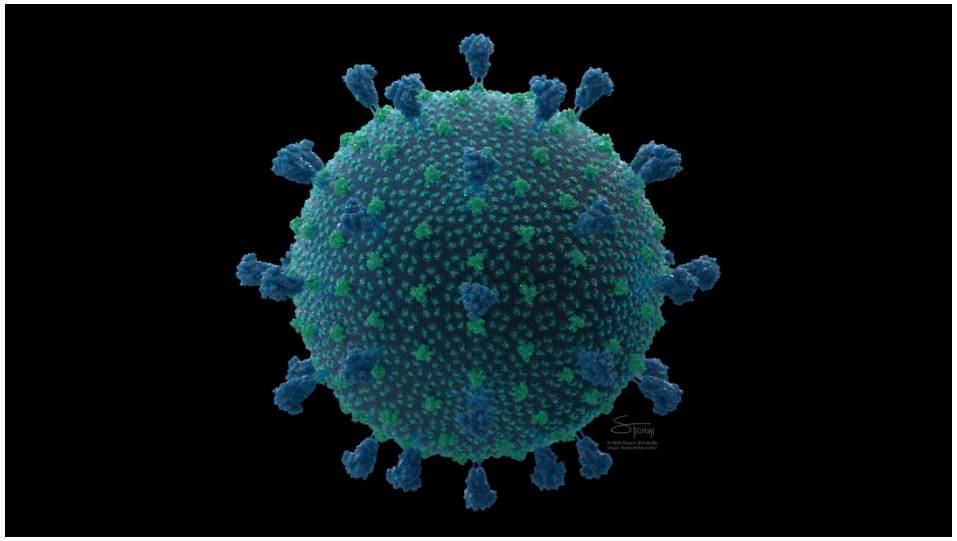
Coronavirus Disease (COVID-19): Protecting the Public during the Pandemic



CARLOS DEL RIO, MD

EMORY UNIVERSITY

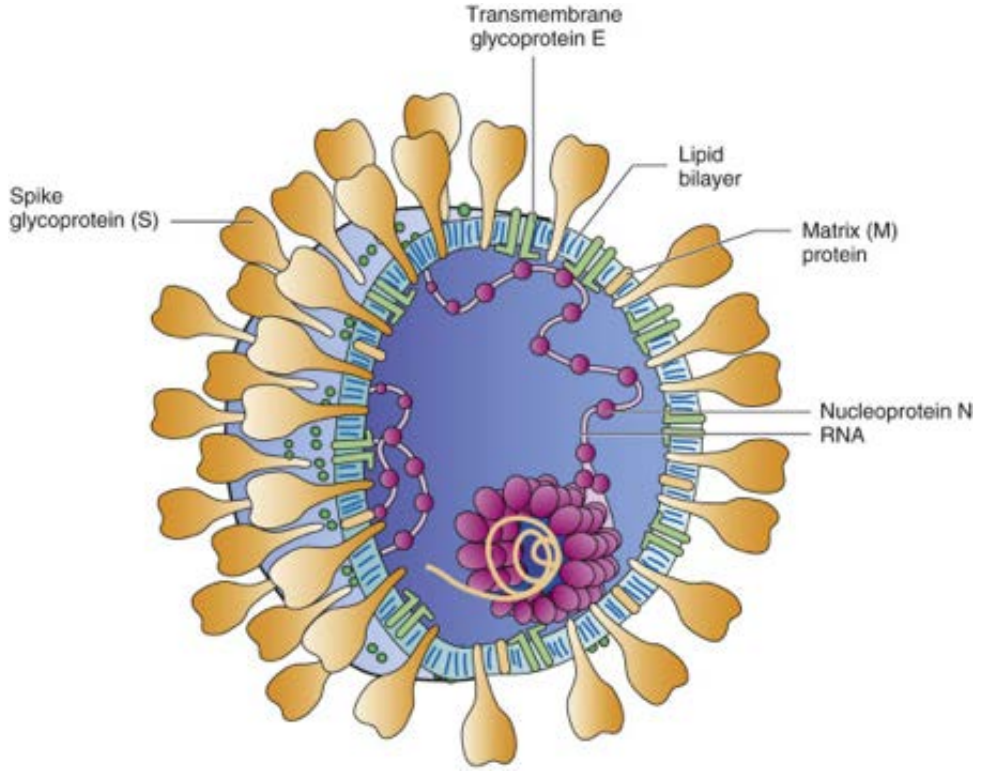
CarlosdelRio7

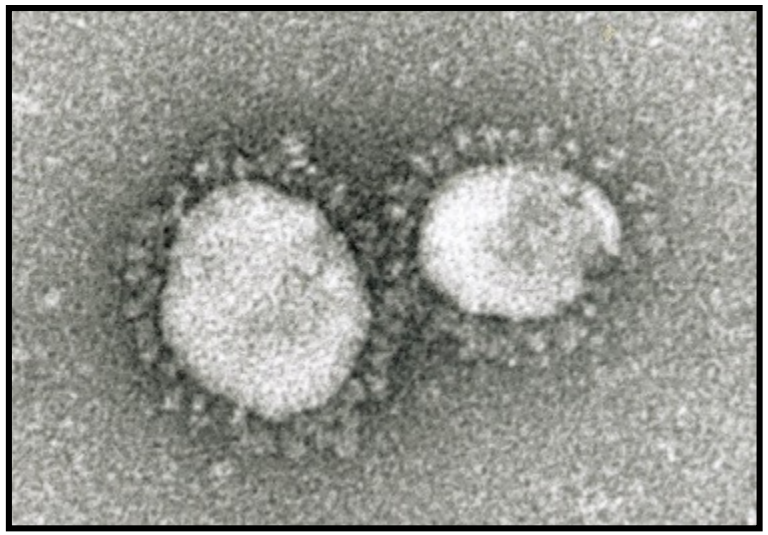
Coronavirus

Enveloped +RNA virus named for solar corona-like appearance of their virions

Cause of 10 – 30% of cases of the common cold

- They replicate at lower temperatures, thus predilection for upper respiratory tract
- The corona helps the enveloped virus survive in the GI tract
- Control of transmission is difficult





COVID-19

“Wuhan pneumonia”

Wuhan, a city in central China, is the capital of Hubei province.

31 December 2019: WHO China Country Office was informed of cases of pneumonia of unknown etiology detected in Wuhan.

07 January 2020: Chinese authorities identified a novel coronavirus (2019-nCoV) as the probable causative agent.

- Disease now named COVID-19 by WHO
- Virus named SARS-CoV-2 (https://www.biorxiv.org/content/10.1101/2020.02.07.937862v1)

As of 23 March 2020: > 330,000 confirmed cases and 14,600 deaths

- As of today ~ 80% in three areas: 24% in Mainland China, 44% in Continental Europe and 10% in US

Human to Human transmission has been confirmed

- > 3,000 HCW infections

Current Status of the COVID-19
(March 23 2020)

Global case numbers: > 337,500 cases; > 160 countries & > 14,600 deaths

- https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
- https://www.worldometers.info/coronavirus/

