

# Use and Misuse of Modelling Studies during the COVID-19 Pandemic: What is their Optimal Role?

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# WE CANNOT AFFORD LOCKDOWNS!

21 April 2020

## COVID-19 will double number of people facing food crises unless swift action is taken



Photo: WFP/ Marwa Awad, A family eating their meal in Burkina Faso

### What Happens to the Musicians When the Orchestra Music Stops?

After years of music training, performers see jobs in classical venues and theaters suddenly dry up; 'no one expects an entire field to disappear'



'No one expects an entire field to disappear,' says Ms. McLean.  
PHOTO: KAYANA SZYMCAK FOR THE WALL STREET JOURNAL

**The Observer** Coronavirus  
**Covid set to cause 400,000 surge in TB deaths as medics diverted**


Millions of missed diagnoses will add to global pandemic toll, warns WHO study

- Coronavirus - latest updates
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▲ A woman and children wait for TB screening at Jakhada village, north India. Photograph: Sanjay Baid/EPA

Collateral Global

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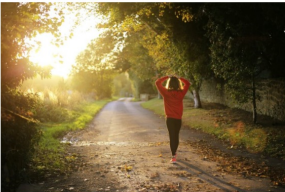
## A global repository for research into the collateral effects of the COVID-19 lockdown measures

The aim of Collateral Global is to provide a resource for scholarship and research into the collateral effects of responses to the COVID-19 pandemic. There are two main facets to this: on the one hand we need to understand how effective the response strategies to COVID-19 have been against their original objectives, and on the other hand to build an understanding of the effect of these strategies on public health, the economy and how people live their lives. Our aim is to gather this information from around the world and provide the data, research and other supporting material as a resource to inform public policy in the years ahead.

### Browse Studies by Topic



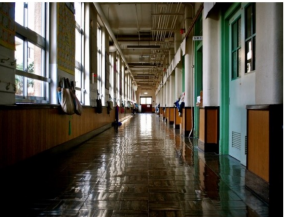
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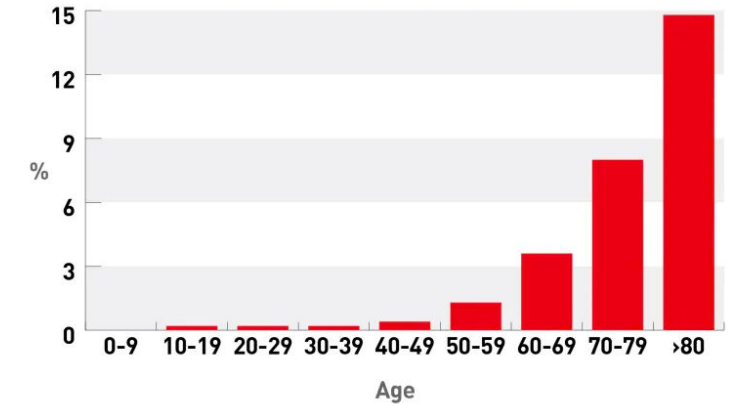


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# A workable solution?

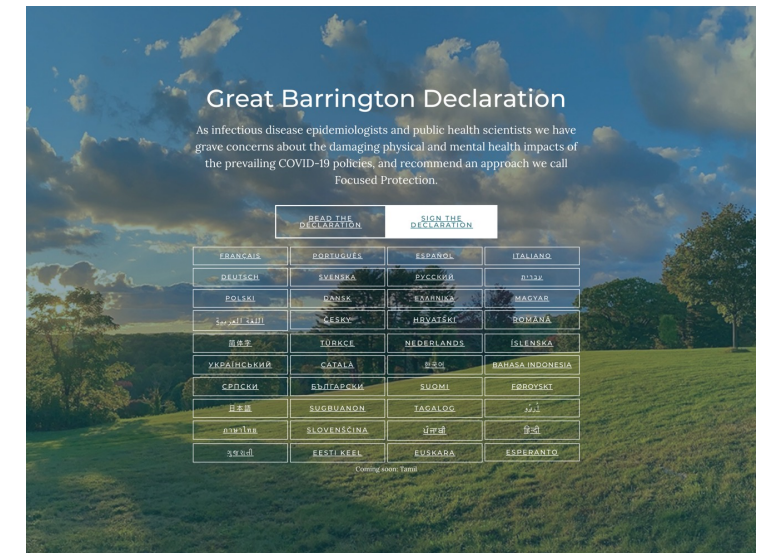
1. Shelter the vulnerable
2. Allow immunity to accumulate in the population
3. Invest in therapy/vaccination
4. Think outside national boundaries!

