COVID-19: Looking Back and Looking Forward

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UIC School of Public Health
September 30, 2020
Wuhan City, Hubei Province, China

Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study @Lancet

- 49/99 (49%) had a history of exposure to the Huanan seafood market.
- Average age was 55.5 years (SD 13.1), including 67 M & 32 F
- Manifestations
  - Fever (82 [83%] patients)
  - Cough (81 [82%] patients)
  - Shortness of breath (31 [31%] patients)
  - Muscle ache (11 [11%] patients)
  - Confusion (nine [9%] patients)
  - Headache (eight [8%] patients),
(A) Wuhan reported 27 unknown pneumonia cases, some had close contact with the Huanan Seafood Wholesale Market and seven of them were serious cases.

Huanan Seafood Wholesale Market was closed

The unknown pathogens was confirmed as a novel coronavirus by China CDC

Wuhan confirmed 41 cases caused by the novel coronavirus and one of them died

Human to human transmissions were officially reported

1. Ten family cluster infection cases were reported in Guangdong.
2. Wuhan goes into lockdown
3. WHO officially named this new disease as Coronavirus Disease 2019, abbreviated COVID-19; 2. ICTV named this novel coronavirus as Severe acute respiratory syndrome coronavirus 2, abbreviated SARS-CoV-2

(B) Map of China showing the distribution of confirmed cases.

(C) Map of the world showing the spread of COVID-19, with countries highlighted in red.
Globally, as of 2:15pm CEST, 26 September 2020, there have been 32,429,965 confirmed cases of COVID-19, including 985,823 deaths, reported to WHO.
COVID-19 Health Inequalities

• African American, Latin-X, and American Indian populations bear a disproportionate burden of Incidence, hospitalization, and death

• These populations experience rates of hospitalization 4.5-5.5 times higher than whites

• UIC Chi-Tracers Program will attempt to ameliorate these disparities.
Postulated Causes of Higher Death Rates in Communities of Color

- Lack of access to health care and health insurance results in higher prevalence of less well-controlled chronic illnesses
- Obesity, hypertension, diabetes, chronic obstructive pulmonary disease leads to higher risk of death
- Non-medical threats to health are also higher: food and housing insecurity, toxic environmental exposures
- Riskier jobs including providing care at long-term cares facilities
- More likely to get care in safety-net facilities that may be overwhelmed by COVID-related surges in demand for acute care
Explosive Growth in Knowledge: Transmission

• Early in the pandemic: Droplet Transmission and Fomite Transmission thought to be pre-eminent modes of transmission

• Currently: Fomites not a major mode of transmission, Droplet Transmission still important and growing evidence that smaller aerosols play a major role in transmission.
Heavy, wet DROPLETS

- Cough
- Sneeze
- Talk
- Breath
- Spit

MORE VIRUS

CLOSE RANGE AEROSOL TRANSMISSION

CAN TAKE SEVERAL MINUTES

LESS VIRUS

VIRUS CONTAMINATED SURFACE

Small, floaty DROPLET NUCLEI

DROplet SIZE

~100µm

~50µm

~5µm (microns)

0m

1m

>10m (not to scale)

measles virus (measles)

influenza virus (flu)

rhinovirus (common cold)

MERS-coronavirus (MERS)

? novel coronavirus (2019-nCoV ARD)

PROBABLY

PROBABLY

NOT YET CLEAR
Short range still imaging of stages of sneezing, revealing the liquid droplets from the 1942 Jennison experiment. Reproduced with permission.

Nicholas R Jones et al. BMJ 2020;370:bmj.m3223
Long range video imaging over 8 m of the multiphase turbulent cloud (gas cloud containing liquid droplets of all sizes) from natural human violent emission such as a sneeze, revealing a range of the cloud, and its droplet concentrated payload, of up to 7-8 m.
• Droplets are important in coughing and sneezing, but growing evidence suggests that in activities like talking, aerosols may be more important.

• Contextual factors play a role: ventilation, indoor vs outdoor.

• Studies of clusters suggest a role for aerosolization:
  • Choir practice: 1 symptomatic person transmitted to 32.
  • Other clusters in fitness gyms, boxing matches, call centres, churches (singing, panting, talking loudly).

• Regardless, distance is still important: smoke analogy.
Current rules on safe physical distance are based on outdated science. Evidence suggests that SARS-CoV-2 may travel more than 6 feet through activities such as coughing and shouting. Rules on distancing should reflect the multiple factors that affect risk, including ventilation, occupancy, and exposure time.

Key Messages

CDC Takes Down Guidance on Airborne Coronavirus Transmission

The agency said the guidance, which was quietly issued on Friday, was a draft version of proposed changes that was posted in error.