US case numbers*: > 33,500 cases and > 410 deaths

- https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html

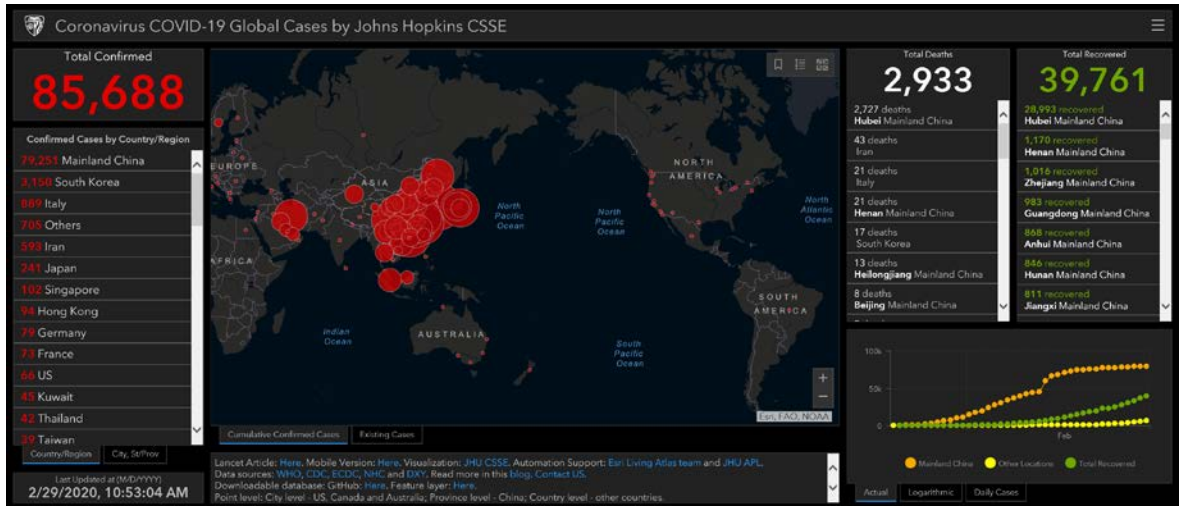
Georgia case numbers*: 620 cases and 25 deaths