**COVID-19 fatality rate by age**  
Among diagnosed cases in Hubei, China, as of Feb.11

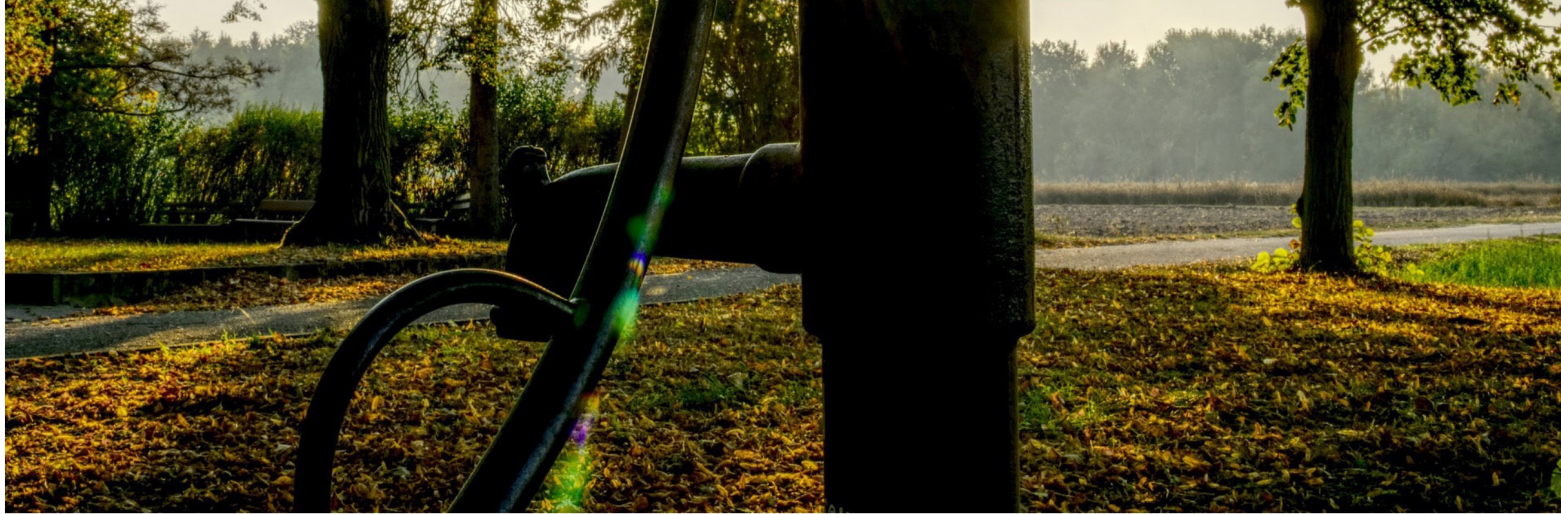


CBC NEWS

Source: Chinese Centre for Disease Control and Prevention





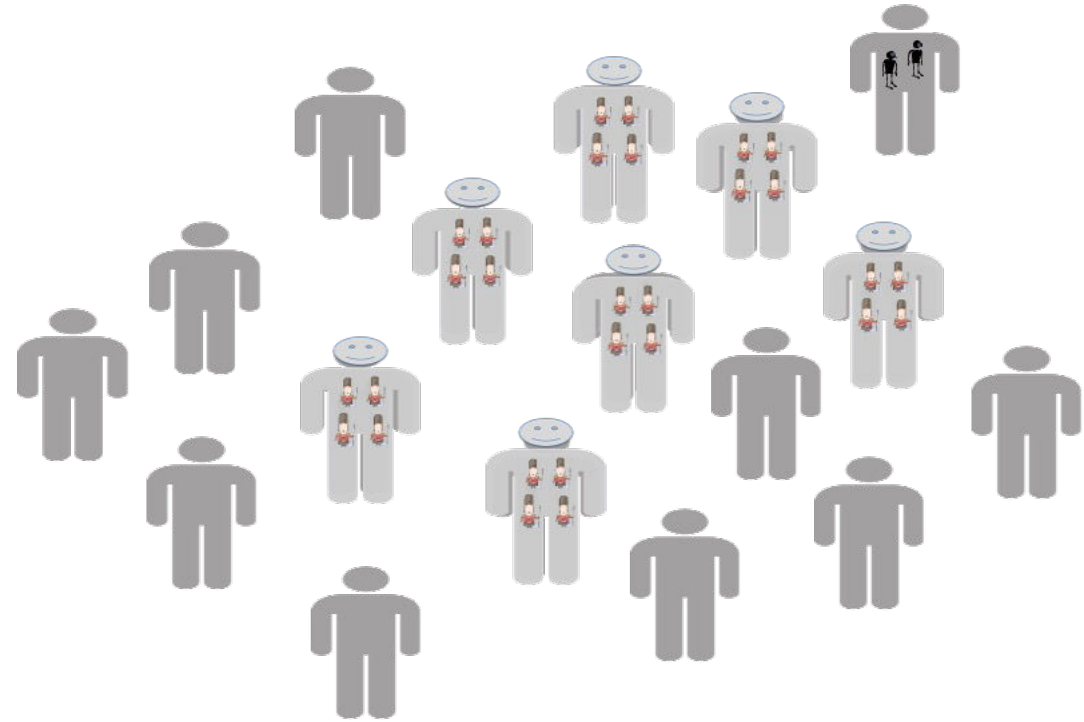
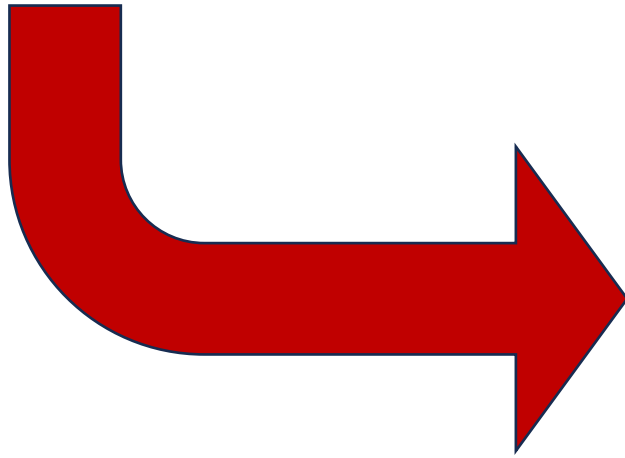
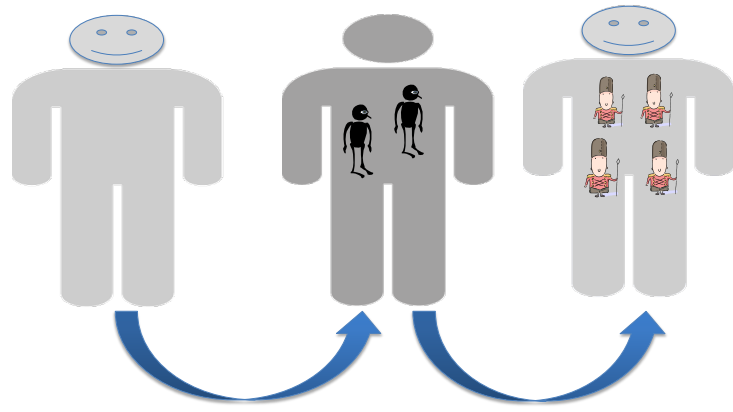


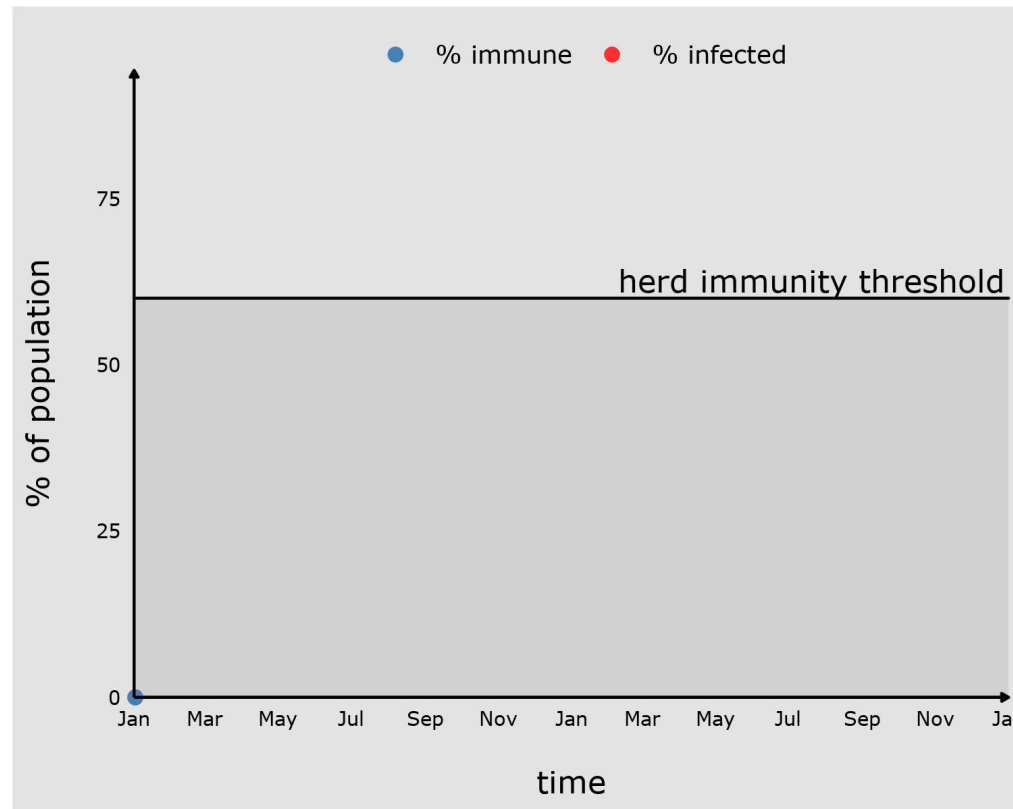
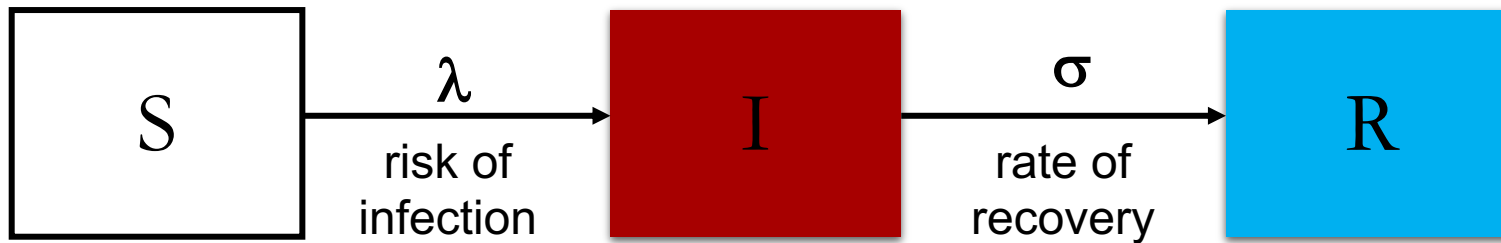
**What if there is no naturally acquired immunity to SARS-CoV-2?**

