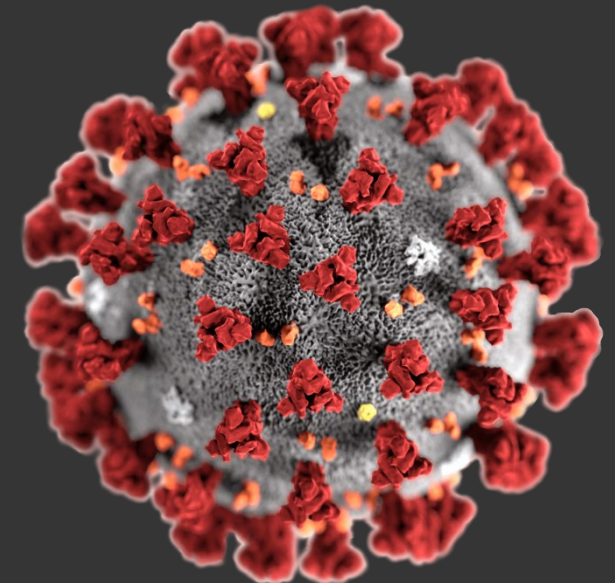
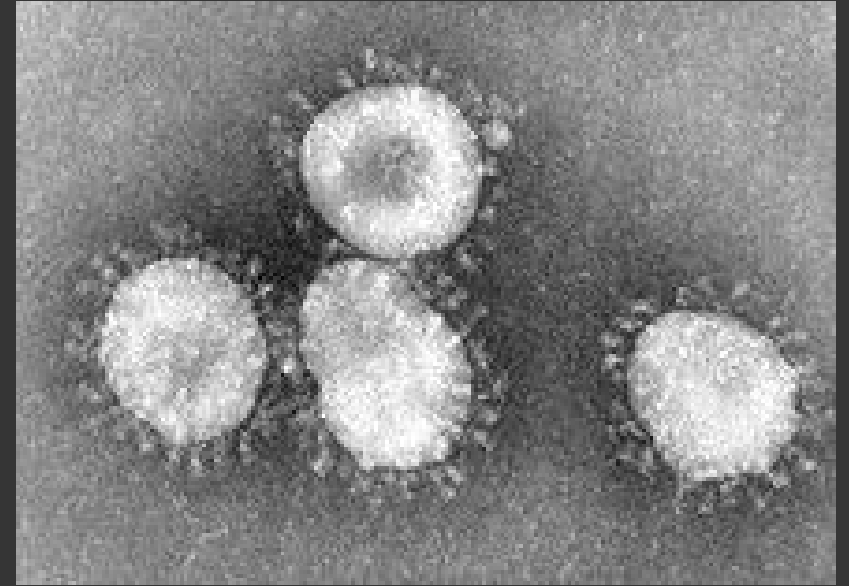


# Coronaviruses

- Coronaviruses are species of virus belonging to the subfamily *Coronavirinae* in the family *Coronaviridae*, in the order *Nidovirales*.
- Coronaviruses are enveloped viruses with a positive-sense single-stranded RNA genome and with a nucleocapsid of helical symmetry. The genomic size of coronaviruses ranges from approximately 26 to 32 kilobases, the largest for an RNA virus.

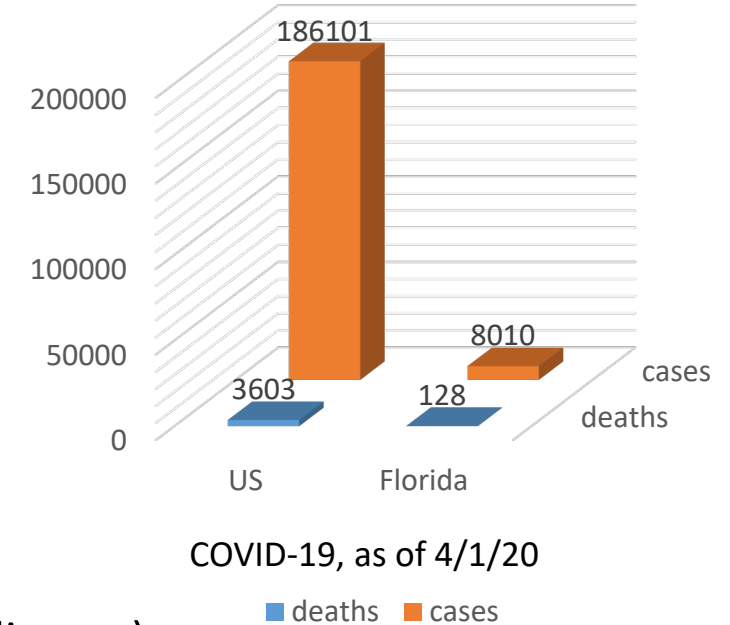


# Coronavirus and Illness

- In domestic and wild animals – common cause of illness, which may range from mild to severe
  - Economically significant coronaviruses of farm animals include porcine coronavirus (transmissible gastroenteritis coronavirus, TGE) and bovine coronavirus, which both result in diarrhea in young animals.
- In humans – one of the most common causes of upper respiratory infections
  - Alphacoronaviruses of humans: *Human coronavirus 229E*, *Human Coronavirus NL63*.
  - Betacoronaviruses of humans: *Human coronavirus HKU1*, *Human coronavirus OC43*, and SARS, MERS, and COVID-19.

