

Letters

RESEARCH LETTER

Seasonal Influenza Activity During the SARS-CoV-2 Outbreak in Japan

Since the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak began, measures for avoiding disease transmission have been widely promoted in Japan, such as use of masks and handwashing, remote work, and cancellation of large events. If effective, these measures may also reduce the spread of other infectious diseases, such as seasonal influenza. We compared the weekly influenza activity in the 2019/2020 season vs 5 previous seasons.

[+ Related article](#)

[+ Audio](#)

Methods | We used data from 2014 to 2020 from the National Institute of Infectious Diseases Japan, which gathers the number of cases of seasonal influenza weekly, diagnosed by physicians based on clinical symptoms or laboratory findings, from approximately 5000 sentinel centers, including hospitals and clinics (60% pediatrics and 40% internal or general medicine clinics).^{1,2} We grouped the weekly reports into seasons (week 40 of the year through week 11 of the following year [September 30, 2019, through March 15, 2020, for the 2019/2020 season]; the season was truncated after week 11 because this was the latest available data for 2020). In each season we assessed the weekly influenza activity, presented as a crude standardized estimate of influenza activity nationally, calculated by multiplying the mean number of reported cases per sentinel center with a constant

Figure. Influenza Activity and Predominant Subtype by Influenza Season and Events Related to Measures Taken to Contain or Mitigate the SARS-CoV-2 Outbreak in the 2019/2020 Season