**What if immunity does not last forever?**

**How can you possibly shelter the vulnerable?**

# HERD IMMUNITY





$$1 - \frac{1}{R_0}$$

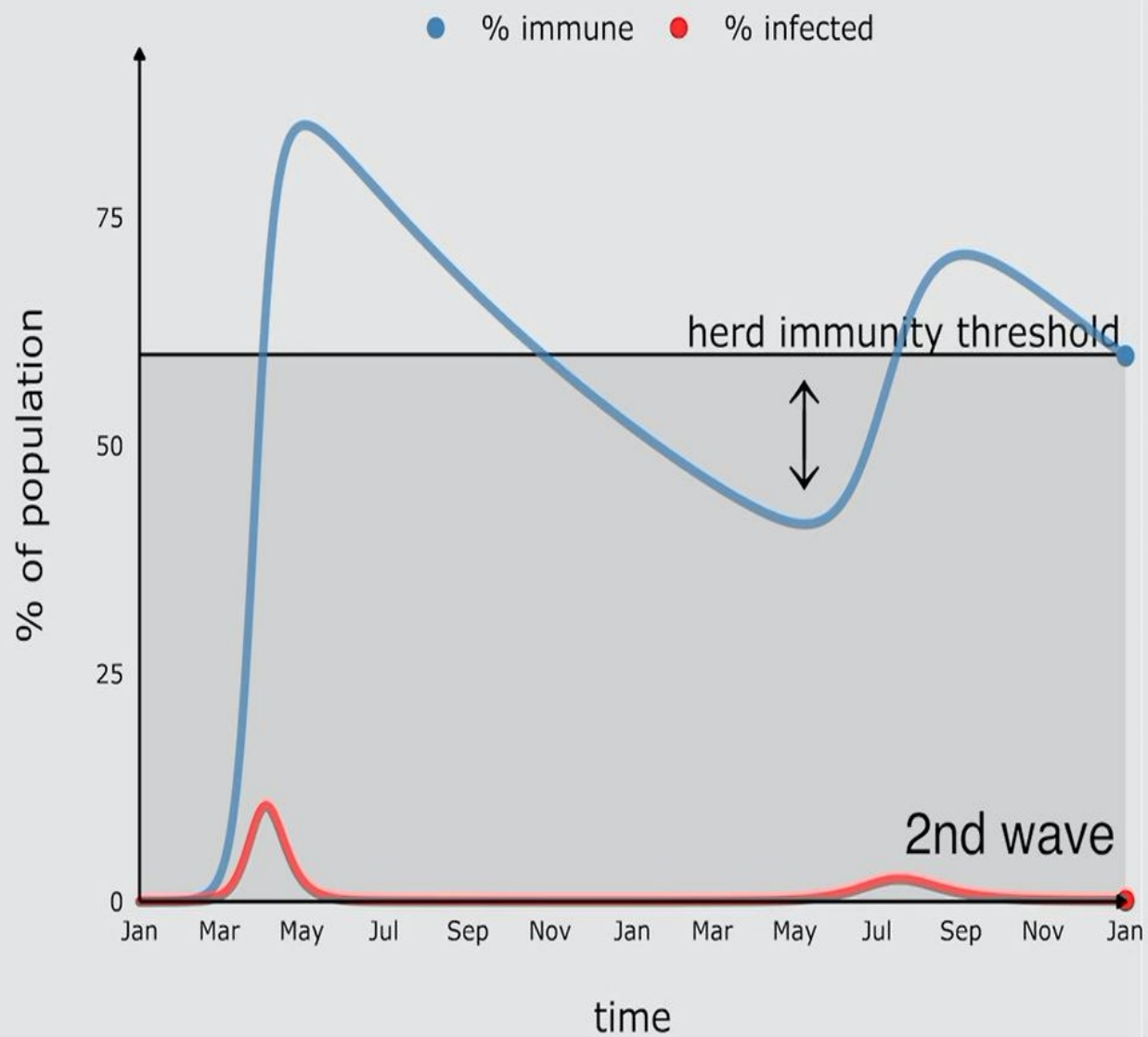
$$\begin{aligned}\frac{dS}{dt} &= -\lambda S \\ \frac{dI}{dt} &= \lambda S - \sigma I \\ \frac{dR}{dt} &= \sigma I\end{aligned}$$