# COVID-19

- Data from first 1,099 cases - China
  - Median age: 47 years
  - Wildlife contact: 1.2%
  - Median incubation period: 3 days (range 0-24 days [CDC: 2-14 days])
  - Symptoms/Signs:
    - Fever - 88%
    - Cough - 68%
    - Sputum production – 33%
    - Lymphopenia – 82%
    - CXR/CT – bilateral patchy shadowing – 9%; ground glass opacity – 5%
  - Possible risk factors: diabetes – 7.4% (16% among those with severe disease)
  - ICU admission: 5%
  - Mortality: 1.36% among patients with symptomatic infection
- Japan
  - 565 citizens repatriated from Wuhan: 8 positive for virus, 4 of whom were asymptomatic
- CDC
  - Increased risk of infection in older persons, underlying health conditions (including diabetes), compromised immune system



# COVID-19 in Florida

Age group	Cases		Hospitalizations		Deaths	
0-4 years	27	0%	1	0%	0	0%
5-14 years	46	1%	2	0%	0	0%
15-24 years	579	8%	13	1%	0	0%
25-34 years	1,137	15%	41	4%	1	1%
35-44 years	1,180	16%	93	9%	3	3%
45-54 years	1,352	18%	140	14%	3	3%
55-64 years	1,308	17%	192	19%	9	9%
65-74 years	1,031	14%	233	24%	26	26%
75-84 years	616	8%	193	19%	35	35%
85+ years	215	3%	82	8%	24	24%
Unknown	4	0%	0	0%	0	0%
<b>Total</b>	<b>7,495</b>		<b>990</b>		<b>101</b>	

# Routes of Transmission

- Sources
  - Respiratory secretions (most common)
    - Present in secretions for several days before onset of symptoms; can persist in secretions for week or more after resolution of symptoms
    - Can be present in persons who never have symptoms (up to 50% of infected persons may be asymptomatic, but can excrete the virus)
  - Stool
  - Urine
- Routes of transmission
  - Close contact
    - Droplets, from cough or sneeze, present briefly in the air, and then on surfaces
  - Airborne
    - Can “drift” in air for several hours
      - Infection of choir in Washington State: 60 people together at choir rehearsal, none symptomatic
        - 45 ill, 2 died

# Detection

- Detection of virus itself
  - Genetic approach – detection of virus itself
    - Currently requires RT-PCR, which remains standard assay for the virus
      - Technically difficult, requires special instrumentation, appropriate operator safety precautions
      - National problem with shortage of supplies
        - Lack of swabs for nose and throat
        - Lack of reagents to run machines
        - Lack of Personal Protective Equipment for people collecting samples
    - Rapid tests approved, but generally not available
  - Antibody approach – looking for presence of antibodies to see if people have been infected
    - Generally requires blood sample
    - Assays still under development; rapid test approved, but generally not available





# SCCAHS Response to COVID-19

- NIOSH Center addresses worker health and safety topics in the **agriculture, fishing, and forestry** industries throughout Southeastern coastal states
- Key networks to share information through during pandemic:
  - SCCAHS stakeholders, including but not limited to:
    - Florida Department of Agriculture and Consumer Services
    - Florida Farm Bureau
    - Florida Fruit and Vegetable Association
    - Farmworker Association of Florida
  - UF Institute of Food and Agricultural Sciences (IFAS) Extension
  - Extension Disaster Education Network (EDEN)
    - <https://extensiondisaster.net/>
    - Florida specific information: <https://piecenter.com/resources/natural-disaster-resources/>



