

# COVID-19

## ET MAINTENANT, ON FAIT QUOI ? LE POINT SUR LE FUTUR DE L'ÉPIDÉMIE

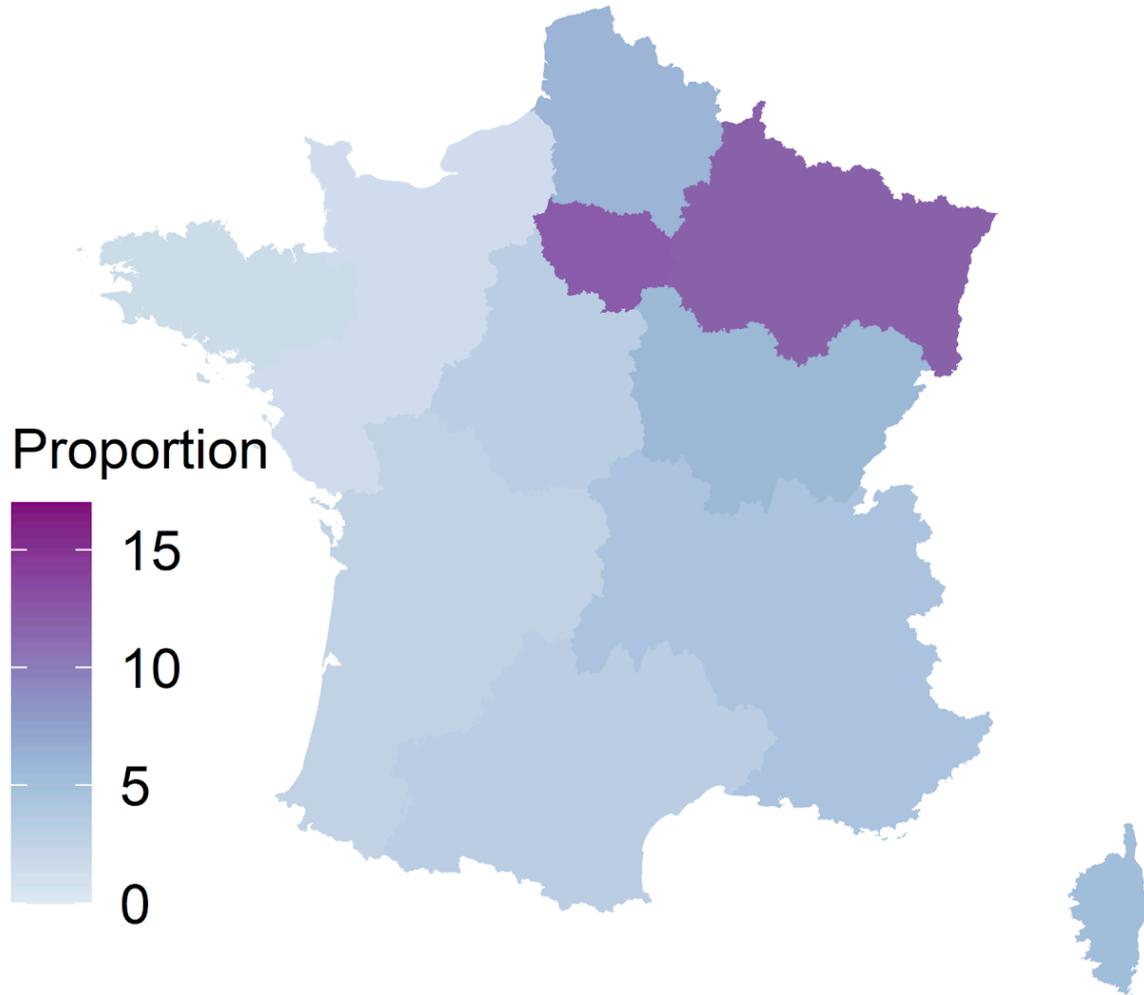
**ARNAUD FONTANET**

Responsable du département Santé globale  
de l'Institut Pasteur  
CNAM



INSTITUT DE FRANCE  
Académie des sciences

Proportion infected - May 11th (%)