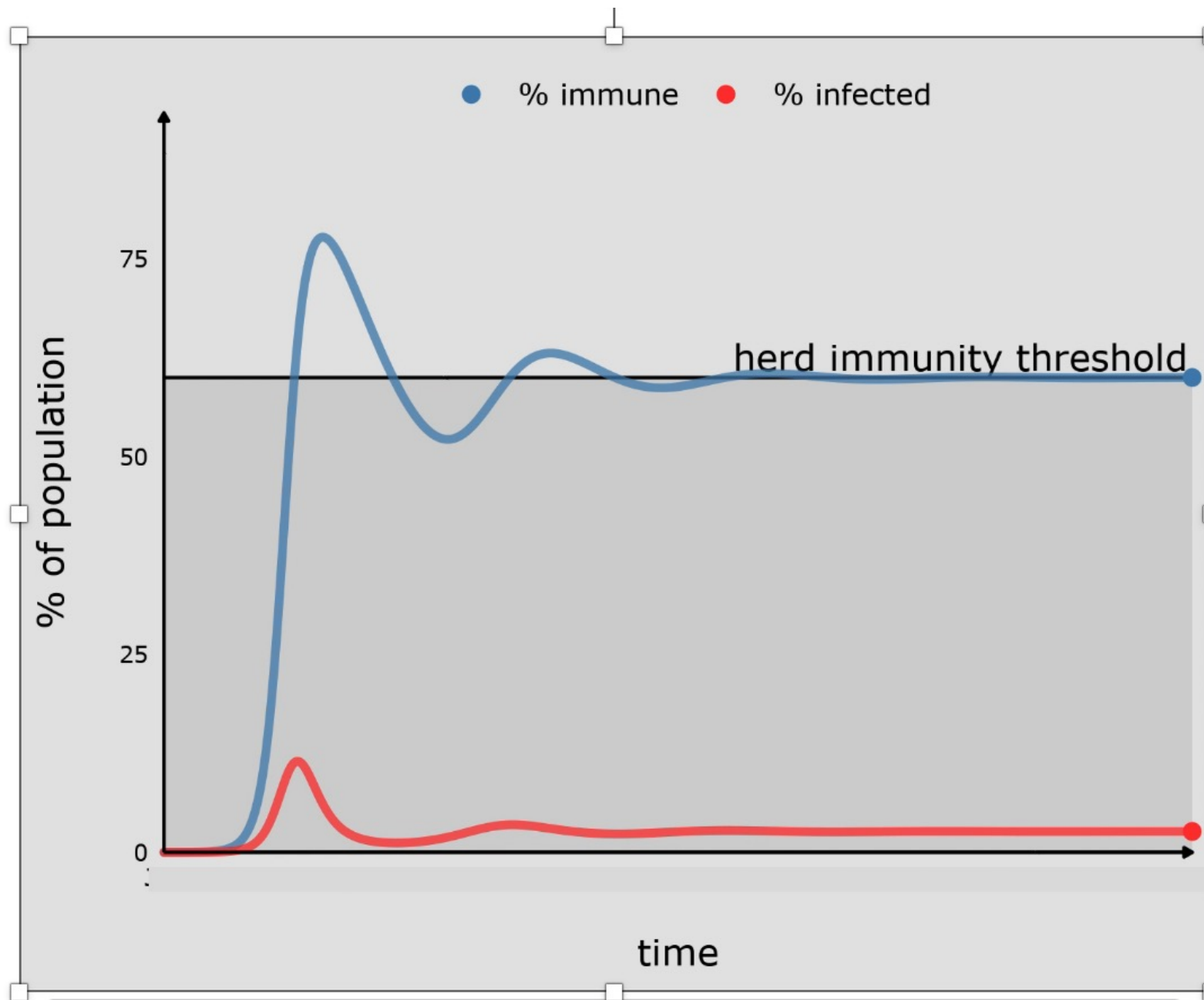
$$\lambda = BI$$

$$R_0 = B/\sigma$$

Fundamental  
Transmission  
Potential

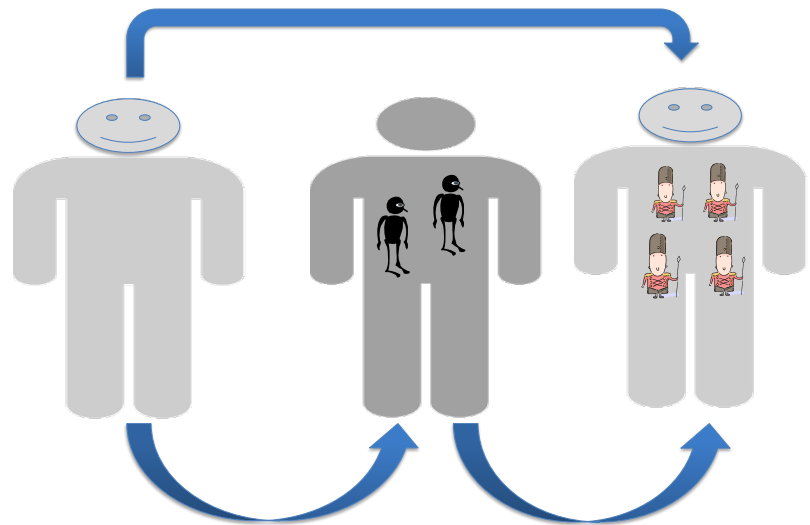
$R_0$  is the average number of **secondary cases** generated by a **primary case** in a totally susceptible population.



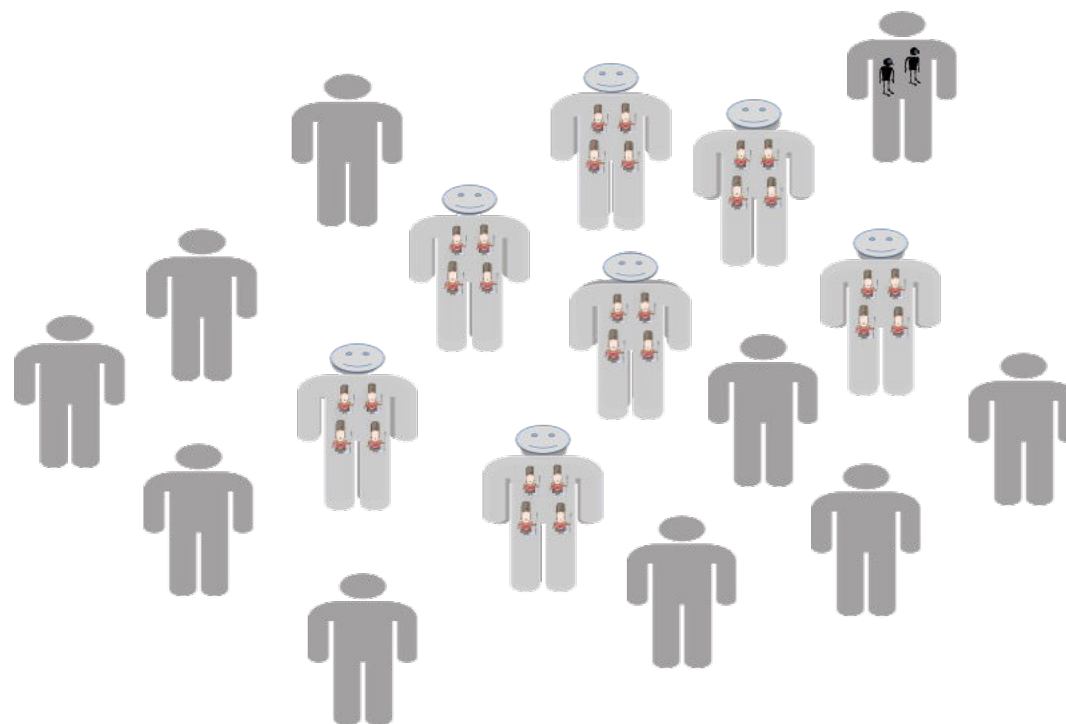




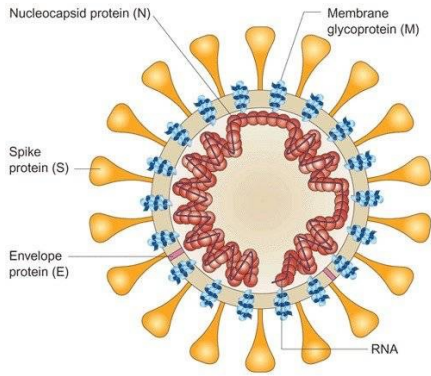
VACCINATION



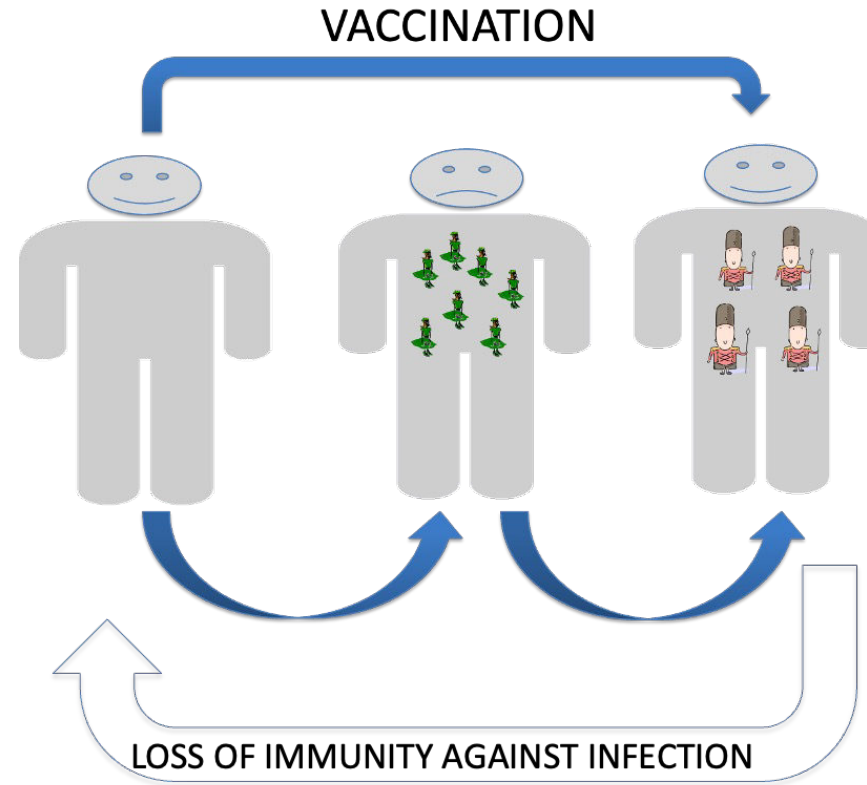
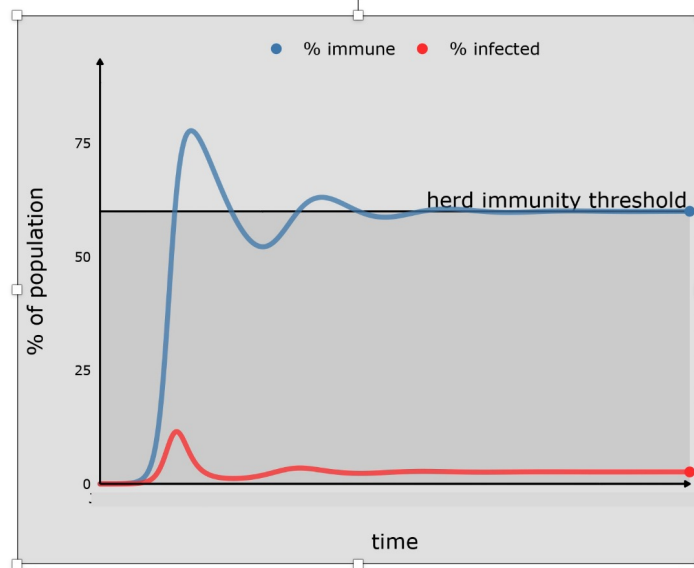
HERD IMMUNITY