# SCCAHS Response to COVID-19

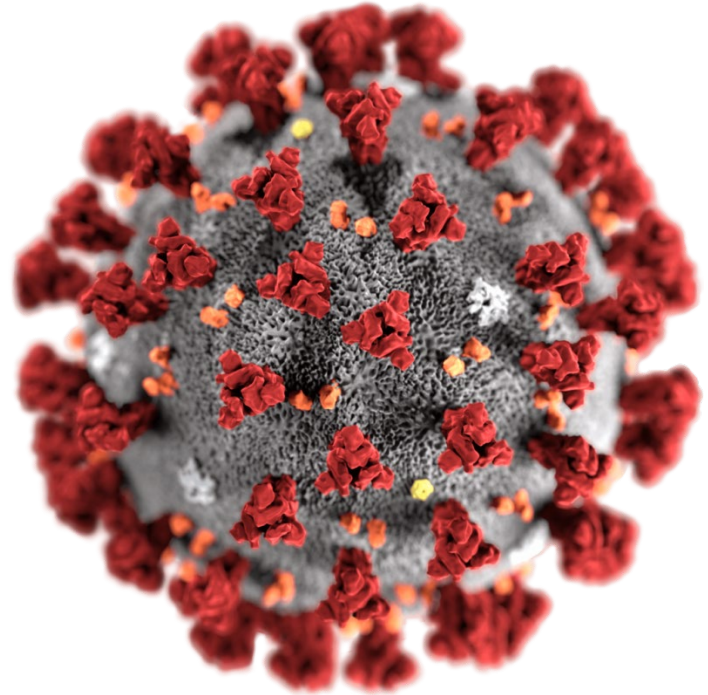
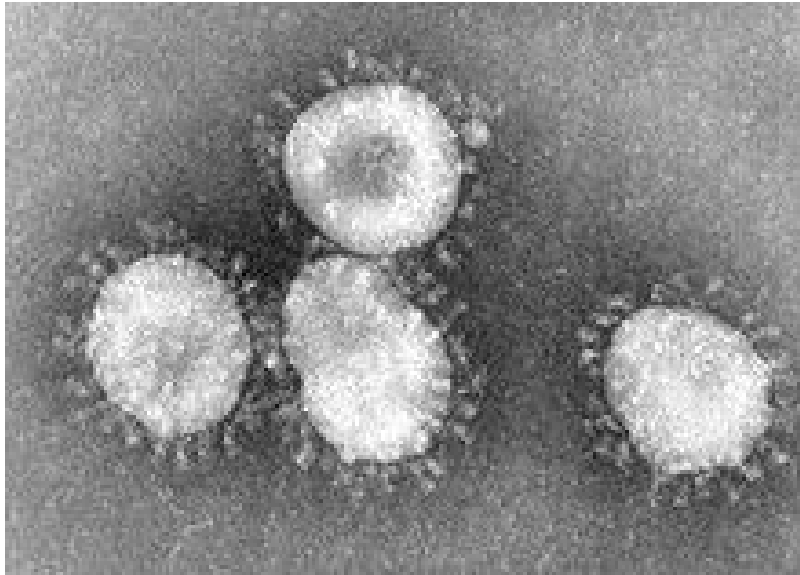
- Hosted annual Community Stakeholder Advisory Board Meeting virtually on March 12
  - Panel discussion topic: stress and resilience among ag workers
  - Shared concerns of COVID-19 in context of resiliency
- **March 16:** started consistently sharing COVID-19 information on Facebook from credible sources such as CDC, WHO, UF and FL Department of Health
- Created webpage on SCCAHS website with COVID-19 resources in English and Spanish. Includes:
  - General COVID-19 information from CDC
  - Information on stress and resiliency during a pandemic
  - Disaster preparedness resources
  - <http://www.sccaahs.org/index.php/ag-health-safety-topics/disaster-preparedness-resiliency/>

# SCCAHS Response to COVID-19

- Providing information on development of portable handwashing stations available to those in agriculture, fishing, and forestry (AFF)
- Hosting virtual webinars and meetings with stakeholders regarding COVID-19
- Conducted interviews with key stakeholders about COVID-19 impacts
- Developing survey to identify health/economic impacts of COVID-19 on AFF