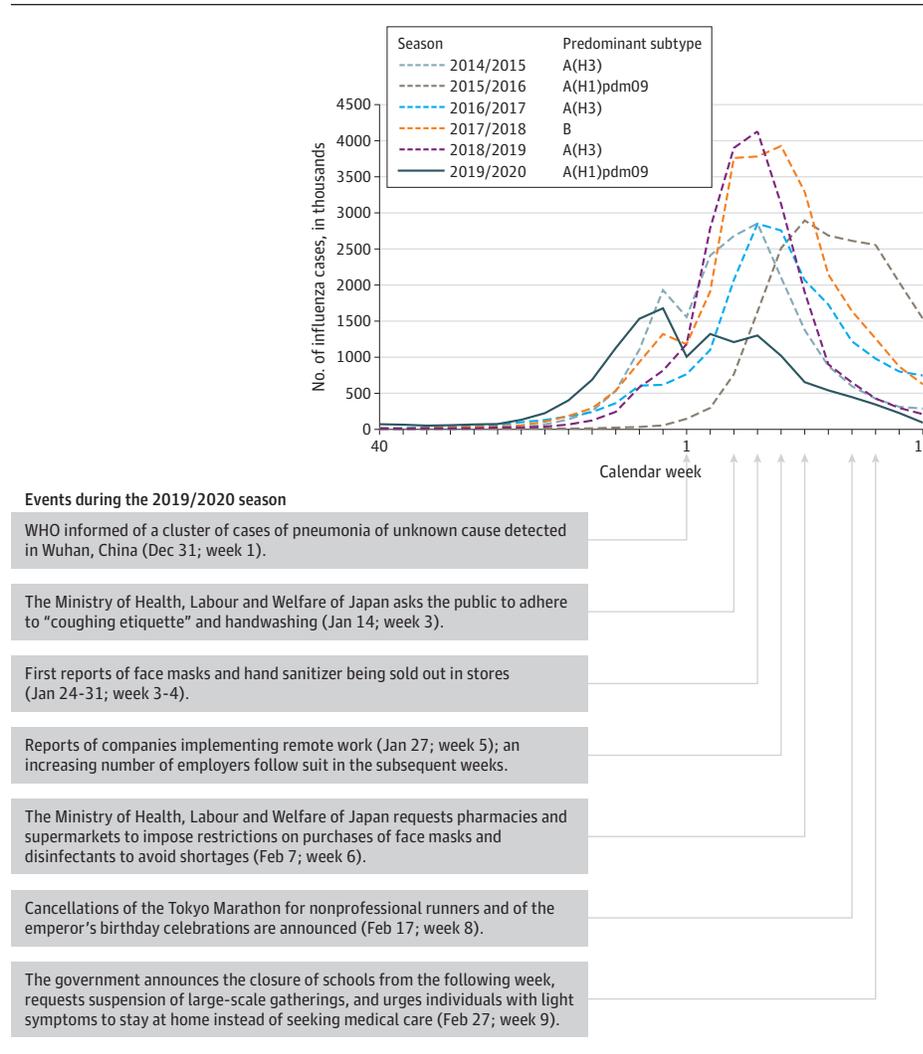


Table. Results From the Difference-in-Difference Model Assessing the Difference in the Estimated Number of Seasonal Influenza Cases in the 2019/2020 Season vs Previous 5 Seasons

Calendar week	Estimated No. of cases ^a		Difference-in-difference value in 2019/2020 vs 2014-2019 seasons (95% CI) ^{a,b}
	2019/2020 season	2014-2019 seasons	
40	71	10	
41	65	10	
42	52	13	
43	58	17	
44	69	22	
45	74	30	
46	133	44	
47	225	71	
48	402	117	
49	688	185	
50	1127	340	
51	1533	652	
52	1678	947	
1	1006	965	-245 (-1535 to 1046)
2	1322	1703	-667 (-1957 to 624)
3	1209	2634	-1712 (-3002 to -421)
4	1301	3048	-2033 (-3324 to -743)
5	1019	2883	-2150 (-3440 to -859)
6	654	2306	-1937 (-3228 to -647)
7	541	1668	-1413 (-2704 to -123)
8	447	1344	-1182 (-2473 to 108)
9	344	1129	-1071 (-2361 to 220)
10	227	864	-923 (-2214 to 368)
11	93	681	-874 (-2164 to 417)

^a Numbers are reported in thousands.

^b Subtraction of differences before week 1 from week 1 to 11 differences. Negative values represent fewer cases in the 2019/2020 season vs the 2014 to 2019 seasons. The difference-in-difference regression model included categorical variables for each week of the season and for the 2019/2020 season (vs previous seasons) and interaction variables between each of weeks 1 to 11 and the 2019/2020 season.

number (n = 72 201) representing the number of outpatient visits to hospitals and clinics in the country in 2019³ vs the health care institutions in the surveillance system.^{1,4} We estimated the change in influenza activity after the SARS-CoV-2 outbreak using a “difference-in-difference” regression model that included a variable for each week, a variable representing the average difference in influenza activity per week for the 2019/2020 season vs the 2014 to 2019 seasons before the outbreak (week 1-11), and interaction variables for each week after the outbreak and the 2019/2020 season. The difference-in-difference value was considered statistically significant if the 95% CI did not overlap 0. Approximately 10% of the sentinel centers provided samples from a subset of influenza cases from week 36 through week 7 in the 2019/2020 season and from week 36 through week 35 in the 2014 to 2019 seasons for analysis using polymerase chain reaction (PCR) testing. Using these data we assessed the predominant subtype of the influenza virus and compared the distribution of cases by age group (aged <15, 15-54, and ≥55 y) in the 2019/2020 season vs the 2014 to 2019 seasons (not including the 2015/2016 season, for which age-specific data were not available) using the χ^2 test. Stata version 16.1 (StataCorp) was used. Institutional board review was not required because no individual-level data were used.