# COVID -19 1<sup>ère</sup> vague France, 2020

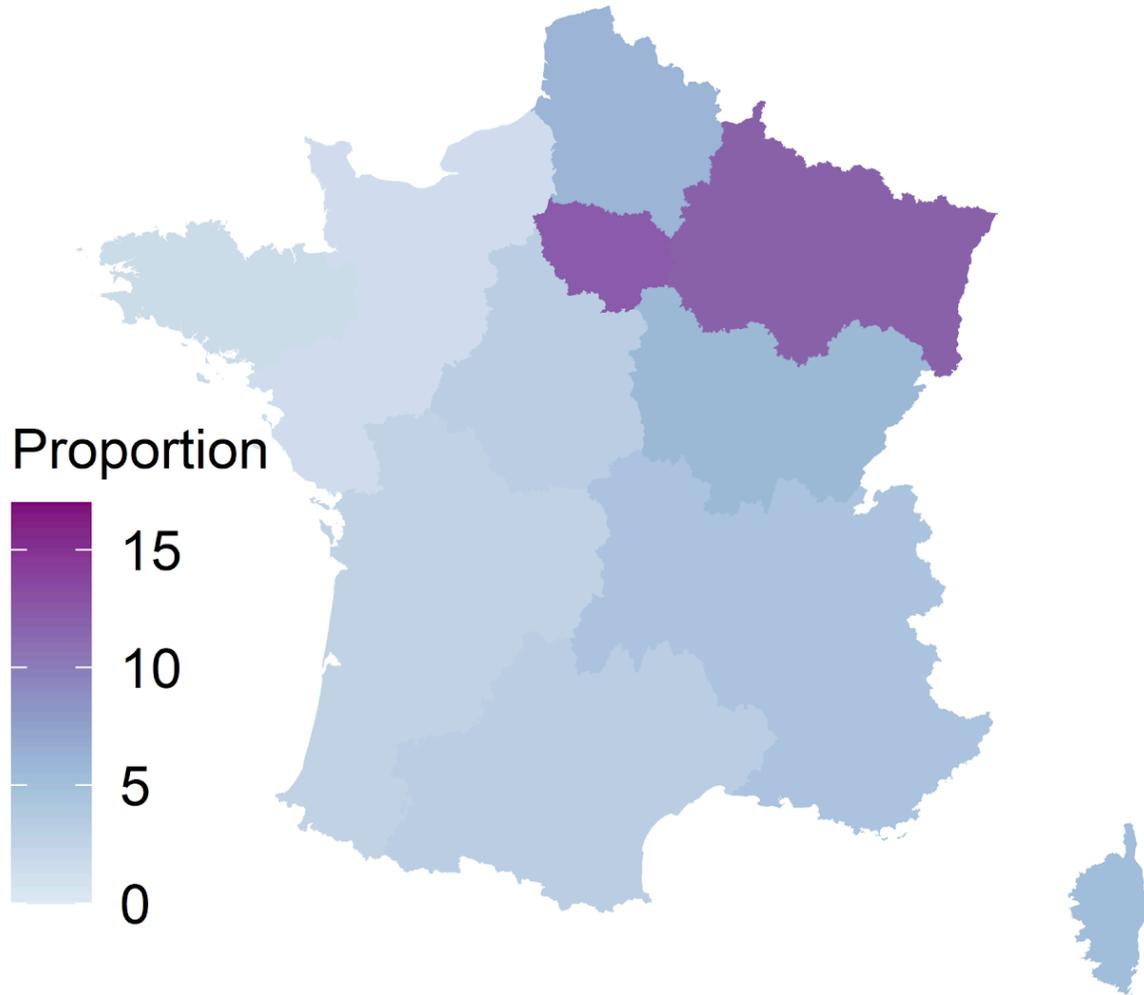
5.7% de la population infectée

$R_0 = 3.3$

Immunité collective:  $1 - (1/3.3) = 70\%$

(Salje et al., 2020, submitted)

Proportion infected - May 11th (%)



# COVID -19 1<sup>ère</sup> vague France, 2020

5.7% de la population infectée

$R_0 = 3.3$

Immunité collective:  $1 - (1/3.3) = 70\%$

Et maintenant, on fait quoi?

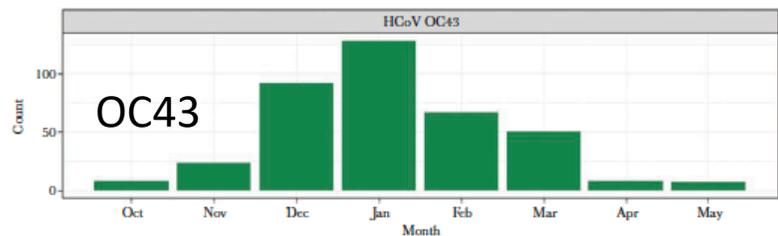
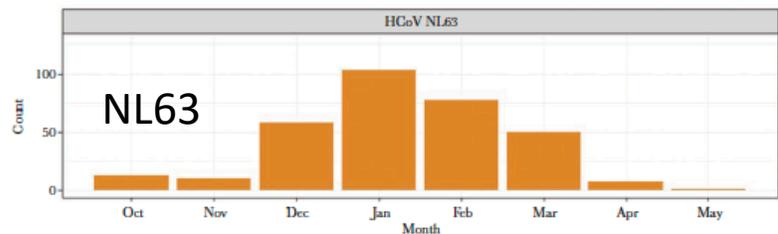
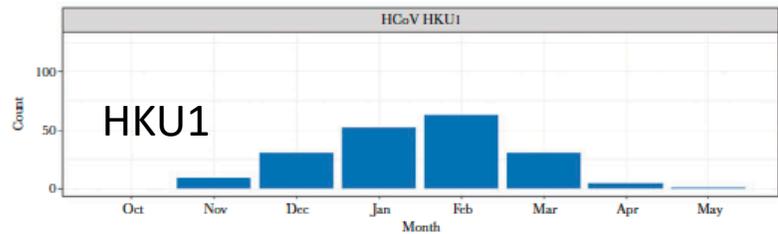
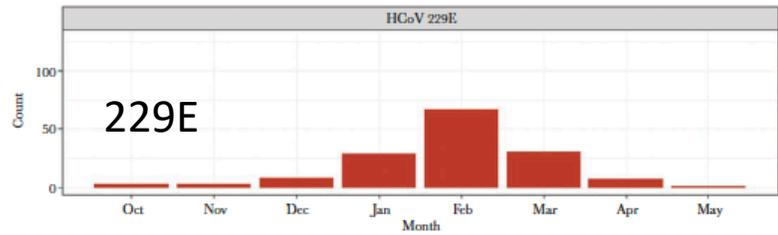
(Salje et al., 2020, submitted)

