



Learning from Wuhan, US and Europe COVID-19 data on public health interventions

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WHO declares the coronavirus outbreak a pandemic

March 11, 2020

By HELEN BRANSWELL @HelenBranswell and ANDREW JOSEPH @DrewQJoseph / MARCH 11, 2020



Unemployment Rate in US

Weekly initial unemployment claims in 2020

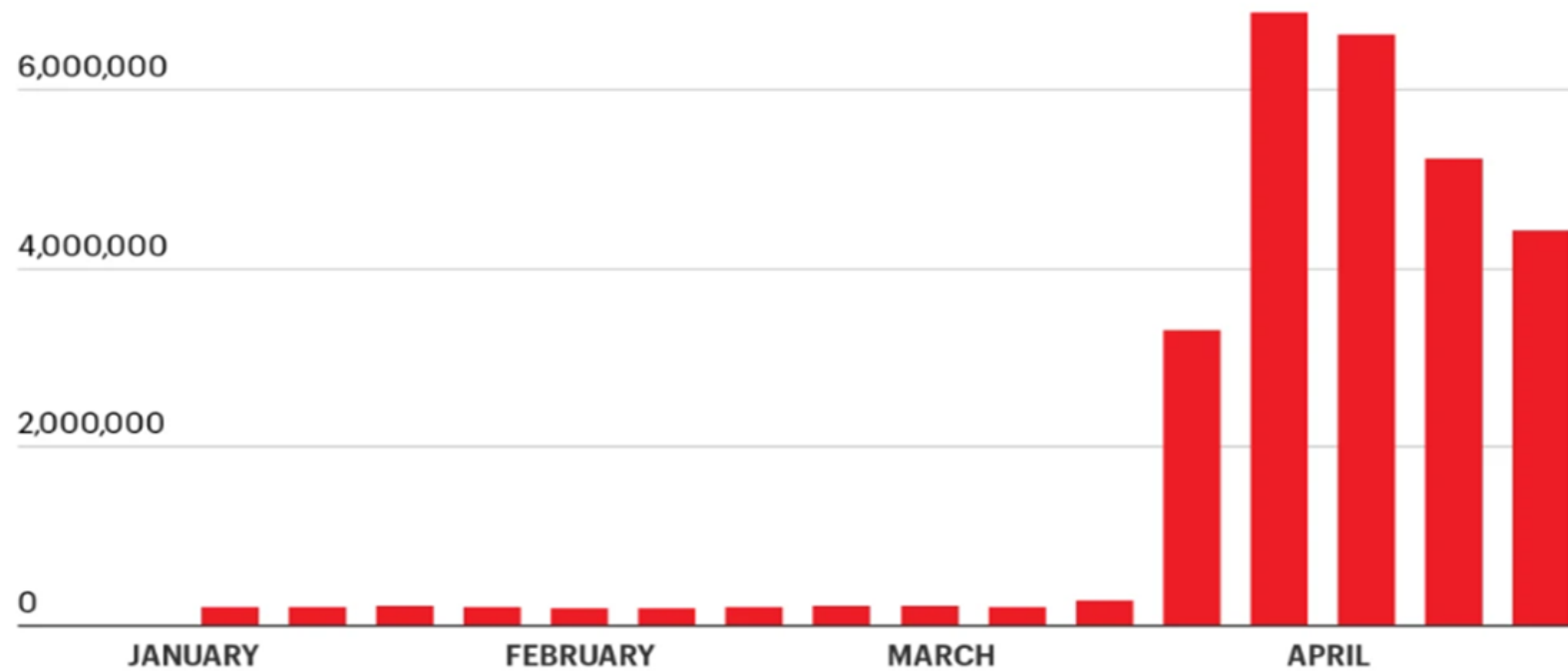


CHART: LANCE LAMBERT • SOURCE: U.S. DEPARTMENT OF LABOR

FORTUNE

Scientific community



nature

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NEWS • 16 MARCH 2020

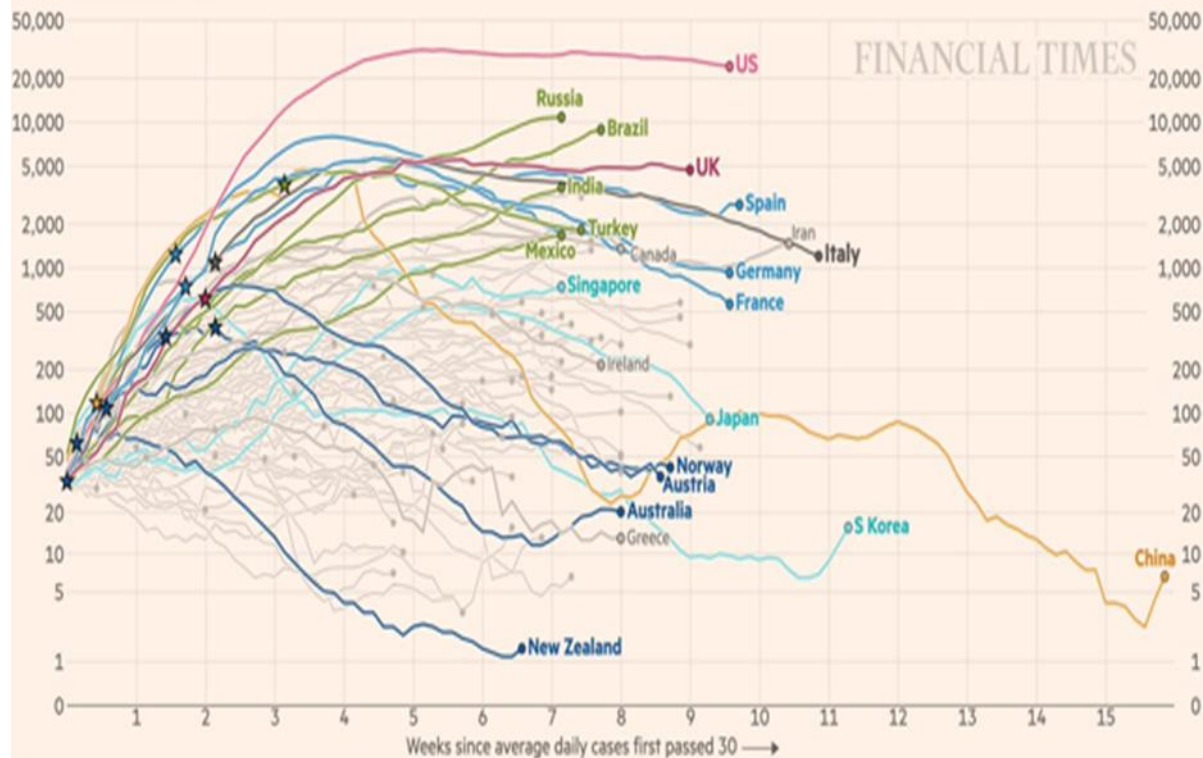
A year without conferences? How the coronavirus pandemic could change research

As scientific meetings are cancelled worldwide, researchers are rethinking how they network – a move that some say is long overdue.

4.2 Million COVID-19 Cases and 285K Deaths in the World (May 13, 2020)

Several countries have turned the corner, with numbers of new cases now in decline

