

Population-level patterns of COVID-19 and Flu: What should we expect?

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A perfect storm?

FLUVID > Flu and COVID

COVID-19 and flu, a perfect storm - Editorial in Science by Belongia and Osterhom DOI: [10.1126/science.abd2220](https://doi.org/10.1126/science.abd2220)



Source: David Clode/Unsplash.

Two competing menaces?

FLUVID < Flu or COVID



Source: Frida Bredesen/Unsplash.

Glass half empty

Flu or COVID < FLUVID < Flu and COVID



Source: Ellen Jenni/Unsplash.

Glass half empty

Flu or COVID < FLUVID < Flu and COVID



Source: Ellen Jenni/Unsplash.

Glass half empty

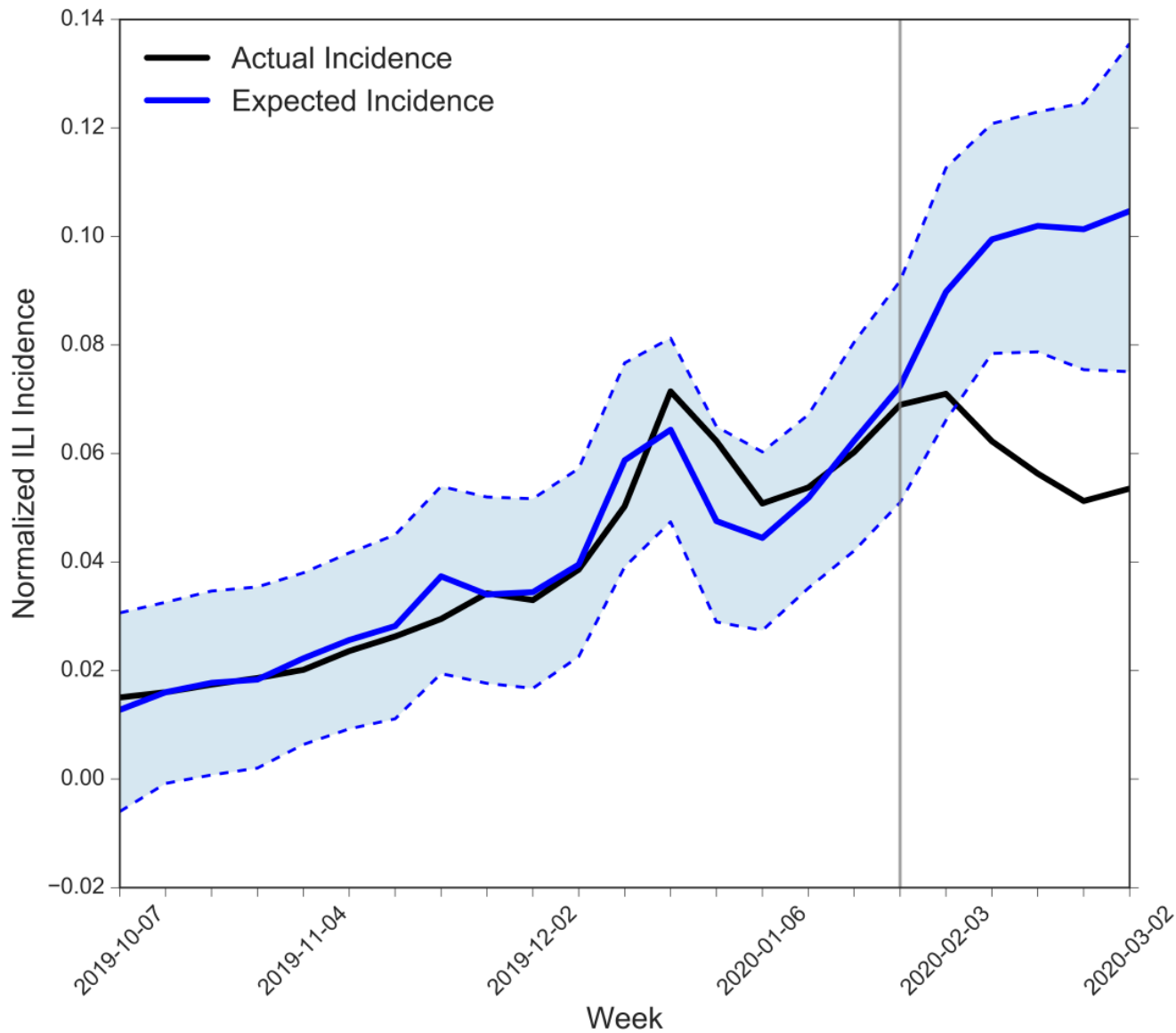
Flu or COVID < FLUVID < Flu and COVID



- Behavior change/Non-pharmaceutical interventions (NPI)
- Competition for hosts/Immunological interactions