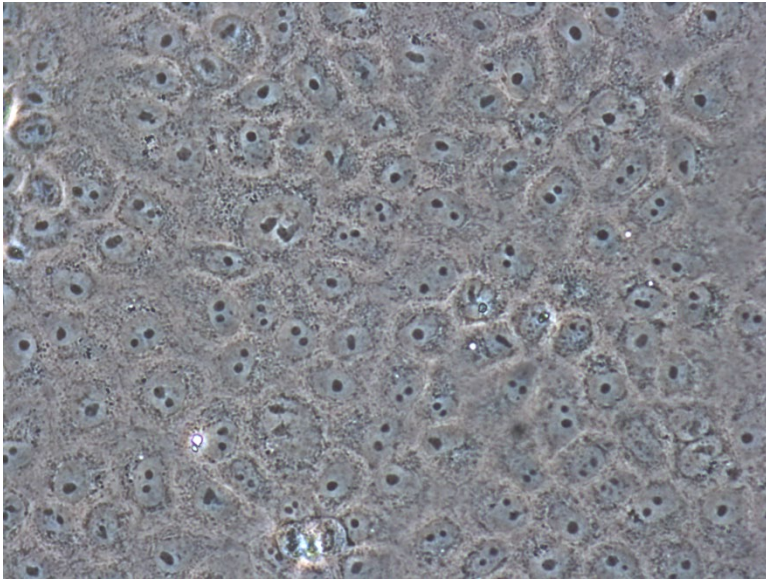


## Severe acute respiratory syndrome coronavirus 2 = SARS CoV-2

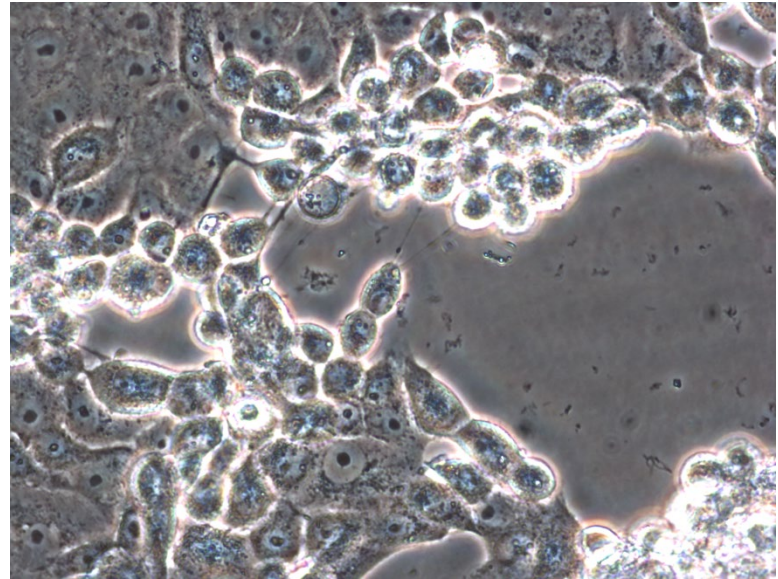


SARS CoV-2 causes COVID-19

# Isolation of coronavirus in cell cultures



**Non-infected cells**



**Coronavirus-infected cells**

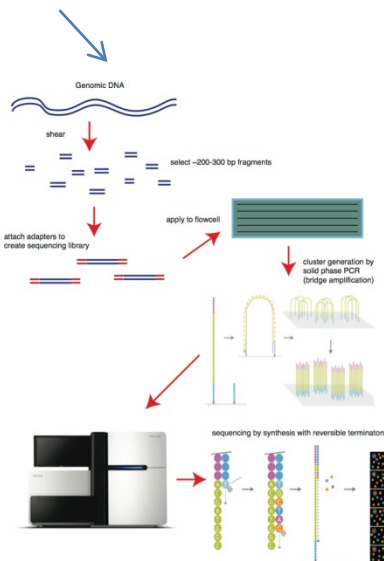
Workers wearing  
powered air- purifying  
respirators (PAPR)





# Determination of SARS CoV-2 genomic codes

## Virus genomic RNA



Create better tests

Track source of virus

Vaccines, Basic Research

### A. RdRp gene

WH-Human\_1(China)2019-Dec  
BetaCoV/Wuhan/IPCAMS-WH-01/2019/EPI\_ISL\_402123  
BetaCoV/Wuhan/IDC-HB-01/2019/EPI\_ISL\_402119  
BetaCoV/Wuhan/IDC-HB-04/2020/EPI\_ISL\_402120  
BetaCoV/Wuhan/IDC-HB-05/2019/EPI\_ISL\_402121  
BetaCoV/Wuhan/WH04/2019/EPI\_ISL\_402124  
M0772933 Bat SARS-related CoV (bat-SL-CoVZC45)  
NC\_044718 Human SARS-related CoV (e.g. Frankfurt-1)  
NC\_014470 Bat SARS-related CoV (BM48-31/BGR/2008)



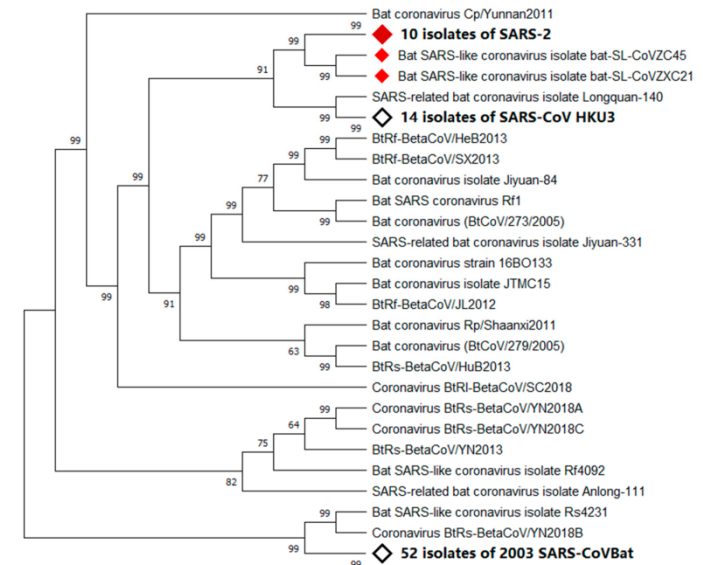
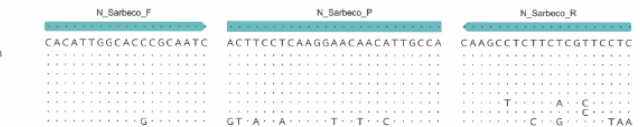
### B. E gene

