

Looking for evidence of a high burden of COVID-19 in the United States from influenza-like illness data

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Introduction

In December 2019, an outbreak of a novel, SARS-like coronavirus was detected in Wuhan, China. In the intervening weeks, case counts have grown substantially. As of this writing, there are 83,652 confirmed cases globally and at least 2,858 deaths of what is currently named COVID-19 [1]. It is now understood that the virus transmits efficiently from person to person, with R_0 estimates above 2 and perhaps as high as 3.7 [2, 3].

Sustained human-to-human transmission has begun to be observed outside of China, and the possibility of unrecognized spread in the United States and other countries cannot be ruled out at this stage. As an early effort to explore this scenario in the United States, we compare the proportion of weighted influenza like illness (wILI) that tests negative for influenza during the 2019-2020 flu season to trends from previous seasons. If it were the case that COVID-19 were circulating unobserved in the United States, we might expect to see in recent weeks a higher fraction of ILI specimens that test negative for influenza compared to the same time in past seasons.

Methods

Data

We downloaded publicly available ILINet and WHO-NREVSS data for the national and regional levels.

From the ILINet dataset, we downloaded weighted influenza-like illness (wILI), which measures the percentage of doctor's office visits at sentinel providers that had the primary complaint of fever plus an additional influenza-like symptom (cough, sore throat, etc...). For the WHO-NREVSS data, we obtained the total number of specimens tested by participating clinical laboratories, as well as the percent of those specimens that tested positive for influenza. These data have been aggregated into a single reporting system since the 2015/2016 season, so we use data since that time. Both data sources are available at the weekly time-scale, defined as using the MMWR week standard used by the CDC.

The code used to produce this report is available on GitHub at <https://github.com/reichlab/ncov>.

Influenza-like illness not attributable to influenza

One possible measure of influenza illness not attributable to influenza (ILI-) can be calculated as follows:

$$\text{ILI-} = (1 - \text{proportion of tests positive for influenza}) \times \text{wILI}$$

It is important to note that reported wILI can vary substantially due to differences in the types of health care providers reporting into ILINet. Therefore, some increases in reported wILI from one season to another may be driven in part by changes in provider type make up. An approximate way to adjust for this is by

dividing reported wILI by the baseline for a given region and season. Baselines are provided by the CDC. This results in the following calculation of a relative ILI-

$$\text{rILI} = (1 - \text{proportion of tests positive for influenza}) \times \frac{\text{wILI}}{\text{baseline level for ILI}}$$

Results & Discussion

We plotted ILI- and rILI- as a function of the week within each flu season and stratified by region (Figure 1).

In the last weeks of 2019 and first weeks of 2020, the observations of ILI burden due to non-influenza pathogens (rILI-) are, relative to what has been observed in the past 5 seasons, on the high side. However, rILI- also is not dramatically out of line with what has been observed in seen in previous years.

These results do not particularly rule out any possibilities of COVID-19 transmission occurring in the US at the time of the most recent data reporting or not. If COVID-19 were present in the US, these data would seem to suggest that its incidence would be currently relatively small, as it would not be adding much relative to levels of rILI- observed in past seasons. However, it is hard to determine this conclusively, as we have not performed an exhaustive analysis about what other pathogens were or were not circulating in those past seasons.

If COVID-19 were to cause significant influenza-like illness in subsequent weeks, we might expect the rILI-metric to increase and be larger than previous seasons. However, media attention could also drive more individuals with mild influenza-like illness symptoms to seek care than usual even in the absence of widespread COVID-19 transmission in the US. If these additional individuals seeking care were more likely to have an illness not caused by influenza, then this could also drive up the rILI- metric.

State Data evaluation

California

As of March 1st 2020 there have been documented cases of community spread in California. We apply a similar analysis above to examine the departure of the California ILI level from the state baseline. Here a season specific baseline is computed as the average of the ILI values for epiweek 40-42.

