

# COVID-19

## Just the Facts

(and some educated guesses  
based on similar viruses)

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March 13, 2020

# Disclosures

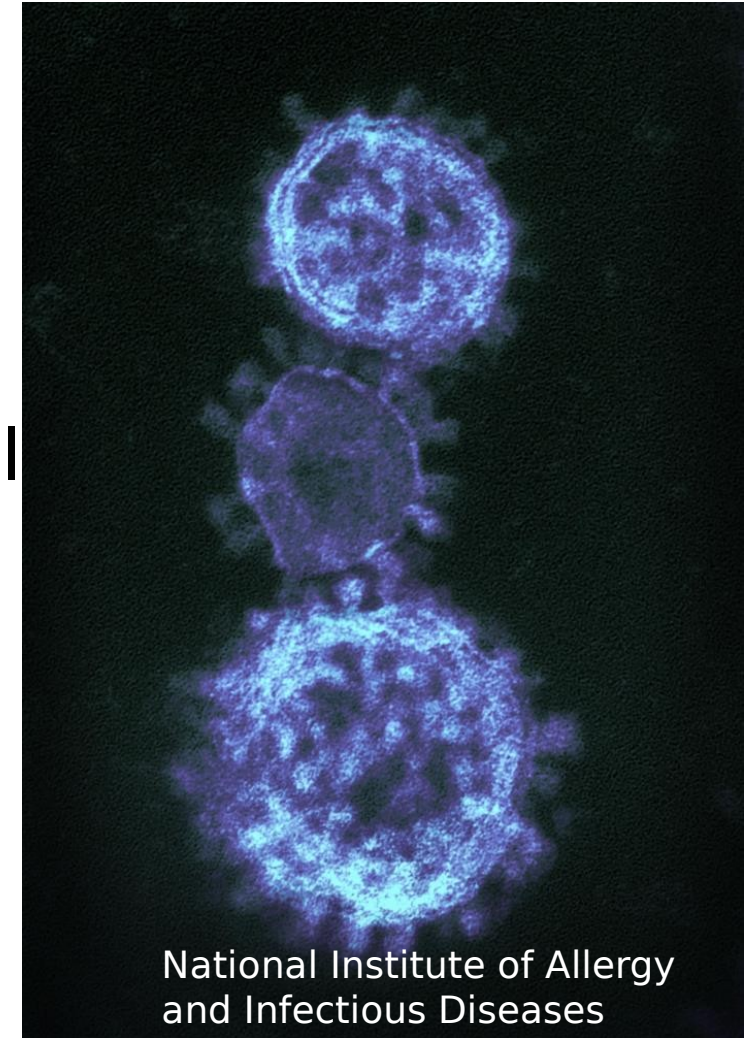
- No Relevant Financial Interests
- There will be math
- Black text = known research on COVID-19
- Green = educated guesses based on epidemiology or knowledge of similar viruses
- Purple = speculation

# Overview

- Biology of the virus
- COVID-19 disease
- Transmission
- Current status of pandemic
- Epidemiologic concepts
- What to do here in New Mexico
- Resources

# Coronavirus Family<sup>1</sup>

- RNA Viruses
- Glycoprotein “spikes” on envelope – crown like appearance
- > 60 Unique viruses
  - 4 Human strains – common cold
  - Multiple different animal strains
    - Can “make the jump” to humans
    - SARS
    - MERS
    - **SARS-CoV-2 causes COVID-19 Disease**



National Institute of Allergy  
and Infectious Diseases

# COVID-19<sup>1</sup>

- **CoronaVirus Disease 2019**
- Emerged in Wuhan, China in December of 2019
- Clustered around local seafood market
- Illegal live animal trading
- Source animal is still unknown
  - SARS – Bats  Civets  Humans
  - MERS – Bats  Camels  Humans

# COVID-19 Characteristics<sup>2</sup>

- 44,672 Confirmed Cases (as of February 11, 2020)
- Severity
  - Mild 81% -- No deaths
  - Severe 14% -- No deaths
  - Critical 5%
- **Case Fatality Rate: 2.3%** (Deaths ÷ People with disease)
  - **Age >80: 15%**
  - **Age 70-79: 8%**
  - **Age 0-9: 0%**

# COVID-19 Characteristics

- **Case Fatality Rate: 2.3%**
- **Influenza (historically): 0.15%**
- **Influenza (1918 pandemic): 2.5%**
- **SARS: 10%**
- **MERS: 34%**
- **Ebola: 50%**
- **Bird Flu (H5N1): 60%**

# COVID-19 Characteristics<sup>2</sup>

- Pre-existing conditions increase Fatality Rates
- **Cardiovascular disease**
- **Diabetes**
- **Chronic respiratory disease**
- **Hypertension**
- **Cancer**



# Symptoms<sup>3,4,5</sup>

- Fever – 80-98%
- Cough – 60-80%
- Muscle aches – 30-50%
- Shortness of breath – 30%
- Headache – 10-30%
- Diarrhea – 5-10%