- https://dph.georgia.gov/covid-19-daily-status-report

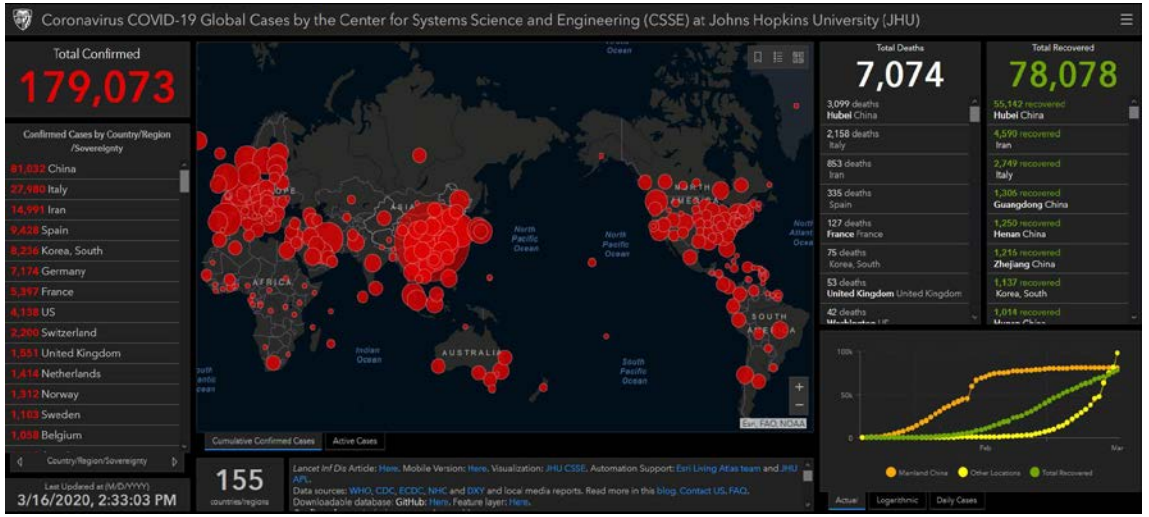
*significant undertesting

CoVID-19 Worldwide Progression: March 1-20, 2020

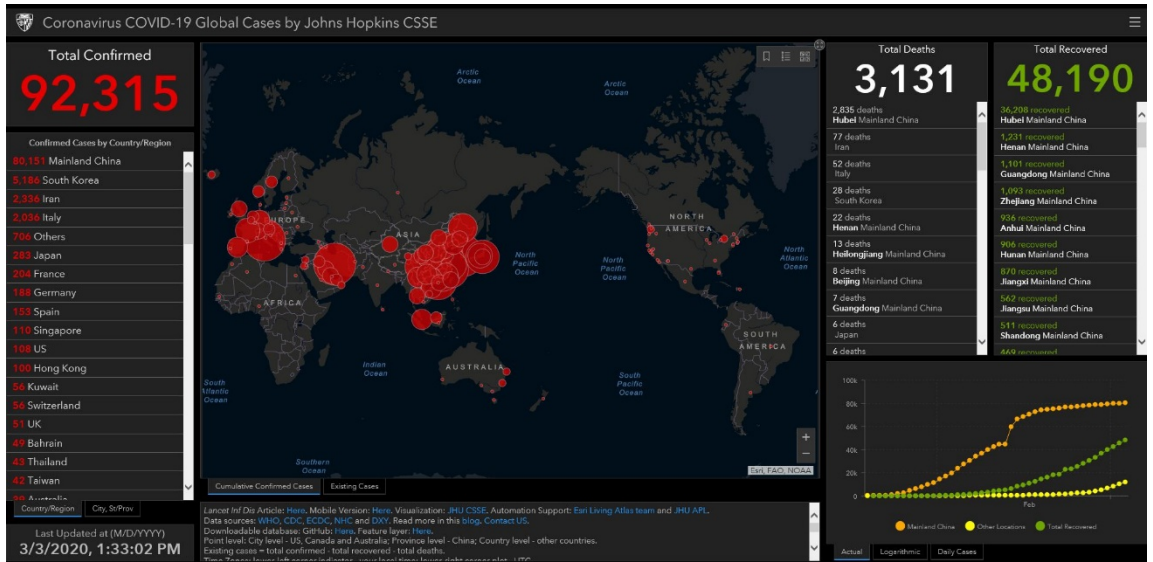
FEB 29, 2020



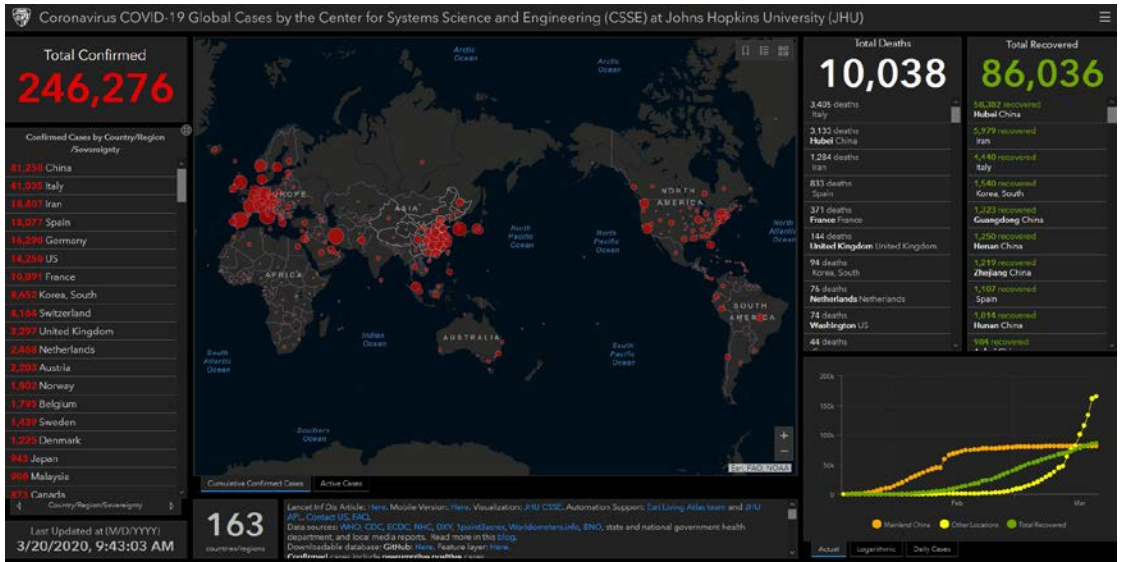
MARCH 16, 2020



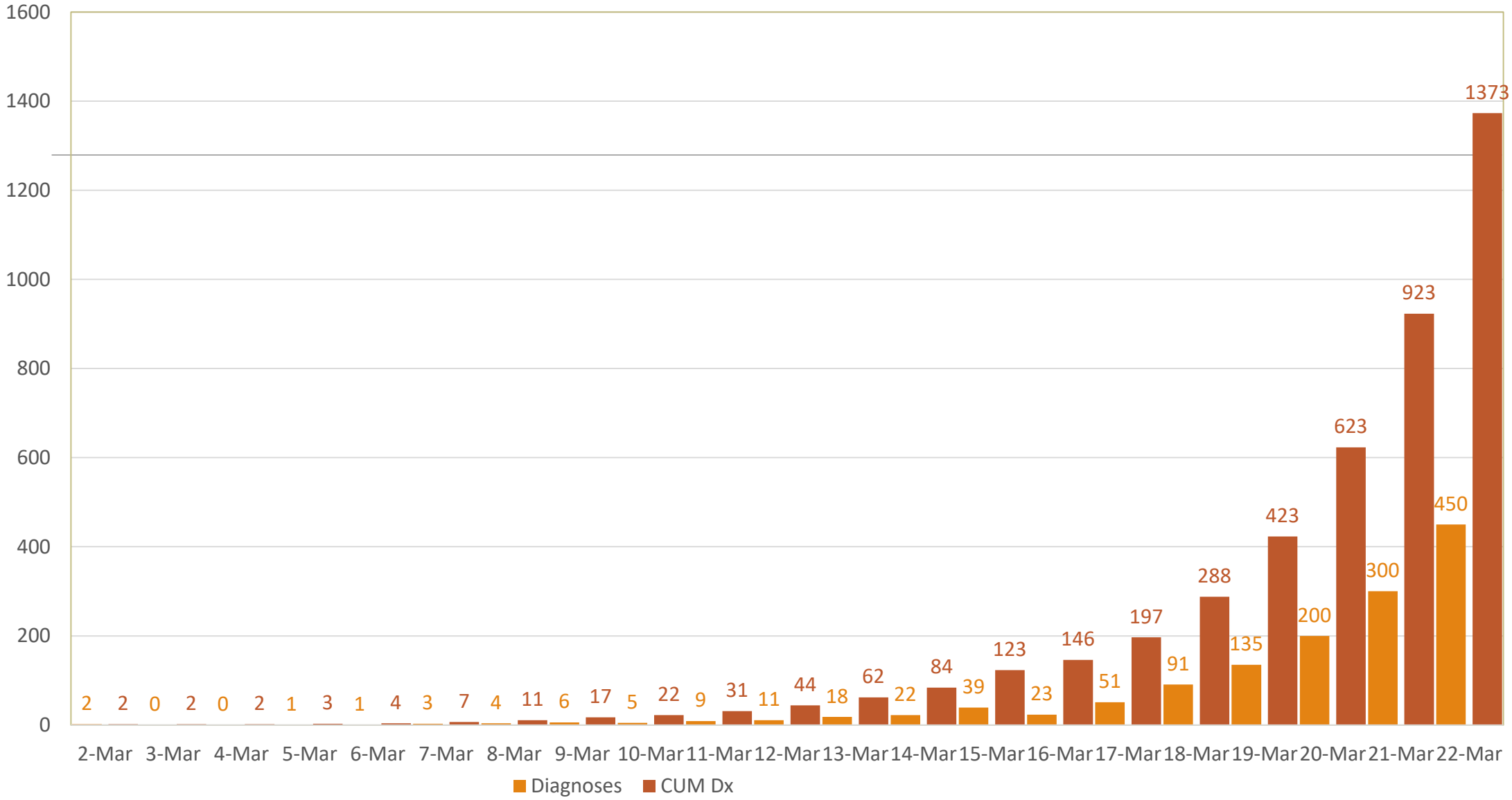
MARCH 3, 2020



MARCH 20, 2020



CoVID-19 in Georgia



COVID19 estimates vs Flu in Georgia
(if no aggressive interventions are done)

	Mid-COVID-19 Estimates	High COVID-19 Estimate
Cases	106,174	1,380,265
Medical Visits	31,852	690,132
Hospitalizations	10,617	276,053
ICU Beds	5,309	138,026
Deaths	1,062	27,605
Deaths among 65+ population	849	22,084

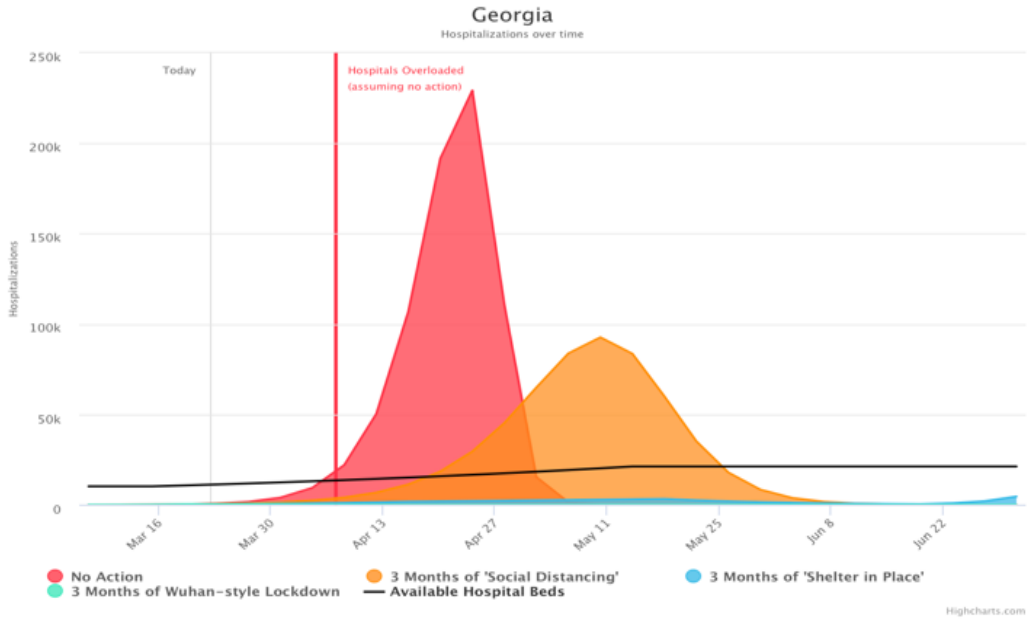
COVID19 estimates for Atlanta
(if no aggressive interventions are done)

	Mid-COVID-19 Estimates	High COVID-19 Estimates
Cases	59,500	773,494
Medical Visits	17,850	386,747
Hospitalizations	5,950	154,699
ICU Beds	2,975	77,349
Deaths	595	15,470
Deaths among 65+ population	476	12,376

Why you must act now: Georgia

Public leaders & health officials:
The only thing that matters right now is the speed of your response

This model is intended to help make fast decisions, not predict the future



Point of no-return for intervention to prevent hospital overload:

Mar 24 to Mar 29

https://covidactnow.org/state/GA

Predicted Outcomes after 3 Months

Scenario	Estimated Cumulative Infected	Estimated Date Hospitals Overloaded	Estimated Deaths
No Action	>70%	Tue Apr 07 2020	211,000
3 Months of Social distancing*	>70%	Mon Apr 20 2020	158,000
3 Months of Shelter-in-place*	5%	outside time bound	6,000
3 Months of Wuhan-style Lockdown**	<1%	never	<1000

https://covidactnow.org/state/GA

What about Bats?