# Coronavirus saisonniers

## Cohorte HIVE

### Ann Harbor, Michigan

#### 2010-8



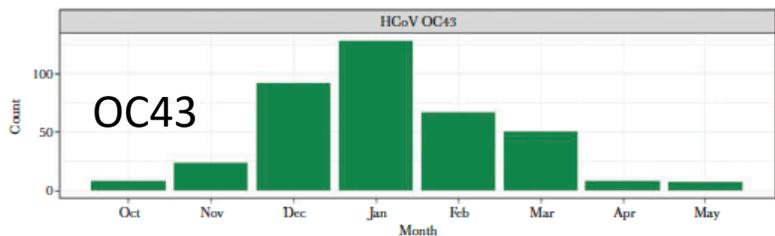
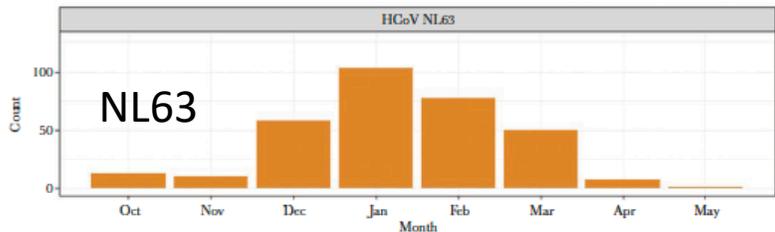
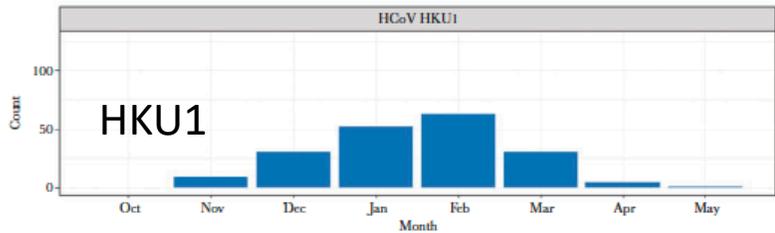
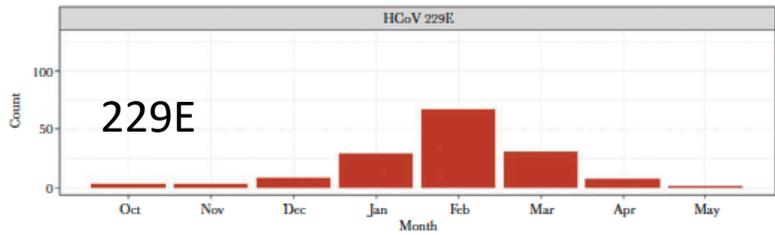
(Monto et al., JID, 2020)

# Coronavirus saisonniers

## Cohorte HIVE

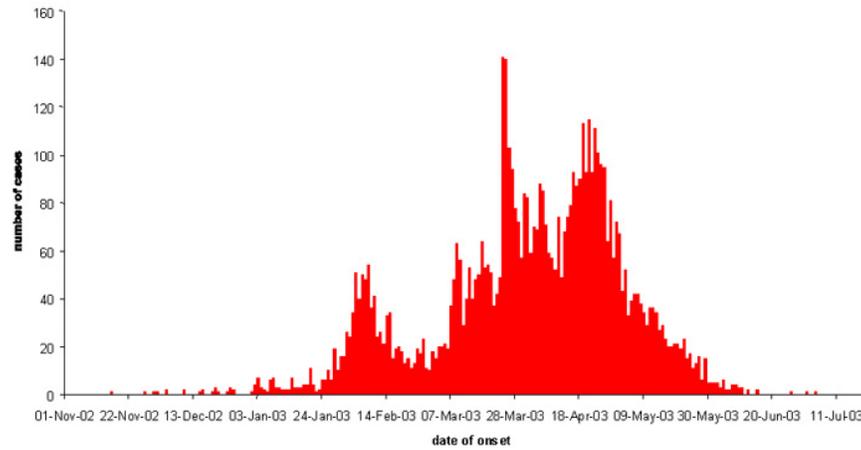
### Ann Harbor, Michigan

#### 2010-8



(Monto et al., JID, 2020)

Probable cases of SARS by week of onset  
Worldwide\* (n=5,910), 1 November 2002 - 10 July 2003



\*This graph does not include 2,527 probable cases of SARS (2,521 from Beijing, China), for whom no dates of onset are currently available.

SRAS, 2003

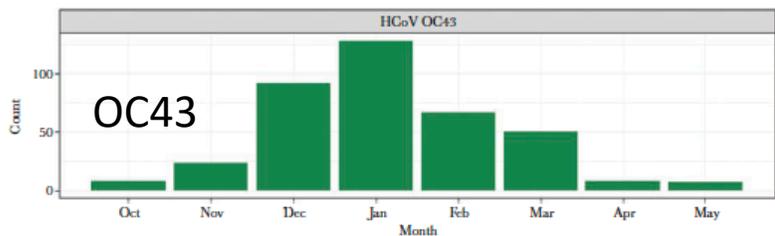
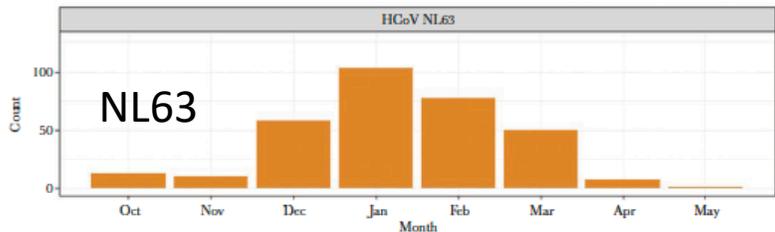
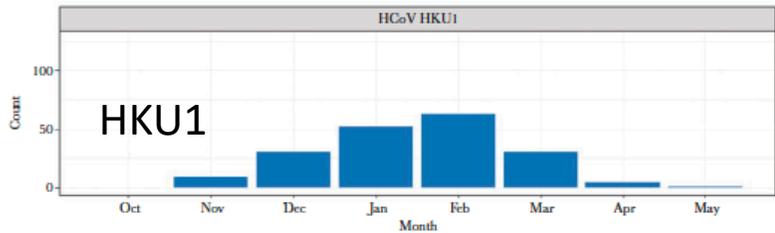
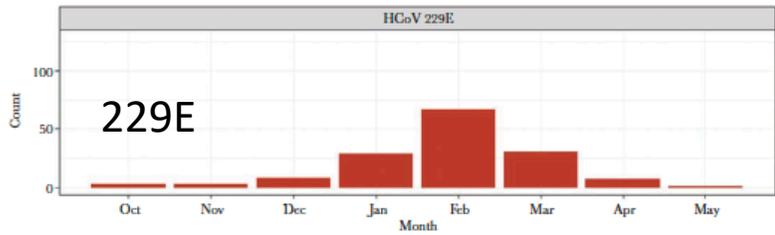
(Source: OMS)