**What is missing from this list???**

# Symptoms<sup>3,4,5</sup>

## **What is missing from this list???**

- Runny nose – 0-4%

# Symptoms<sup>3,6</sup>

- Exposure to symptom onset – 4 days (95% within 12.5 days)
- Symptom onset to dyspnea – 5 days
- Median Duration of hospitalization - 10 days
- Duration of illness – >14 days (case reports > 30 days)

# Pregnancy and delivery<sup>12</sup>

- Review of 9 pregnant women who tested positive for SARS-CoV-2
- Symptoms similar to general population
  - Fever, cough, malaise.
- All had C-section for other indications (NOT COVID-19)
- All recovered with no complications
- 6 patients had further viral testing – **ALL NEGATIVE**
  - Newborn throat swab
  - Amniotic fluid
  - Umbilical cord blood
  - Breast milk

# Pediatrics<sup>2, 13,14</sup>

- Symptoms are milder
- Initial Chinese CDC report -- 44,672 patients
  - Age 0-9: No deaths
  - Age 10-19: No deaths
- All reported cases in China from age 28 days – 11 months
  - No deaths or serious complications
- 1 case report of critically ill 7 year – recovered
- Also true for SARS and MERS – no pediatric deaths

# Treatment

- No specific treatment
- No vaccine
- “Supportive care”
  - Oxygen
  - IV Fluids
  - Medications to support blood pressure

# Transmission

<https://www.cdc.gov/coronavirus/2019-ncov/about/index.html>

- Human-to-Human
- “Community Transmission”
  - No known exposure to an infected person
  - No travel to a high risk region
- Respiratory droplets and aerosol
- Droplets on surfaces or objects

# Infectious Period<sup>10, 11</sup>

- First 5 days of illness most infectious
- Rapidly decreases by day 10 of illness
- Transmission can happen BEFORE symptoms start



# Infected Surfaces<sup>16</sup>

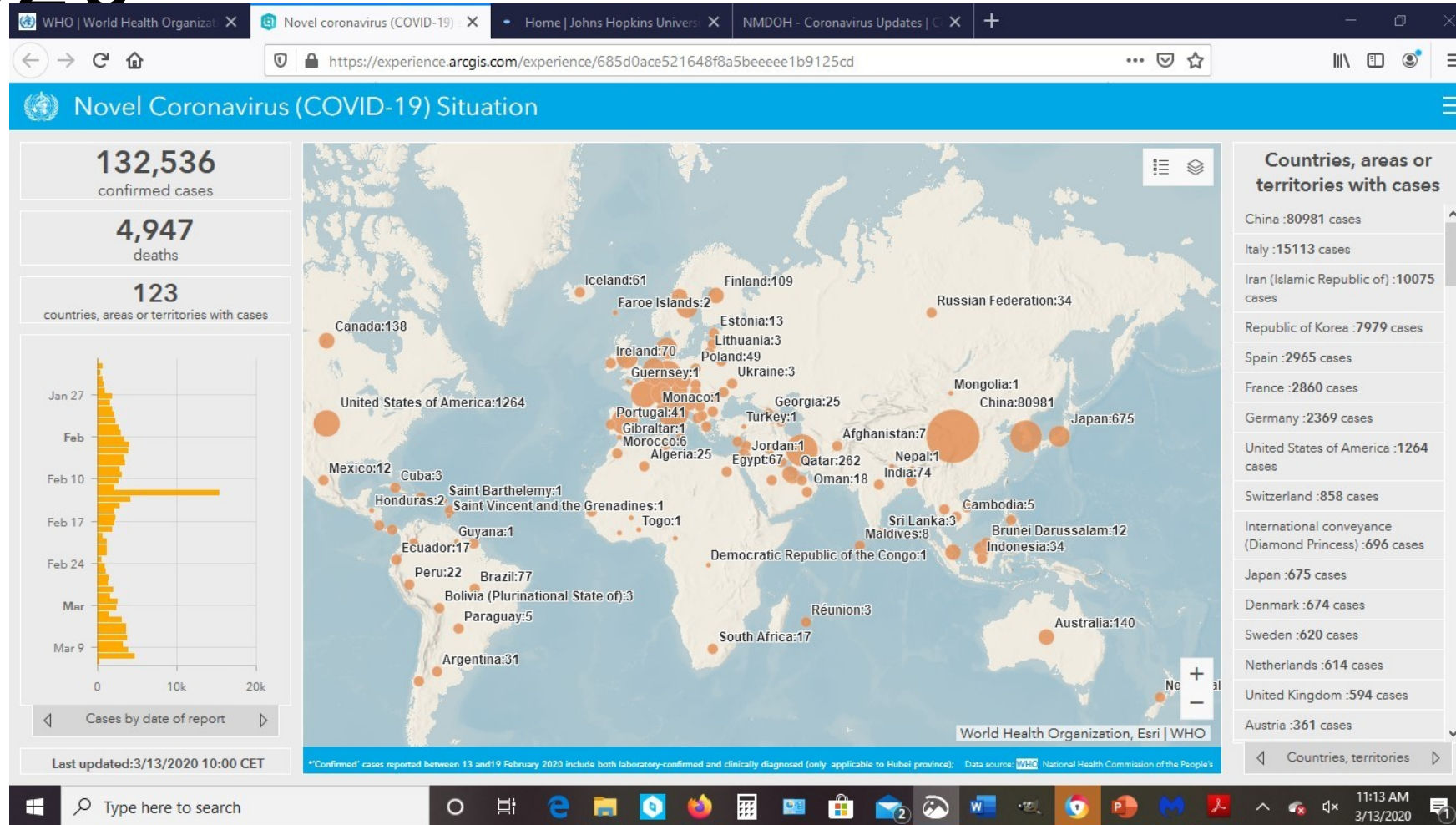
- 70° F, 65% humidity
- Plastic – 3 days
- Stainless steel – 2 days
- Cardboard – 1 day
- Airborne – 3 hrs