By Cecelia Smith-Schoenwalder, Staff Writer  Sept. 21, 2020, at 2:26 p.m.
Inconsistent Guidance From CDC

- Friday Sept 18th: CDC website updated:
  - “growing evidence that droplets and airborne particles can remain suspended in the air and be breathed in by others, and travel distances beyond 6 feet (for example, during choir practice, in restaurants, or in fitness classes)… This is thought to be the main way the virus spreads.”

- Monday, September 21st: Reverts to old guidance: “virus is spread mainly from person-to-person” and does not mention the possibility of it being airborne.

- WHO acknowledged increasing evidence about airborne transmission in July, but has maintained its stance the virus is primarily spread by large droplets that are emitted through coughs and sneezes.
At first, US recommendations did not include the need for facial masking

Use in China and other Asian countries suggested efficacy

Asymptomatic and pre-symptomatic transmission were important transmission drivers

Asymptomatic infection was estimated to occur 40% of the time with viral shedding equivalent to symptomatic persons

Universal facial masking seen as way of interrupting asymptomatic transmission
Potential Additional Rationale for Facial Masking: “Variolation”

- Hypothesized that masking, in addition to reducing transmission, may reduce the severity of COVID-19 in those infected despite mask wearing
- Ingrained theory that the severity of a disease is related to the size of the viral inoculum received
  - High dose of COVID-19 can overwhelm and dysregulate the immune system
- Masking can reduce the inoculum size
- The Variolation hypothesis holds that by reducing inoculum size, milder or asymptomatic infection will result from COVID-19 acquired through a mask

Ghandi M, Rutherford GW, NEJM, 9_9_20
Evidence for the Variolation Hypothesis

- Animal model: Syrian Hamster- simulated mask wearing, less likely to be infected, but if infected had milder disease than non-mask wearing hamsters

- Argentinian cruise ship – passengers provided with surgical masks: rate of asymptomatic infection 81%, vs 20% in previous outbreaks w/o universal masking

- Food processing plants: employees issued masks, > 500 became infected, (95% asymptomatic)

- Moreover, evidence emerging that even asymptomatic infection, induces strong cell-mediated immunity

- Needed studies: Studies comparing the strength and durability of immune response in persons with asymptomatic vs symptomatic infection
FREEDOM
NO
LOCKDOWN
MASKS
TESTS
VACCINE
Vaccine Update

• Several ongoing coronavirus-vaccine trials could announce game-changing results next month
• Public concern that political pressure could lead to the premature approval of vaccine
• AstraZeneca, Pfizer, and Moderna released their protocols describing how tests are being conducted
Concerns about the Role of Politics

• Pew Research survey shows that proportion willing to receive an available vaccine decreased from 72% in May to 51% in September

• Three quarters thought the U.S. would approve a vaccine before safety and efficacy established

• Prior FDA-issued EUAs for hydroxchloroquine and convalescent plasma fuel skepticism, Framing as “Warp Speed” unfortunate

• Vaccine trial protocol for the Pfizer vaccine allows for early evaluation of results after just 32 infection events.
  • Although efficacy measurable at that point, safety and duration of protection cannot be measured

• ? Public hearing for EUA determinations for vaccines
Concerns about Adverse Events

- Media reports transverse myelitis in the AstraZeneca (AZ) trial, AZ releases no data on participant condition or receipt of vaccine vs placebo
- AZ admits to a second, earlier case with symptoms of transverse myelitis (participant subsequently diagnosed with MS)
- Maintaining confidentiality vs lack of transparency and loss of public confidence
- Plans for robust, longer-term, post licensure vaccine safety monitoring will need to be visible
Considerations for Vaccine Rollout

• Nat’l Academy of Medicine Committee advising ACIP

• Prioritize persons most at risk (health care workers, nursing home residents, prison inmates and workers, persons with underlying health conditions, people from communities of color) or

• Prioritize reducing transmission by prioritizing public workforce, essential workers, students, young people who may be more likely to spread infection to others
NY Times Survey of more than 1600 American Colleges (9/25/2020)

- 130,000 cases and 70 deaths since the pandemic began
- 35 colleges with at least 1,000 cases
- U Alabama – 2690 cases
- UNC – 1199 cases
- Notre Dame – 704 cases
- University of Illinois at Urbana-Champaign - 2,227
- UIC - 108 cases
The UIC Re-opening

- Partial Re-opening (11,000 students, 7000 employees)
- Social Compact: A civic responsibility to protect the UIC community
  - Social Distancing/Avoiding crowds
  - Hand hygiene
  - Face masks
- Surveillance Testing Program
- Contact Tracing
The UIC COVID Contact Tracing and Epidemiology Program (UIC-CCTEP)