# IMMUNITY AGAINST INFECTION IS TRANSIENT

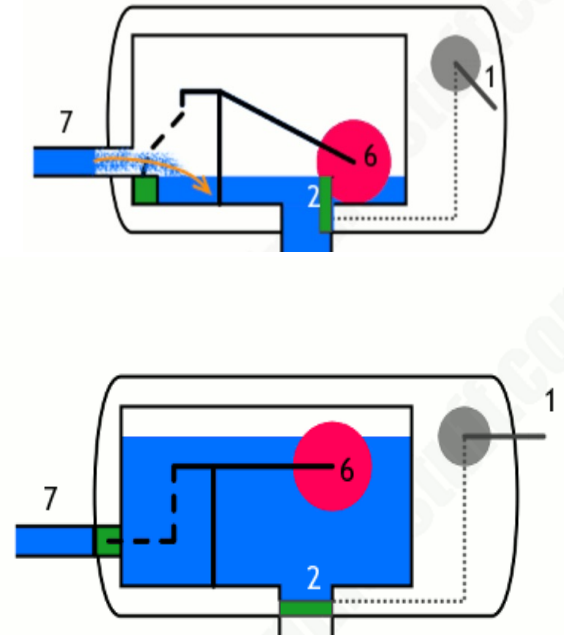


SARS-CoV-2



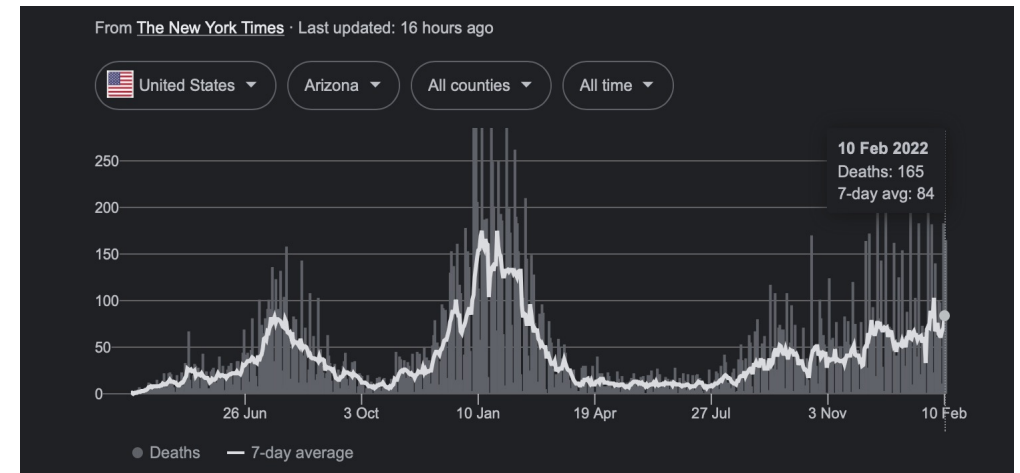
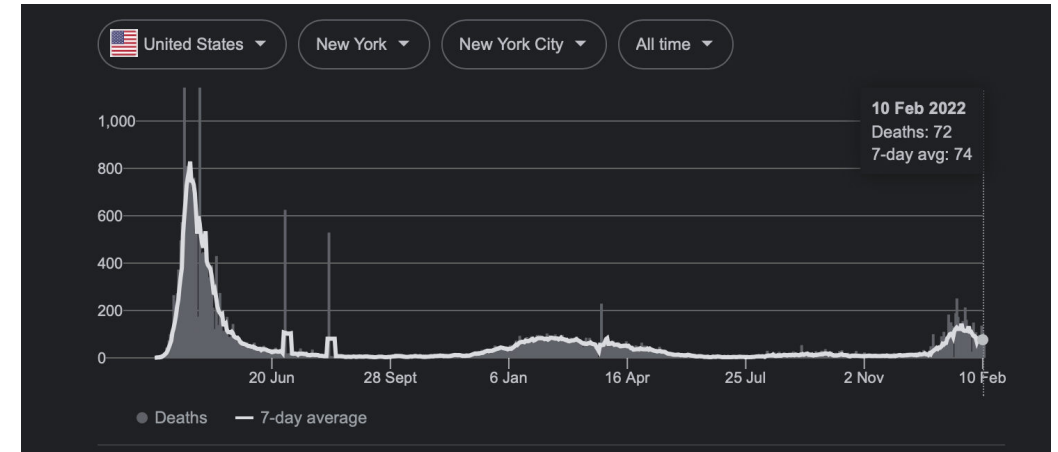
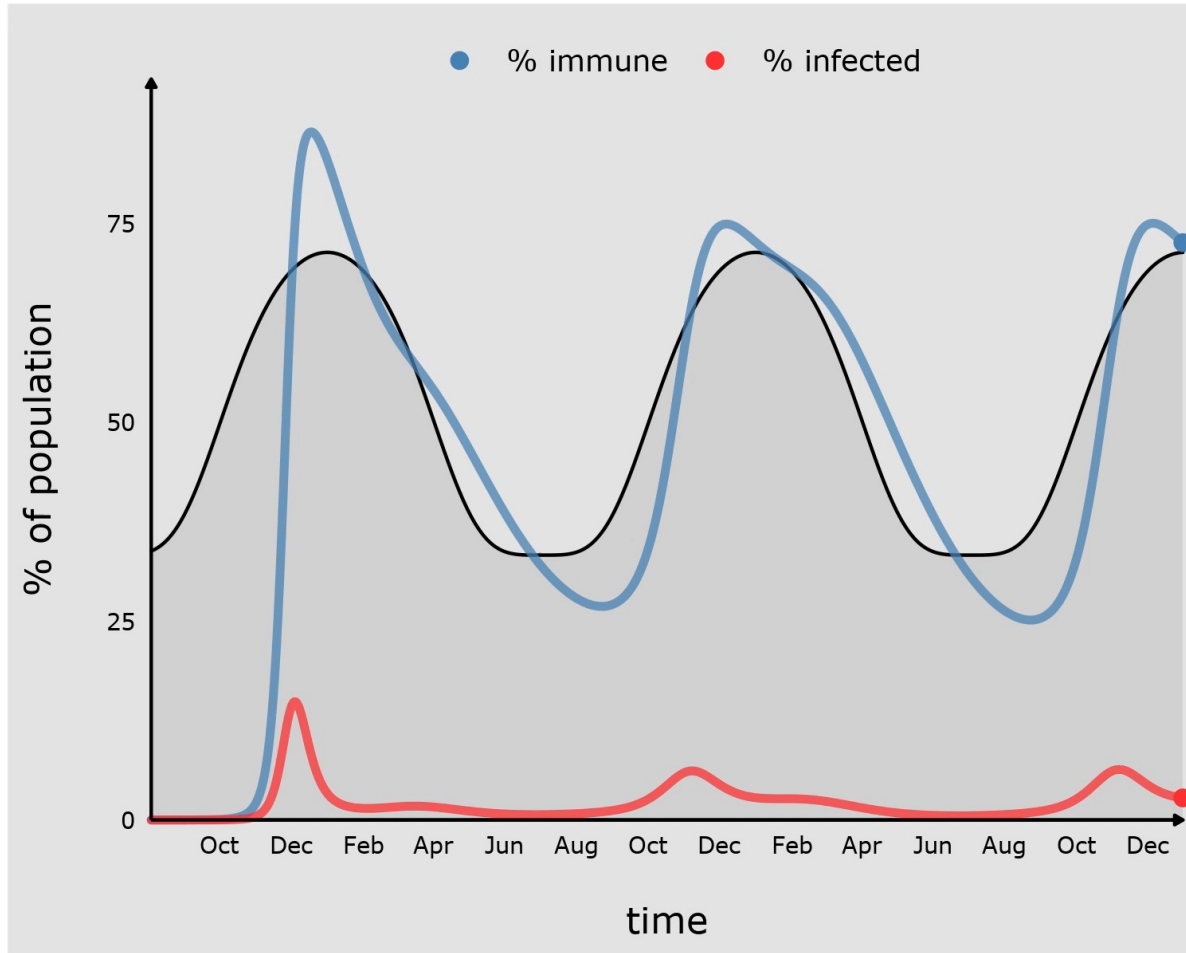
## Seasonal coronavirus protective immunity is short-lasting