# Preventing Transmission<sup>9</sup>

- Surgical mask on patient
- N95 respirator on caregivers
- Handwashing with soap and water
- Alcohol based hand sanitizers
- Surface cleaners
  - Bleach
  - Hydrogen peroxide
  - Alcohol
  - Betadine

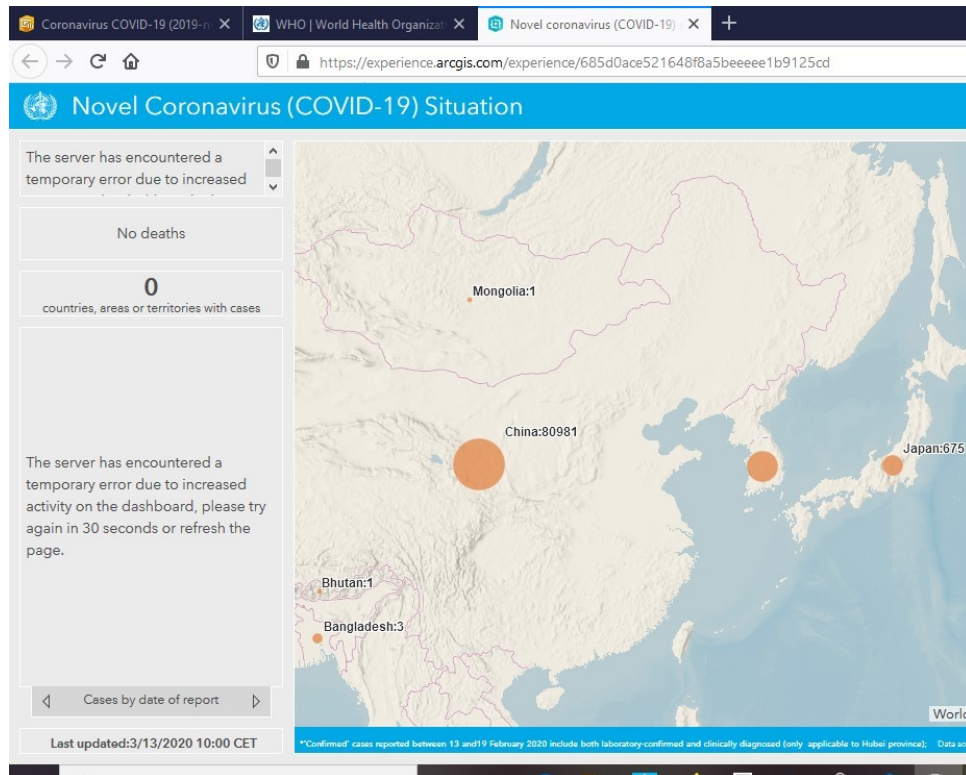
<https://www.americanchemistry.com/Novel-Coronavirus-Fighting-Products-List.pdf>