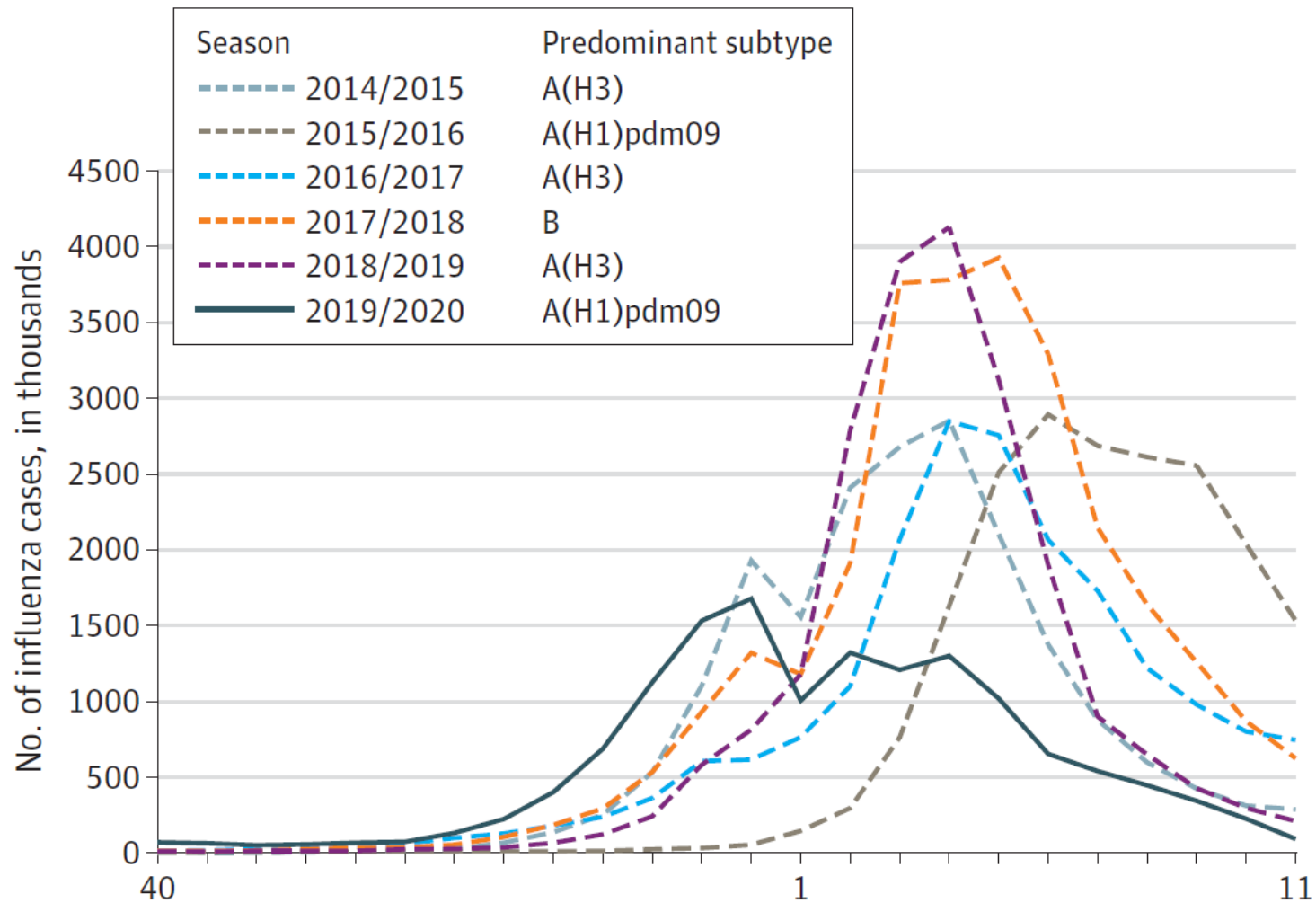
Behavior change/Non-pharmaceutical interventions (NPI)

2019/2020 Influenza in the US



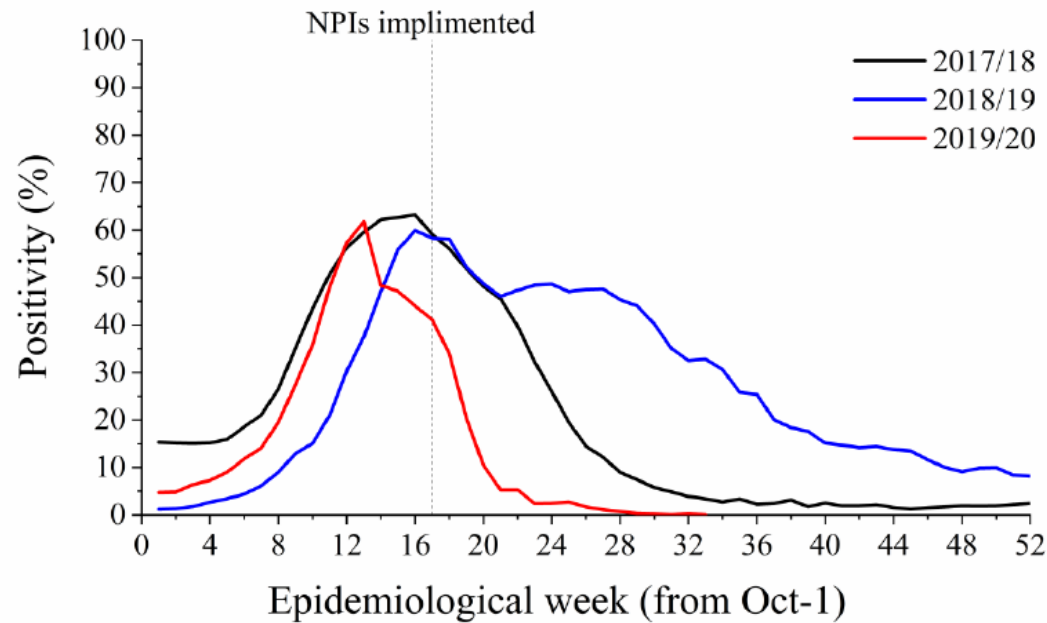
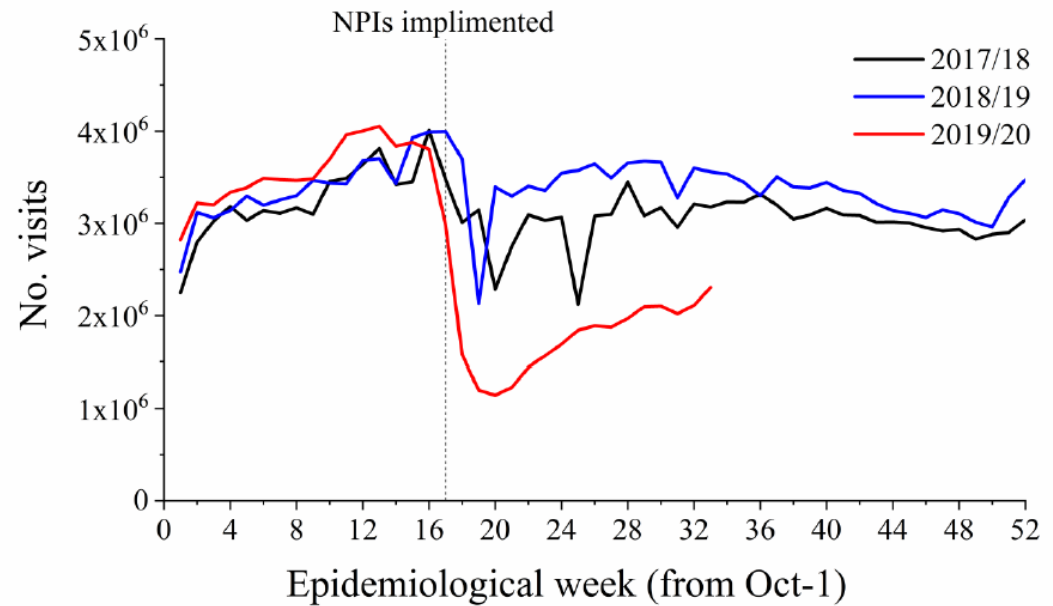
Zipfel and Bansal <https://doi.org/10.1101/2020.03.30.20047993>