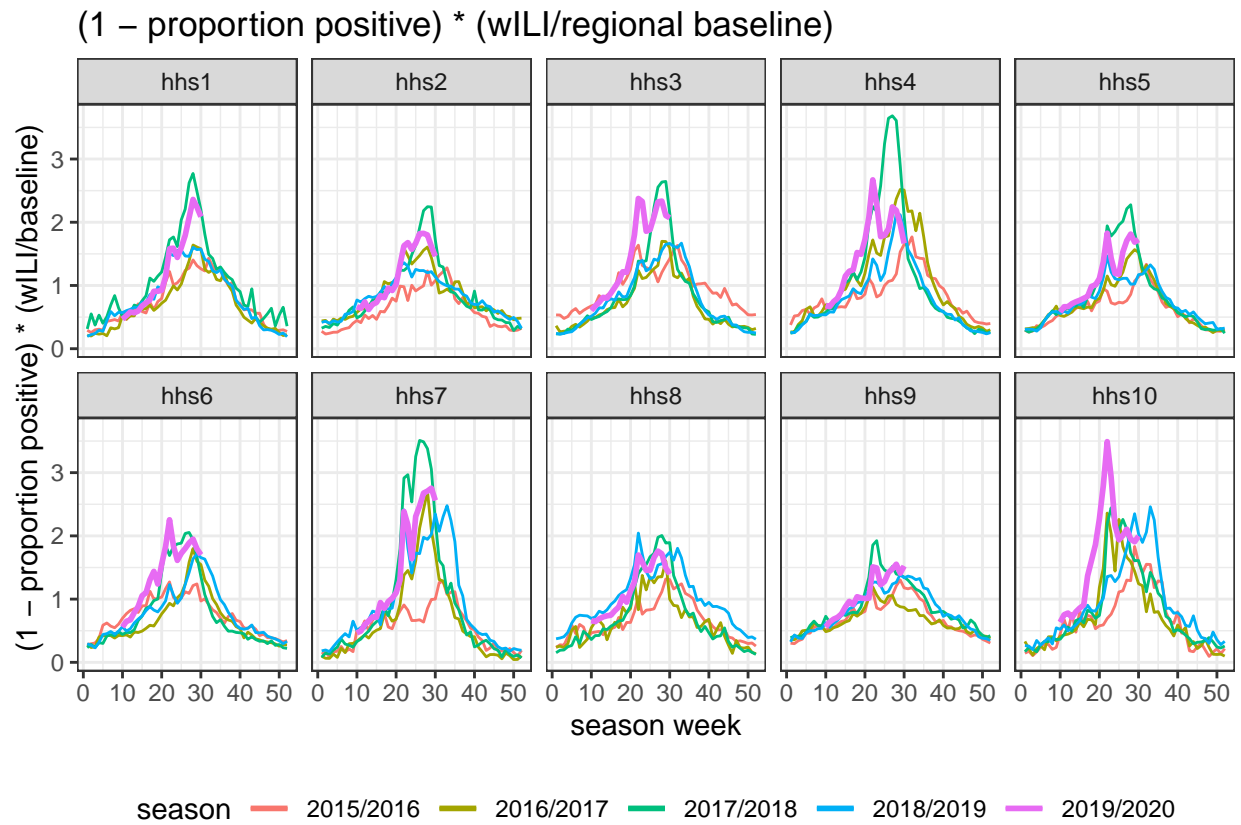
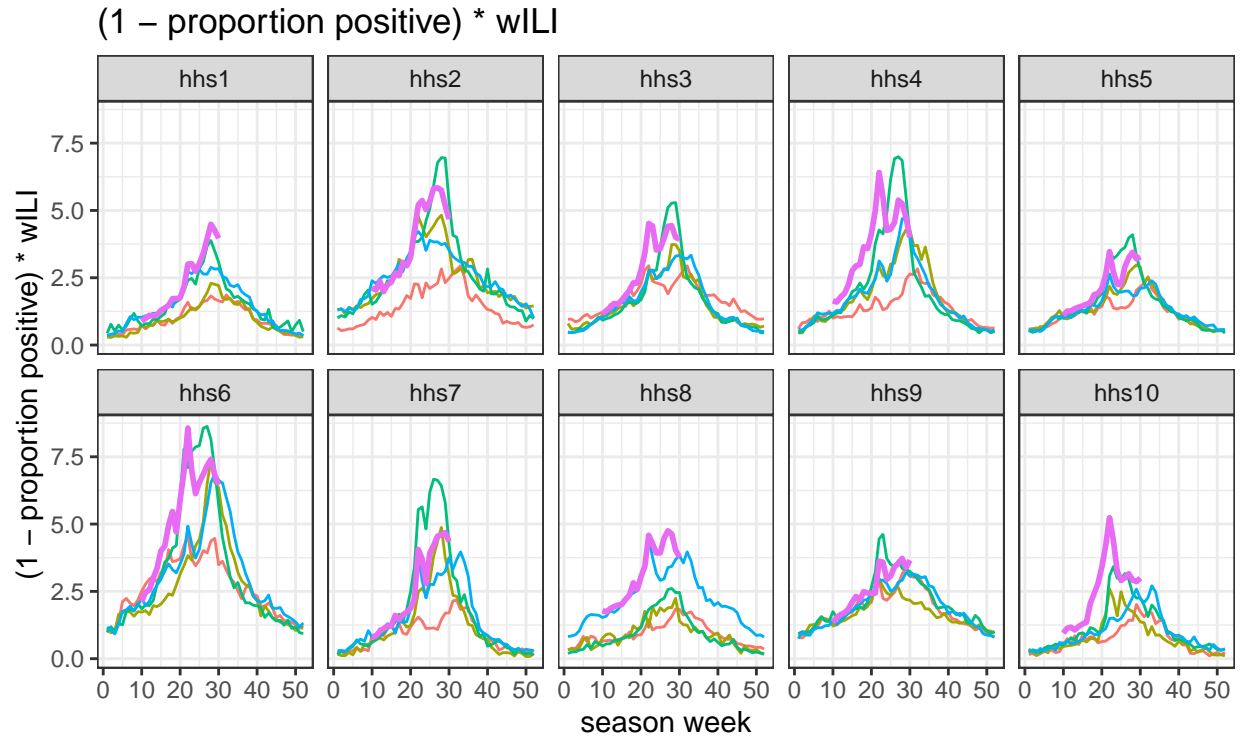