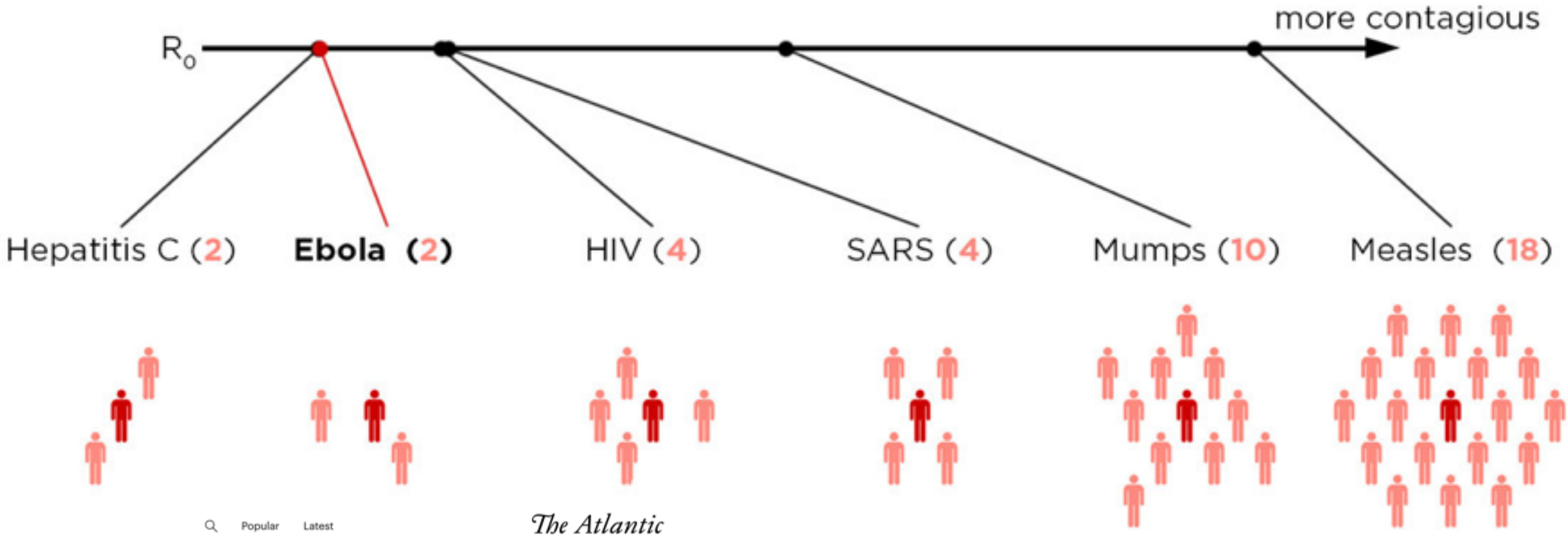
- Bats make up roughly 20% of all species of mammals and live to reach 40 years or more.
- Their ability to fly means they can transmit viruses far and wide.
- Bats have evolved to tolerate more viruses than other mammals and carry a significant proportion of zoonoses.
- Bats have suppressed their immune system thus allowing them to tolerate more viruses without getting sick.
  - Innate immunity likely works slightly differently in bats
- More than 500 coronaviruses in China come from bats.
  - China is a “hotspot” for bat-borne coronaviruses to emerge.
- Usually there is an intermediary animal which passes the virus to humans.

Global Coronavirus Outbreaks to Date

N = ~8000 ~2500 >300,000 and counting

	SARS-CoV	MERS-CoV	2019-nCoV
Origin	Guangdong, China	Saudi Arabia	Wuhan, China
Animal Reservoir	Bats --> Civets	Bats → Camels	**Bats → ?**
Cell Receptor	ACE2 receptor	DPP4 receptor	ACE2 Receptor
Incubation period	2-10 days	2-14 days	2-14 days
Basic reproduction # (Ro)	About 2	< 1	**2-3.5?**
Symptoms	Fever, cough, atypical PNA, ARDS, occasional diarrhea	Fever, cough, atypical PNA, ARDS; GI sxs and AKI	Fever, cough, atypical PNA→ can progress to ARDS, MODS
Asymptomatic Transmission	No	Yes	**Unknown**
Nosocomial Transmission	58% of cases	70% of cases	**Yes, unknown how common**
Case Fatality Rate	10%	35%	**Unknown (proportion of fatal cases 2.5-3% overall; 10-15% in hospital pts)**
Outbreak Contained	Yes	No	No

The number of people that **one sick person** will infect (on average) is called R_0.
Here are the maximum R_0 values for a few viruses.



Popular Latest

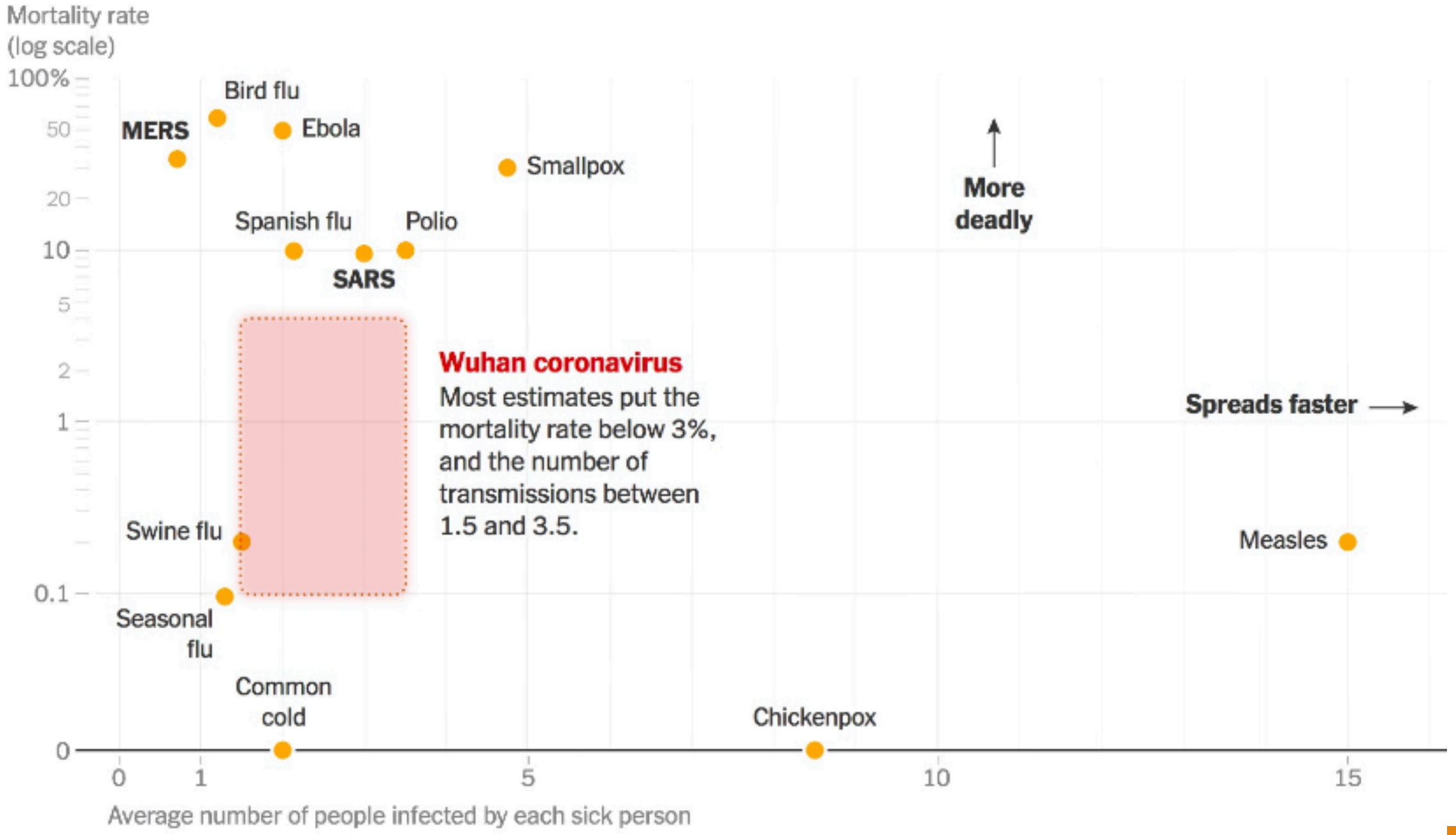
The Atlantic

SCIENCE

The Deceptively Simple Number Sparking Coronavirus Fears

Here's what the oft-cited R0 number tells us about the new outbreak—and what it doesn't.