2019/2020 Influenza in Japan



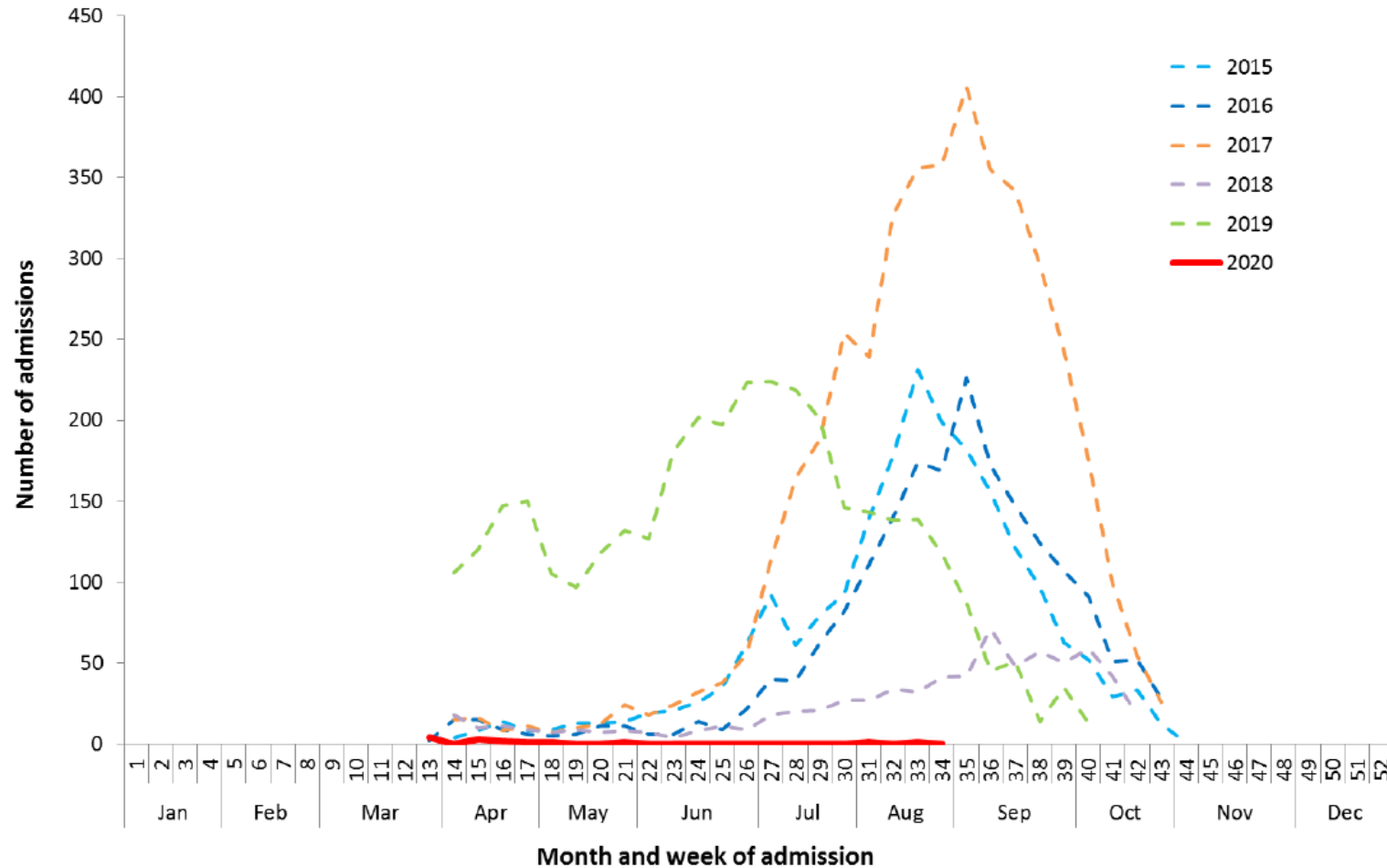
Sakamoto et al. <https://doi.org/10.1001/jama.2020.6173>

2019/2020 Influenza in China



2020 Influenza in Australia

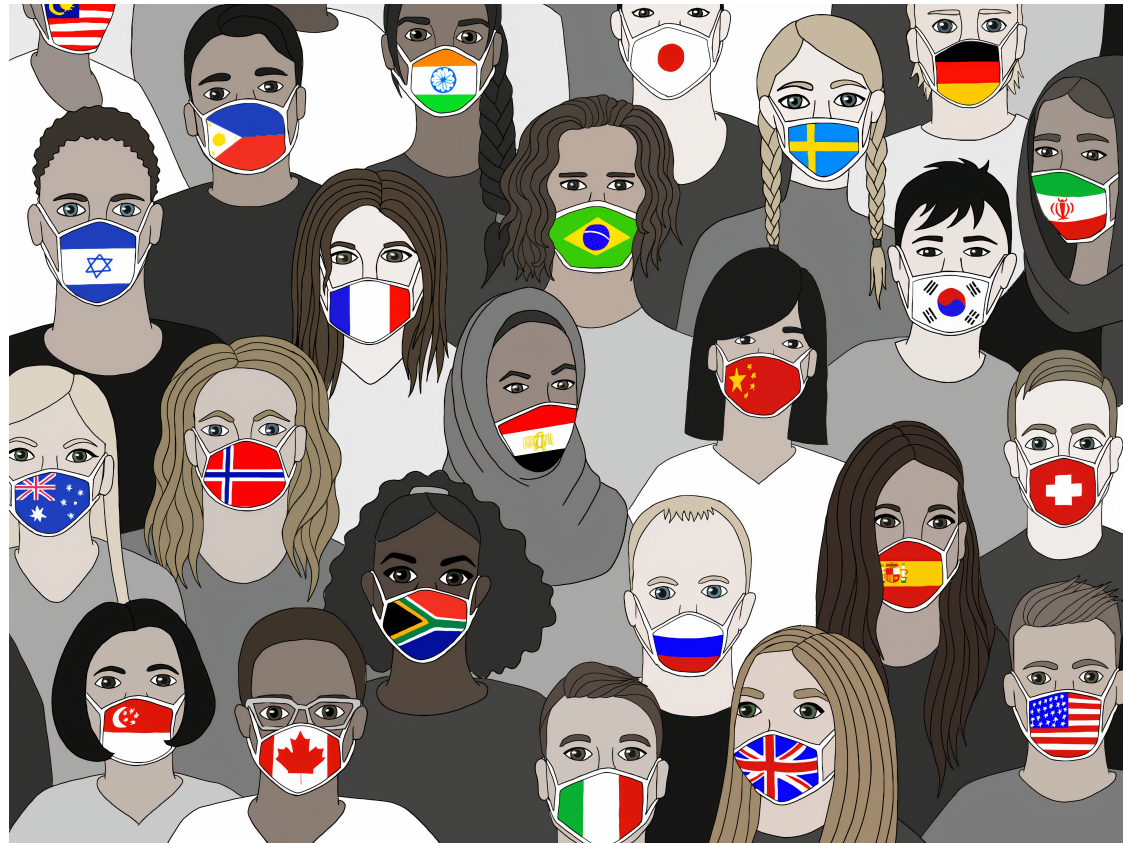
Figure 7. Number of influenza hospitalisations at sentinel hospitals, between March and October, 2014 to 2020 by month and week*