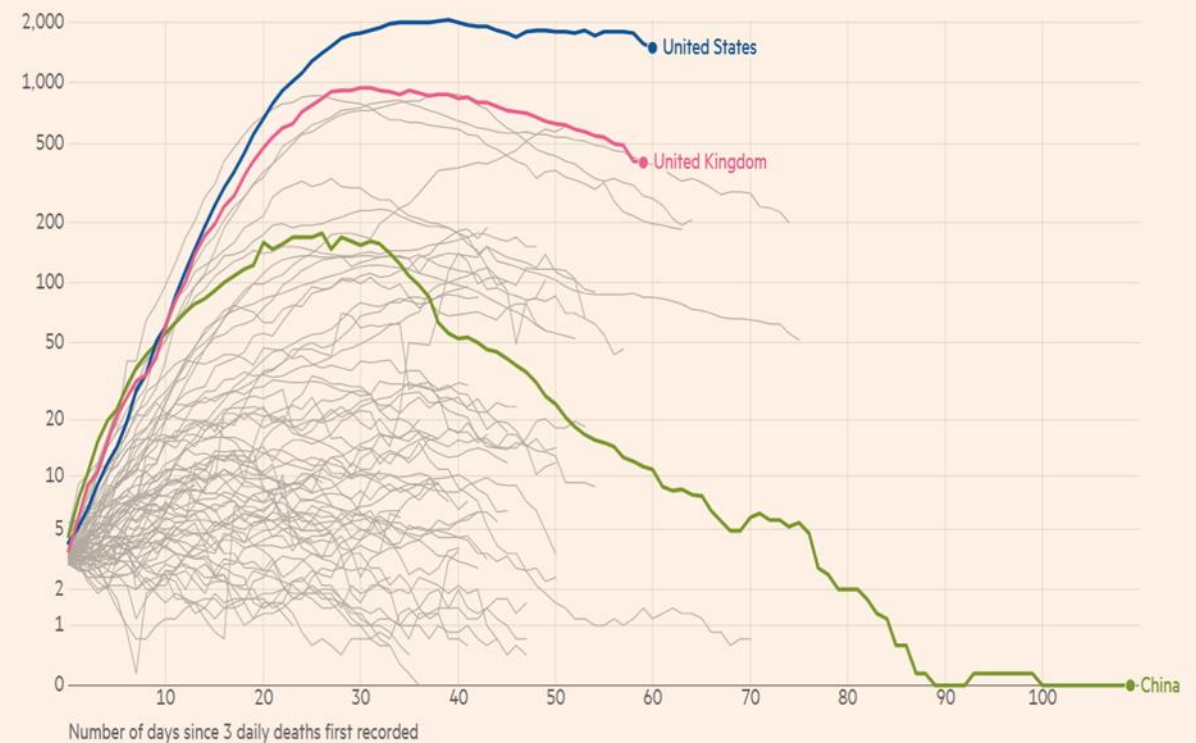
Daily confirmed cases (7-day rolling average), by number of weeks since 30 daily cases first recorded
Stars represent national lockdowns ★



FT graphic: John Burn-Murdoch / @jburnmurdoch
Source: FT analysis of European Centre for Disease Prevention and Control; FT research. Data updated May 11, 22:18 BST
© FT

New deaths attributed to Covid-19 in United States and United Kingdom

Seven-day rolling average of new deaths, by number of days since 3 average deaths first recorded



Huge Multi-faceted Impact

Learning from COVID-19 Cases in Wuhan, US and Europe




A Pre-print of Analysis of 26,000 COVID-19 cases until Feb 18 in Wuhan was posted immediately in MedRxiv on March 6, 2020




Comment on this p

Article usage: March 2020 to April 2020

Evolving Epidemiology and Impact of Non-pharmaceutical Interventions on the Outbreak of Coronavirus Disease 2019 in Wuhan, China

 Chaolong Wang, Li Liu, Xingjie Hao, Huan Guo, Qi Wang, Jiao Huang, Na He, Hongjie Yu, Xihong Lin,

 An Pan, Sheng Wei, Tangchun Wu

doi: <https://doi.org/10.1101/2020.03.03.20030593>

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should *not* be used to guide clinical practice.

Show by month

Abstract

Pdf

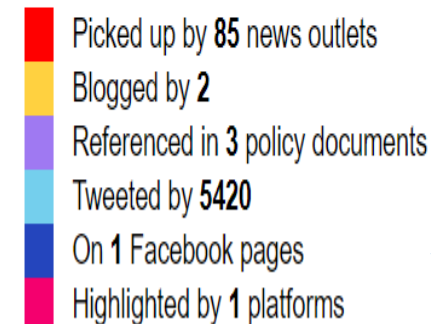
Total

114,652

43,794



See more details



Abstract views=119K
Pdf downloads=46K

- A summary of the key findings is at my tweet @XihongLin

Acknowledgement

An Pan, Chaolong Wang, Li Liu, Xingjie Hao, Huan Guo, Qi Wang, Jiao Huang, Na He, Hongjie Yu, Sheng Wei, Tangchun Wu



**Tongji School of Public Health
Huazhong Science and Technology University
Wuhan**

(blue=HSPH alum)



Thank all of my Tongji SPH co-authors for their tireless work on finishing this manuscript in a short time. The gained knowledge benefits US and other countries at this critical time.

Part I of the Updated MedRxiv Preprint was Published in JAMA, April 10: Analysis of 32,000 cases Until March 8, 2020

New Online

Views **113,680** | Citations **0** | Altmetric **1391** | Comments **2**



PDF



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CME & MOC



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Original Investigation

ONLINE FIRST

FREE

April 10, 2020

Association of Public Health Interventions With the Epidemiology of the COVID-19 Outbreak in Wuhan, China

An Pan, PhD¹; Li Liu, MD, PhD¹; Chaolong Wang, PhD¹; et al



**Top 0.01% among 15
millions of articles**

Testified in the Evidence Session of the Science and Technology Committee of the UK Parliament on April 17

Weekly update



17 April 2020

This week (the week commencing 13 April)

As part of our inquiry into [UK science, research and technology capability and influence in global disease outbreaks](#), we held our third public evidence session. We focussed on the effectiveness and longevity of social distancing measures in the UK, the wider implications of these measures for the population, and international strategies for relaxing social distancing measures.

This week, we took evidence from:

- Dr James Rubin, Reader in the Psychology of Emerging Health Risks, King's College London
- Professor Graham Medley, Professor of infectious disease modelling, London School of Hygiene and Tropical Medicine
- Professor Xihong Lin, Professor of biostatistics, Harvard T.H. Chan School of Public Health

Media Coverage and Interview



The
New York
Times

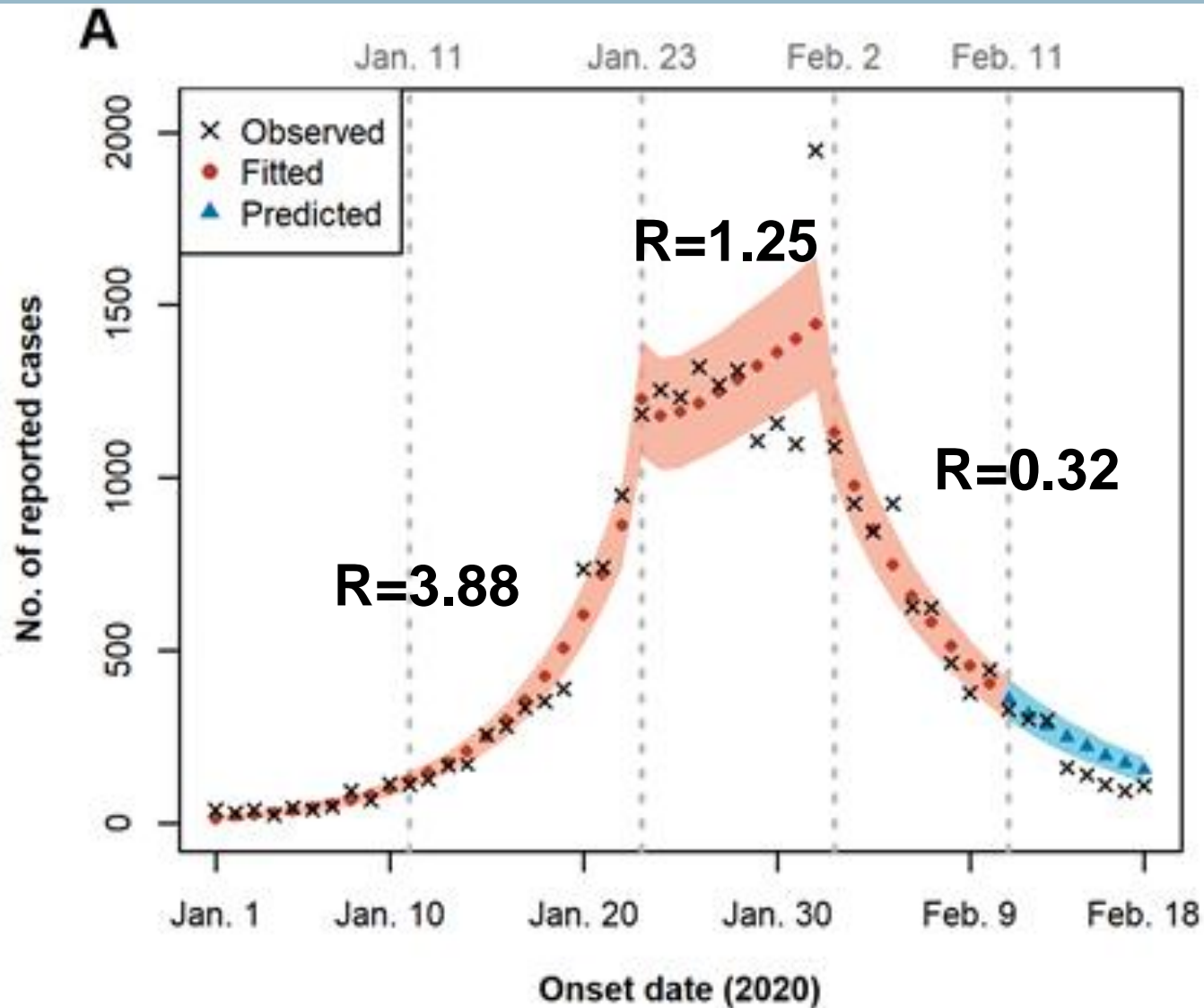
THE WALL STREET JOURNAL.
WSJ



The Telegraph

The Harvard Crimson

Key Point: Wuhan Experience shows the COVID-19 Outbreak Can Be Controlled: Social Distancing + Centralized Isolation and Quarantine