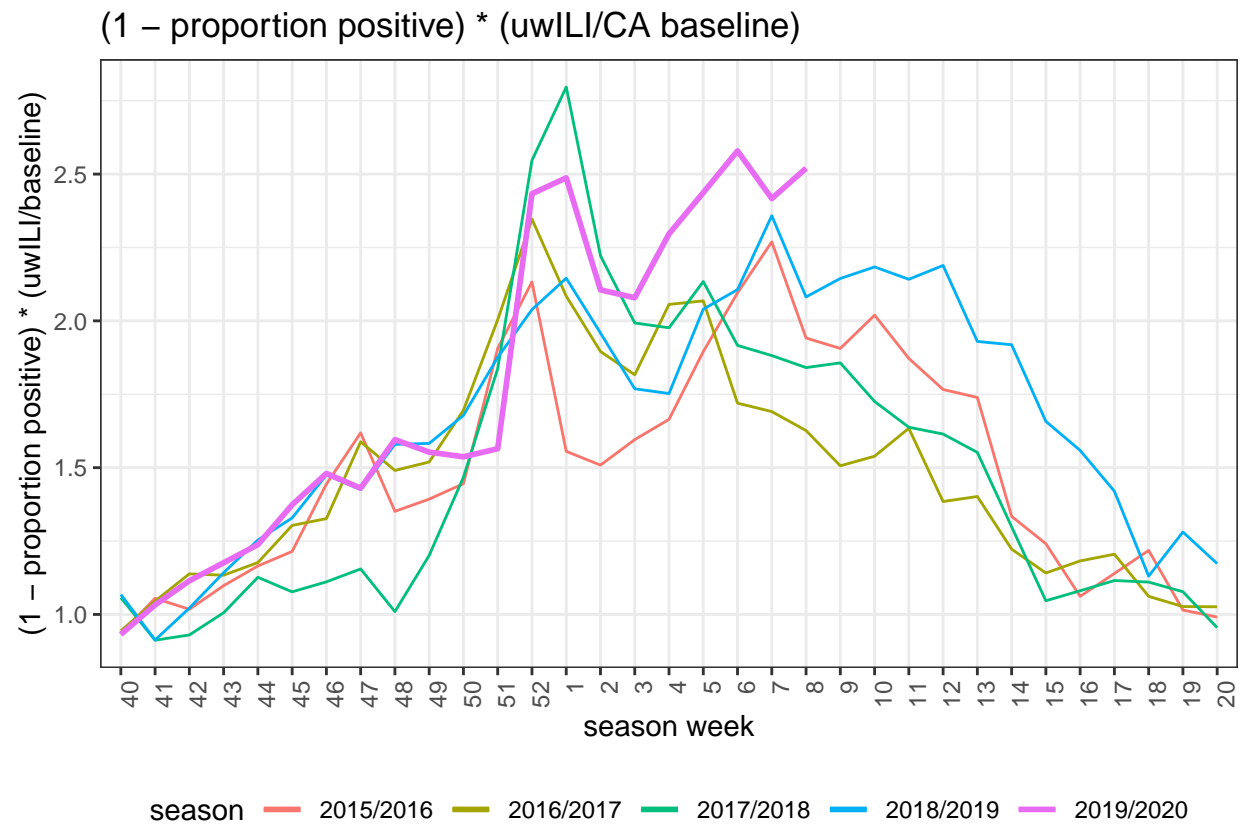
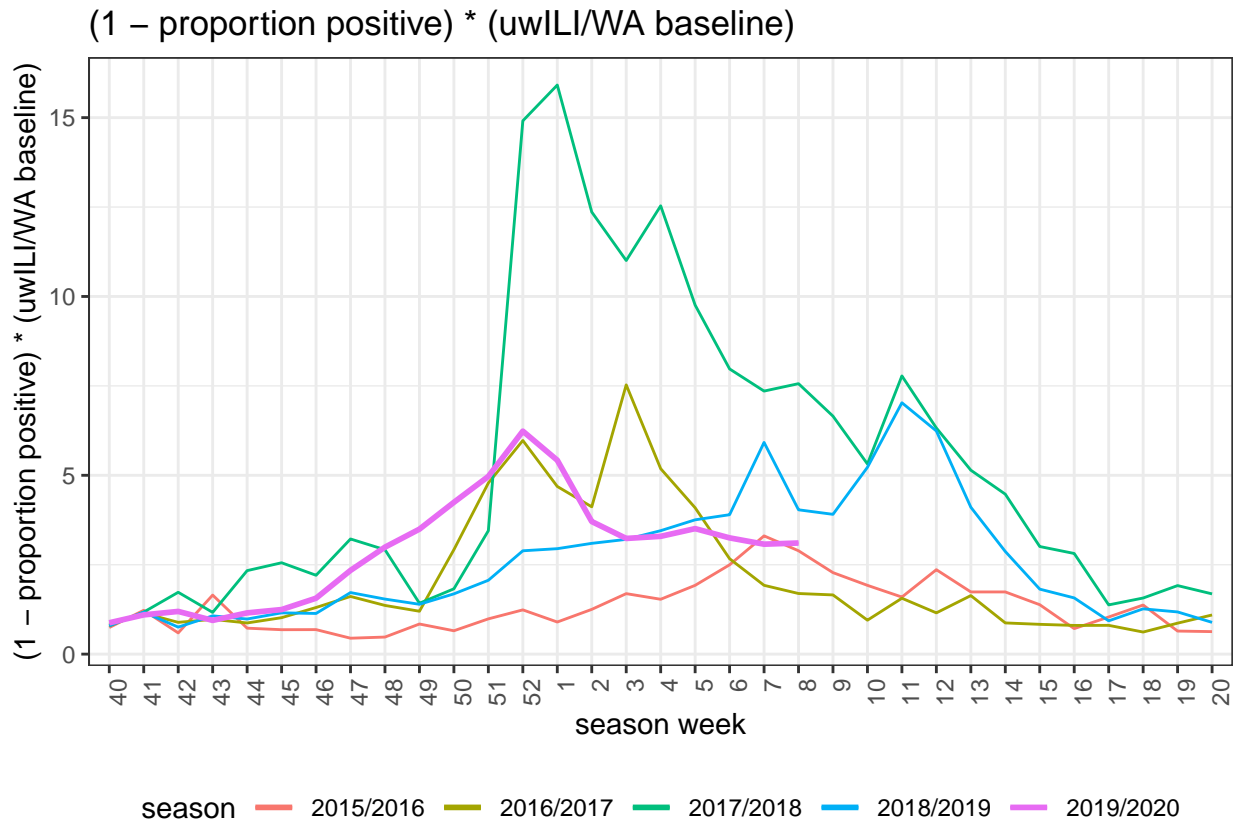