[Australian Influenza Surveillance Report.](#)

NPI work!

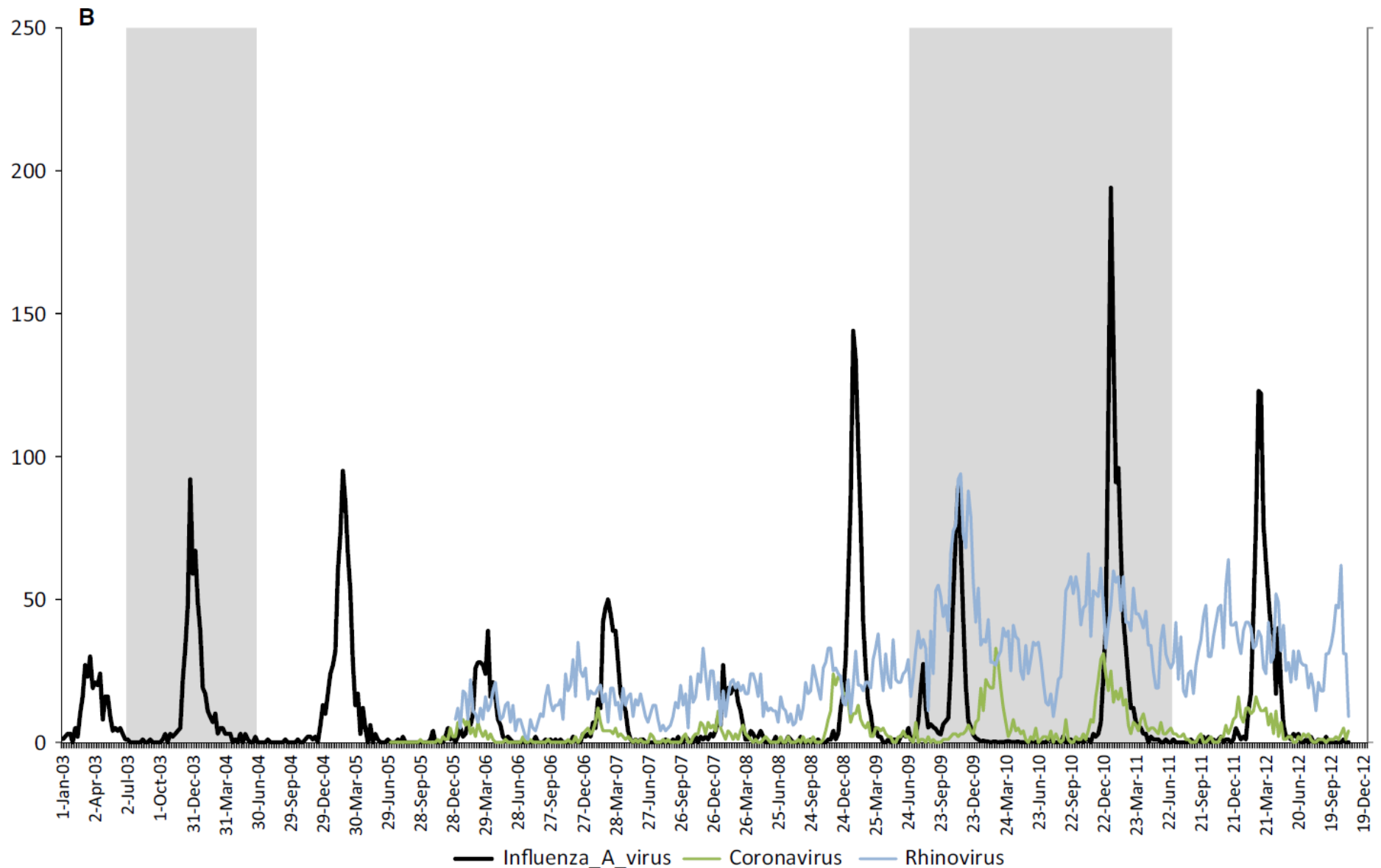
As long as we continue to adhere to NPI (e.g. reduced social interactions, mask use), we should expect to see lower numbers for **all respiratory infections**.