Effective Reproductive Number R_t

=

Average # of people infected by a case

Analysis of 26,000 cases

SEIR model

Wuhan, China



Population Size: 11M

Wuhan, China

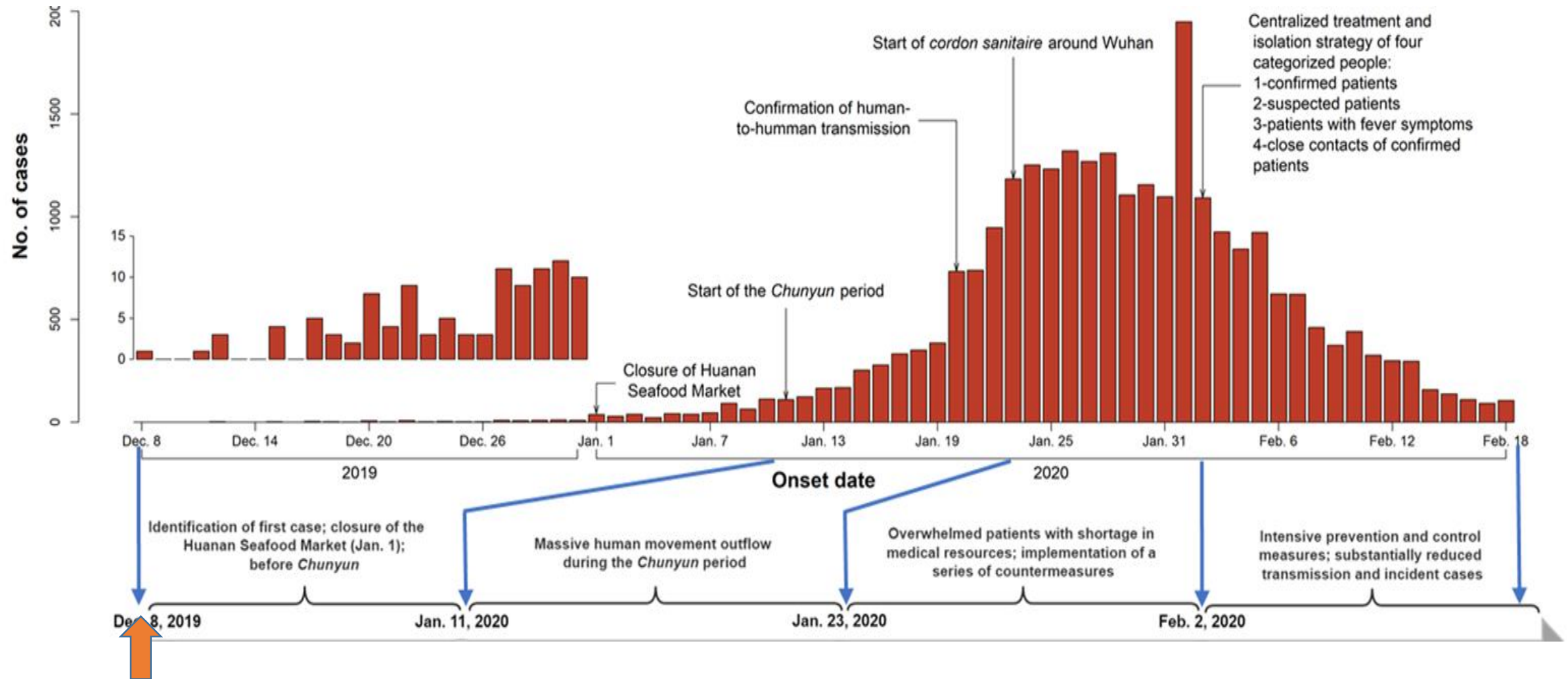


Changjiang river in the background



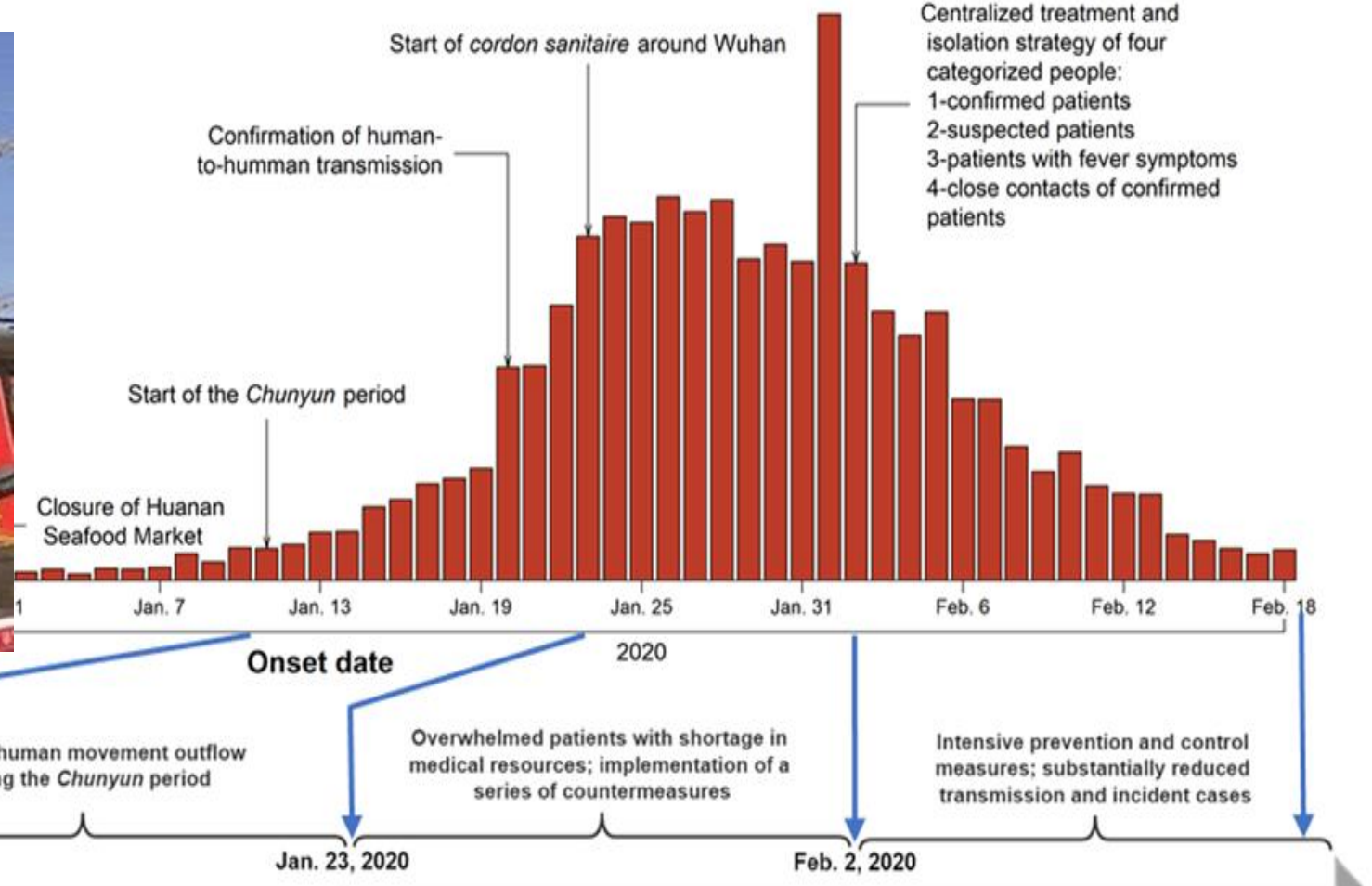
East Lake, Cherry Blossom