# COVID-19 Global Situation March 13, 2020

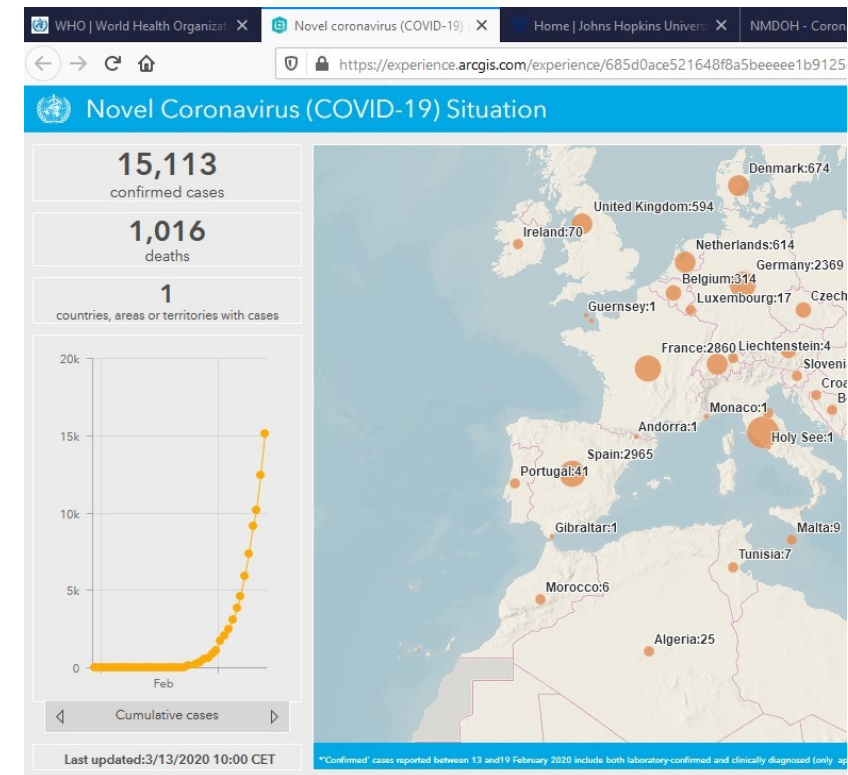


# COVID-19 Global Situation March 13, 2020

**Korea Case Fatality Rate:**  
 **$66/7979 = 0.8\%$**



**Italy Case Fatality Rate:**  
 **$1016/15113 = 6.7\%$**



# COVID-19 United States

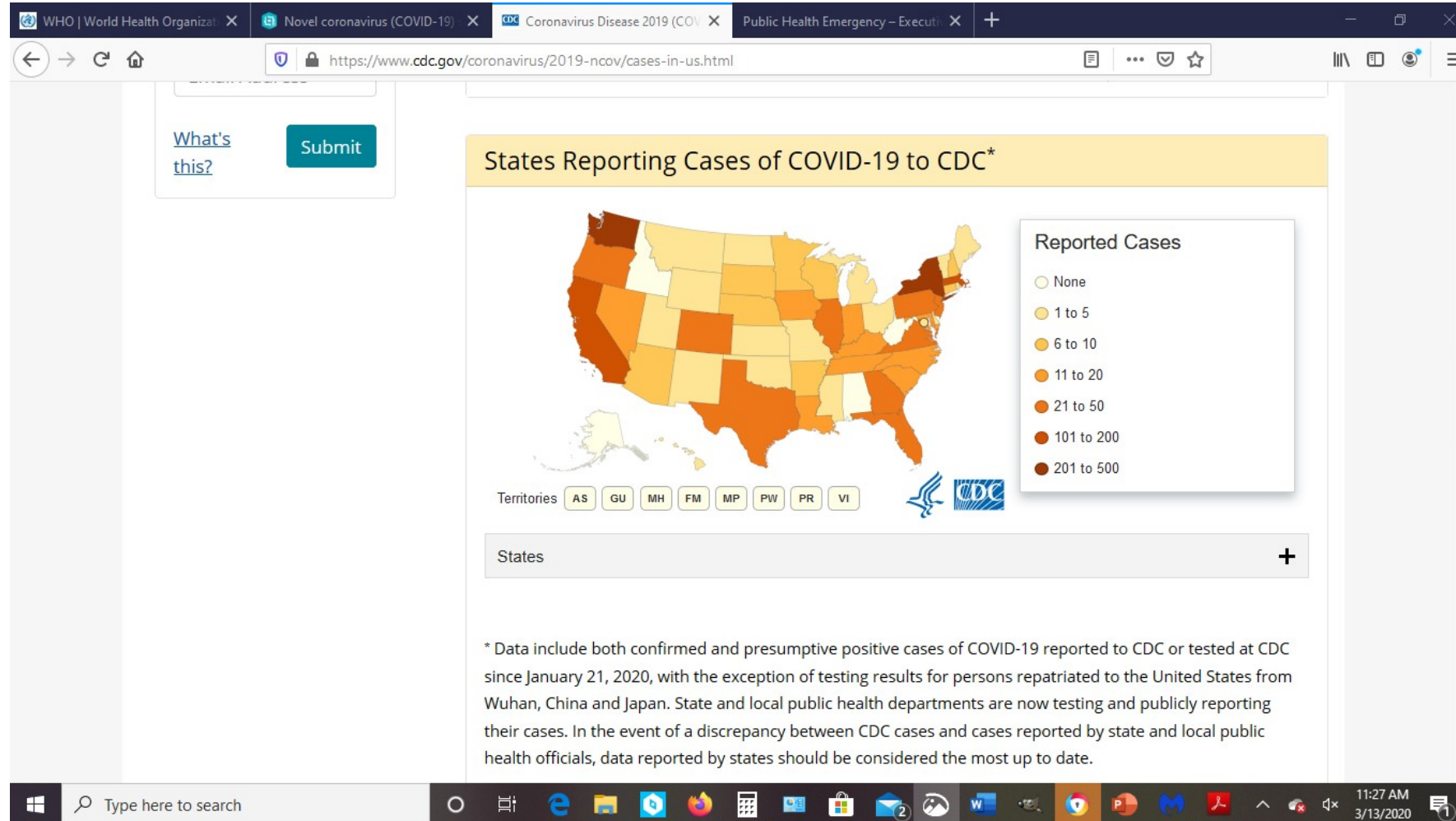
The screenshot shows a web browser with multiple tabs open, including WHO, Novel coronavirus (COVID-19), CDC, and NMDOH. The active tab is the CDC page titled "Coronavirus Disease 2019 (COVID-19) in the U.S.". The page URL is <https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html>. The page is updated as of March 13, 2020. It features a left sidebar with navigation links such as "COVID-19 Situation Summary", "Cases in the U.S.", "Testing in the U.S.", "Global Map", "CDC in Action", "White House Task Force", "What You Should Know", "Travel Information", "Preventing COVID-19 Spread in Communities", "Protect Yourself & Family", and "Higher Risk & Special". The main content area has the heading "Coronavirus Disease 2019 (COVID-19) in the U.S." and a subheading "Updated March 13, 2020". It states that the page is updated regularly at noon Mondays through Fridays, with numbers closing at 4 p.m. the day before reporting. The text explains that CDC is responding to an outbreak of respiratory illness caused by a novel (new) coronavirus, which first started in Wuhan, China, but cases have been identified in a growing number of other locations internationally, including the United States. It mentions that in addition to CDC, many public health laboratories are now testing for the virus that causes COVID-19. A right sidebar titled "On This Page" lists links: "U.S. at a Glance", "Cases Reported to CDC", "States Reporting Cases to CDC", "Cases among Repatriated Persons", and "Epi Curve: U.S. Cases by Illness Onset". At the bottom, a section titled "COVID-19: U.S. at a Glance\*" provides a summary of cases:

- Total cases: 1,629
- Total deaths: 41
- Jurisdictions reporting cases: 47 (46 states and District of Columbia)

The Windows taskbar at the bottom shows the time as 11:22 AM on 3/13/2020.



# COVID-19 United States



# COVID-19 New Mexico

WHO | World Health Organizat... Novel coronavirus (COVID-19) X Home | Johns Hopkins Univers... NMDOH - Coronavirus Updates | C X

cv.nmhealth.org

Coronavirus Hotline: 1-855-600-3453 Return to the Main NMDOH Site

NEW MEXICO DEPARTMENT OF HEALTH

Newsroom & Updates Public Info Clinician Info Laboratory Info About COVID-19 FAQ's

**⚠ TRAVEL RECOMMENDATIONS**

## 2019 Novel Coronavirus Disease (COVID-19)

A new coronavirus is causing an outbreak of pneumonia. The virus was first identified in December 2019, among people who visited a seafood and animal market in Wuhan City, China. Health authorities have confirmed that the virus is able to spread from person to person. Cases have been identified in the United States.

**LATEST UPDATES**

**CORONAVIRUS HOTLINE: 1-855-600-3453**

**6**

**Positive Cases of COVID-19 in New Mexico**

### COVID-19 Test Results in NM

Presumptive Positive *	6
Confirmed Positive	0
Negative	167
Total Tests **	173

*\*Cases are presumptive positive until confirmed positive by the Centers for Disease Control and Prevention (CDC)*

Type here to search

11:11 AM 3/13/2020

# Transmission Rates<sup>7,8</sup>

- ~~Basic Reproduction Number:  $R_0$~~  A measure of how contagious a pathogen is.
- Number of people infected by one person
- COVID-19 2.3-2.5
- Influenza (historically) 1.5 – 1.5
- Influenza (1918 Pandemic) – 2
- Measles 18
- MERS – 0.75



~~COVID-19~~  $R_0 = 2.5^{15}$

- This number factors into these calculations:
- Estimates of 50% of the population becoming infected
- Estimates of 70% of contacts need to be traced and isolated for containment be successful (spoiler alert! It's not!)
- The outbreak may slow, but not stop with warmer weather

# Estimated U.S. Fatalities

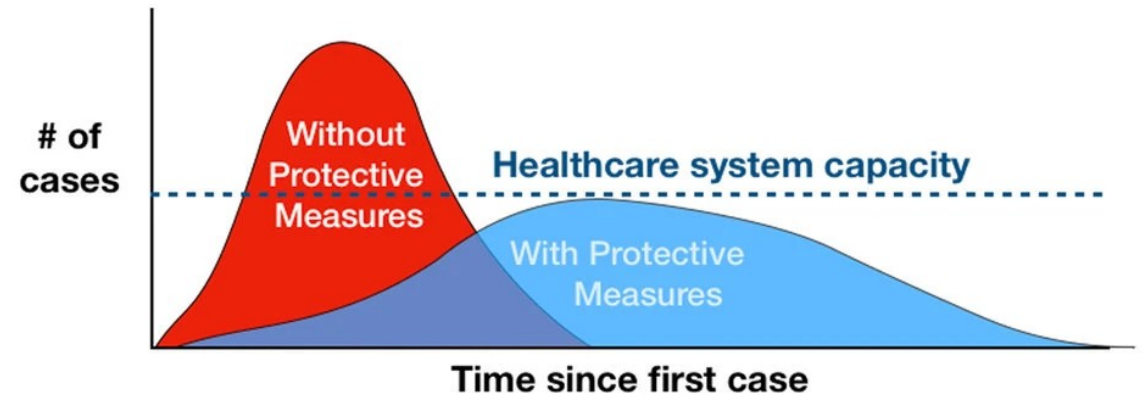
- New infection – nobody is immune
- Estimate 50% of the population will be infected
- U.S. Population (2018) = 327.2 million
- $327.2 \div 2 = 163.6$  million infected