Results | Analyses were based on 8 414 693 cases of influenza (981 373 from the 2019/2020 season). Across all seasons,

influenza activity increased toward the end of the year. While influenza activity reached its peak between week 4 and 6 in the 2014 to 2019 seasons, there was a plateau in the beginning of the year and a decrease from week 5 onwards in the 2019/2020 season (**Figure**). In the difference-in-difference analysis, influenza activity was significantly lower from week 3 through week 7 in the 2019/2020 season vs the 2014 to 2019 seasons (**Table**). PCR test results were available on 51 847 samples. The predominant subtypes of influenza virus are shown in the **Figure**. The number of PCR-confirmed cases in the 2014 to 2019 seasons was 25 930 (63.3%) in individuals younger than 15 years, 10 215 (24.9%) in individuals aged 15 to 54 years, and 4801 (11.7%) in individuals aged at least 55 years; in the 2019/2020 season, the numbers were 2267 (68.9%) in individuals younger than 15 years, 770 (23.4%) in individuals aged 15 to 54 years, and 254 (7.7%) in individuals aged at least 55 years. A lower proportion of cases in the 2019/2020 season vs previous seasons included individuals aged at least 15 years ($P < .001$).

Discussion | Seasonal influenza activity was lower in 2020 than in previous years in Japan. Influenza activity may have been affected by temperature⁵ or virulence (although influenza activity in the 2019/2020 season was moderately severe in other parts of the world⁶), but also by measures taken to constrain the SARS-CoV-2 outbreak. While closure of schools and suspension of large events occurred late in the influenza

season, awareness regarding measures to reduce the risk of disease transmission was high among the Japanese public from early in the year. Limitations of this study include lack of availability of age-specific weekly data on influenza activity and information regarding means of diagnosis. Concerns regarding the SARS-CoV-2 outbreak may have changed detection of influenza through changes in symptomatic individuals seeking medical attention or in physicians' inclination to test for influenza.

Haruka Sakamoto, MD, MPH
Masahiro Ishikane, MD, PhD
Peter Ueda, MD, PhD

Author Affiliations: University of Tokyo Graduate School of Medicine, Department of Global Health Policy, Tokyo, Japan (Sakamoto, Ueda); Disease Control and Prevention Center, National Center for Global Health and Medicine, Tokyo Japan (Ishikane).

Corresponding Author: Peter Ueda, MD, PhD, Department of Global Health Policy, Graduate School of Medicine, University of Tokyo, 113-0033, Tokyo, Japan (peter.ueda@gmail.com).

Accepted for Publication: April 6, 2020.

Published Online: April 10, 2020. doi:[10.1001/jama.2020.6173](https://doi.org/10.1001/jama.2020.6173)

Author Contributions: Dr Ueda had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: All authors.

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: All authors.

Critical revision of the manuscript for important intellectual content: All authors.

Statistical analysis: Sakamoto, Ueda.

Administrative, technical, or material support: Sakamoto, Ishikane.

Supervision: Sakamoto, Ishikane.

Conflict of Interest Disclosures: None reported.

1. Infectious diseases weekly reports. National Institute of Infectious Diseases website. Accessed March 2, 2020. <https://www.niid.go.jp/niid/ja/idwr.html>
2. Okabe N. [Influenza surveillance in Japan]. *Kansenshogaku Zasshi*. 2006;80(2):59-63. doi:[10.11150/kansenshogakuzasshi1970.80.59](https://doi.org/10.11150/kansenshogakuzasshi1970.80.59)
3. Ministry of Health, Labour and Welfare. National survey of health care institutions. Published March 26, 2019. Accessed March 2, 2020. <https://www.mhlw.go.jp/toukei/saikin/hw/iryosd/m19/is1901.html>
4. Ministry of Health, Labour and Welfare. Regarding the change in methods for estimating the number of patients with seasonal influenza. Published 2018. <https://www.niid.go.jp/niid/images/epi/flu/levelmap/suikei181207.pdf>
5. Deyle ER, Maher MC, Hernandez RD, Basu S, Sugihara G. Global environmental drivers of influenza. *Proc Natl Acad Sci U S A*. 2016;113(46):13081-13086. doi:[10.1073/pnas.1607747113](https://doi.org/10.1073/pnas.1607747113)
6. Livingston E, Bucher K, Rekito A. Coronavirus disease 2019 and influenza. *JAMA*. Published February 26, 2020. doi:[10.1001/jama.2020.2633](https://doi.org/10.1001/jama.2020.2633)