Wuhan CDC (n=25,961): December 8 – February 18



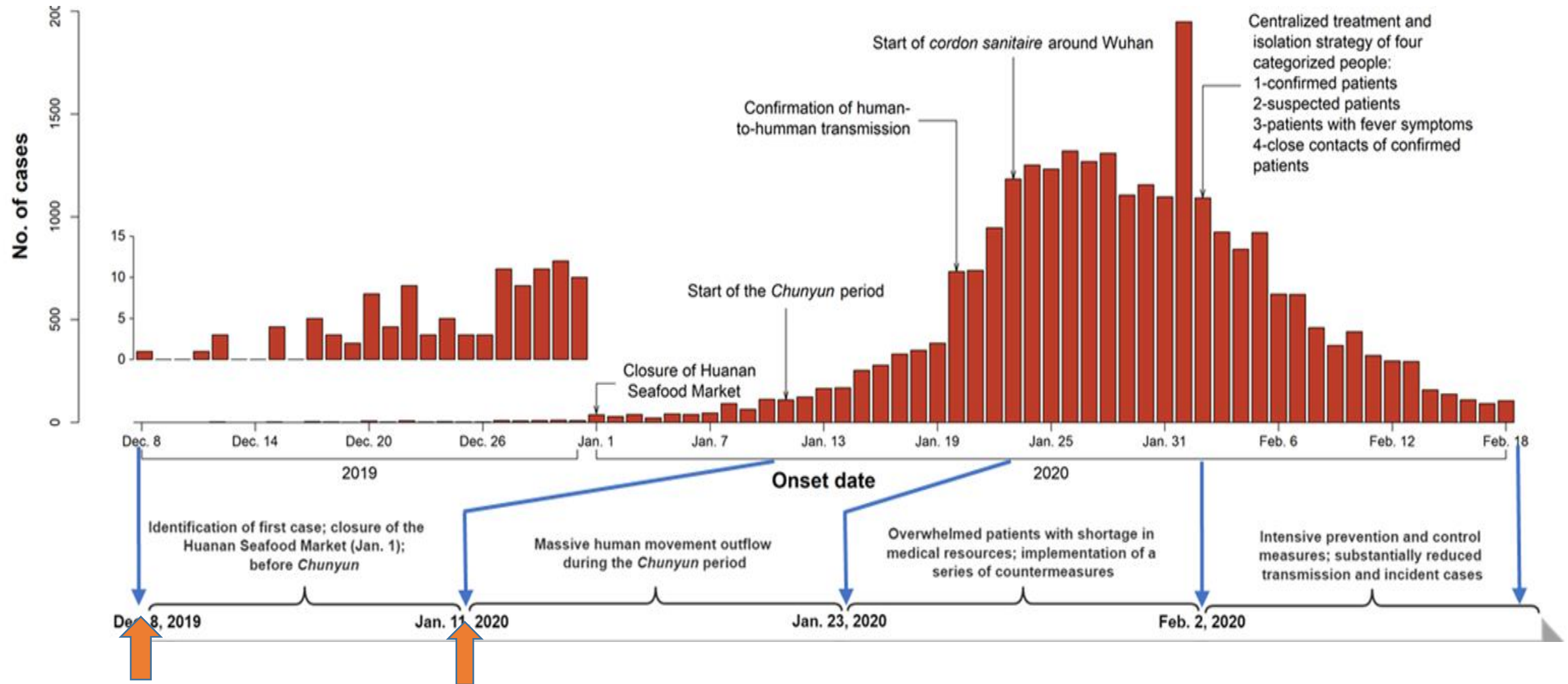
Dec 8, 2019: First case: close to the Huanan Seafood Market

Wuhan CDC (n=25,961): December 8 – February 18



Dec 8, 2019: First case: close to the Huanan Seafood Market

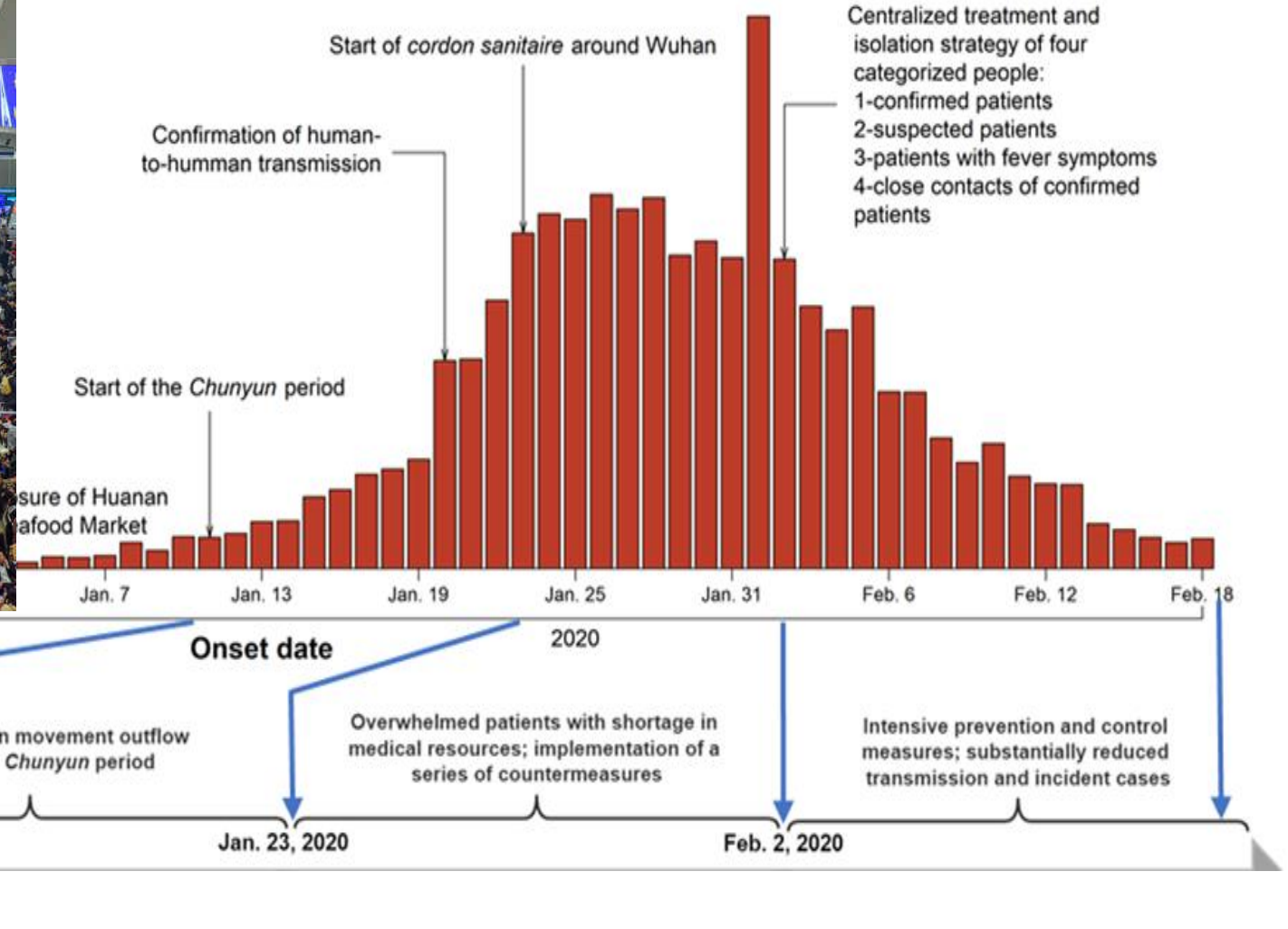
Wuhan CDC (n=25,961): December 8 – February 18