ED YONG 7:00 AM ET


Mortality rate
(log scale)
100%
50
20
10
5
2
1
0.1
0
Bird flu
MERS
Ebola
Smallpox
Spanish flu
Polio
SARS
More
deadly
Wuhan coronavirus
Most estimates put the
mortality rate below 3%,
and the number of
transmissions between
1.5 and 3.5.
Spreads faster
Swine flu
Measles
Seasonal
flu
Common
cold
Chickenpox
0
1
5
10
15
Average number of people infected by each sick person

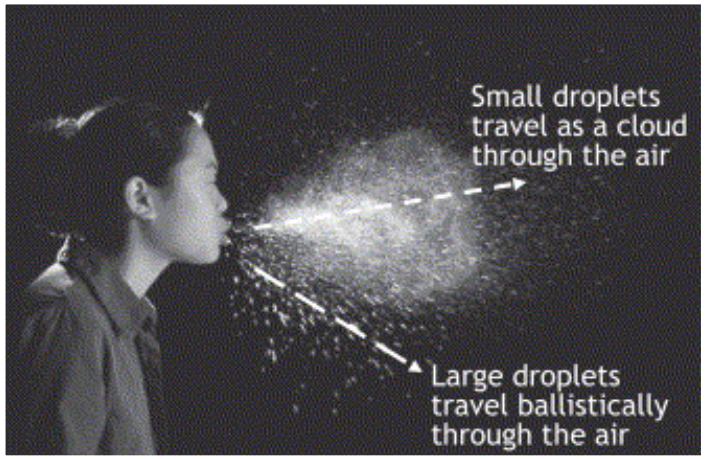
COVID-19 Transmission

Respiratory secretions - main mode of transmission

- Spread through respiratory droplets in the air and that land on surfaces
- Transmission from people before onset of symptoms or without symptoms possible but contribution off these infections appears to be small

Stool – unlikely to be a source

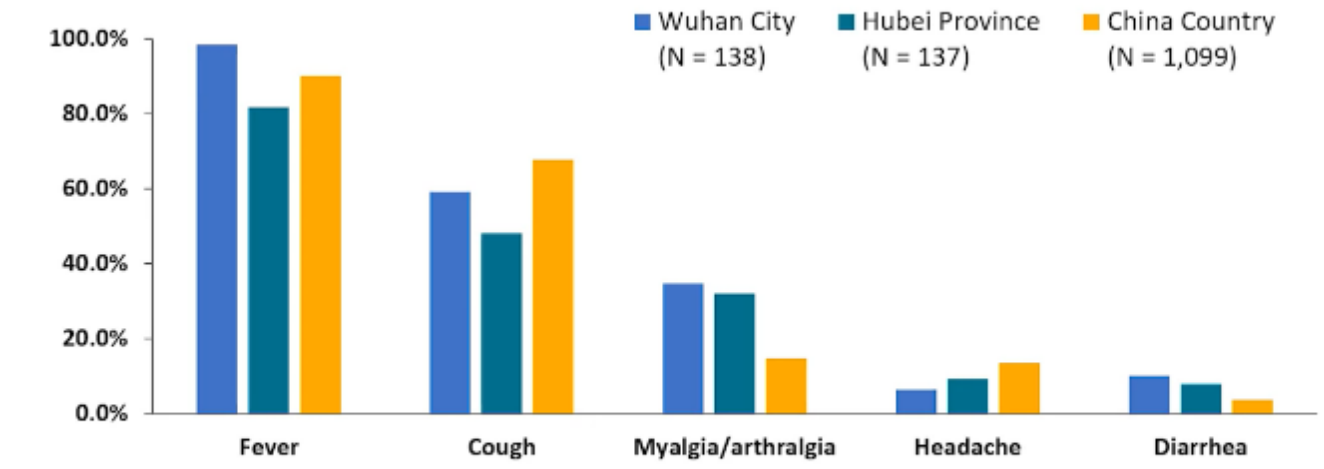
Perinatal – no transmission observed



Tang JW et al, *J Hosp Infect* 2006; 64:100-14.

Signs and Symptoms of COVID-19

No particular signs and symptoms can discriminated COVID-19 from other respiratory infections such as influenza



Liu 2020, Chinese Med J; DOI: 10.1097/CM9.0000000000000744. Wang 2020, JAMA; doi:10.1001/jama.2020.1585.
Guan 2020, N Engl J Med; DOI: 10.1056/NEJMoa2002032.

Clinical Course of COVID-19

Incubation period is ~5 days (range = 2 – 14 days)

~80 % have mild illness (~80%)

- fever (83 – 98%)
- cough (76 – 82%)
- myalgia or fatigue (11 – 44%)

