reported on January 16, 2020 (*17*). A first state of emergency was subsequently declared from April 7 to May 25, 2020 (Weeks 15 to 22) (*18*). The Government set a goal of reducing human contact by at least 70% and by 80% if possible, and some places where people gather, such as schools and public facilities, were closed, events were canceled, and the general public was asked to stay home as much as possible.

A second state of emergency was declared from January 8 to March 21, 2021 (Weeks 1 to 11) in 11 prefectures (Tokyo, Saitama, Chiba, Kanagawa, Tochigi, Gifu, Aichi, Kyoto, Osaka, Hyogo, and Fukuoka) (*19*). Measures targeting restaurants were implemented. Restaurants were allowed to be open until 8 PM at the latest, alcohol could be served until 7 PM, and a fine of up to 300,000 yen could be imposed on those restaurants that failed to comply. Moreover, businesses were asked to thoroughly implement teleworking in order to reduce the number of on-site employees by 70%.

A third state of emergency was declared from April 25 to June 20, 2021 (Weeks 16 to 24) in 10 prefectures (Hokkaido, Tokyo, Aichi, Kyoto, Osaka, Hyogo, Okayama, Hiroshima, Fukuoka, and Okinawa) (*20*). The goal was to control the flow of people during the vacation week for a brief period of time. Restaurants and bars that serve alcoholic beverages and offer karaoke were asked to suspend operations while other restaurants were asked to remain open no later than 8 PM. Teleworking was asked to be implemented and status of implementation was asked to be disclosed. Although schools remained open to an extent, after-school club activities were restricted to a degree.

Figure 2 shows the daily number of newly confirmed COVID-19 cases from January 2020 to June 2021. During the period from when the first patient was reported on January 16, 2020 to the end of the third state of emergency on June 20, 2021, the number of confirmed cases increased to 784,000 and 14,400 people have unfortunately died (*21*). The number of confirmed cases decreased during all three declared states of emergency.

Behavioral changes for prevention and control of seasonal influenza in the future: What has been learned?

Prevention and control measures implemented in response to COVID-19 have become the "new normal" in daily life and work, and they seem to have been effective in reducing the spread of seasonal influenza as well. Basic infection prevention measures have been thoroughly implemented, such as wearing masks, handwashing, and avoiding confined spaces, crowded places, and close-contact settings. More importantly, the behavioral changes adopted to constrain COVID-19 during three declared states of emergency reduced population density and contact with others, including closing schools, asking restaurants to reduce their business hours, teleworking, curbing the flow of people during vacation week, *etc*.

One can reasonably assume that the absence of seasonal influenza outbreaks during the 2020-2021 flu season in Japan is related to the prevention and control measures implemented in response to the COVID-19 pandemic. Behavioral changes adopted to constrain COVID-19 will serve as a valuable reference to reduce the spread of seasonal influenza in the future.

Funding: None.

Conflict of Interest: The authors have no conflicts of interest to disclose.

References

1. Iuliano AD, Roguski KM, Chang HH, *et al*. Global Seasonal Influenza-associated Mortality Collaborator Network. Estimates of global seasonal influenza-associated respiratory mortality: A modelling study. Lancet. 2018; 391:1285-1300.
2. Sakamoto H, Ishikane M, Ueda P. Seasonal influenza activity during the SARS-CoV-2 outbreak in Japan. JAMA. 2020; 323:1969-1971.
3. Yokomichi H, Mochizuki M, Lee JJ, Kojima R, Yokoyama T, Yamagata Z. Incidence of hospitalisation for severe complications of influenza virus infection in Japanese patients between 2012 and 2016: A cross-sectional study using routinely collected administrative data. BMJ Open. 2019; 9:e024687.
4. Maita H, Kobayashi T, Akimoto T, Matsuoka F, Osawa H, Kato H. Factors associated with seasonal influenza self-diagnosis: A prospective observational study in Japan. NPJ Prim Care Respir Med. 2020; 30:9.
5. Chotpitayasunondh T, Fischer TK, Heraud JM, Hurt AC, Monto AS, Osterhaus A, Shu Y, Tam JS. Influenza and COVID-19: What does co-existence mean? Influenza Other Respir Viruses. 2021; 15:407-412.
6. Ministry of Health, Labor, and Welfare. Influenza surveillance. *https://www.mhlw.go.jp/stf/shingi/2r9852000002oeqs-att/2r9852000002oetv.pdf* (accessed May 1, 2021) (in Japanese)
7. Ministry of Health, Labor, and Welfare. Press Release on Influenza: The 2020-2021 Flu Season. *https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/kenkou_iryou/kenkou/kekkaku-kansenshou01/houdou_00008.html* (accessed May 1, 2021) (in Japanese)
8. National Institute of Infectious Diseases. Infectious Diseases Weekly Report. *https://www.niid.go.jp/niid/images/idsc/idwr/IDWR2021/idwr2021-09.pdf* (accessed May 1, 2021). (in Japanese)
9. National Institute of Infectious Diseases. Map of the severity of influenza outbreaks. *https://www.niid.go.jp/niid/ja/flu-map.html* (accessed May 1, 2021). (in Japanese)
10. Editorial. Universal health care must be a priority - even amid COVID. Nature. 2021; 593:313-314.
11. Lee K, Worsnop CZ, Grépin KA, Kamradt-Scott A. Global coordination on cross-border travel and trade measures crucial to COVID-19 response. Lancet. 2020; 395:1593-1595.
12. Inoue H. Japanese strategy to COVID-19: How does it work? Glob Health Med. 2020; 2:131-132.
13. Karako K, Song P, Chen Y, Tang W. Shifting workstyle to teleworking as a new normal in face of COVID-19: Analysis with the model introducing intercity movement and behavioral pattern. Ann Transl Med. 2020; 8:1056.
14. Usami M, Sasaki S, Sunakawa H, *et al*. care for children's mental health during the COVID-19 pandemic in Japan. Glob Health Med. 2021; 3:119-121.
15. Karako K, Song P, Chen Y, Tang W. Analysis of COVID-19 infection spread in Japan based on stochastic transition model. Biosci Trends. 2020; 14:134-138.
16. Lu N, Cheng KW, Qamar N, Huang KC, Johnson JA. Weathering COVID-19 storm: Successful control measures of five Asian countries. Am J Infect Control. 2020; 48:851-852.
17. Ministry of Health, Labor, and Welfare. Report of pneumonia associated with a novel coronavirus (1st case). *https://www.mhlw.go.jp/stf/newpage_08906.html* (accessed May 2, 2021). (in Japanese)
18. COVID-19 Information and Resources. Basic response to and policy on COVID-19. *https://corona.go.jp/expert-meeting/pdf/kihon_h_0407.pdf* (accessed May 2, 2021). (in Japanese)
19. COVID-19 Information and Resources. Basic response to and policy on COVID-19. *https://corona.go.jp/expert-meeting/pdf/kihon_h_20210113.pdf* (accessed May 2, 2021). (in Japanese)
20. COVID-19 Information and Resources. Basic response to and policy on COVID-19. *https://corona.go.jp/expert-meeting/pdf/kihon_h_20210610.pdf* (accessed May 2, 2021). (in Japanese)
21. Ministry of Health, Labor, and Welfare. Press Release on COVID-19 (June 2021) *https://www.mhlw.go.jp/stf/newpage_19382.html* (accessed June 21, 2021). (in Japanese)

Received May 20, 2021; Revised June 21, 2021; Accepted June 23, 2021.

Released online in J-STAGE as advance publication June 25, 2021.

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