WH-Human\_1(China)2019-Dec  
BetaCoV/Wuhan/IPCAMS-WH-01/2019/EPI\_ISL\_402123  
BetaCoV/Wuhan/IDC-HB-01/2019/EPI\_ISL\_402119  
BetaCoV/Wuhan/IDC-HB-04/2020/EPI\_ISL\_402120  
BetaCoV/Wuhan/IDC-HB-05/2019/EPI\_ISL\_402121  
BetaCoV/Wuhan/WH04/2019/EPI\_ISL\_402124  
M0772933 Bat SARS-related CoV (bat-SL-CoVZC45)  
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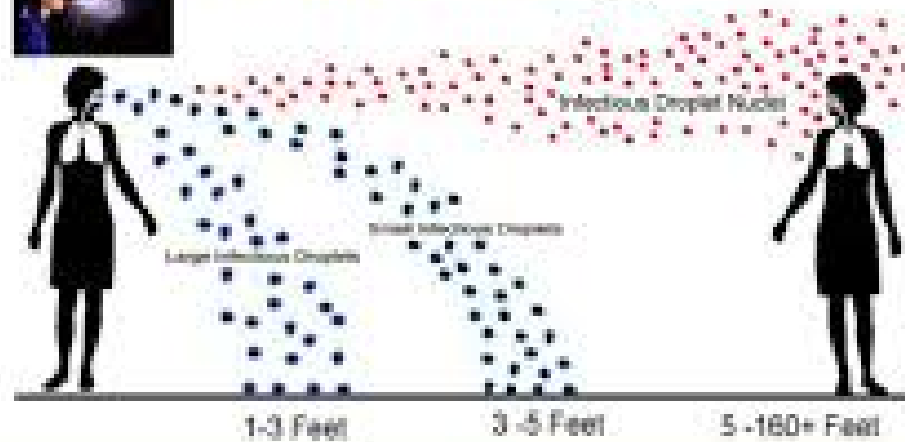
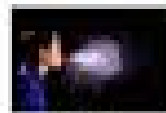
### C. N gene

WH-Human\_1(China)2019-Dec  
BetaCoV/Wuhan/IPCAMS-WH-01/2019/EPI\_ISL\_402123  
BetaCoV/Wuhan/IDC-HB-01/2019/EPI\_ISL\_402119  
BetaCoV/Wuhan/IDC-HB-04/2020/EPI\_ISL\_402120  
BetaCoV/Wuhan/IDC-HB-05/2019/EPI\_ISL\_402121  
BetaCoV/Wuhan/WH04/2019/EPI\_ISL\_402124  
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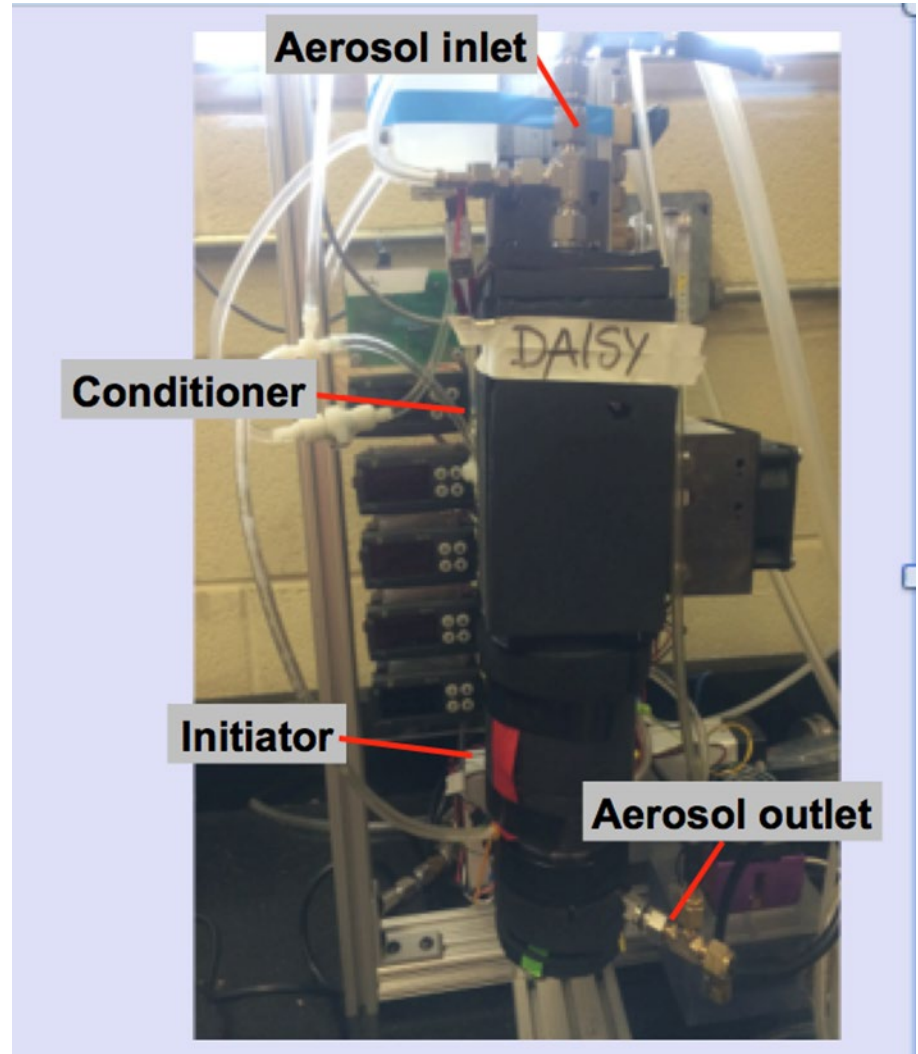
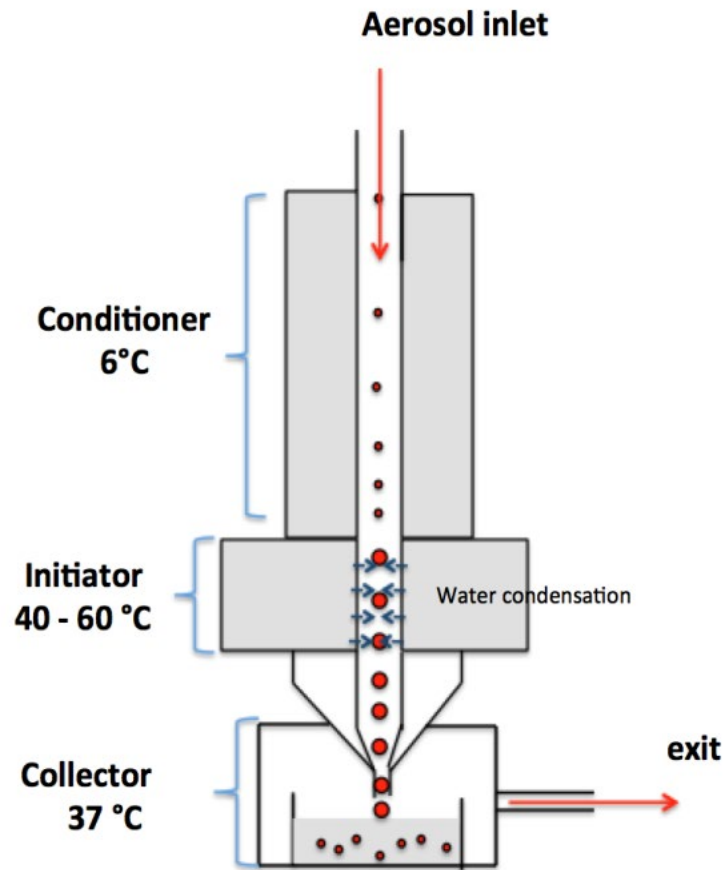