Dec 8, 2019: First case: close to the Huanan Seafood Market

Jan 11, 2020: Start of Spring Festival Travel

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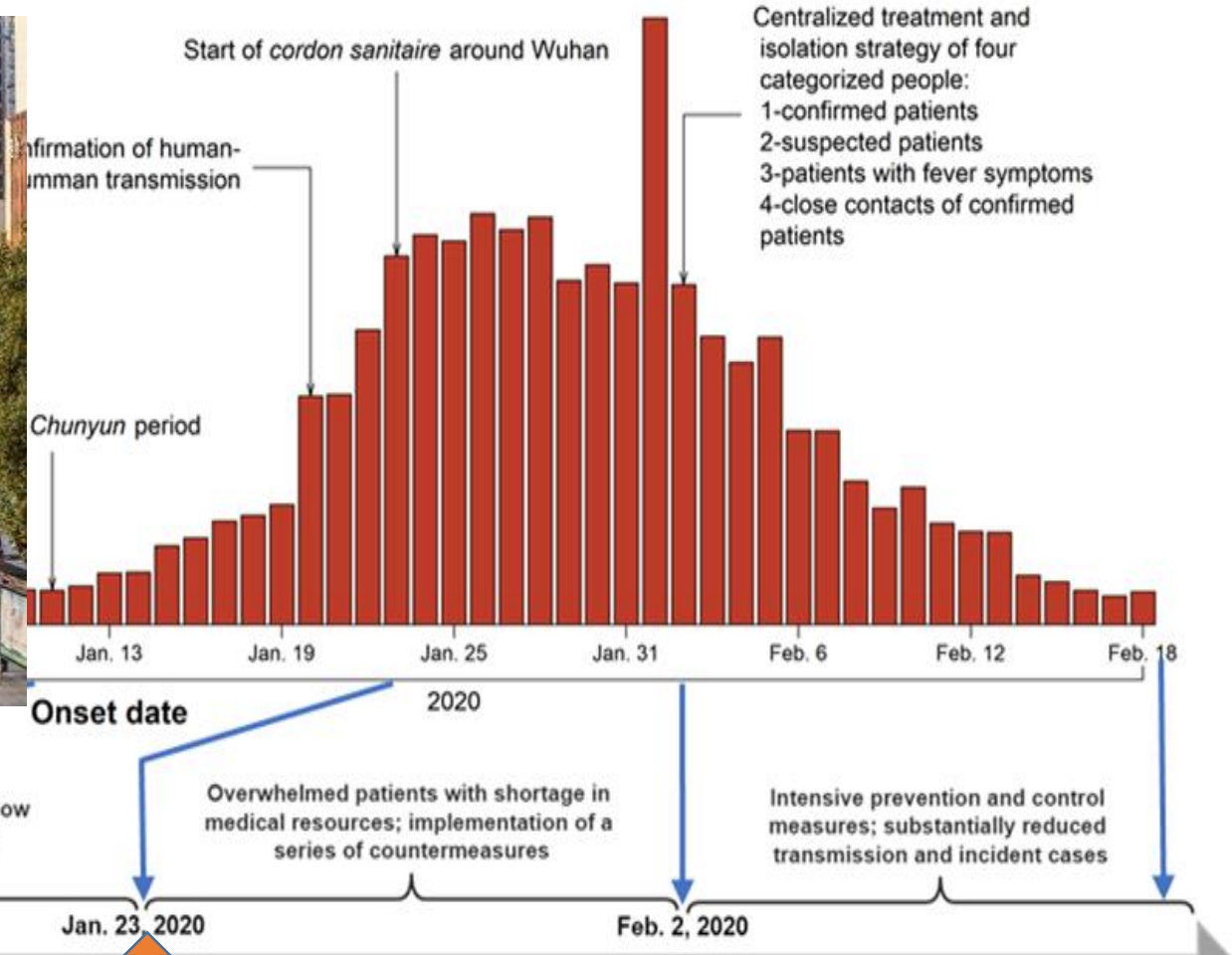


Dec 8, 2019: First case: close to the Huanan Seafood Market

Jan 11, 2020: Start of Spring Festival Travel

Wuhan CDC (n=25,961): December 8 – February 18

Traffic ban

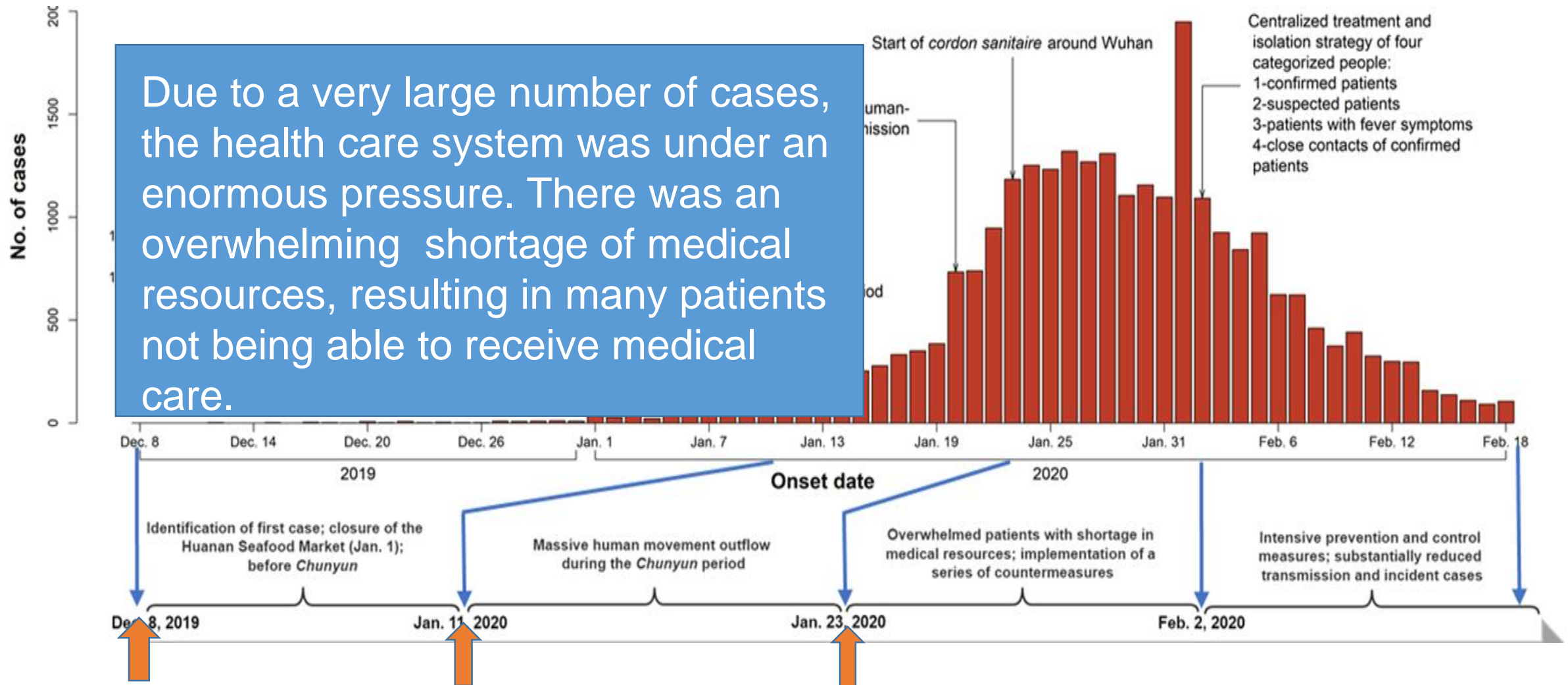


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Jan 23, 2020 Start of Cordon Sanitaire

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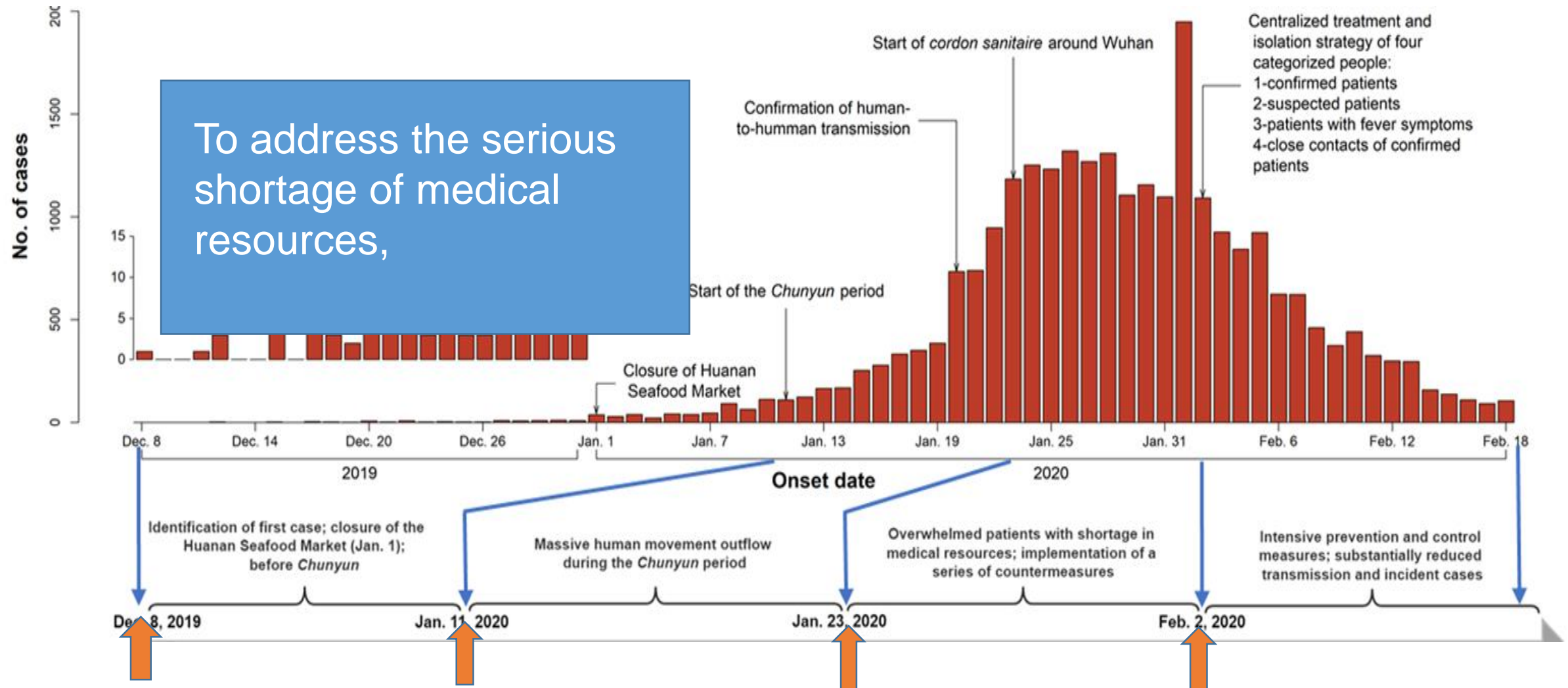