- The CCTEP Model
- Director of Contact Tracing: Ellen Stein, MS
- Research Data Scientist: Jocelyn Vaughn, MS
- 17 Student Contact Tracers
  - School of Public Health
  - College of Nursing
  - Anthropology
  - College of Social Work
  - College of Applied Health Sciences (OT)
  - Undergraduate Campus
Contact Tracing since August 31st

- Several cluster investigations linked to small social gatherings, mainly in off-campus housing (2-25 persons)
- 13,168 Saliva Tests performed, 69 infected persons identified – overall positivity rate 0.52%
- No evidence of transmission beyond initial cases and their contacts

Health Ambassador Role:

- Prevention Messaging
- Facilitating Health Activities (flu vaccination)
- Observational Studies of adherence to prevention measures
Thank You!
For more information please go to: publichealth.uic.edu
Meat Packing Plants

- Frequent site of outbreaks
- High levels of worker contagion
- Poor ventilation
- Cramped working conditions
- Background noise (which leads to shouting)
- Low compliance of mask wearing
A more nuanced view of transmission risk?

• Physical distance could vary by graded levels of risk
• Variations by setting, occupancy level, contact time, and whether face coverings are worn
• In the highest risk situations (poor ventilation, high occupancy, prolonged contact time, no face coverings, i.e. bars or night clubs), physical distancing beyond 6 feet should be considered and minimizing occupancy time.

• More research necessary
  - Cut-off durations of exposure
  - Detailed studies of airflow patterns with respect to infected person
  - Patterns and properties of respiratory emissions during different physical activities
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<th>Type and level of group activity</th>
<th>Low occupancy</th>
<th>High occupancy</th>
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Risk of transmission:
- Low
- Medium
- High

* Borderline case that is highly dependent on quantitative definitions of distancing, number of individuals, and time of exposure.
A Spectrum of Risk

COVID-19 Risk Index
Risk levels for exposure vary based on four main factors:

- **Enclosed space**
- **Duration of interaction**
- **Crowds**
  - Density of people + challenges for social distancing
- **Forceful exhalation**
  - Sneezing, yelling, singing, and coughing

**Low / Medium**
- Playing "distanced" sports outside
- Taking a taxi or a ride-sharing service
- Outdoor restaurant dining

**Medium**
- Visiting hospital emergency department
- Dentist appointment
- Working in an office
- Indoor restaurant or coffee shop

**Medium / High**
- Exercising at a gym
- Hair/nail salon and barbershops
- Traveling on public transportation

**High**
- Bars and nightclubs
- Indoor party
- Playing contact sports
- Public transportation

Ezekiel J. Emanuel, MD, PhD, Perelman School of Medicine at the University of Pennsylvania / James P. Phillips, MD, EMT-T George Washington University / Saskia Popescu, PhD, MPH University of Arizona/George Mason University
What is **herd immunity**? how it works

**No immunization**

If only *some* get vaccinated ... the virus easily spreads.

**With immunization**

If *most* get vaccinated ... the virus is contained.

SOURCE Centers for Disease Control and Prevention
Concerns about Vaccine Trial Goals

- Trials designed to test whether vaccines reduce symptomatic cases of COVID-19
- Critics argue that a trial designed to detect prevention of severe disease and death would be more relevant
- Such a trial would have needed more subjects and more time
Fauci on Vaccines

• September 27th: Americans will begin to be vaccinated in November and December
• Different vaccines for different populations (e.g. elderly persons)
Vaccines: Key Remaining Questions

- When will the public be able to have confidence in available vaccines? → vaccine promotion efforts targeting clinicians and general public
- When will vaccine uptake be high enough to enable a return to prepandemic conditions?
- When will the vaccine be available and how will the rollout be organized when vaccine is still in relatively short supply?
To Guard Against Mistaken Conclusions We Must:

• Couple data with SES markers, indicators of economic inequality

• Understand the effect of “weathering” or advanced aging caused by bodily wear and tear, responses to external stressors, especially racial discrimination

• Understand the unequal distribution of COVID-testing, Preventive Services, and respiratory hazards and toxic sites (environmental injustice)

• Understand impact of food insecurity, housing instability, and limited access to transportation
Potential Solutions

• Change policies that keep structural racism in place and promote education on how the health field perpetuates social inequality and how that relates to health disparities.

• New policies are needed to increase economic empowerment and educational opportunities for low income communities.

• Community programs that build stable and supportive structures as part of pandemic recovery efforts.

• Health systems need to build trust in vulnerable communities to counteract generations of mistreatment, unethical experimentation, and criminal neglect of minority communities.

• Targeted intervention to address social risk factors.