## Infectious Droplets & Droplet Nuclei Travel Lengths



## Air Sampler for Virus Aerosols that Operates via a Water Condensation Process



Prototype of a highly efficient (effective) air sampler developed at UF that works well for collecting virus aerosols and maintaining the viability of the collected virus particles.



# COVID-19 Projections under different levels of non-pharmaceutical interventions

Ira Longini, Ph.D.  
Professor of Biostatistics  
University of Florida

# Research Activities

- Randomized, adaptive phase 3 trials for COVID-19 therapeutics
  - Therapeutic use
  - Prophylactic use
- Randomized, adaptive phase 2b and 3 trials for COVID-19 vaccines
- Mathematical modeling of the transmission and control of SARS-CoV -2 on local and global scales



# Preliminary modelling results going live in the next day or so

Alessandro Vespignani, Northeastern University



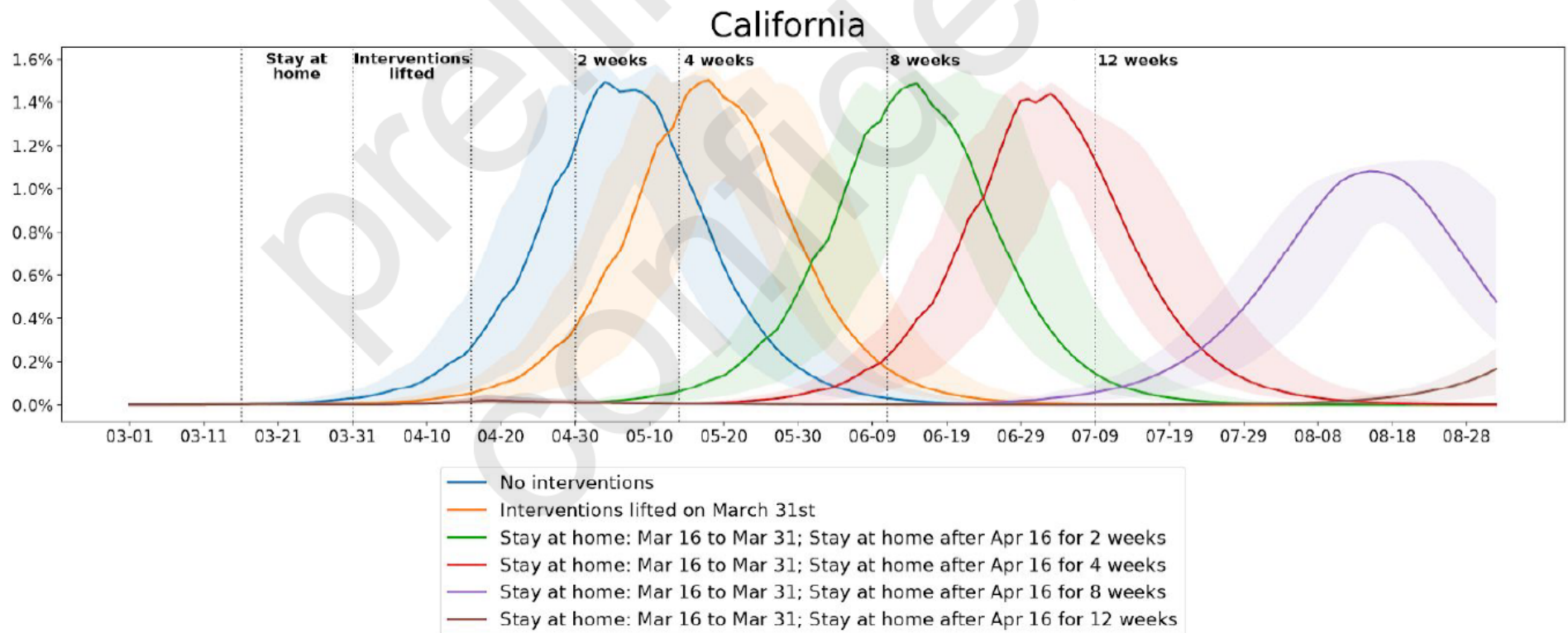
Laboratory for the  
Modeling of Biological +  
Socio-technical Systems