# Coronavirus saisonniers

## Cohorte HIVE

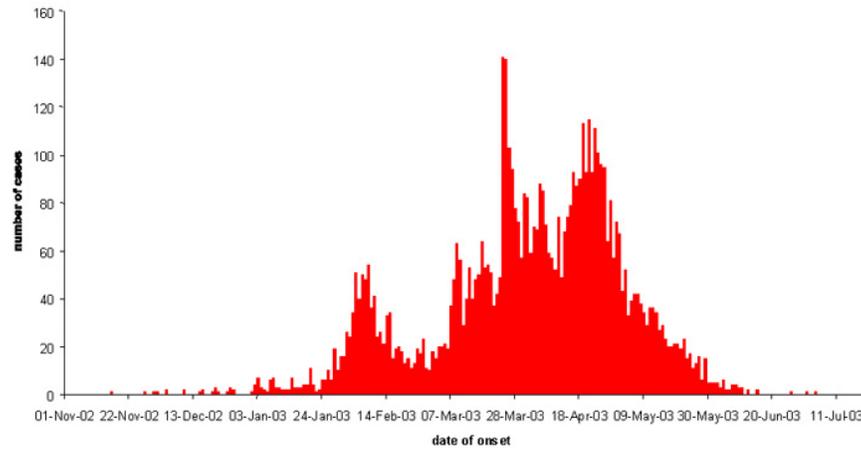
### Ann Harbor, Michigan

#### 2010-8



(Monto et al., JID, 2020)

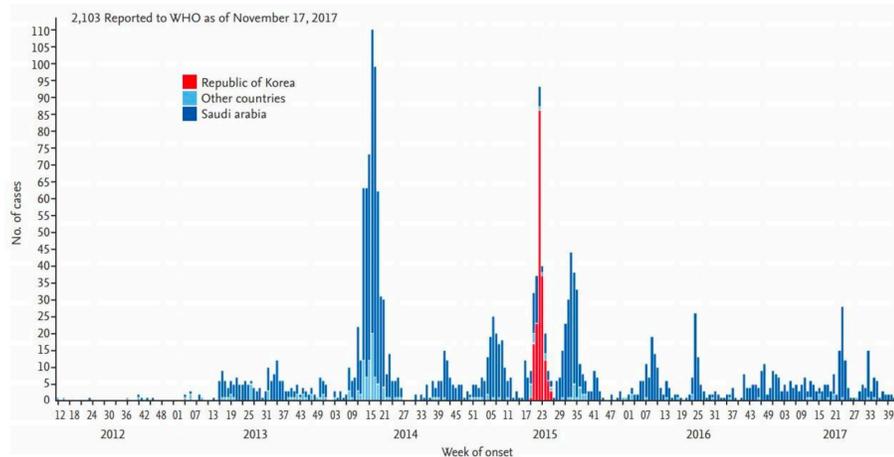
Probable cases of SARS by week of onset  
Worldwide\* (n=5,910), 1 November 2002 - 10 July 2003



SRAS, 2003

(Source: OMS)

\*This graph does not include 2,527 probable cases of SARS (2,521 from Beijing, China), for whom no dates of onset are currently available.



MERS, 2012-7

(Source: OMS)

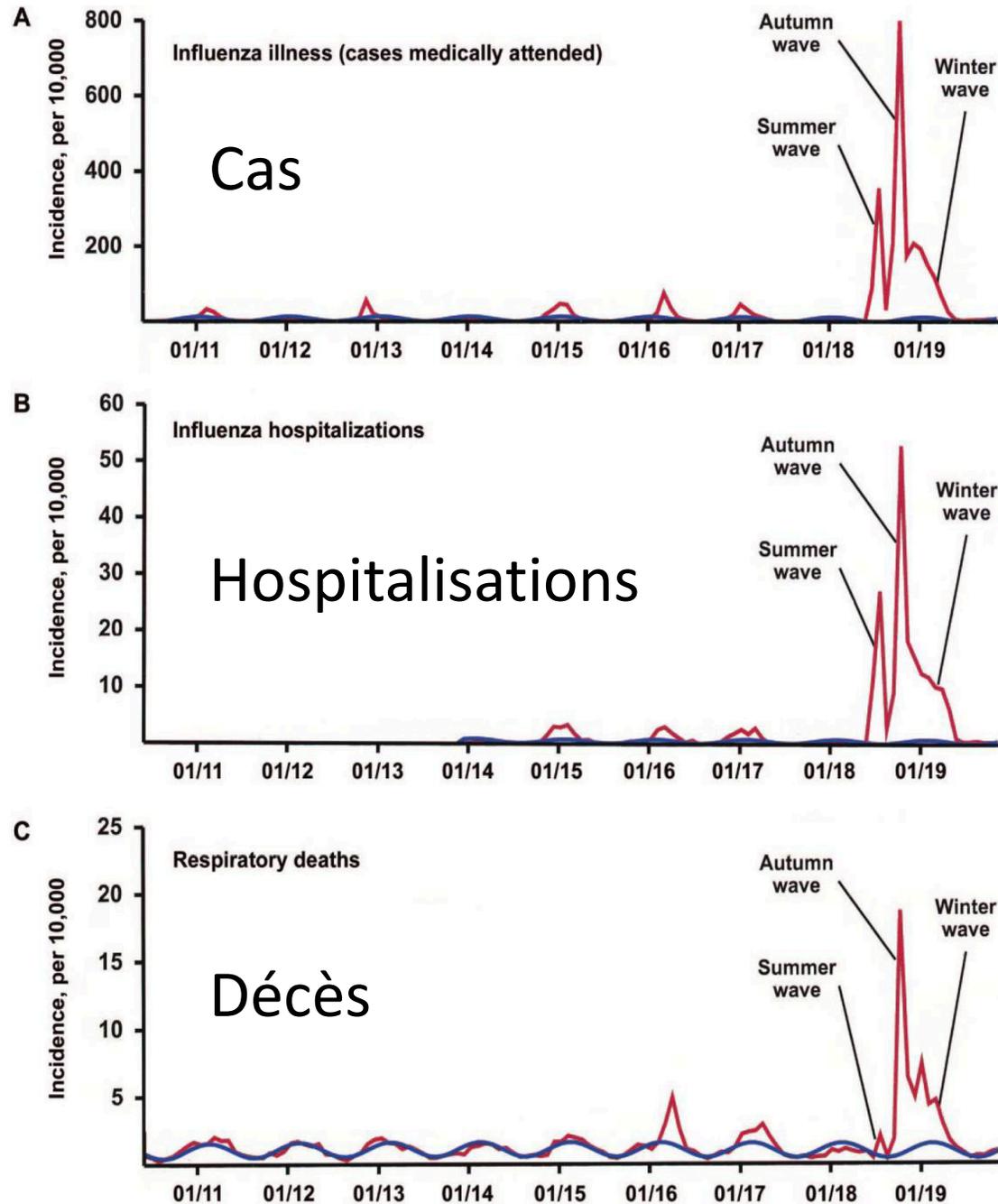
# Effet de la température – SARS-CoV-2

Table. Stability of SARS-CoV-2 at different environmental conditions.