# Estimated U.S. Fatalities

- 163.6 million infected
- Case Fatality Rate (WHO statistics 3/13/2020)
- US  $(36 \div 1264) = 2.8\% \times 163.6 = 4.58$  million
- South Korea  $(66 \div 7979) = 0.8\% \times 163.6 = 1.3$  million
- Italy  $(1016 \div 15113) = 6.7\% \times 163.6 = 11.0$  million

# Strategies to Control Outbreaks

- **Containment** – trace, isolate, 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 the hell happened Wednesday?!?

- WHO Declared pandemic
- Strategies moved from containment to mitigation
- New Mexico reported its first 4 cases
- Governor declared Public Health Emergency

# What is a Public Health Emergency?

<http://cv.nmhealth.org/2020/03/11/public-health-emergency-executive-order-2020-004/>

- An unfortunate term
- Pertains to policy and funding
- Allows state to enact or ease regulations
- Allows state to release funds and obtain funds from federal gov't for public health

# Why is everything getting canceled all of a sudden?

- Transition from containment strategy to mitigation
- Minimize large gatherings of people
- “Flatten the curve”

# Can I still fill out a March Madness bracket?

- Yes -- You will still lose in your pool to the 8 year old, though



# Why can't we contain it?

- Virus is most contagious early on, when people don't feel really sick (or not sick at all)
- Not testing enough people – a lot of people have mild or no symptoms
- Not able to trace and isolate enough contacts

# I think I might have it

- **NM Department of health is co-ordinating all testing**
- Call 855-600-3453
- They will ask you screening questions and determine if testing is appropriate at this time
- They will give you instructions to obtain testing.
- **There are still not enough tests for everyone**

**Call 855-600-3453 if you  
think you might have it**

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**think you might have it**

**Call 855-600-3453 if you**  
**think you might have it**

\*Shrug\*

Maybe I should just go  
to the ER



# Maybe I should just go to the ER

## **DO go to the ER if:**

- You are short of breath
- You have chest pain
- You feel dizzy or lightheaded

## **DON'T go to the ER if:**

- You think you might have been exposed
- You think you might have it
- You want to get tested just in case
- The ER *does not* have a special-double-secret-hidden-cache of tests
- The ER still has to take care of all the other emergencies, too!



# What *should* I do then?

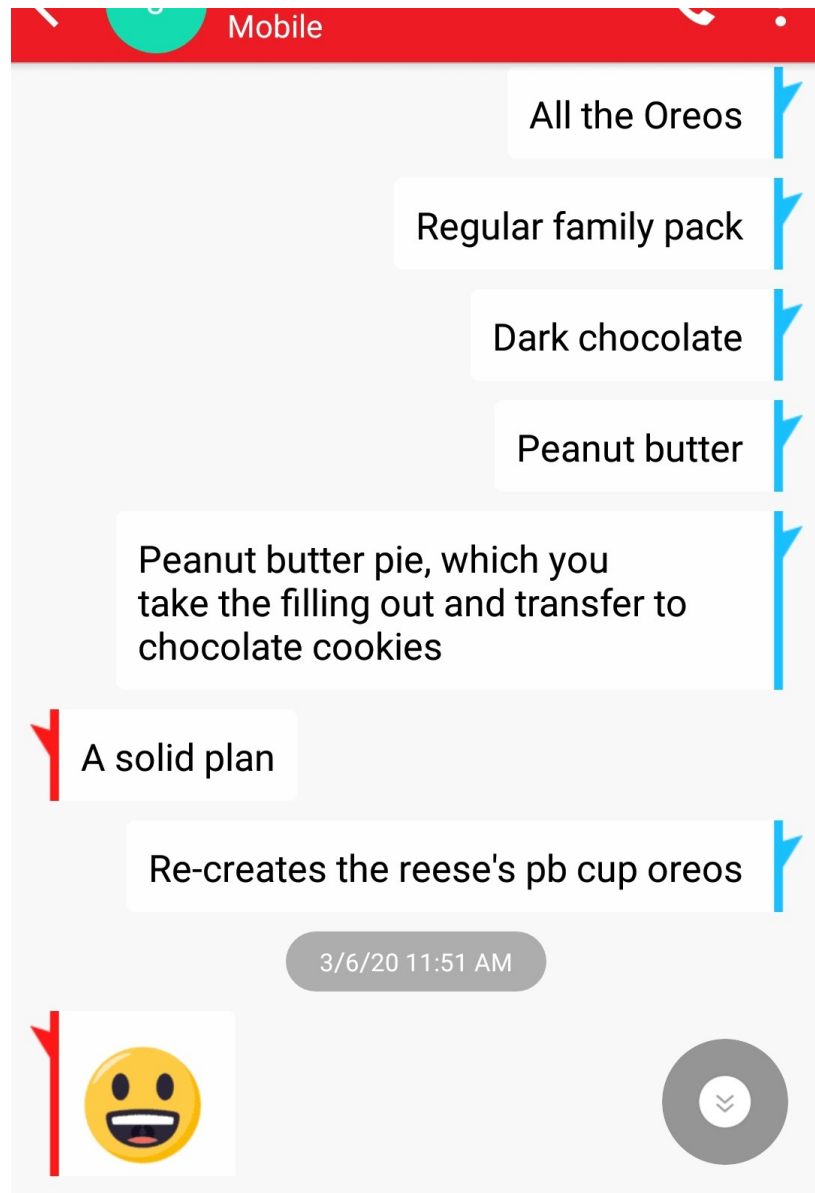
- Stay home if you are sick
- Cough/sneeze into a tissue or your elbow
- Wash your hands frequently with soap and water (20 seconds)
  - OR clean your hands with alcohol based hand sanitizer
- Once a day, clean items you touch frequently with a disinfectant
- Be socially responsible! These are your friends, your parents, your grandparents, your friends' parents and grandparents!