M. Elizabeth Halloran, U. Wash. and Ira Longini, U FL

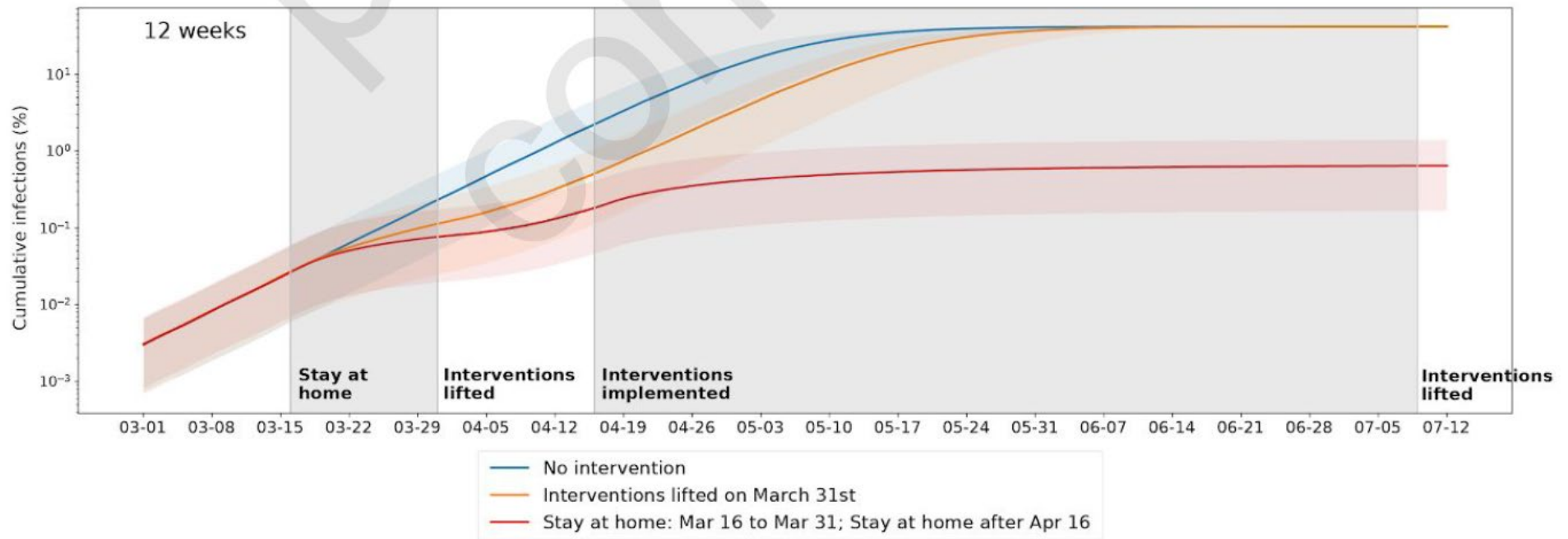


CENTER FOR  
INFERENCE & DYNAMICS  
OF INFECTIOUS DISEASES

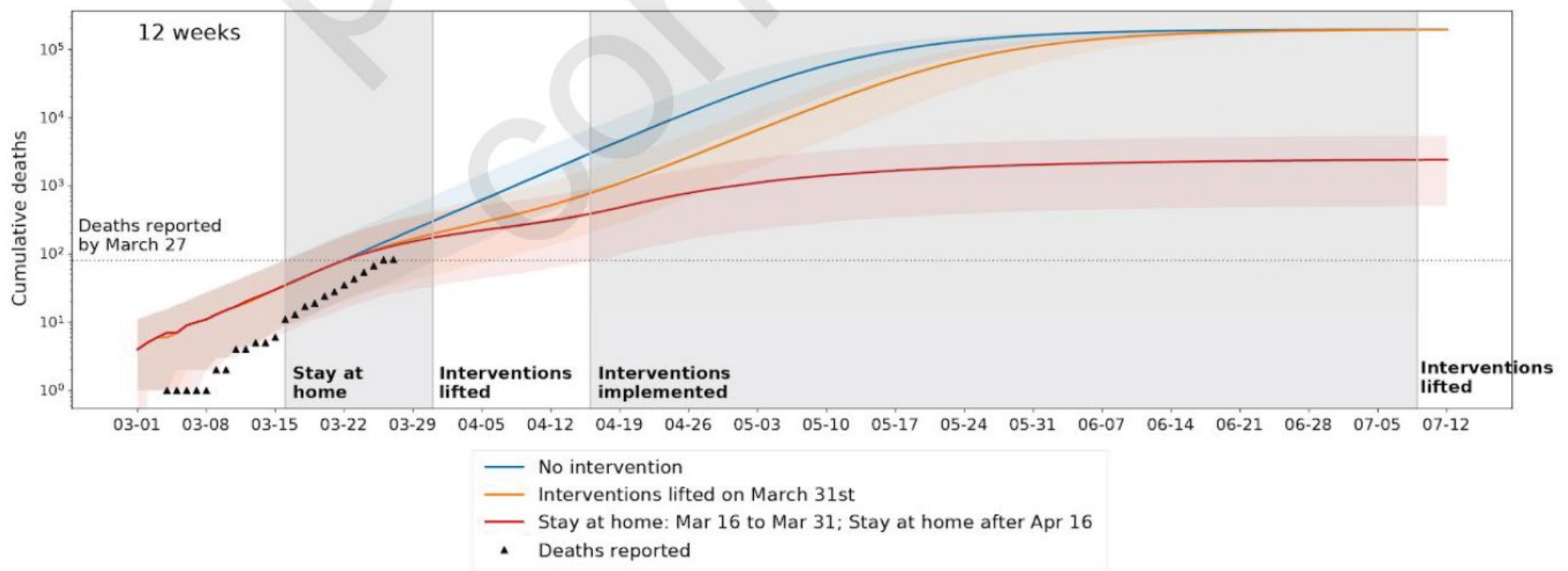
# Daily new infections incidence different scenarios in California



# Cumulative infections per 100 individuals for the different scenarios stay at home for 12 weeks in California



# Cumulative number of deaths interventions are implemented 12 weeks in California



# Cumulative clinical attack rate (AR) and cumulative number of deaths in California

	Stay at home (March 16-March 31) and after April 16 (in bracket the 90%CI)							
	2+2 weeks		2+4 weeks		2+8 weeks		2+12 weeks	
	Clinical AR(%)	Deaths	Clinical AR(%)	Deaths	Clinical AR(%)	Deaths	Clinical AR(%)	Deaths