<https://unitednations.talenthouse.com/artworks/2280176>

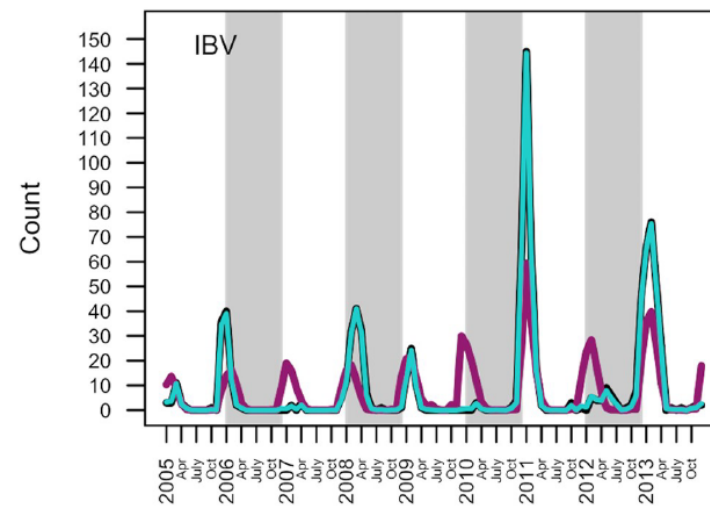
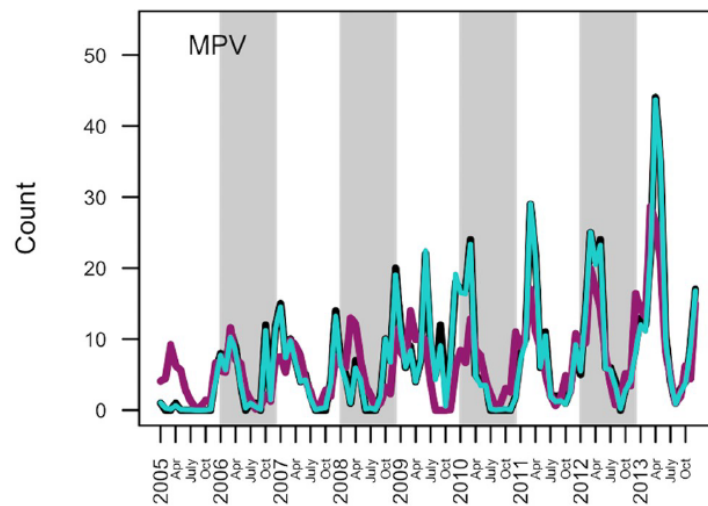
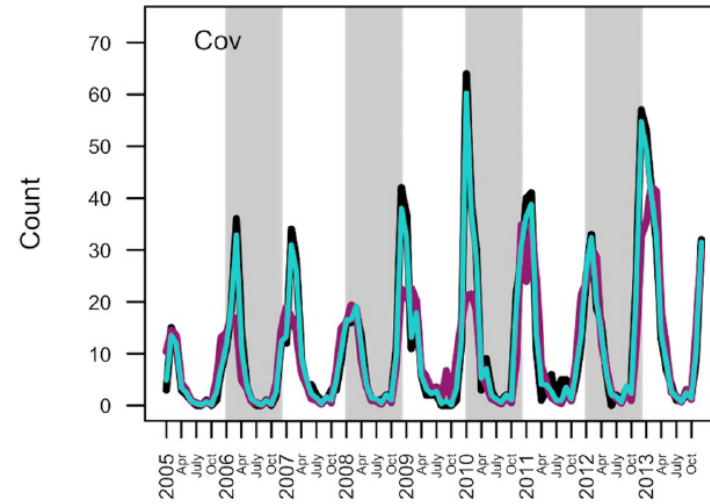
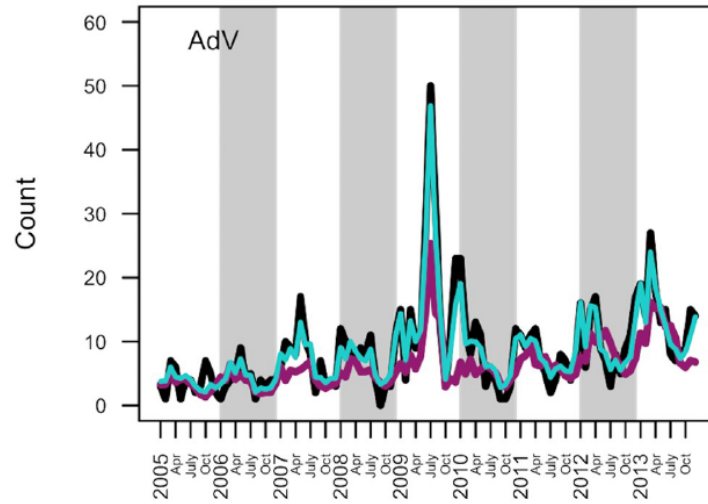
Competition for hosts/ Immunological interactions

Flu and hCoV circulation - Netherlands



van Asten et al. <https://doi.org/10.1111/irv.12348>
2009 influenza reduced by a scaling factor.

No interactions between Flu B and hCoV - Scotland



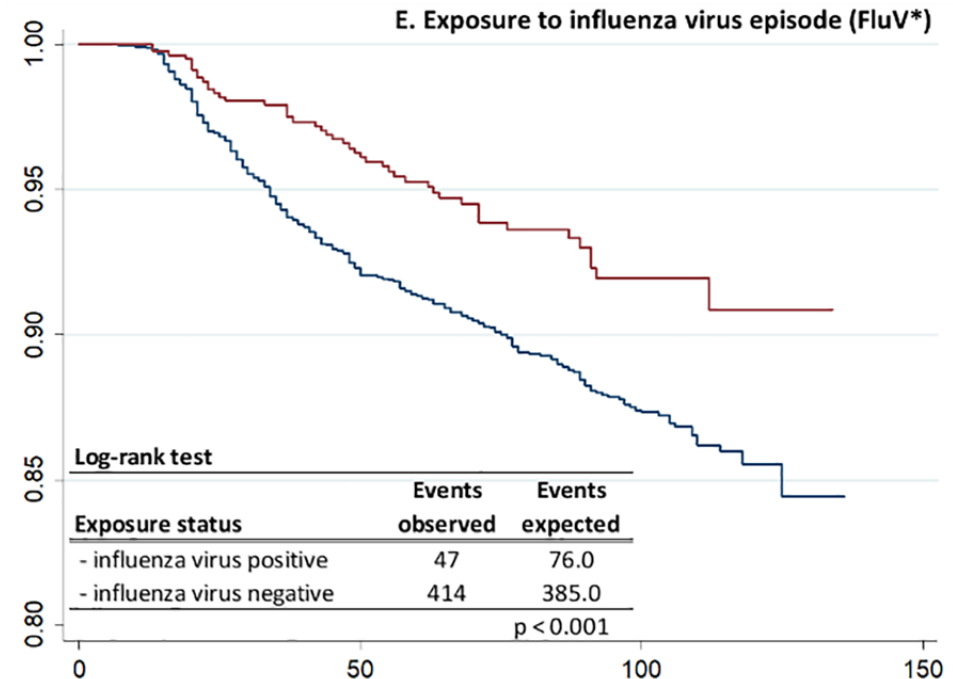
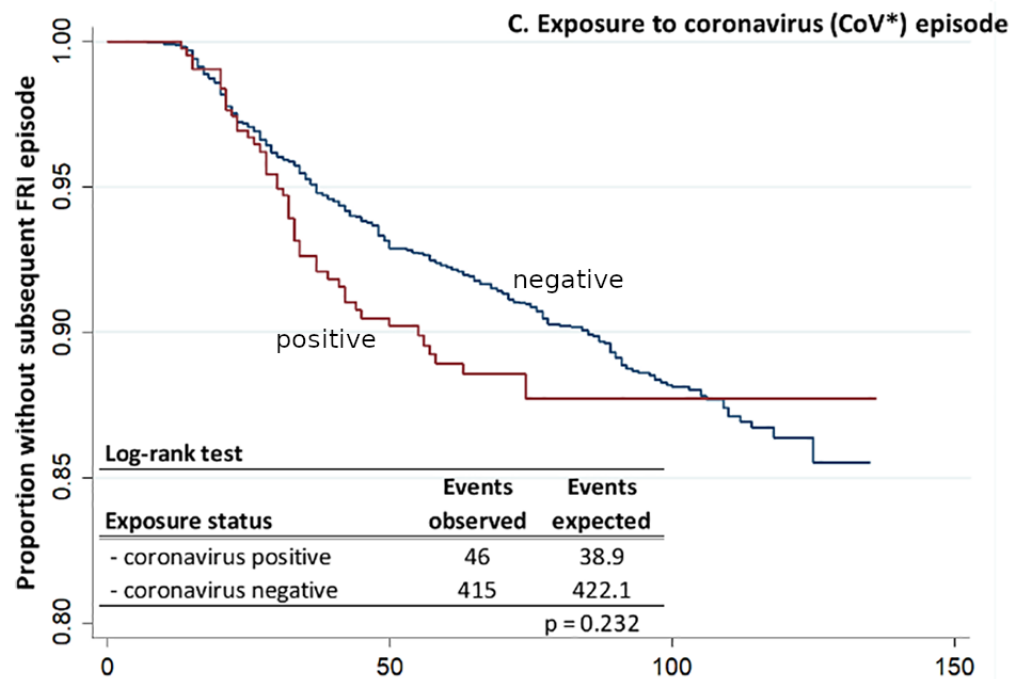
Maybe Flu - hCoV interactions - Australia 2011-16