Arthur W. D. Edridge<sup>1</sup>, Joanna Kaczorowska<sup>1</sup>, Alexis C. R. Hoste<sup>2</sup>, Margreet Bakker<sup>1</sup>, Michelle Klein<sup>1</sup>, Katherine Loens<sup>3,4</sup>, Maarten F. Jebbink<sup>1</sup>, Amy Matser<sup>5</sup>, Cormac M. Kinsella<sup>1</sup>, Paloma Rueda<sup>2</sup>, Margareta Ieven<sup>1</sup>, Herman Goossens<sup>3,4</sup>, Maria Prins<sup>5,6</sup>, Patricia Sastre<sup>2</sup>, Martin Deijls<sup>1</sup> and Lia van der Hoek<sup>1,5\*</sup>

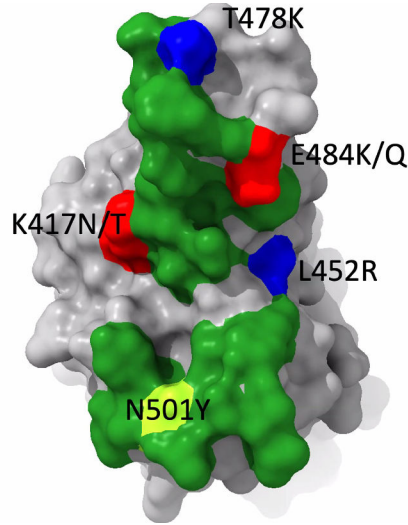
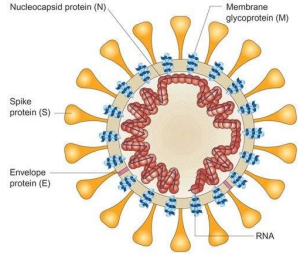


THIS DOES NOT PREVENT THE ESTABLISHMENT AND MAINTENANCE OF HERD IMMUNITY THROUGH NATURAL INFECTION

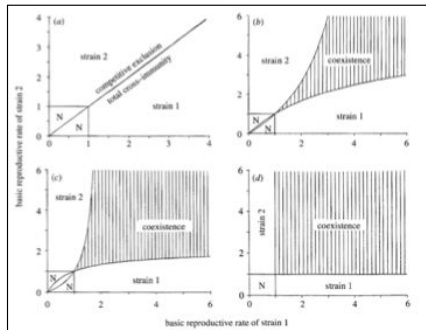
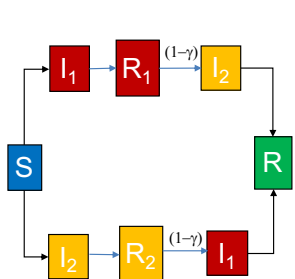
# Effects of seasonality