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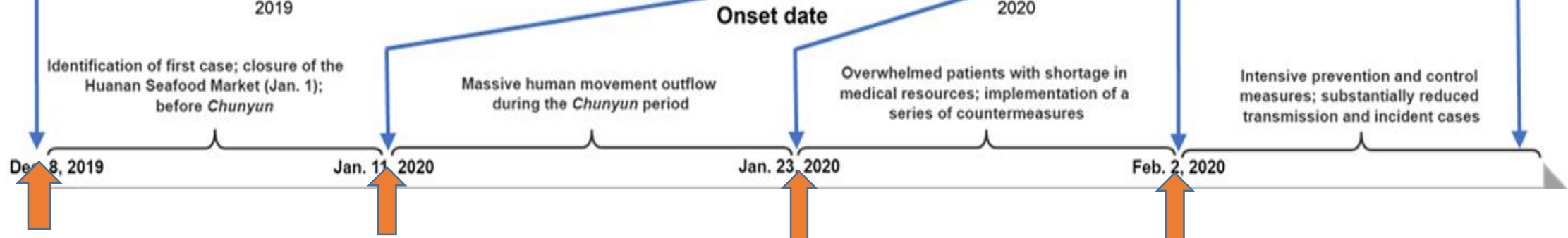
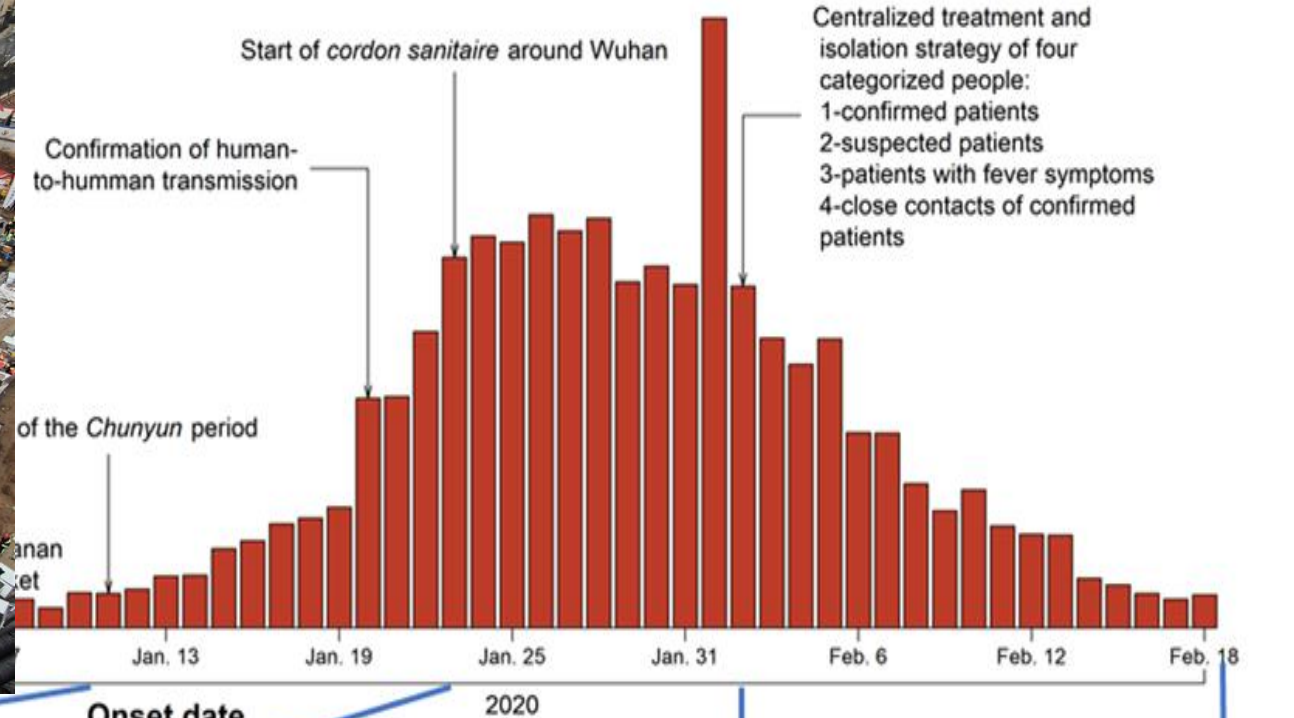
Dec 8, 2019: First case: close to the Huanan Seafood Market

Jan 11, 2020: Start of Spring Festival Travel

Jan 23, 2020 Start of Cordon Sanitaire

**Feb 2, 2020
2 New and 16 Field Hospitals Launched**

Wuhan CDC (n=25,961): December 8 – February 18



Dec 8, 2019: First case: close to the Huanan Seafood Market

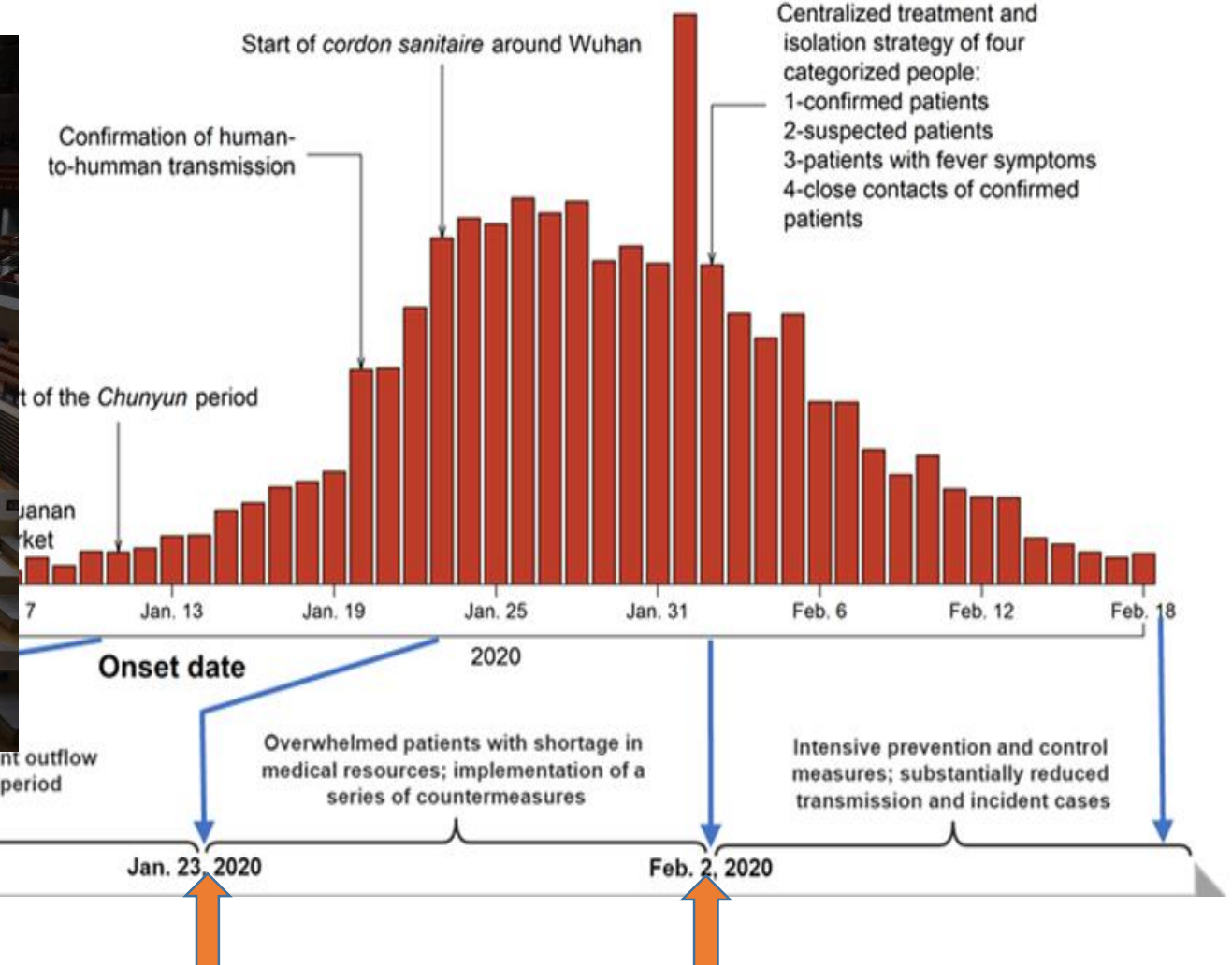
Jan 11, 2020: Start of Spring Festival Travel