March 31	0.07 [0.02-0.16]	172 [45-380]	0.07 [0.02-0.16]	172 [42-380]	0.07 [0.02-0.16]	179 [50-414]	0.07 [0.02-0.17]	174 [33-404]
April 30	0.39 [0.09-0.86]	960 [250-2,151]	0.38 [0.09-0.834]	962 [239-2,139]	0.4 [0.10-0.86]	1013 [288-2,237]	0.4 [0.1-0.89]	970 [200-2,210]
May 31	5.33 [1.49-9.92]	8,396 [2,336-17,188]	0.84 [0.22-1.79]	2,303 [580-4,962]	0.58 [0.16-1.3]	2,113 [630-4668]	0.59 [0.15-1.29]	2,031 [424-4,581]
June 30	38.23 [30.87-39.8]	123,950 [75,050-146,647]	17.44 [6.87-24.6]	32,070 [10,213-52,782]	0.75 [0.20-1.6]	2,582 [762-5,616]	0.63 [0.16-1.38]	2,363 [495-5,303]
July 12	40.92 [39.14-41.14]	168,034 [138,328-177,750]	32.67 [20.49-36.4]	89,178 [41,633-114,717]	1.31 [0.37-2.6]	3,513 [1,067-7,342]	0.64 [0.16-1.4]	2,410 [507 [5,402]

The colors of the cells, from green to orange, indicate when the daily number of ICUs needed will surpass the state's capacity



Thank you