Decrease in Positivity Rate of Influenza Tests Coinciding With Outbreak of SARS-CoV-2: Data From a Southeastern Wisconsin Laboratory

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ABSTRACT

Background: The SARS-CoV-2 outbreak prompted public health interventions and changes in public behavior that may have affected the 2019-2020 influenza season.

Methods: Using data from a laboratory in southeastern Wisconsin, we compared the number of weekly influenza tests and their positivity rates during the 2019-2020 influenza season with the previous 4 seasons.

Results: The number of influenza tests per week at the outset of the SARS-CoV-2 outbreak was higher than the average the previous 4 years, and positivity rates declined to 0% earlier than any of the previous 4 seasons.

Conclusion: The testing trajectory and positivity rate for influenza differed during the part of the 2019-2020 season coinciding with the SARS-CoV-2 outbreak as compared to similar periods during the previous 4 seasons.

BACKGROUND

The outbreak of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) in the United States coincided with the latter half of the 2019-2020 influenza season. Several public health interventions were enacted to control the SARS-CoV-2 outbreak. These unprecedented interventions led to mandated changes in public behavior, such as banning large gatherings. Additionally, the SARS-CoV-2 outbreak has received widespread news coverage, leading to high public concern and awareness,[1] which, in turn, has led to voluntary changes in public behavior. An example is a decrease in "non-essential" travel, which has been measurable using mobile phone data.[2] Though these behavior changes are aimed at preventing SARS-CoV-2 transmission, given the similarities in transmission of respiratory viruses, they could also unintentionally affect seasonal influenza.[3]

The change in trajectory of seasonal influenza coinciding with the SARS-CoV-2 outbreak has been described previously. For example, in one of the first such reports, Sakamoto el al reported that the seasonal influenza activity in Japan was lower in 2020 than in previous years.[4] Though there have been several similar reports since, this has not been widely reported in the US, particularly for Wisconsin. Various regions of the world and US states were affected by the SARS-CoV-2 outbreak at different times and may have different baseline influenza activity. They also may have differing baseline public health practices, deployment of mandated public health measures, and public concern and awareness. As a result, the impact of the SARS-CoV-2 outbreak on seasonal influenza may differ by region.

We hypothesized that the 2019-2020 influenza season in Wisconsin was affected by the SARS-CoV-2 outbreak and examined the outbreak's impact on testing for seasonal influenza using data from an academic health system laboratory in Wisconsin.

METHODS

We used data from 2015 to 2020 from an academic health system laboratory in southeastern Wisconsin, which is also a regional reference laboratory serving eastern Wisconsin. The data included tests for both hospitalized and ambulatory patients. We obtained weekly influenza testing numbers and positivity rates (PR), then calculated the tests per week and PR for the 2019-2020 season. We compared

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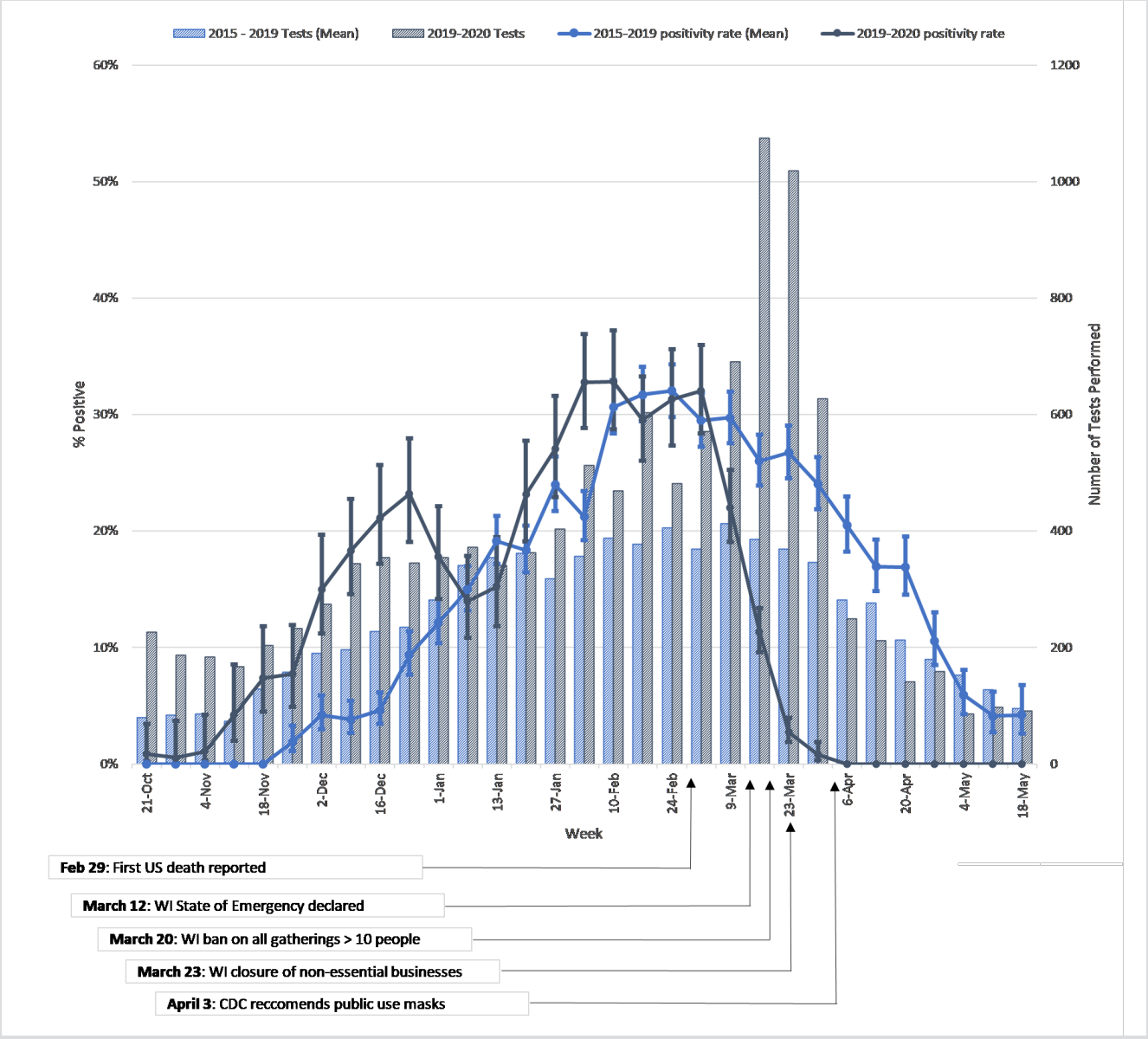
Figure. Number of Influenza Tests Performed and Positivity Rates Per Week During 2019-2020 Season vs Mean Number of Influenza Tests and Positivity Rate for Past 4 Seasons Combined (2015-2019)