Figure 1: US HHS Regions plots showing ILI- values since the 2015/2016 season (top), and rILI- values (bottom).



Washington

Similarly in Washington,



Works Cited

- [1] <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/situation-reports/>
- [2] Yang, Y., Lu, Q., Liu, M., Wang, Y., Zhang, A., Jalali, N., Dean, N., Longini, I., Halloran, M. E., Xu, B., Zhang, X., Wang, L., Liu, W., & Fang, L. (2020). Epidemiological and clinical features of the 2019 novel coronavirus outbreak in China. MedRxiv, 2020.02.10.20021675. <https://doi.org/10.1101/2020.02.10.20021675>
- [3] Imai, N., Cori, A., Dorigatti, I., Baguelin, M., Donnelly, C. A., & Riley, S. (n.d.). Report 3: Transmissibility of 2019-nCoV. <https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-2019-nCoV-transmissibility.pdf>.

Changelog

29 February 2020: updated for new ILI data. Minor rephrasing in intro.

21 February 2020: updated for new ILI data.

16 February 2020: updated to revise name of COVID-19, updated case counts and ILINet data, added citations and revised statements about R0.

2 February 2020: Updated to include new ILINet data released on Friday, Jan 31.

26 January 2020: Although our overall assessment has not changed and our analysis has not been updated, we have updated the discussion to better convey the level of uncertainty in our analysis. We also added a heavier line for the 2019/2020 season in the figures.

25 January 2020: First version of report released.

1 March 2020: Added California analysis.