~ 30% of hospitalized patients required intensive care

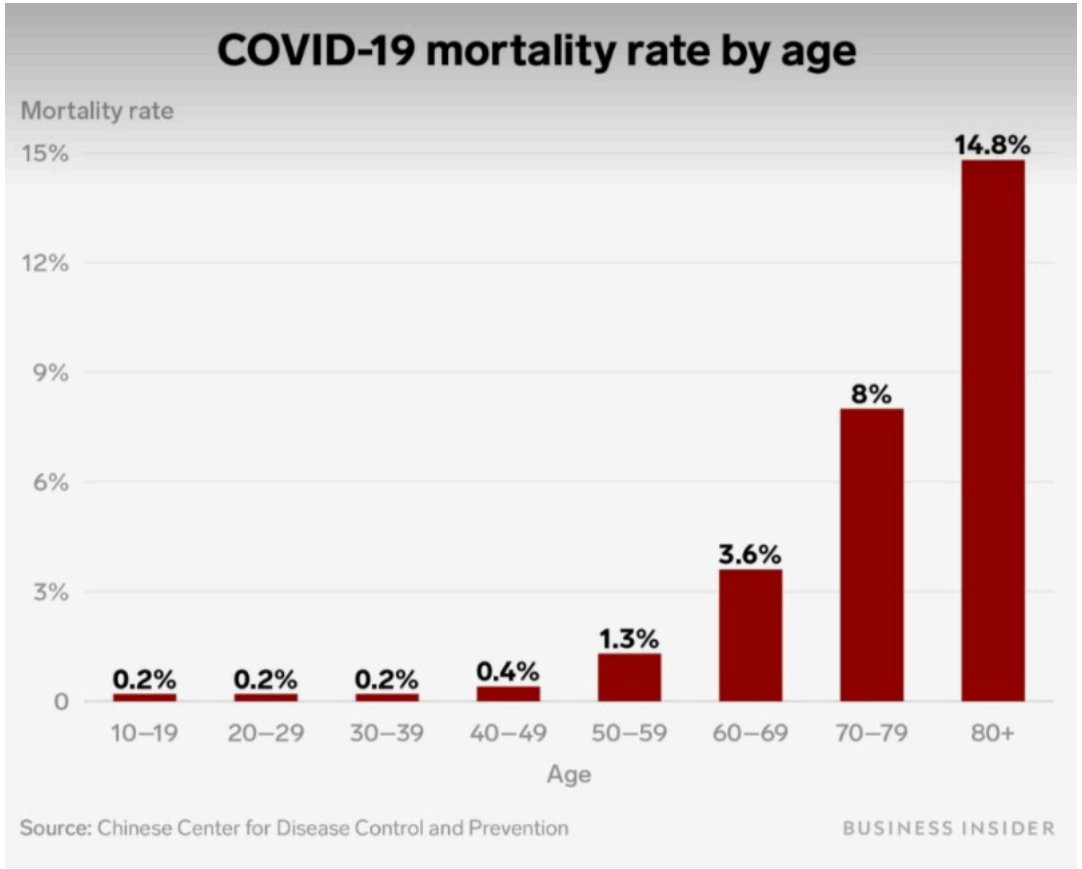
- 5-10% require mechanical ventilation

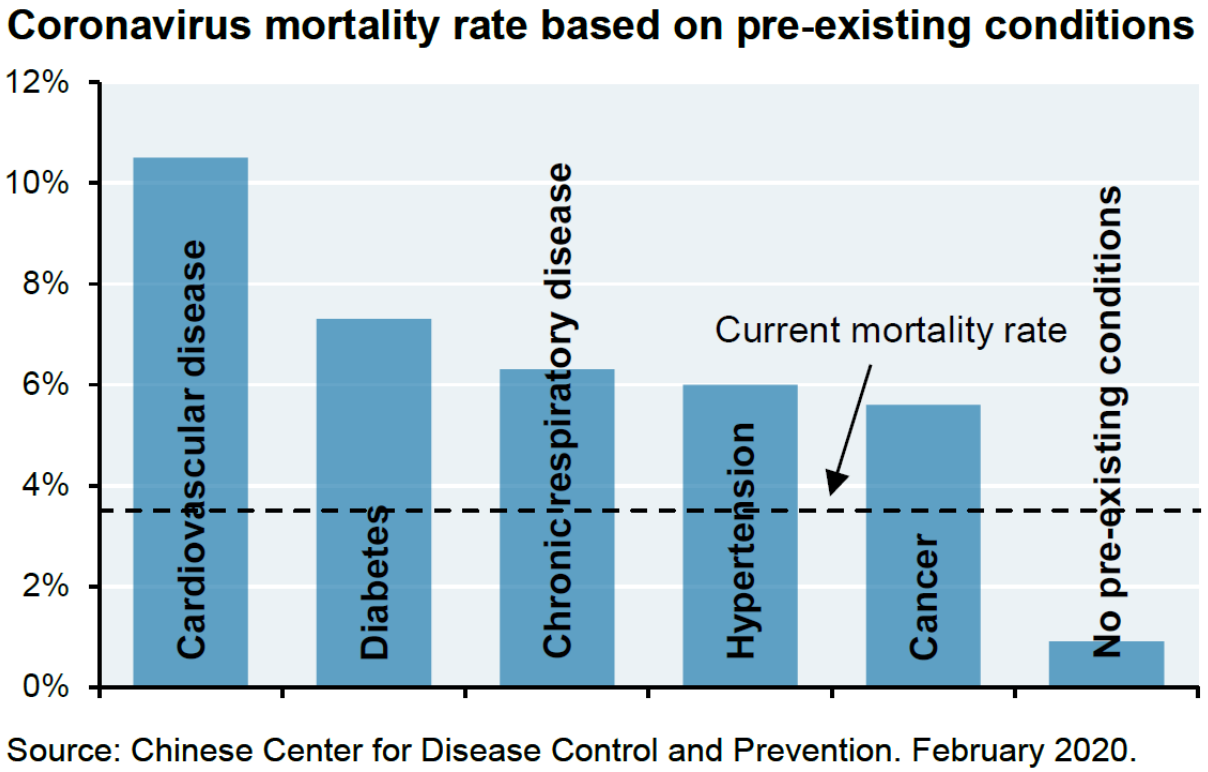
No approved medication

- NIH clinical trials have started

Supportive care has been very successful for most patients

COVID-19 Mortality





Testing for COVID-19

Testing by detecting RNA of virus:

- Nasopharyngeal swab and Throat swab
- Lower respiratory sample if possible

Until recently only available at CDC

- Now available in most state laboratories (GA DPH now has it)

Commercial labs (ej: Quest, LabCorp, ViraCor) now are performing testing

Time from sample acquisition to test result is still longer than desired

Still needed: greater ability to obtain testing without coming to hospital or busy clinic

Quarantine vs. Isolation

Isolation

To separate **ill** persons who have a communicable disease from those who do not have that disease

Restricts the movement of ill persons to help stop the spread of certain diseases

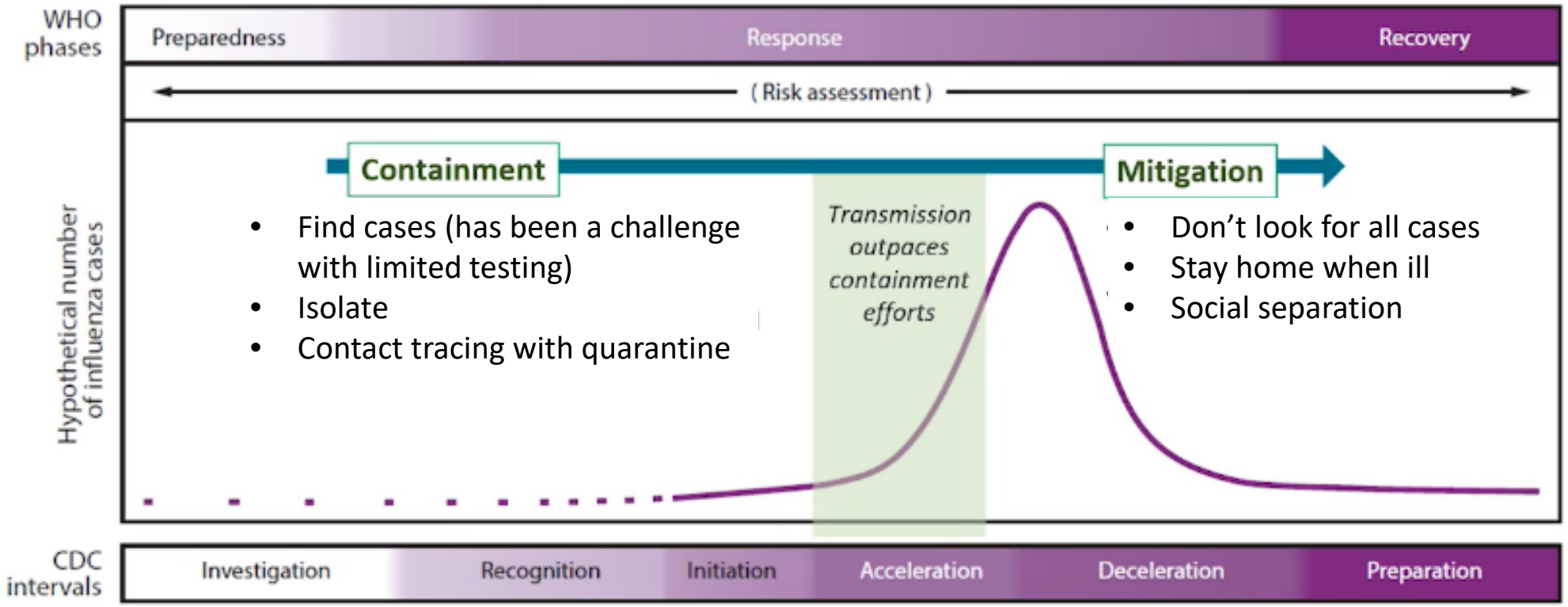
Example: Isolation for patients with infectious tuberculosis

Quarantine

- To separate and restrict the movement of **well** persons who may have been exposed to a communicable disease
- Monitor to see if they become ill
- These people may have been exposed to a disease and do not know it, or they may have the disease but do not show symptoms.
- Quarantine can also help limit the spread of communicable disease.

https://www.hhs.gov/answers/public-health-and-safety/what-is-the-difference-between-isolation-and-quarantine/index.html

Preparedness and Response Framework for Pandemics



Adapted from: Holloway 2014, MMWR Recomm Rep;63(No. RR-6). Qualls 2017, MMWR Recomm Rep; 66(No. RR-1). Jernigan 2020, MMWR Early Release: February 25, 2020.