Negative association for probability of co-infection

	Adenovirus	Coronavirus	Influenza A	Influenza B
Adenovirus		<0.001	<0.001	0.004
		0.35 (0.20–0.61)	0.11 (0.06–0.21)	0.17 (0.05–0.58)
Coronavirus		p-value	0.007	0.255
		Odds ratio	0.37 (0.18–0.76)	1.66 (0.69–4.01)

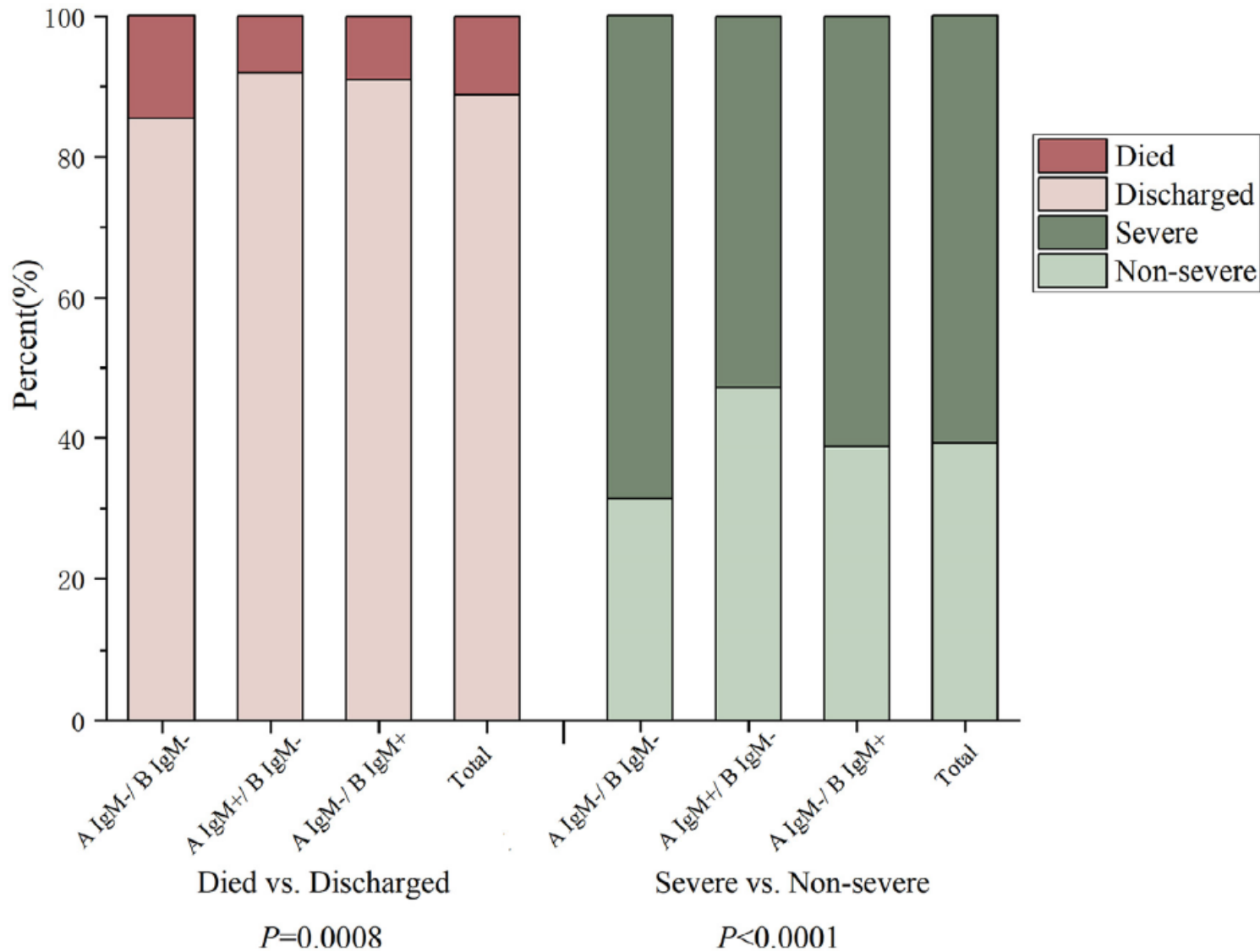
Price et al. <https://doi.org/10.1017/S0950268819001055>

No Flu - hCoV interactions among Singapore military recruits



Chen et al. <https://doi.org/10.1093/infdis/jiz046>

Flu might reduce COVID impact



Wu et al. <https://doi.org/10.1016/j.jinf.2020.05.050>

Host/immunity interactions

Interaction between COVID-19 and Flu are likely, but effects are probably small.