Vertical bars represent 95% confidence intervals. The horizontal axis notes the first date of each week for the 2019-2020 season. The horizontal axis is annotated with select events and public health measures enacted during the SARS-CoV-2 outbreak.

them to the mean numbers of samples collected and PR per week for the combined 4 previous seasons using a logistic regression with week and season as categorical variables. We included an interaction so the resulting estimates and confidence intervals correspond to week-by-week model-free binomial analysis.

In accordance with Medical College of Wisconsin's policies, this study was not subject to institutional review board approval because it did not use patient-level data and was not deemed human subjects research.

RESULTS

During the 2019-2020 influenza season, 11,438 tests were performed with 1805 (15.8%) positive results. In the previous 4 seasons, 33,099 tests were performed, with 5,945 (18.0%) positive results. The positive rate in the 2019-2020 season was significantly higher than previous seasons until the second week in January, and it started to decline sharply and significantly in the second week of March (Figure). This decline continued until the second week of April, when positivity reached zero and has remained at zero since. Previously, the earliest zero positivity was during the 2017-2018 season in the last week of May, which is 8 weeks later than what we observed during the 2019-2020 season. In the 3rd and 4th weeks of March 2020, the number of tests performed was

much higher than previous years (1075 and 1019 tests, respectively, compared to an average of 386 and 369 previous years).

DISCUSSION

We noted an initial increase in influenza testing in southeastern Wisconsin followed by a dramatic decline in detection of seasonal influenza coinciding with the outbreak of SARS-CoV-2 and consequent changes in public health policy and public behavior. We also noted the earliest decline to zero influenza cases detected compared to the previous 4 seasons. Prior to this decline, our data show higher positivity rates for influenza tests compared to previous years, consistent with early projections of a severe 2019-2020 influenza season in Wisconsin.[5]

The initial testing increase could have been due to several reasons. For example, because of the high media attention given to the SARS-CoV-2 outbreak, more individuals may have sought care for respiratory symptoms compared to previous years. It is also possible that health care providers were prompted by a shortage of SARS-CoV-2 tests to test more for influenza as a first step to explain a patient's symptoms and conserve SARS-CoV-2 tests for use in patients negative for influenza.

The decline in influenza detection during the 2019-2020 season could have been due to less testing for influenza, which may have happened if clinicians had started testing preferentially for SARS-CoV-2 during this period. Instead, we found that influenza testing was much higher or the same during this period compared to previous years. As influenza and SARS-CoV-2 are symptomatically indistinguishable, it is highly unlikely that patients with influenza self-selected to not seek care. The most plausible hypothesis to explain our finding is that the public health interventions and changes in public behavior in response to the SARS-CoV-2 outbreak unintentionally led to the decreased spread of influenza in 2020.

Our examination is limited by our use of data from a single laboratory. Further, we did not have access to patient-level data that may shed further light on the differences in characteristics of patients tested for influenza in the 2019-2020 season compared to previous seasons. Examining differences in the trajectory of influenza using patient-level data presents an area for future research.

There is concern that the resurgence of SARS-CoV-2 will coincide with the onset of the 2020-2021 influenza season.[6] Together, coinciding influenza and SARS-CoV-2 outbreaks could overwhelm health care facilities much more so than SARS-CoV-2 alone.[7] Apart from the direct health effects of the viruses, this surge in hospitalizations would decrease availability of health care resources for other medical conditions and could lead indirectly to excess morbidity and mortality unrelated to influenza or SARS-CoV-2.[8] An additional intervention to mitigate this will be to increase influenza vaccination rates.[9] This will be important in Wisconsin, as there is considerable room for improvement with vaccination rates across Wisconsin counties between 28% and 54%.[10]

Our examination crucially and additionally shows that persuading the public to change its behavior through policy and information—as was accomplished at the outset of the SARS-CoV-2 outbreak—could again decrease the impact of a "double hit" this fall and winter. These efforts could save lives directly by decreasing the occurrence of seasonal influenza, as well as the occurrence of SARS-CoV-2, and indirectly by decreasing the burden on health care facilities.

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