

# COVID-19

## 3<sup>rd</sup> Week of March

### What Just Happened?

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March 19, 2020



# Disclosures and Disclaimers

- No relevant financial interests
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# New Mexico

# 3/19/2020

<https://cv.nmhealth.org/>

- 28 Cases
- 1<sup>st</sup> case of Community Transmission
- Department of Health Secretary issued more stringent mitigation measures

# Nationally 3/19/2020

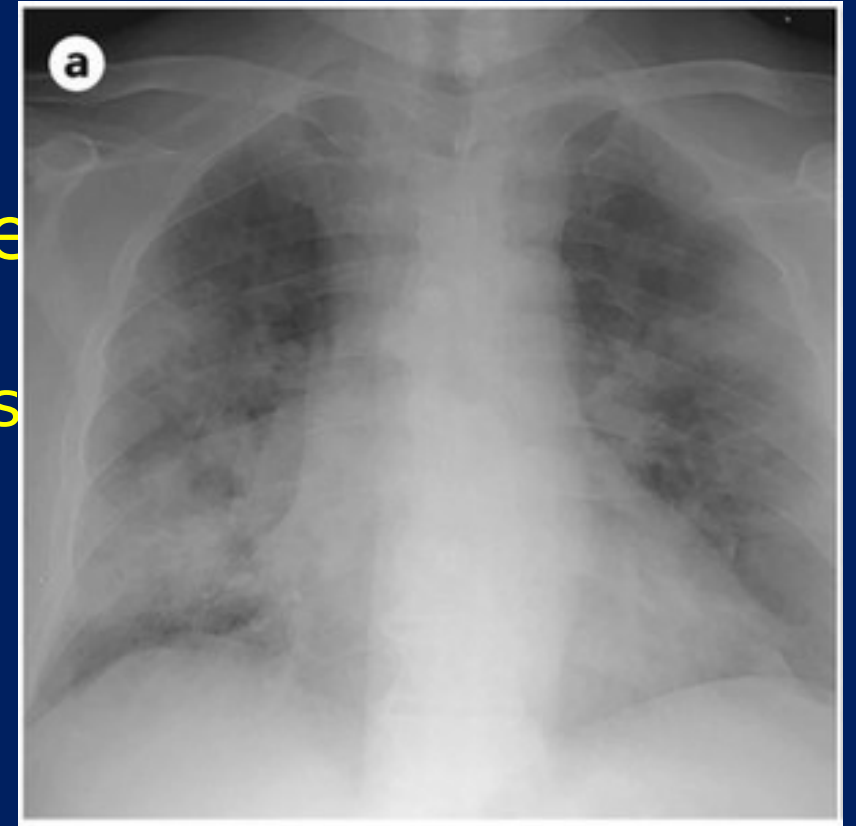
- <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>
- 10442 cases, 150 deaths (Case Fatality Rate 1.4%)
- All 50 states, DC, Puerto Rico, Guam, US Virgin Islands
- President declared national emergency
- Stricter social distancing measures
- Federal government working to enact economic relief

# Globally 3/19/2020

- <https://www.arcgis.com/apps/opstdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>
- 235,404 cases, 9785 deaths (CFR 4.2%)
- Italy 41,035 cases, 2405 deaths (CFR 8.3%)
- Korea 8565 cases, 91 deaths (CFR 1.1%)

# Why all the talk about ventilators?

- Severe pneumonia
- Acute Respiratory Distress Syndrome
  - Immune response is overactive
  - Blood vessels leak fluid into the air sacs
  - Lungs fill up with fluid
- Requires mechanical ventilation
  - Breathing tube
  - Ventilator machine to force air in