Time	Virus titre (Log TCID <sub>50</sub> /mL)									
	4°C		22°C		37°C		56°C		70°C	
	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD	Mean	±SD
1 min	N.D.	N.D.	6.51	0.27	N.D.	N.D.	6.65	0.1	5.34	0.17
5 mins	N.D.	N.D.	6.7	0.15	N.D.	N.D.	4.62	0.44	U	-
10 mins	N.D.	N.D.	6.63	0.07	N.D.	N.D.	3.84	0.32	U	-
30 mins	6.51	0.27	6.52	0.28	6.57	0.17	U	-	U	-
1 hr	6.57	0.32	6.33	0.21	6.76	0.05	U	-	U	-
3 hrs	6.66	0.16	6.68	0.46	6.36	0.19	U	-	U	-
6 hrs	6.67	0.04	6.54	0.32	5.99	0.26	U	-	U	-
12 hrs	6.58	0.21	6.23	0.05	5.28	0.23	U	-	U	-
1 day	6.72	0.13	6.26	0.05	3.23	0.05	U	-	U	-
2 days	6.42	0.37	5.83	0.28	U	-	U	-	U	-
4 days	6.32	0.27	4.99	0.18	U	-	U	-	U	-
7 days	6.65	0.05	3.48	0.24	U	-	U	-	U	-
14 days	6.04	0.18	U	-	U	-	U	-	U	-

A) Temperature\*

# Grippe espagnole Copenhague, 1918-9



1<sup>ère</sup> vague estivale:

- R: 2.2-3.0
- CFR: 0.35%
- Excès mortalité: 15-44 ans

2<sup>ème</sup> vague automnale:

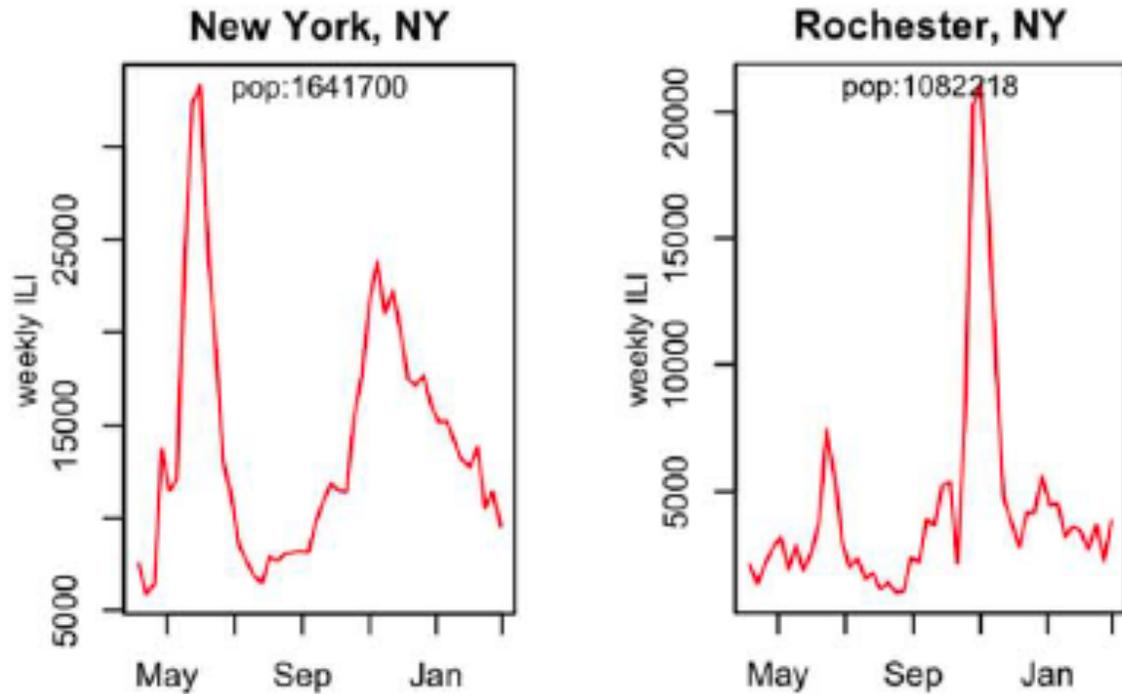
- R: 1.2-1.3
- CFR: 2.3%
- Excès mortalité: 15-44 ans

3<sup>ème</sup> vague hivernale:

- CFR: 1.7%
- Excès mortalité: équilibré

# Grippe H1N1 pdm09, 2009-2010

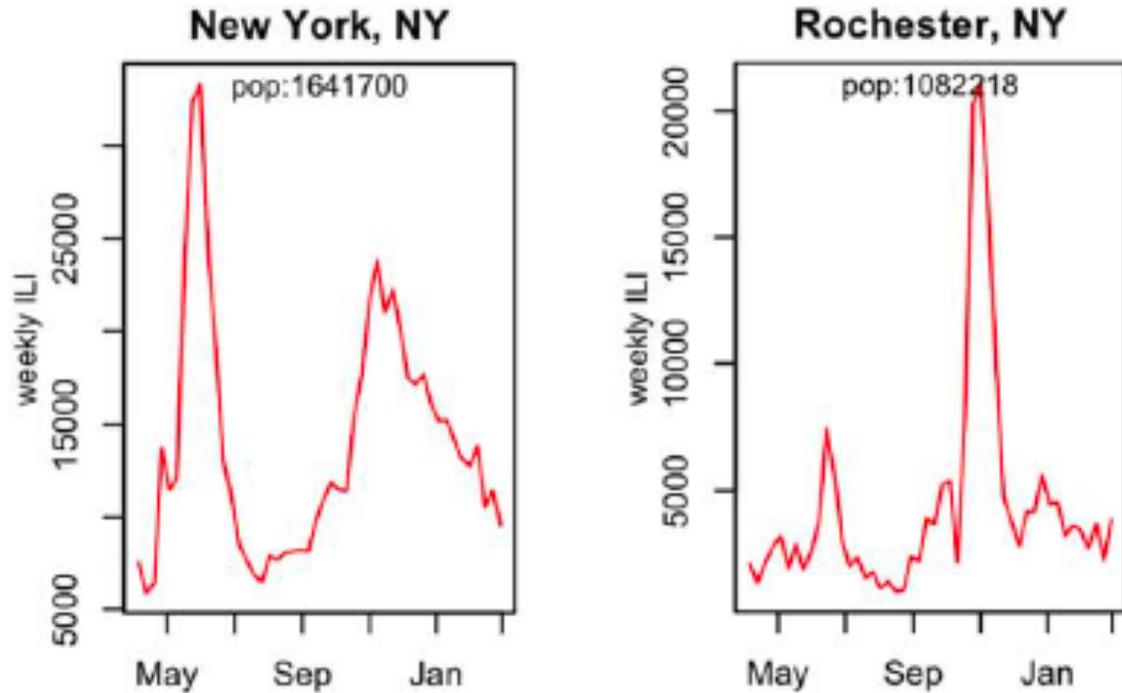
## Etat de New York



(Viboud et al, PLoS One, 2009)