# Variants!

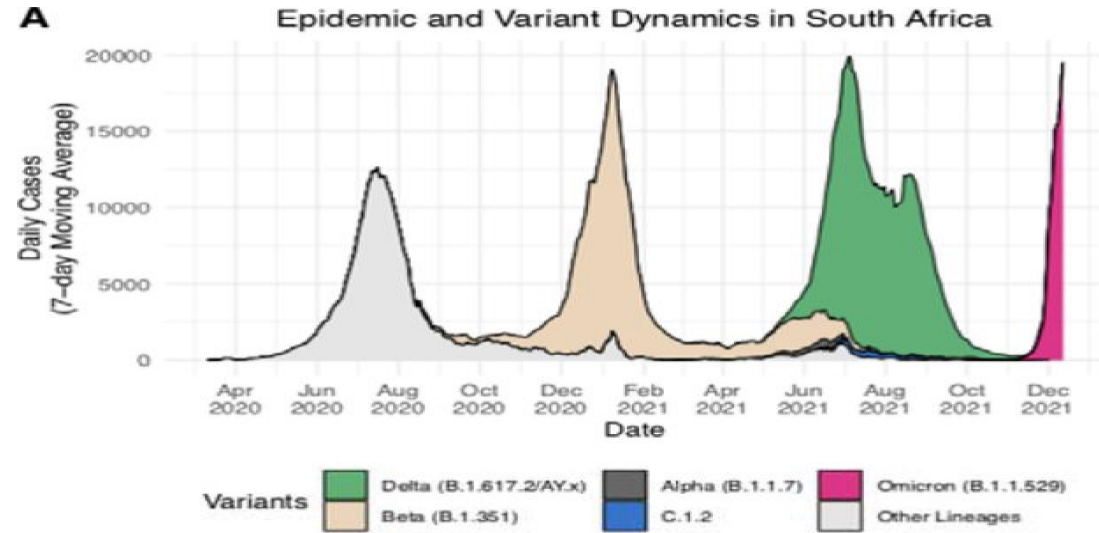


Green – where spike attaches to the cell receptor ACE2



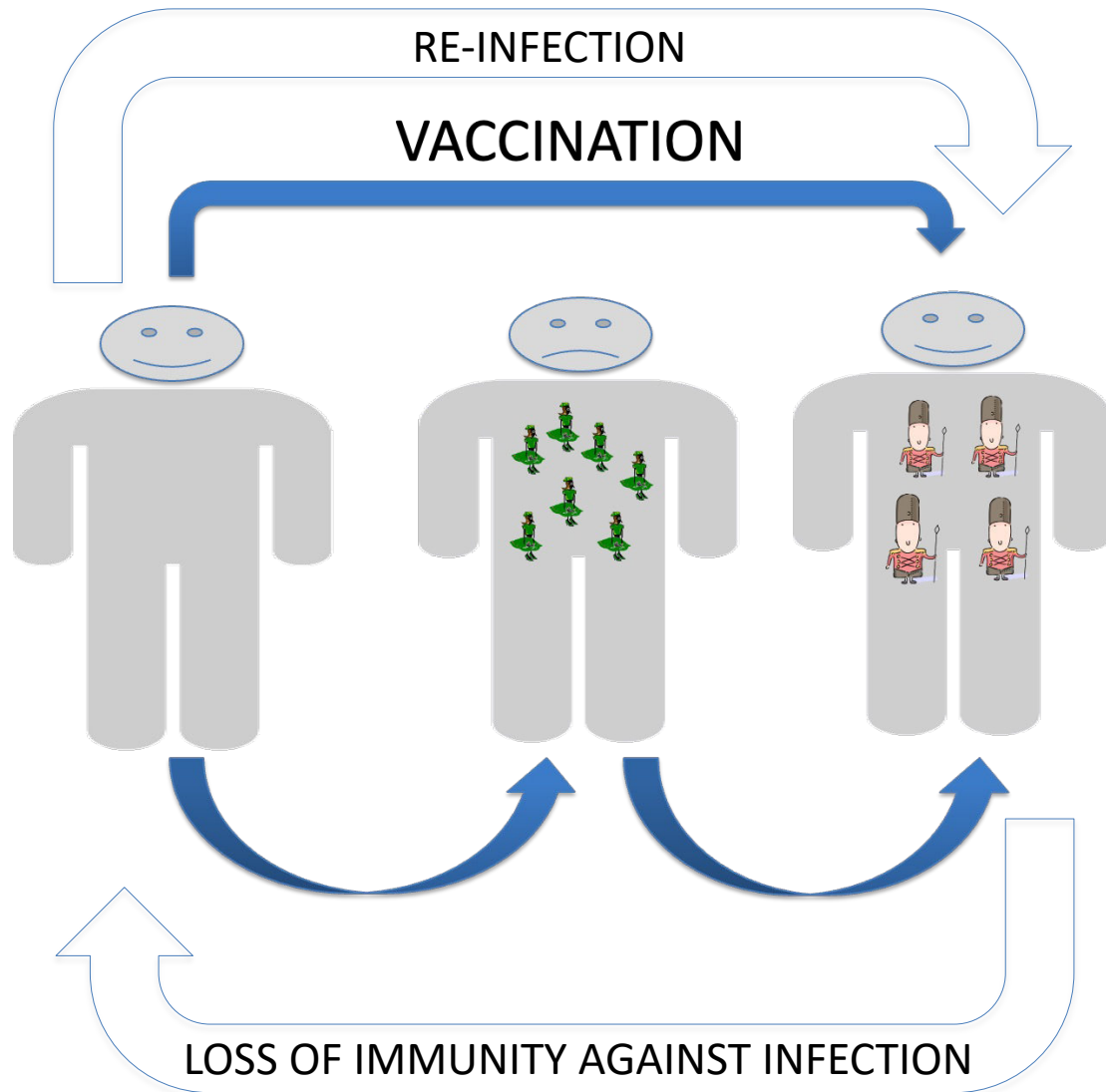
$$\frac{\Delta R_0}{R_0} = \frac{(1-\gamma)(R_0 - 1)}{1 + (1-\gamma)(R_0 - 1)}$$

It is impossible to say whether a variant is intrinsically less virulent or more transmissible.



## Omicron

The reduction in DEATH is being driven by a combination of reduction in risk of INFECTION through herd immunity and a reduction in risk of SEVERE DISEASE through natural exposure and vaccination rather than a diminution in VIRULENCE of SARS-CoV-2.

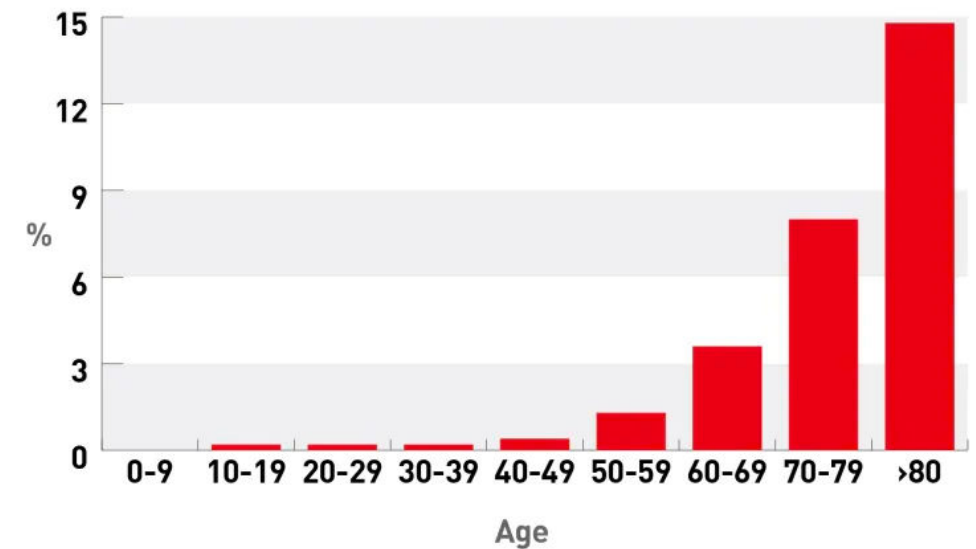


**IMMUNITY AGAINST INFECTION IS TRANSIENT**

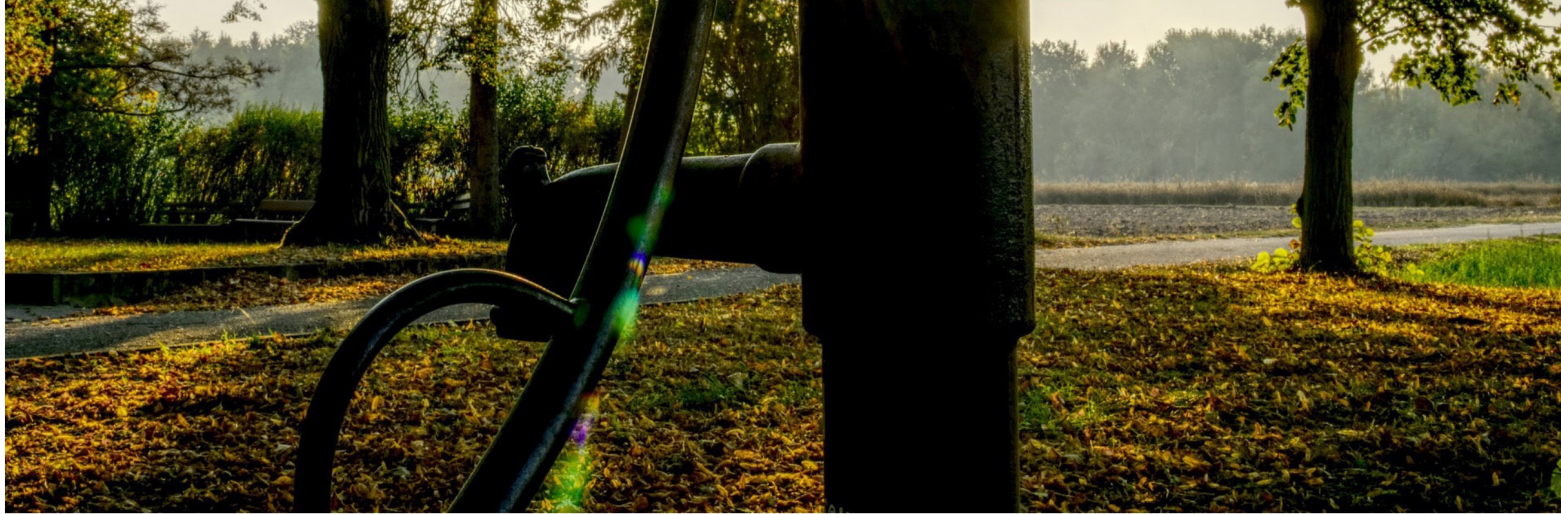
**BUT INFECTION/VACCINATION CONFERS DURABLE PROTECTION AGAINST SEVERE DISEASE**

### **COVID-19 fatality rate by age**

Among diagnosed cases in Hubei, China, as of Feb.11







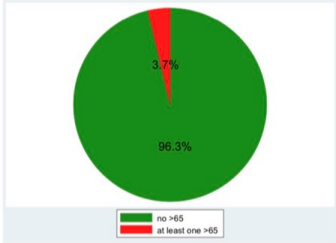
**What if there is no naturally acquired immunity to SARS-CoV-2?**