# What *should* I do then?

<https://www.cdc.gov/coronavirus/2019-ncov/downloads/community-mitigation-strategy.pdf>

page 3

- Consider 2-week supply of prescription and over the counter medications, food and other essentials. Know how to get food delivered if possible
- Establish ways to communicate with others (e.g., family, friends, co-workers)
- Establish plans to telework, what to do about childcare needs, how to adapt to cancellation of events.



+ Type a message...



Me trying to figure out how  
"wash your hands" translates to  
"buy alllll the toilet paper".

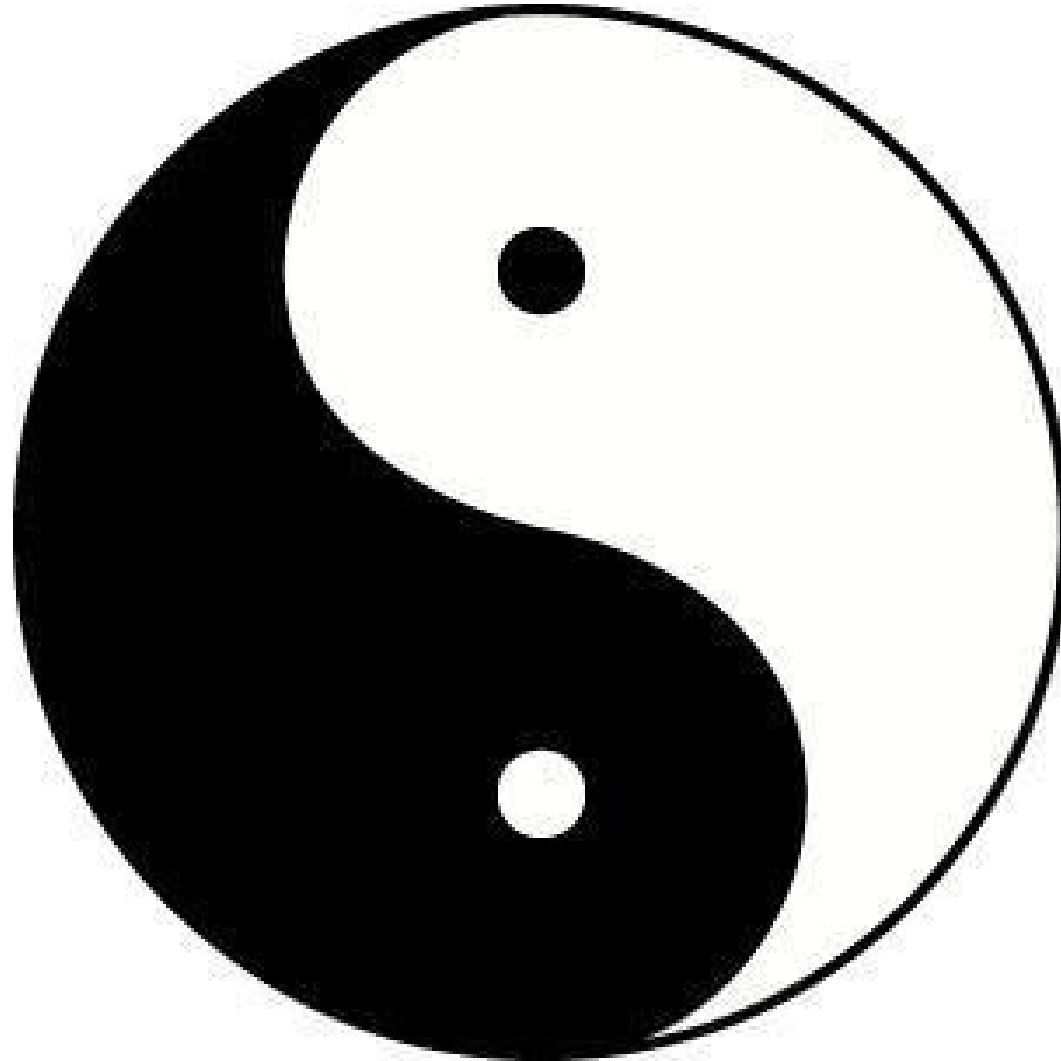


# COVID-19 Conclusion

- No specific treatment
- No vaccine
- Hand hygiene and respiratory hygiene are the best protective measures
- Elderly and people with pre-existing conditions are at higher risk
- > 97.5% of patients will survive

# A Hundred Million Americans Will...

Get  
COVID-19,  
recover,  
and say,  
“That’s  
it?!?!  
THAT’S  
WHAT ALL  
THE FUSS  
WAS



Know  
someone  
who dies  
from  
COVID-19.

**THAT’S**  
what all  
the fuss is  
about

# COVID-19 Resources and References

- <https://www.who.int/health-topics/coronavirus>
- <https://www.cdc.gov/coronavirus/2019-ncov/index.html>
- <https://cv.nmhealth.org/>
- <https://coronavirus.jhu.edu/>
- All state health departments will have a COVID-19 web page
- All major medical journals have Coronavirus resource page
  - All publications are open

# Classification

1) Xu, X., Chen, P., Wang, J. *et al.* Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission. *Sci. China Life Sci.* 2020.

<https://doi.org/10.1007/s11427-020-1637-5>

# Characteristics

2) Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA*. Published online February 24, 2020. [doi:10.1001/jama.2020.2648](https://doi.org/10.1001/jama.2020.2648)



# Symptoms

3) Xu Xiao-Wei, et al. Clinical findings in a group of patients infected with the 2019 novel coronavirus (SARS-Cov-2) outside of Wuhan, China: retrospective case series *BMJ* 2020; 368 :m606  
<https://doi.org/10.1136/bmj.m606>

4) Huang, Chaolin, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China *Lancet* 395:497-506  
February 15, 2020  
[https://doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)

5) Wang D, et al. Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA*. Published online February 07, 2020.  