Jan 23, 2020 Start of Cordon Sanitaire

Feb 2, 2020 2 New and 16 Field Hospitals Launched

Wuhan CDC (n=25,961): December 8 – February 18

16 Field Hospitals by converting stadiums and exhibition centers



Dec 8, 2019: First case: close to the Huanan Seafood Market

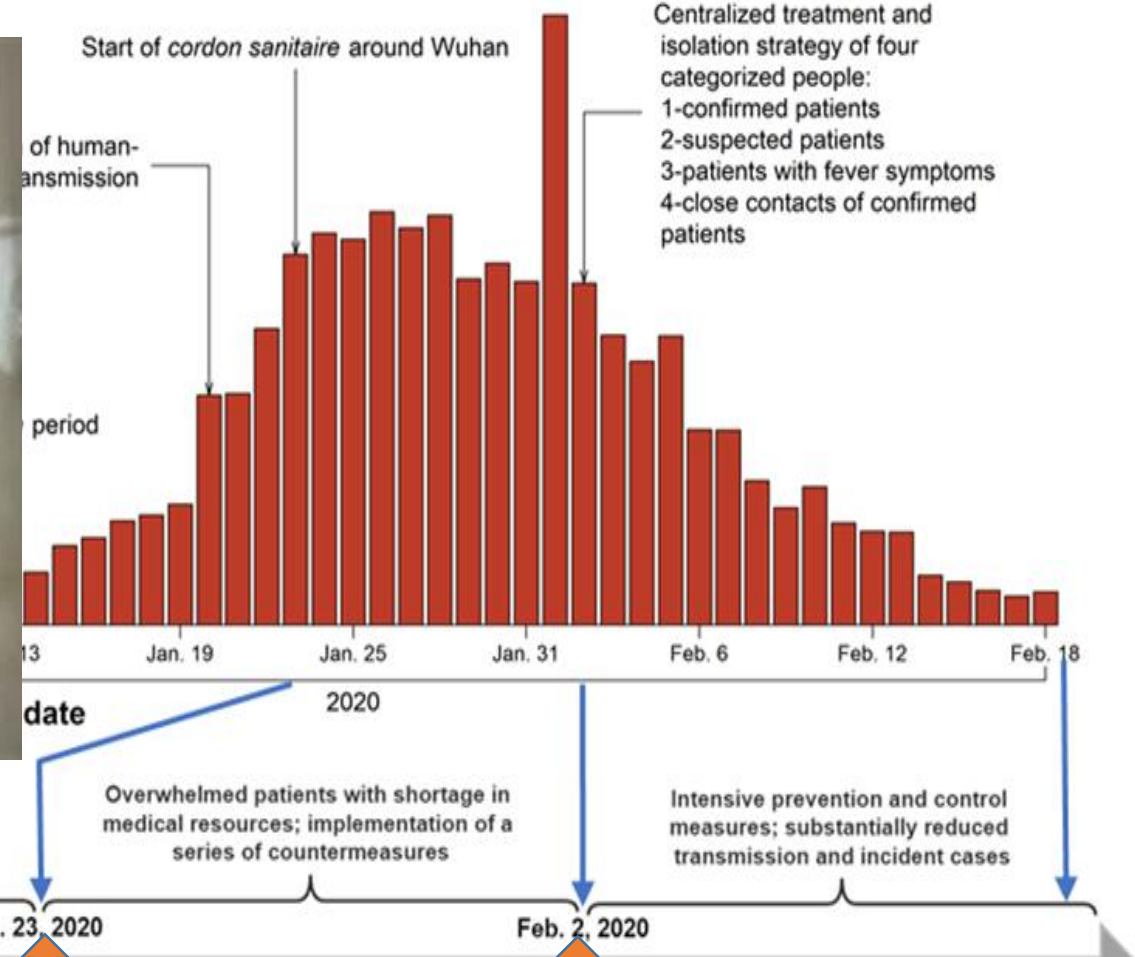
Jan 11, 2020: Start of Spring Festival Travel

Jan 23, 2020 Start of Cordon Sanitaire

Feb 2, 2020 2 new and 16 field hospitals launched

Wuhan CDC (n=25,961): December 8 – February 18

Designated hotels and university dorms were used for additional beds for presumptive cases and close contacts



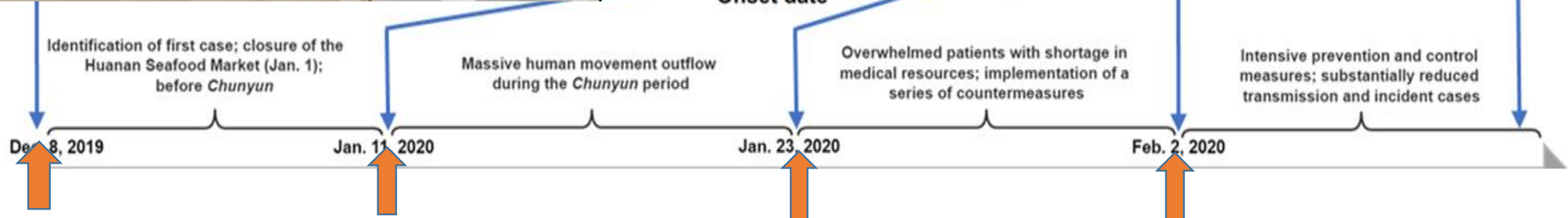
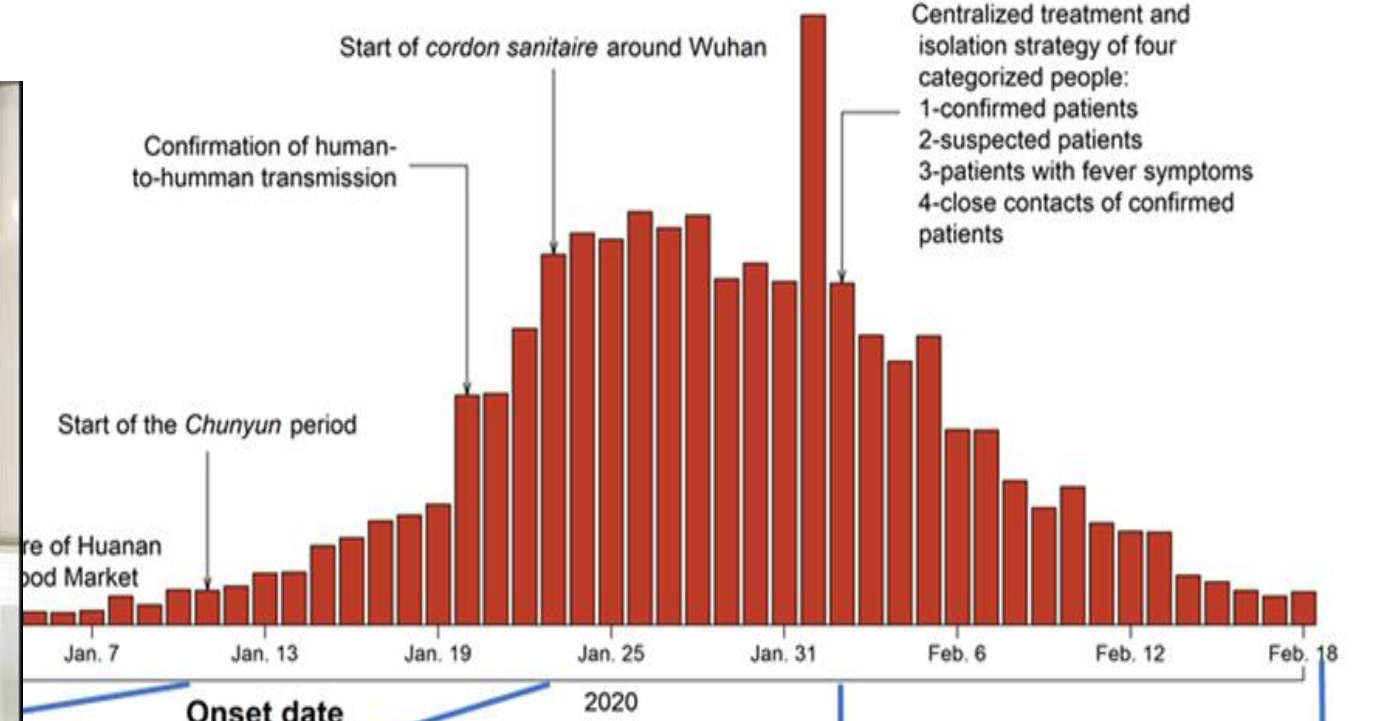
Dec 8, 2019: First case: close to the Huanan Seafood Market