Preparing your healthcare system

Review your facility emergency plan

Create an emergency contact list

Communicate about COVID19 with staff and patients

Protect your workforce

- Screen patients and visitors for symptoms of acute respiratory illness

Ensure proper use of Personal Protective Equipment (PPE)

Conduct an inventory of available PPE

Encourage sick employees to stay home

Separate patients with respiratory symptoms so they are not waiting with other patients

Consider strategies for patients to stay home

https://www.cdc.gov/coronavirus/2019-ncov/healthcare-facilities/steps-to-prepare.html

Personal Protective Equipment

Gown

Gloves

N-95 Respirator

Face Shield

Personal Protective Equipment are Single Use Only
Discard after leaving the patient room and perform hand hygiene

Challenges in Infection Prevention

In the case of 2019-nCoV, the difficulty in controlling the virus includes:

- presence of many mild infections: difficulty in identifying and isolating cases at an early stage
- limited resources for isolation of cases and quarantine of their close contacts
- Training needed to donning and duffing PPE
  - Great video from NETEC: https://www.youtube.com/watch?v=bG6zISnenPg

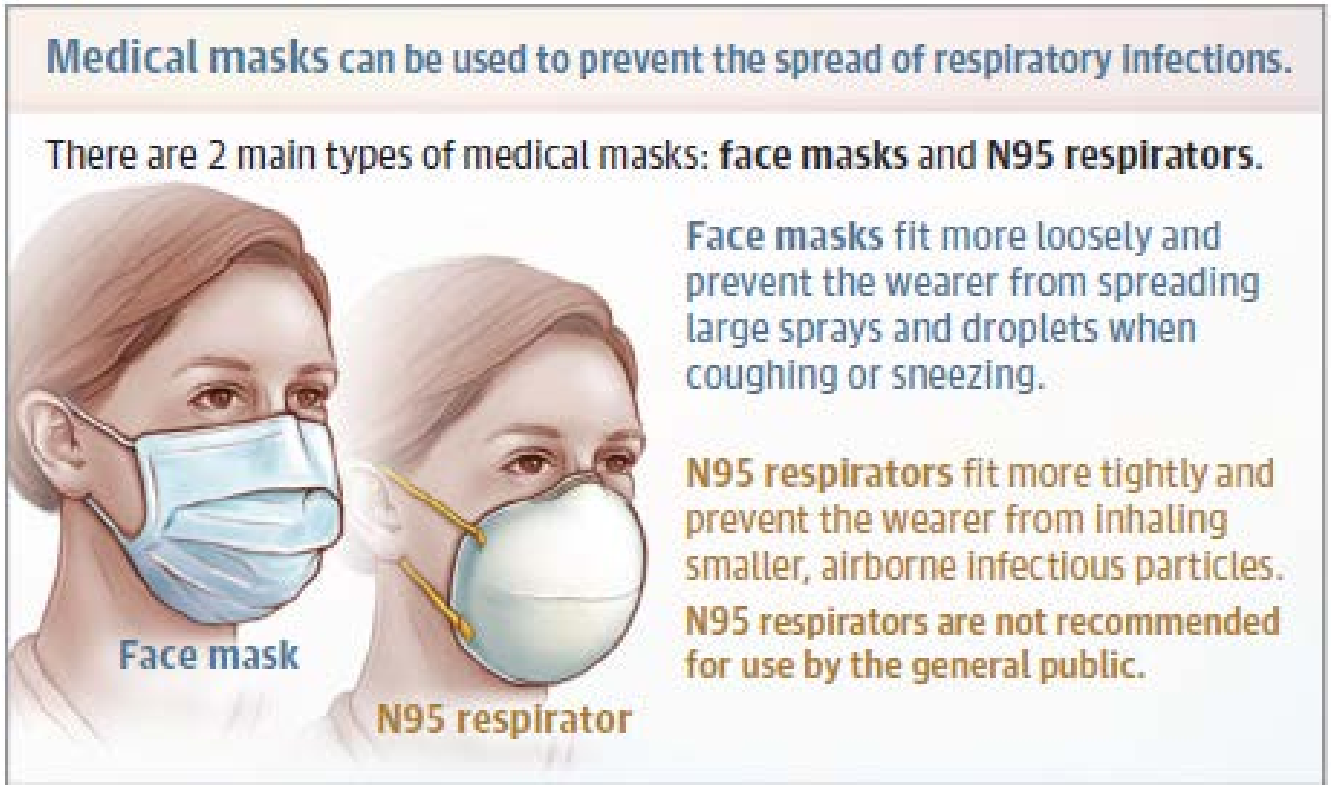
What about masks?

Surgical mask:

- Meant to protect the environment from the wearer (designed to keep the surgeon's respiratory pathogens away from a patient)
- Does a good job of trapping large droplets and some aerosols

Respirator (N95 Mask):

- Fits tighter to the face and is meant to help protect the wearer from inhaling droplets in the environment

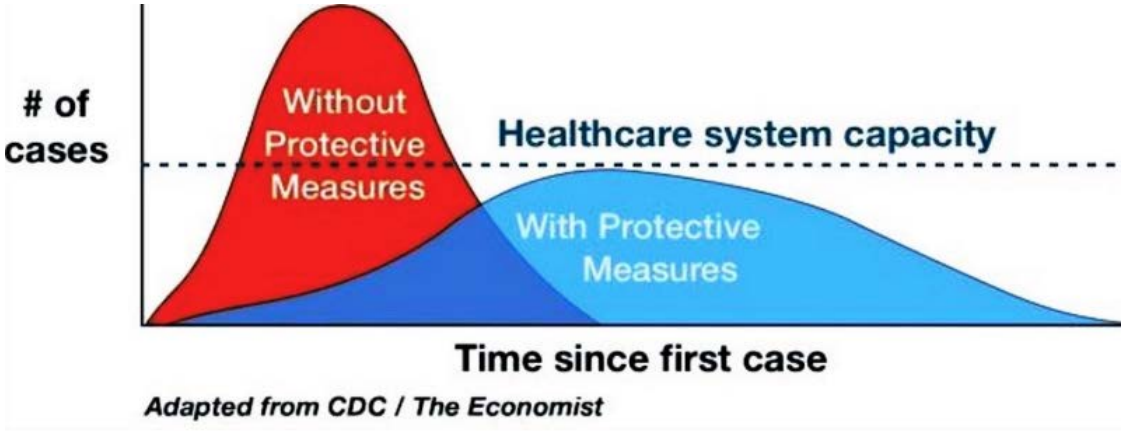


Non-pharmacologic measures

- Border screenings/closures
  - Little value at this point
- Mass gatherings
  - Important to prevent them – may have significant impact on conferences and sporting event
    - In Atlanta the NCAA Basketball final 4 and the Decennial Conference in Infection Prevention
- Public transportation
  - Potential place for spread
- School closures
  - Have to be implemented early to have impact
- Isolation of infected
  - Critically important, need testing to identify those infected!

Goals of Mitigation Strategies

- Minimizing morbidity
- “Flattening” the epidemic curve to avoid overwhelming healthcare services
- Keeping impact on economy manageable
- Slowing progression of epidemic to allow for vaccine and other treatment development



Social Distancing

"TO LIMIT THE SPREAD IN THE COMMUNITY WE NEED TO SPREAD THE COMMUNITY"