<https://doi:10.1001/jama.2020.1585>

# Symptoms

6) Lan, L., et.al., Positive RT-PCR Test Results in Patients Recovered From COVID-19 *JAMA* 2020  
<https://doi:10.1001/jama.2020.2783>

# Transmission

7) Zhang S, et al., Estimation of the reproductive number of Novel Coronavirus (COVID-19) and the probable outbreak size on the Diamond Princess cruise ship: A data-driven analysis, *International Journal of Infectious Diseases* 2020, <https://doi.org/10.1016/j.ijid.2020.02.033>

8) Zhao, S, et al., Preliminary estimation of the basic reproduction number of novel coronavirus (2019-nCoV) in China, from 2019 to 2020: A data-driven analysis in the early phase of the outbreak, *International Journal of Infectious Diseases* 2020, 92:214-217, <https://doi.org/10.1016/j.ijid.2020.01.050>

# Transmission

9) Kampf, G. et al. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents *Journal of Hospital Infection* 2020

<https://doi.org/10.1016/j.jhin.2020.01.022>

10) Rothe, C., et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany *NEJM* 2020

<https://doi.org/10.1056/NEJMc2001468/>

11) Zou, L., et al., SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients *NEJM* 2020

[https://doi.org 10.1056/NEJMc2001737](https://doi.org/10.1056/NEJMc2001737)

# Special Populations

12) Chen, H., et.al., Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records *Lancet* (2020) 395:811-815

[https://doi.org/10.1016/S0140-6736\(20\)30360-3](https://doi.org/10.1016/S0140-6736(20)30360-3)

13) Wei, M., et.al., Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China *JAMA* (2020)

<https://doi:10.1001/jama.2020.2131>

14) Cao, Q., et al., SARS-CoV-2 infection in children: Transmission dynamics and clinical characteristics *J Formos Med Assn* (2020) 119(3):670-673 <https://doi.org/10.1016/j.jfma.2020.02.009>

# Controlling the Outbreak

15) Anderson, R. et.al., How will country-based mitigation measures influence the course of the COVID-19 epidemic? *Lancet* 2020

[https://doi.org/10.1016/S0140-6736\(20\)30567-5](https://doi.org/10.1016/S0140-6736(20)30567-5)

16) Van Doremalen, N., et.al., Aerosol and surface stability of HCoV-19 compared to SARS-CoV-1 , *Submitted to NEJM* (2020) [Preprint DOI](#)

<https://doi.org/10.1101/2020.03.09.20033217SARS-CoV-62>