**What if immunity does not last forever?**

**How can you possibly shelter the vulnerable?**

# How can you possibly shelter the vulnerable?

Figure 1. A Tiny Proportion of Young UK Workers Live with Older People  
[where younger is defined as under age 40, and the cut-off definition for older is over age 65]

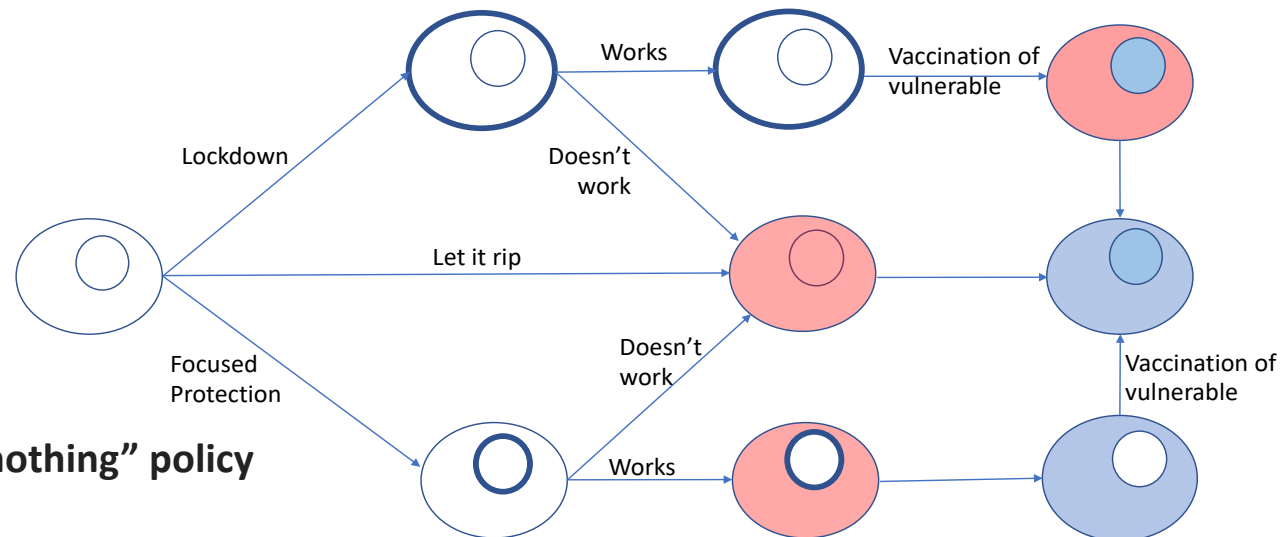


Infection control in care homes and hospitals

Social distancing of vulnerable population

Targeted vaccination of those at risk

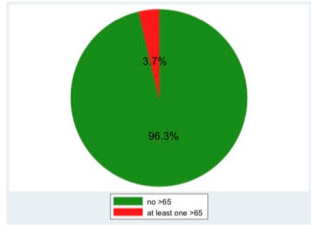
It is curious that many who persist in their belief that focused protection of the vulnerable sectors of the population during the COVID -19 pandemic was an unworkable (and thereby unethical) proposition, do not find their imaginations stretched by the possibility that the same intervention might have worked at the level of the entire population.



Characterised as a “do nothing” policy

# How can you possibly shelter the vulnerable?

Figure 1. A Tiny Proportion of Young UK Workers Live with Older People  
[where younger is defined as under age 40, and the cut-off definition for older is over age 65]



Infection control in care homes and hospitals

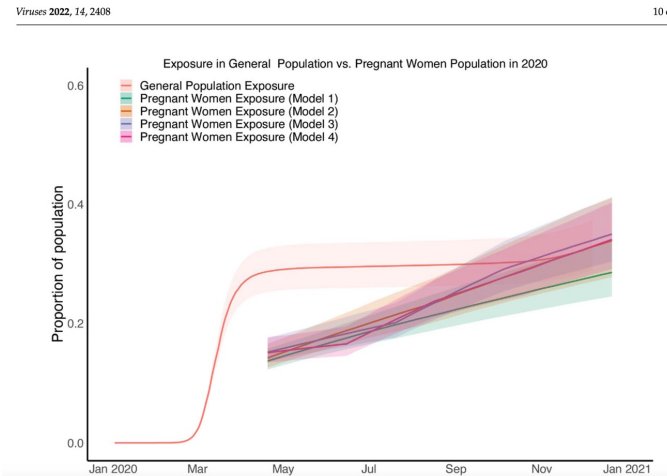
Social distancing of vulnerable population

Targeted vaccination of those at risk

## Can we create an evidence base for focused protection?

### Estimating the Effectiveness of Shielding during Pregnancy against SARS-CoV-2 in New York City during the First Year of the COVID-19 Pandemic

Siyu Chen <sup>1,\*</sup>, Elisabeth A. Murphy <sup>2</sup>, Angeline G. Pendergrass <sup>3</sup>, Ashley C. Sukhu <sup>4</sup>, Dorothy Eng <sup>4</sup>, Magdalena Jurkiewicz <sup>4</sup>, Iman Mohammed <sup>5</sup>, Sophie Rand <sup>2</sup>, Lisa J. White <sup>1</sup>, Nathaniel Hupert <sup>1,6,7</sup> and Yawei J. Yang <sup>2,4,\*</sup>



*Individual risk reduction*

# A inversion of the schedule of certainties

What we were LEAST CERTAIN about was the effects of NPIs on the transmission dynamics of disease and the long term goal of such interventions

We had some uncertainty regarding the fundamental biological properties of the virus but less so than was broadcast; fundamentally “this uncertainty was weaponised” (W.Park, pers comm)

What we were MOST CERTAIN about was that the NPIs would cause extreme and long term damage to the most vulnerable (the young, the old and the poor)

## Avoiding ambiguity

Scientists sometimes use mathematics to give the illusion of certainty.

Sunetra Gupta

What words conceal is as important as what they reveal. Although the essence of raw communication may be clarity, in literature it is the inexact and the imprecise that allow us to push forward the boundaries of human experience and cognition. This is most obvious in poetry, which relies on the flexibility of meaning to record and analyse the breadth and depth of human emotion. For example, the wealth of tenderness in this extract from Seamus Heaney's poem "Sunlight" derives from the mystical alliance between love and a well-worn object:

of disciplines to the altar of mathematical reasoning. Indeed, the widespread misappropriation of the language of mathematics in the social and biological sciences has to be one of the great tragedies of our time.

Nothing can be sadder than the sight of equations crawling down a page of literary theory, nothing more raucous than the invasion of simple rules of cause and effect into the language of psychoanalysis. Far less obvi-



Beyond words: injudicious use of mathematics to analyse events such as stock-market crashes can often confuse rather than clarify.



**'THE HARM WAS PREVENTABLE'**  
LOCKDOWN IMPACT ON CHILDREN