Social Distancing and Personal Hygiene


At Home


At School


At Work


At a Gathering

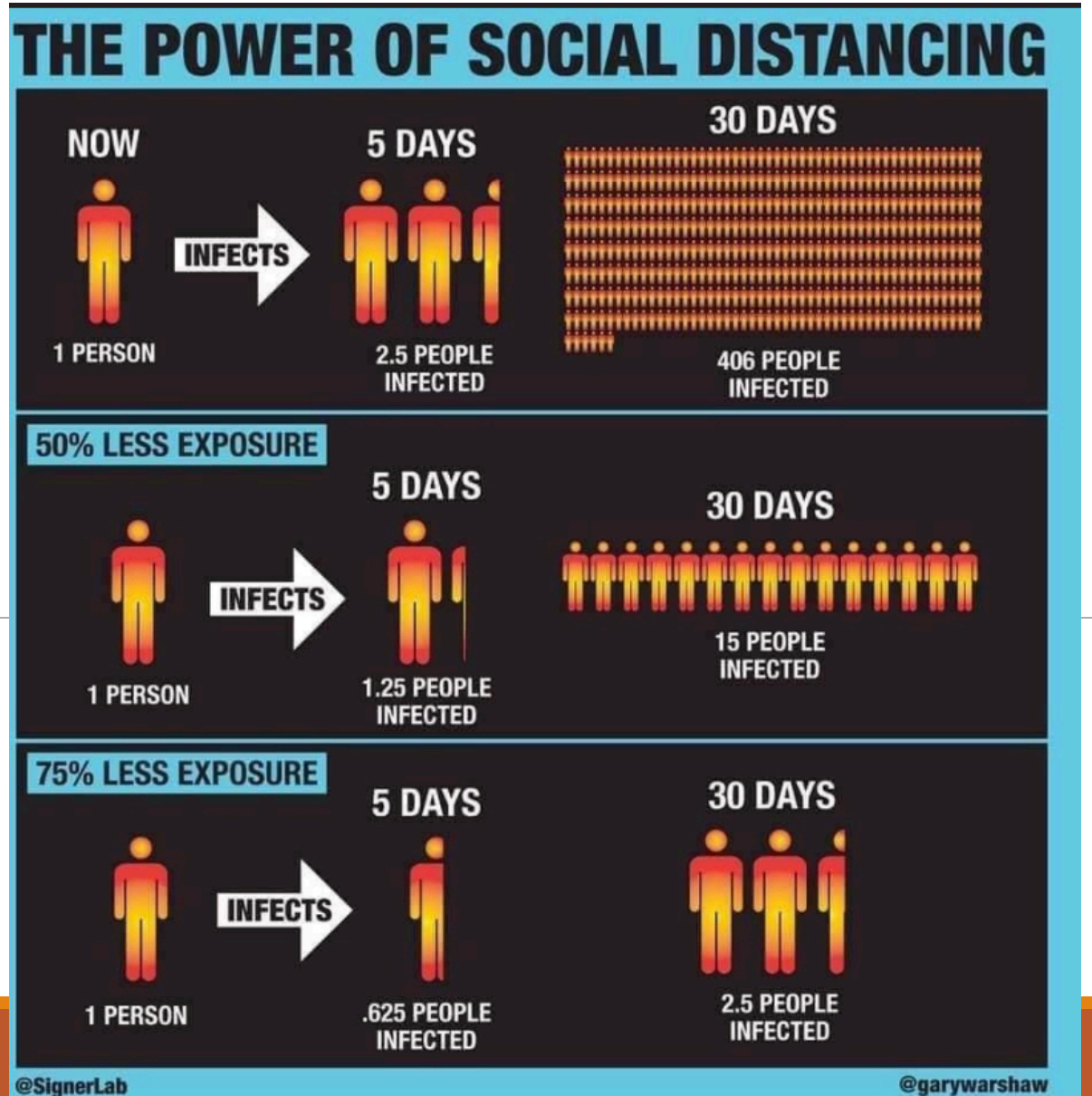
https://www.cdc.gov/nonpharmaceutical-interventions/index.html

- Stay home if sick
- Notify MD office before visit
- Limit movement
- Limit visitors
- At least 2 weeks supply of medications and food

- Early
  - Stay home if sick
  - Hand hygiene
- Mild-moderate
  - Reduce large gatherings
  - Reduce mixing
  - Consider distance learning
- Substantial
  - Distance learning
  - Closure

- Early
  - Stay home if sick
  - Hand hygiene
  - telework
- Mild-moderate
  - Reduce meetings
  - Stagger schedules
  - Limit travel
- Substantial
  - Telework
  - Cancel travel and conferences

Social Distancing



School Closure

- Types of school closure: school, class dismissal, reactive closure, proactive closure
- Things to consider: timing of closure/intervention in the outbreak, disruption for healthcare systems, effects on communities, social and ethical issues (lower SES families will likely be disproportionately affected by a given intervention), cost/ benefit analysis
- Cost effectiveness of closing schools. Think about the economic and social impact of closing schools in regard to the epidemiologic data available

Cauchemez etal,"Closure of schools during an influenza pandemic,"Lancet Inf Dis 2009: 9: 473-81

Preparing your school or university

Emphasize preventive actions for students and staff

- Staying home when sick
- Hand and respiratory hygiene

Review and prepare with student and occupational health

Information-sharing systems with staff, students, and partners.

Review emergency operations plans in case of outbreak on campus

- Prepare for temporary class suspension and event/activity cancellation
  - Use of virtual classrooms?
- Prepare for on campus quarantine

Ensure availability of nutrition and medication

Ensure continuity of education and research

https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-ihe-response.html

Preparing your business and employees

Empower employees to stay home when sick

- Remote work and communication solutions
- Review human resources policies, workplace and leave flexibilities
- Review pay and benefits available to encourage appropriate sick leave

Encourage good hand hygiene

- Alcohol based hand sanitizer at high touch areas (water/coffee dispensers)

Prepare for wide-spread outbreaks

- Social distancing (school/daycare closures, restriction on gatherings)
- Travel restrictions from government or other agencies
- Absenteeism
- Develop Enterprise-wide Bio-preparedness (Pandemic) Plans

https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html

Prevention advice you can use:

Executive Order
Office of the Mayor
City of Atlanta

EXECUTIVE ORDER NUMBER 2020-___
BY THE MAYOR

DECLARING, IN ACCORDANCE WITH SECTION 2-181(A) OF THE CITY OF ATLANTA CODE OF ORDINANCES, THERE TO BE AN EMERGENCY IN EXISTENCE WITHIN THE TERRITORIAL JURISDICTIONAL LIMITS OF THE CITY OF ATLANTA DUE TO THE EXISTENCE OF AN EXTREME LIKELIHOOD OF DESTRUCTION OF LIFE OR PROPERTY WITHIN THE TERRITORIAL JURISDICTIONAL LIMITS OF THE CITY OF ATLANTA DUE TO THE UNUSUAL CONDITION OF THE COVID-19 PANDEMIC; AND ORDERING THE CLOSURE OF ALL BARS AND NIGHTCLUBS THAT DO NOT SERVE FOOD, GYMS AND FITNESS CENTERS, MOVIE THEATERS, LIVE PERFORMANCE VENUES, BOWLING ALLEYS, AND ARCADES, AND PRIVATE SOCIAL CLUBS, LOCATED WITHIN THE TERRITORIAL JURISDICTIONAL LIMITS OF THE CITY OF ATLANTA IN EXERCISE OF MY EMERGENCY POWERS GRANTED PURSUANT TO SECTION 2-181(B)(4) OF THE CITY OF ATLANTA CODE OF ORDINANCES TO; DECLARING THAT RESTAURANTS, AND OTHER EATING AND DRINKING ESTABLISHMENTS WHERE FOOD IS SERVED MUST CEASE OFFERING DINE-IN SERVICES, BUT MAY CONTINUE PREPARING AND OFFERING FOOD TO CUSTOMERS VIA DELIVERY SERVICE, DRIVE-THROUGH, OR TAKE-OUT; PROVIDING THAT CAFETERIAS IN HOSPITALS, NURSING HOMES, OR SIMILAR FACILITIES SHALL NOT BE SUBJECT TO THESE RESTRICTIONS AND MAY CONTINUE NORMAL OPERATIONS; AND FOR OTHER PURPOSES.

- Need to consider likely public response: “*most respondents would comply with recommendations but would be challenged to do so if their income or job were severely compromised*”
- *“During a pandemic, short-duration, rapid-turnaround public surveys can provide timely information to public health officials about the acceptability of recommendations and needed communication to the public if problems are found.”*

Blendon et al. Emerg Infect Dis ,2008

Conclusions

1. It is going to get worse before it gets better
2. We need to “prepare for the worst and hope for the best”
3. This is going to be long (3 -4 months) and there will be significant pain.
   a. We need to protect our healthcare workers but also need to be prepared as some will get infected
   b. We need to provide psychological support/counseling
4. We can make a difference as persons, society and healthcare system
   a) Help promote social distancing
   b) Make sue those sick with fever or respiratory symptoms stay home
5. This too shall pass, how long it lasts is really up to us

The Future

Rapid Diagnostic Test

Antiviral Therapy?

Identification of “Super” spreaders, most efficient transmission routes, period of infectivity, etc.

Spectrum of Disease:

- asymptomatic transmission

Vaccines

Understanding why outbreak occurred and prevent from happending again

Resources

- **CDC**
  - https://www.cdc.gov/coronavirus/about/index.html
- **WHO**
  - https://www.who.int/health-topics/coronavirus
- **IDSA:**
  - https://www.idsociety.org/public-health/Novel-Coronavirus/
- **NYT:**
  - https://www.nytimes.com/live/2020/coronavirus-covid-19-03-18


Mike Luckovich
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SCIENTISTS
DOCTORS
NURSES
FIRST RESPONDERS

Questions?