Mathay, et al. **Acute Respiratory Distress Syndrome**

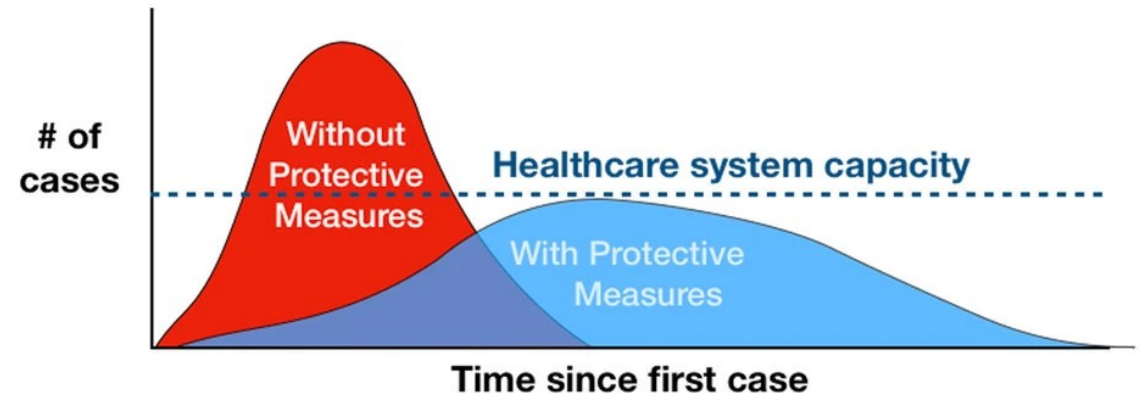
Nat Rev Dis Primers. 2019 Mar 14; 5(1): 18.

# Transmission Rates

- Basic Reproduction Number: - A measure of how contagious a pathogen is.
- Number of people infected by one person
- COVID-19 - 2.5
- $R_0 \leq 1$  - disease no longer spreading

# Strategies to Control Outbreaks

- **Containment** – trace, isolate and quarantine individuals
- **Mitigation** – “social distancing”, cancel gatherings
- Goal is to slow the epidemic “Flatten the Curve”
  - Hospitals not overwhelmed
  - Time to develop vaccine
  - Time to develop/discover effective treatment



*Adapted from CDC / The Economist*



# What changed the tone?

DOI: <https://doi.org/10.25561/77482>

16 March 2020

Imperial College COVID-19 Response Team

## **Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand**

Neil M Ferguson, Daniel Laydon, Gemma Nedjati-Gilani, Natsuko Imai, Kylie Ainslie, Marc Baguelin, Sangeeta Bhatia, Adhiratha Boonyasiri, Zulma Cucunubá, Gina Cuomo-Dannenburg, Amy Dighe, Ilaria Dorigatti, Han Fu, Katy Gaythorpe, Will Green, Arran Hamlet, Wes Hinsley, Lucy C Okell, Sabine van Elsland, Hayley Thompson, Robert Verity, Erik Volz, Haowei Wang, Yuanrong Wang, Patrick GT Walker, Caroline Walters, Peter Winskill, Charles Whittaker, Christl A Donnelly, Steven Riley, Azra C Ghani.

On behalf of the Imperial College COVID-19 Response Team

WHO Collaborating Centre for Infectious Disease Modelling  
MRC Centre for Global Infectious Disease Analysis  
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Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Non-Pharmaceutical Interventions (NPIs)
  - Strategies to control spread of COVID-19
  - Not vaccine or medications
- Suppression
- Mitigation

# Ferguson et al.

<https://doi.org/10.25561/77482>

DOI:

## Suppression -- pros

- Reduce reproduction number  $R < 1$  - disease stops spreading

## Suppression -- cons

- Immunity does not build up in the population
- Needs to be maintained *as long as the virus is circulating or until vaccine is developed (12-18 months)*
- Social and economic costs

# Ferguson et al.

DOI:

<https://doi.org/10.25561/77482>

## **Mitigation -- pros**

- Slows spread of disease, but  $R_0 > 1$
- Goal is to minimize impact on health care system
- Population immunity builds

## **Mitigation -- cons**

- Higher risk population still at risk for critical illness/death
- Mortality may still be high

Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Census information of Great Britain for population density, household size, age, school class size, workplace size, etc.
- Computer simulation assigning individuals to these locations
- Transmission
  - 1/3 – household
  - 1/3 – school/workplace
  - 1/3 – community

Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Start simulation from early January, 2020
- Calibrated simulation to agree with observed outbreaks in GB and US as of March 14.
- Continue simulation on this trajectory
- Educated guesses based on data from outbreak in China to make estimates for
  - Critically ill patients
  - Deaths
  - Duration of hospitalization
  - Duration of ICU care

Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Evaluate potential impact of NPIs
  - Factor in population compliance
- Case isolation in home
- Voluntary home quarantine
- Social Distancing for those >70 years old
- Social Distancing of entire population
- Closure of schools and Universities

Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

## Results for US

- Do nothing different
  - 80% population infected
  - Deaths peak in June at 523,520/day
  - Total COVID-19 deaths 2.2 million
  - Does not include deaths from other causes due to overwhelmed healthcare system
  - ICU beds overwhelmed by April
  - Demand > 30X capacity



Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Results for **mitigation** in GB extrapolated to US
  - Best **mitigation** strategy: case isolation, home quarantine, social distancing >70y.o.
  - Reduces peak ICU demand by 2/3
  - Reduces deaths by 1/2
  - ICU demand 8X capacity

# Ferguson et al. DOI:

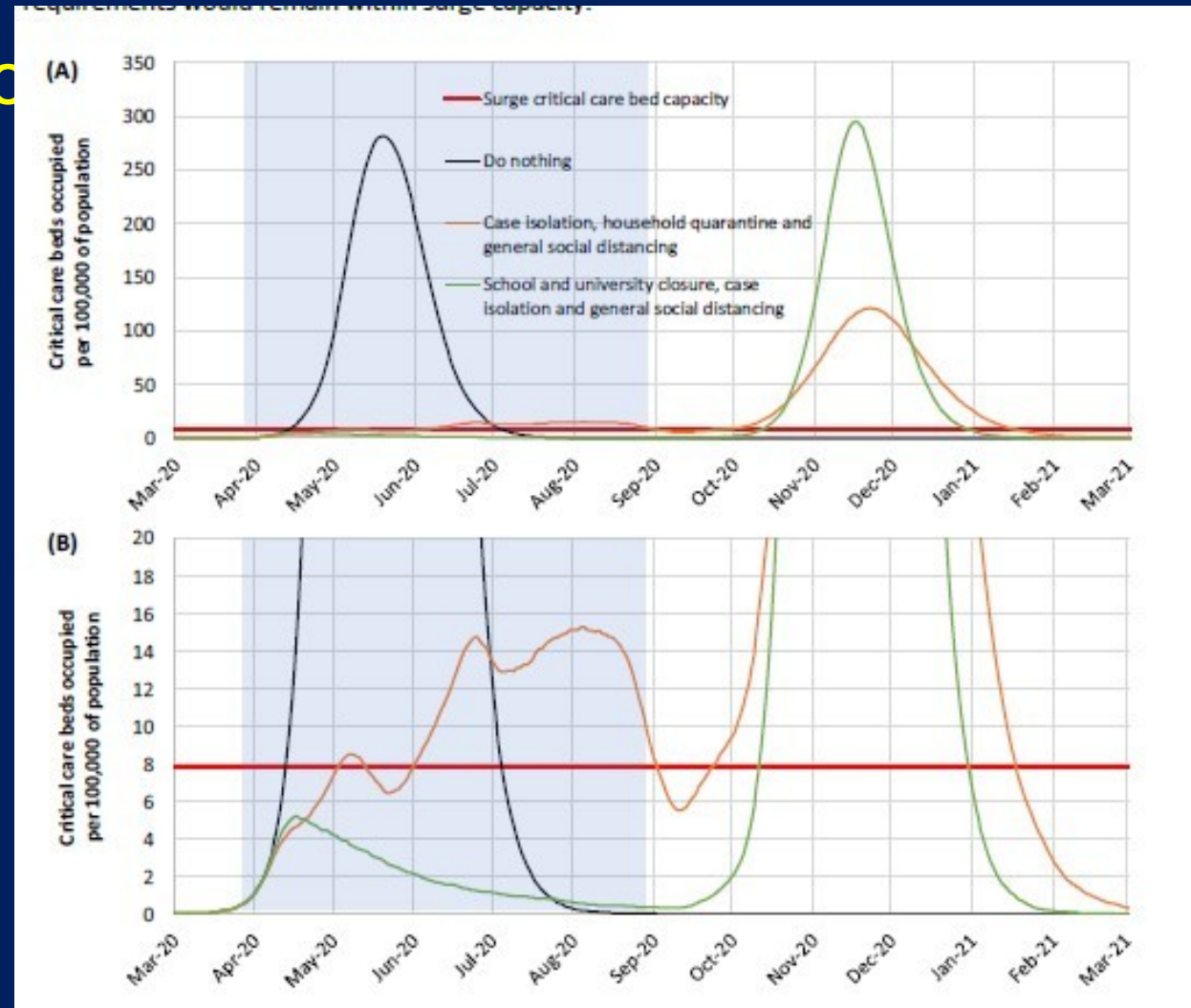
<https://doi.org/10.25561/77482>

- Results for suppression
- To achieve  $R_0 < 1$ 
  - Case isolation
  - Social distancing of entire population
  - School/University closure
  - Household quarantine
- ICU demand peaks 3 weeks after policies in place and then declines
  - Decline continues as long as policies remain in place

# Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Results for suppression



Ferguson et al. DOI:

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- Results for suppression policy with “triggers”
- When ICU demand reaches a certain threshold, suppression policies initiated
- When ICU demand falls below a threshold, policies are discontinued
- Easier to implement than fixed time triggers
- Allows for localized implementation

# Ferguson et al. DOI:

<https://doi.org/10.25561/77482>

- Suppression “trigg

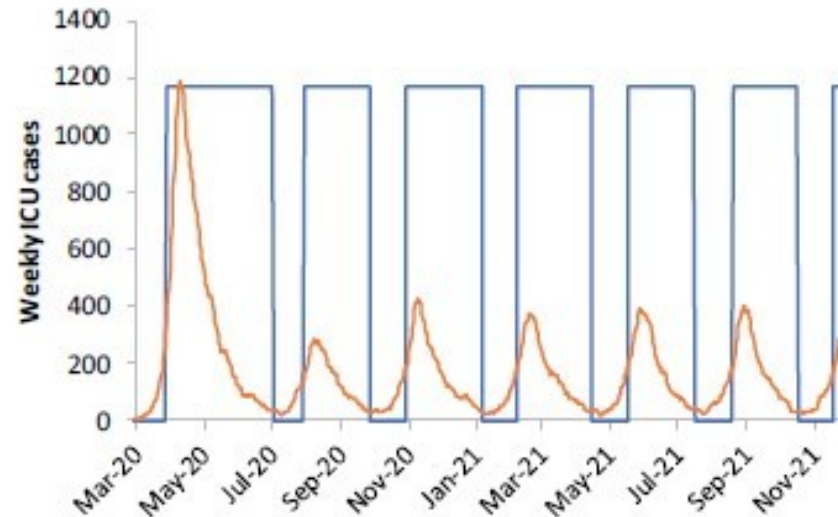


Figure 4: Illustration of adaptive triggering of suppression strategies in GB, for  $R_0=2.2$ , a policy of all four interventions considered, an “on” trigger of 100 ICU cases in a week and an “off” trigger of 50 ICU cases. The policy is in force approximate 2/3 of the time. Only social distancing and school/university closure are triggered; other policies remain in force throughout. Weekly ICU incidence is shown in orange, policy triggering in blue.

Ferguson et al. DOI:

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- “suppression policies are best triggered early in the epidemic” well before peak ICU demand occurs
- “social distancing (plus school and university closure, if used) need to be in force for the majority of the 2 years of the simulation”

Wait, wait, **WAIT!**  
Are we really going to have  
to stay inside for *a year?!?*

*A year?!? Really?!?*



Maybe Not!

# Variables may change over next 3-6 months

- Observe results from China and other countries as they relax restrictions
- Build up enough supply of test kits and health care infrastructure to revert back to Containment strategy – test, trace, isolate
- Start blood testing for antibodies to SARS-CoV-2 to determine people who had asymptomatic or mild cases
  - Those people should be immune and can get out working in the community
- Treatment breakthrough

# I believe

- This is the new normal
- It will be 12 months
- In the better angels of our nature
- We are a resilient community, society, country
- We will rise up to help each other
- We will do all of these things ***as long as we know what to expect and why***

# Conclusion

- Based on computer models, suppression is the most effective way to address the epidemic in the US
- Suppression measures are effective as long as they are in place
- It takes 3 weeks to see the results – **THINGS WILL GET WORSE BEFORE WE SEE THEM GETTING BETTER**
- Local governments may enact and ease suppression measures cyclically based on ICU bed demand and availability
- Be prepared to follow these measures for at least a year

# Thank you!

- Amanda Lewis
- Janet Phillips
- Brittney VanDerWerff

These presentations don't get out to you without their help!

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