Source: Frank Busch/Unsplash.

Predictions: Near-term (this flu season)

- COVID-19 is more transmissible than flu:
 - COVID-19: $R_0 \approx 3-6$, $R_{\text{effective}} \approx R_0$
 - Flu: $R_0 \approx 2-4$, $R_{\text{effective}} \approx 1.X$
- Children/schools are strong drivers of Flu transmission. Currently, most schools have NPI in place.
- Assuming NPI continue, this flu season will be mild.
- Most ILI will likely be COVID-19 (or Rhinovirus), few co-infections.

“Predictions”: Long-term

- Flu and COVID-19 will co-circulate.
- Flu and COVID-19 will likely show some interactions (e.g. a bad/early flu season might lead to a less strong COVID season.)
- Any more solid/precise predictions seem impossible, **because...**



<https://phil.cdc.gov/Details.aspx?pid=2836>

Future vaccines/treatments/NPI

Vaccines: the most important factor

- When do we get COVID vaccine(s), how good will they be, what will the uptake be?
- Will COVID vaccine uptake influence Flu vaccine use?
- How “universal” will a universal Flu vaccine be and when will we have it?

COVID-19 Treatment

- What kind of treatments will become available for COVID?

Future NPI/behavior

- How will NPI and individual behavior be permanently altered?
- How will that be affected by treatments or vaccines?

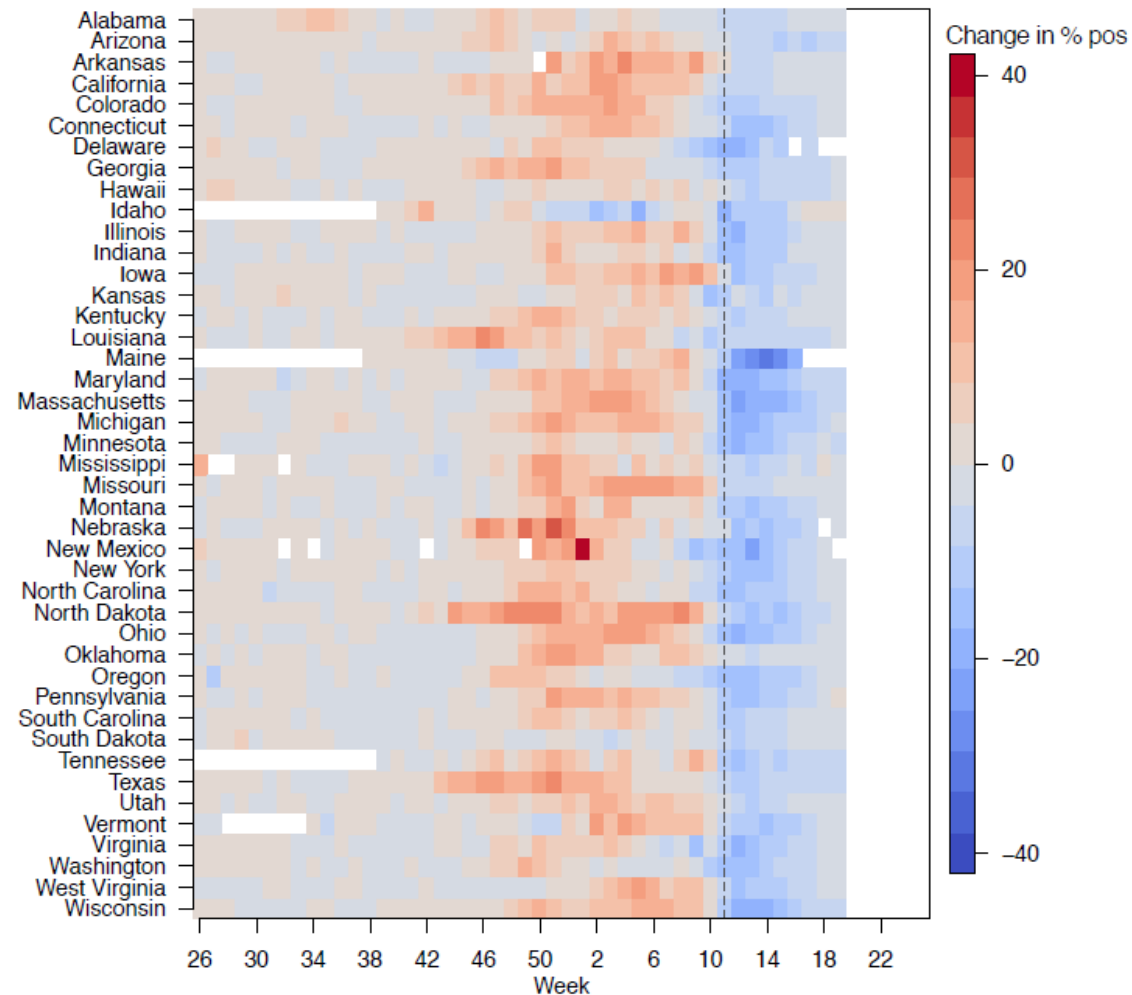
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Additional slides