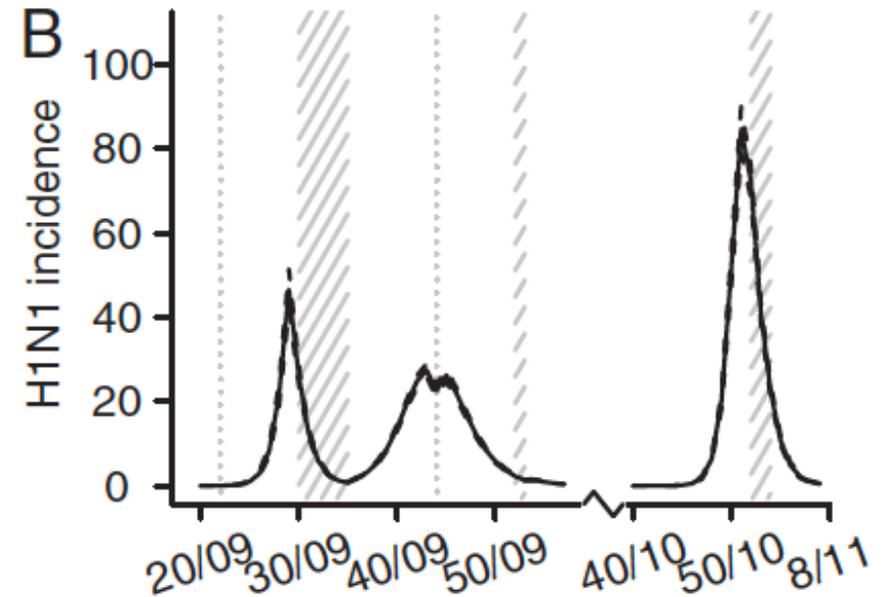
# Grippe H1N1 pdm09, 2009-2010

## Etat de New York

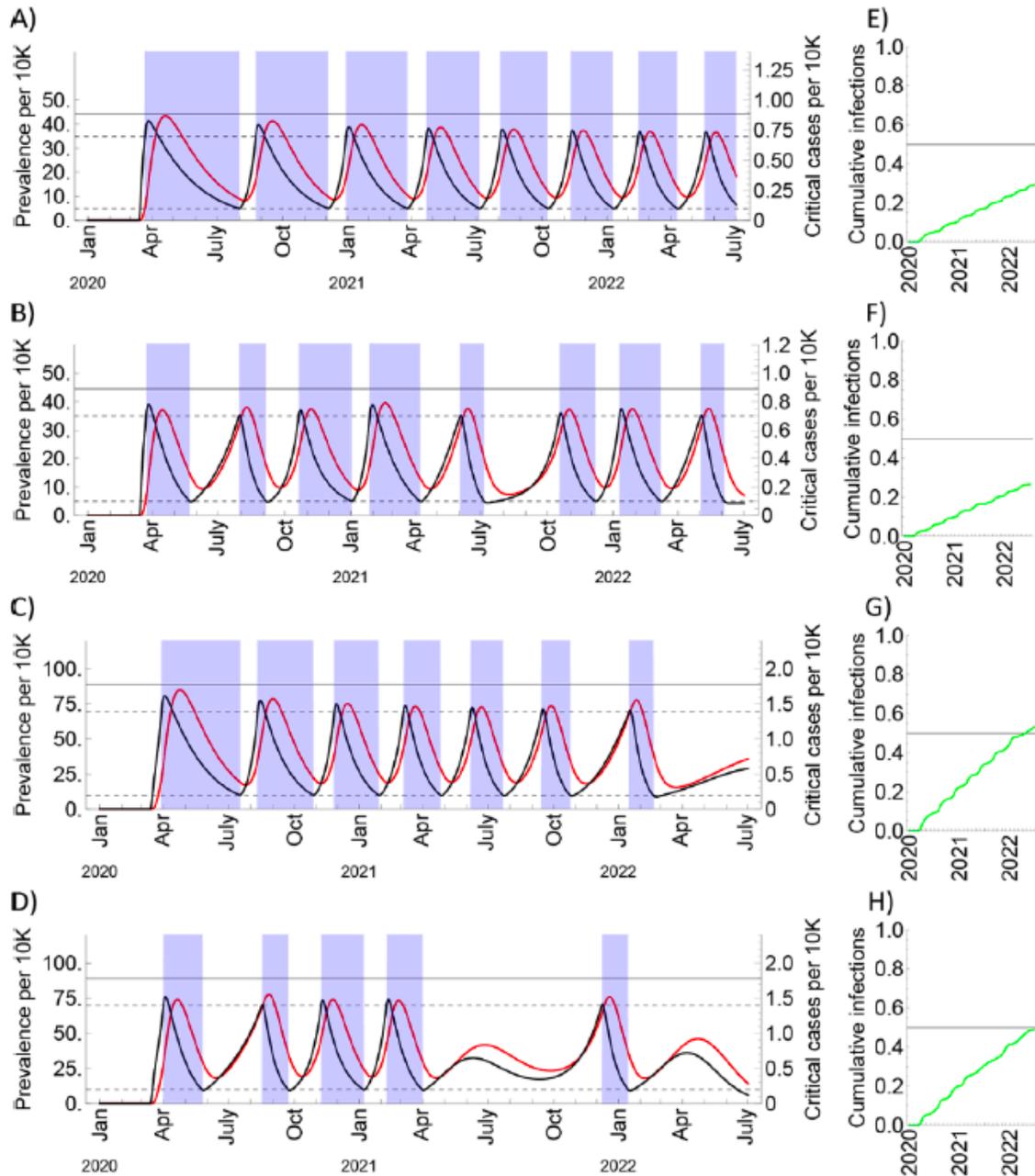


(Viboud et al, PLoS One, 2009)

## Royaume Uni

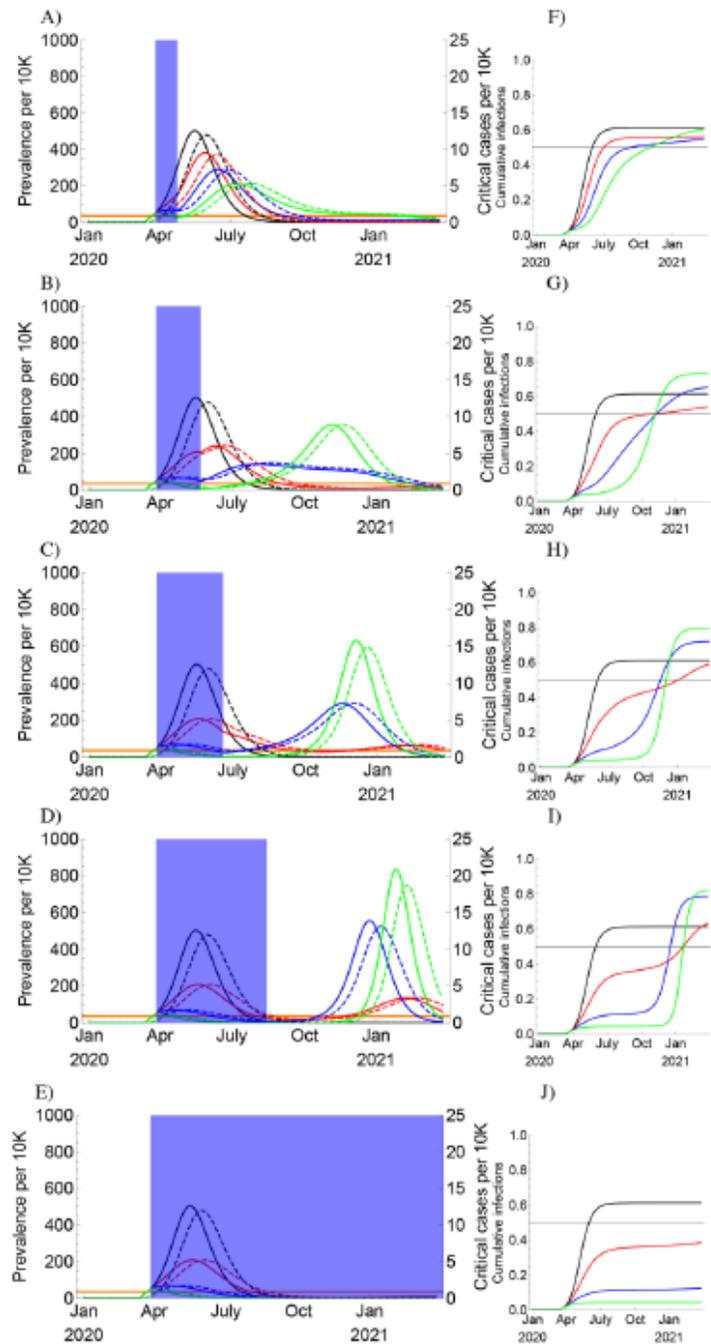


(Dorigatti, PNAS, 2013)



# Scénarios SARS-CoV-2 2020-2022

Acquisition de l'immunité  
collective par séquences  
« distanciation sociale » et  
« relâchement »