2019/2020 Influenza in the US

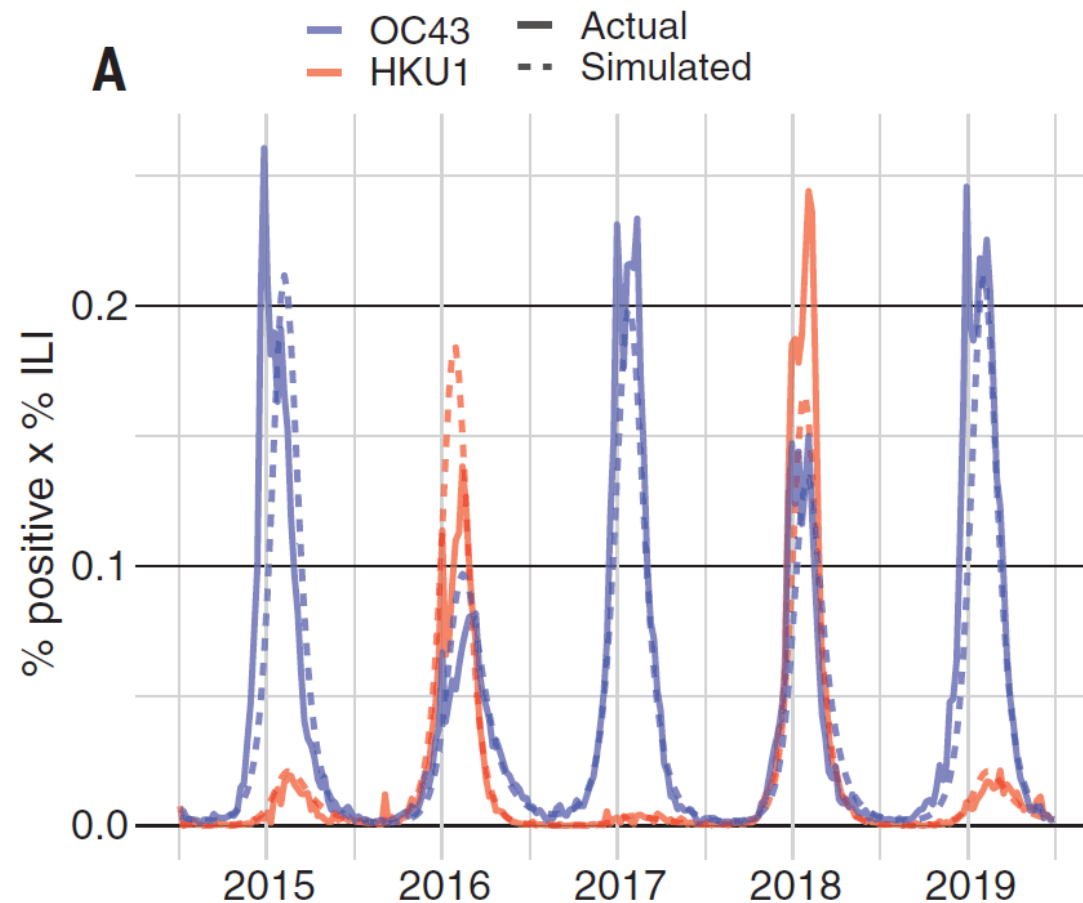
Difference between average of past years and actual incidence



Baker et al. <https://doi.org/10.1101/2020.06.22.20137588>

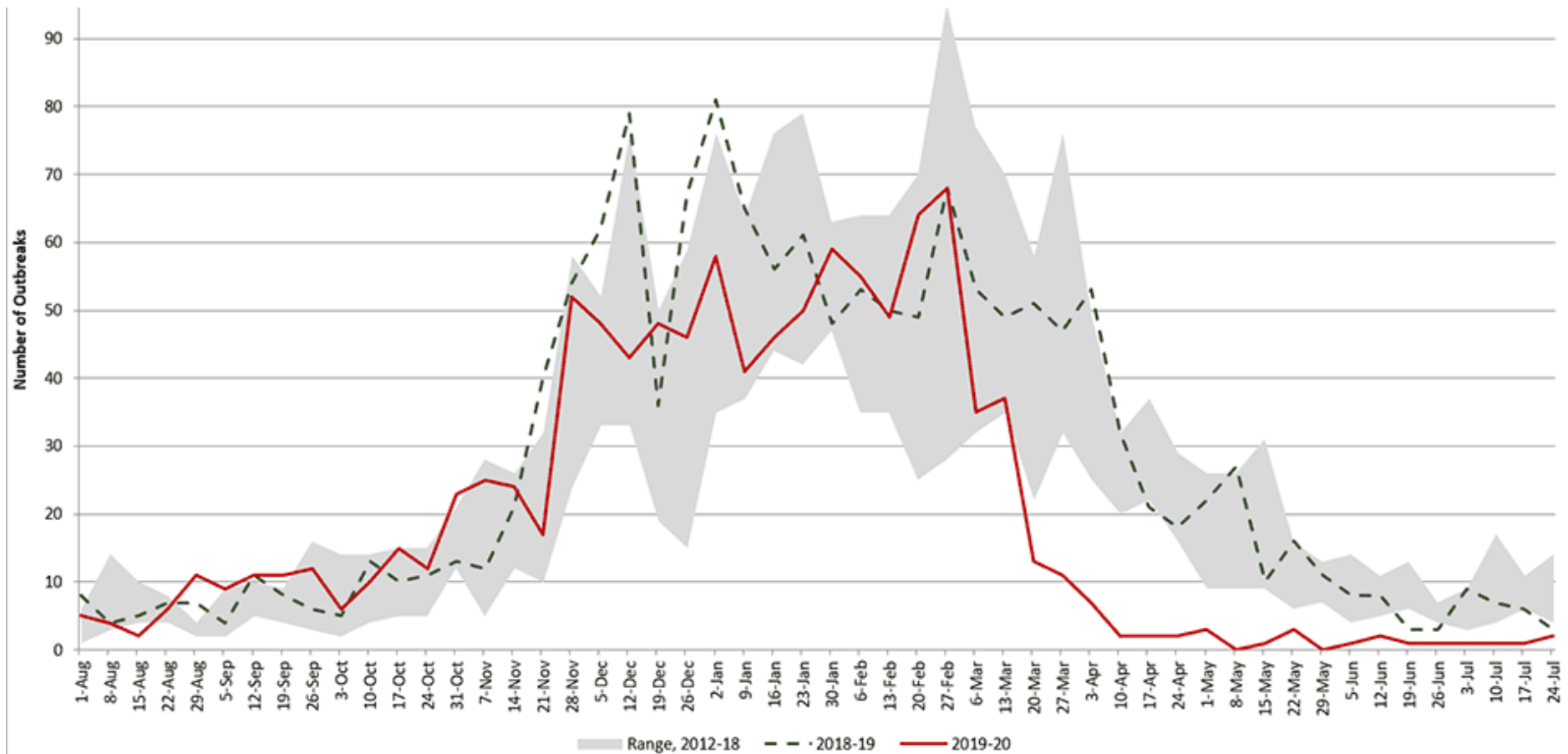
Expect interactions between hCoV and COVID-19

Different human betacoronaviruses seem to interact. Interactions between those strains and COVID-19 are likely.



Kissler et al. <https://doi.org/10.1126/science.abb5793>

COVID-19 impacts not just flu: Norovirus outbreaks in the US



<https://www.cdc.gov/norovirus/reporting/norostat/data.html>