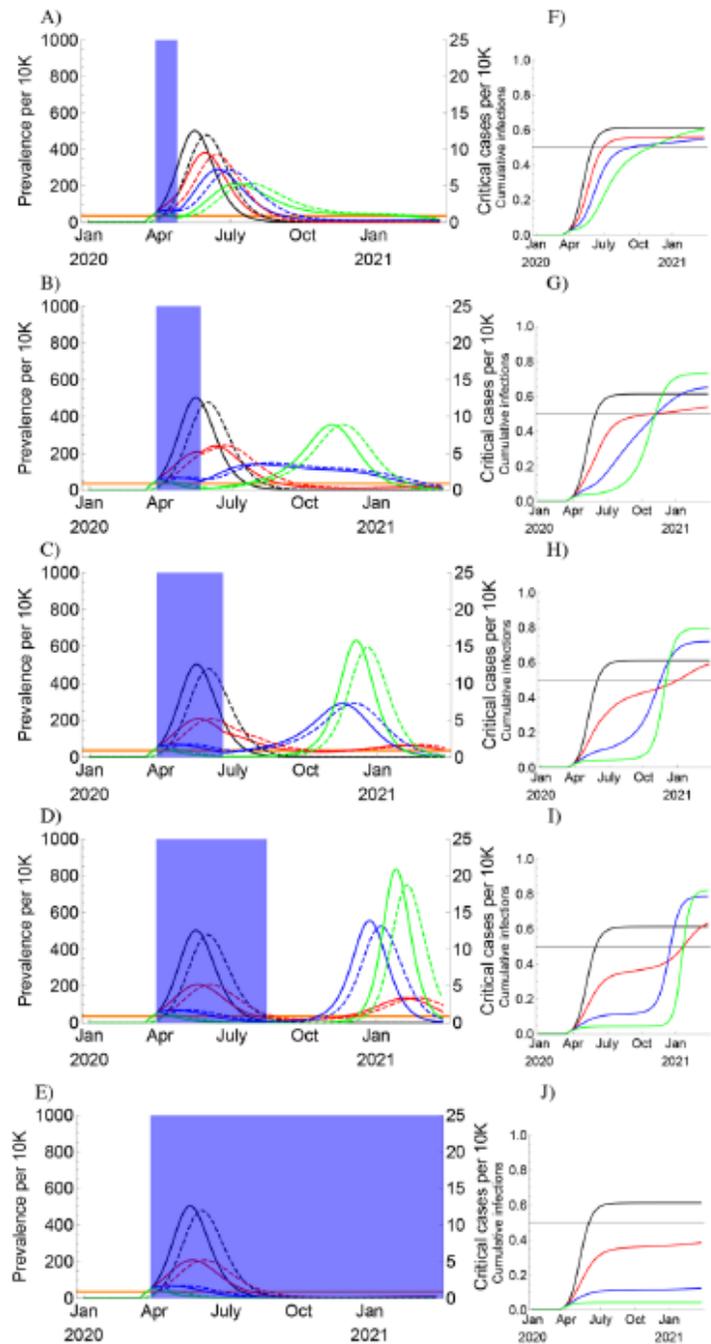
# Scénarios SARS-CoV-2 2020-2022

Acquisition de l'immunité collective par un épisode plus ou moins prolongé de « distanciation sociale »

$R_0 = 2.2$  et  $1.3$

Durée épisode de distanciation sociale: 4, 8, 12, 20 semaines et infini

Efficacité de distanciation sociale: 0%, 20%, 40%, 60%



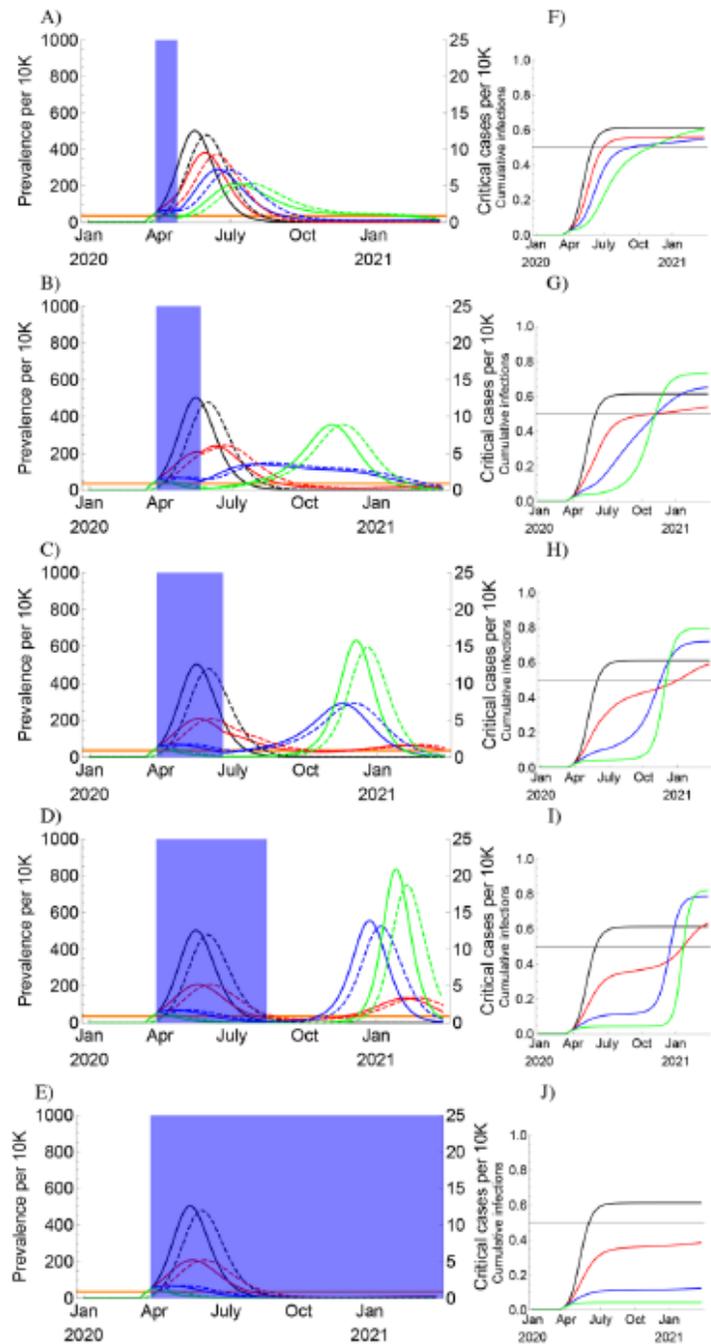
# Scénarios SARS-CoV-2 2020-2022

Et maintenant, on fait quoi?

$R_0 = 2.2$  et  $1.3$

Durée épisode de distanciation sociale: 4, 8, 12, 20 semaines et infini

Efficacité de distanciation sociale: 0%, 20%, 40%, 60%



# Scénarios SARS-CoV-2 2020-2022

Et maintenant, on fait quoi?

On cherche un traitement et un vaccin

$R_0 = 2.2$  et  $1.3$

Durée épisode de distanciation sociale: 4, 8, 12, 20 semaines et infini

Efficacité de distanciation sociale: 0%, 20%, 40%, 60%