Jan 11, 2020: Start of Spring Festival Travel

Jan 23, 2020 Start of Cordon Sanitaire

Feb 2, 2020 2 new and 15 field hospitals launched

Wuhan CDC (n=25,961): December 8 – February 18



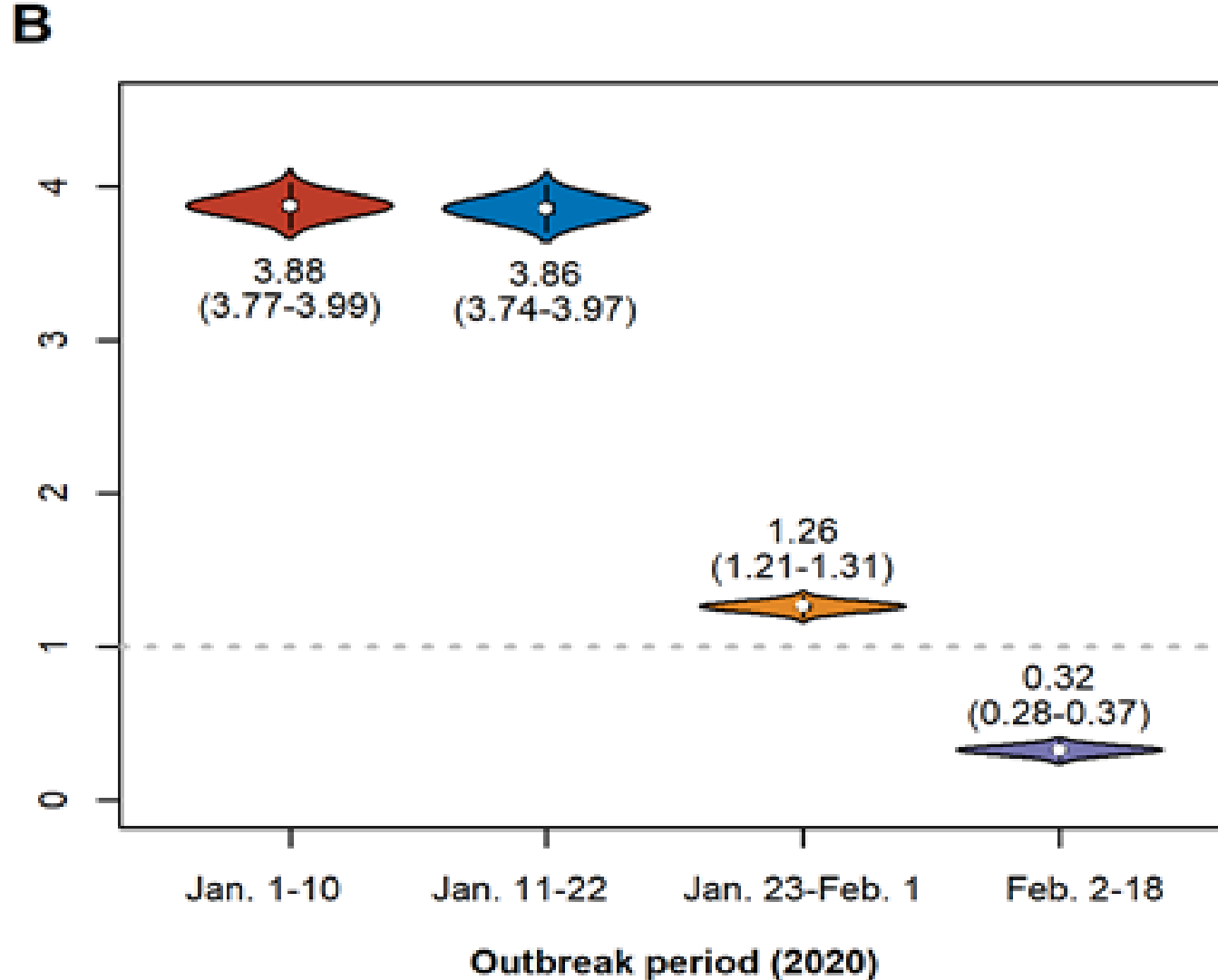
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Feb 2, 2020 2 New and 16 Field Hospitals launched

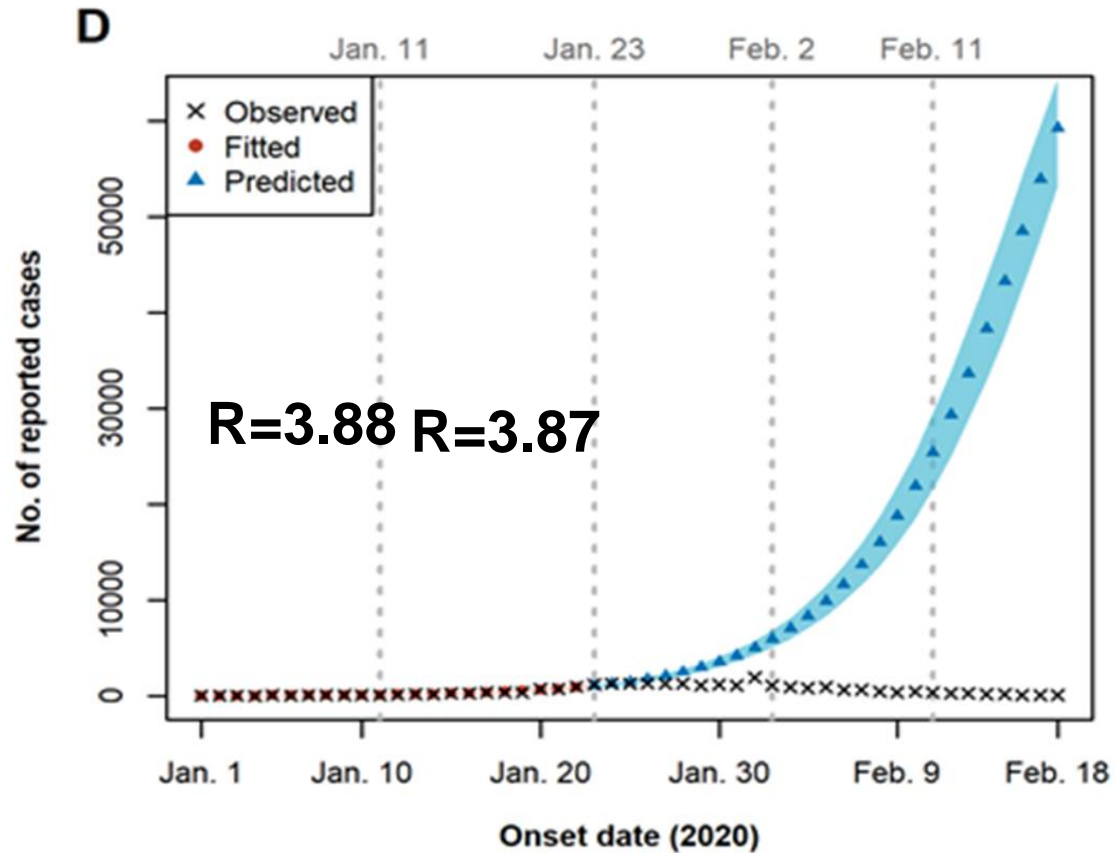
Estimated Effective Reproducible Number R Using Extended SEIR Model



Assume

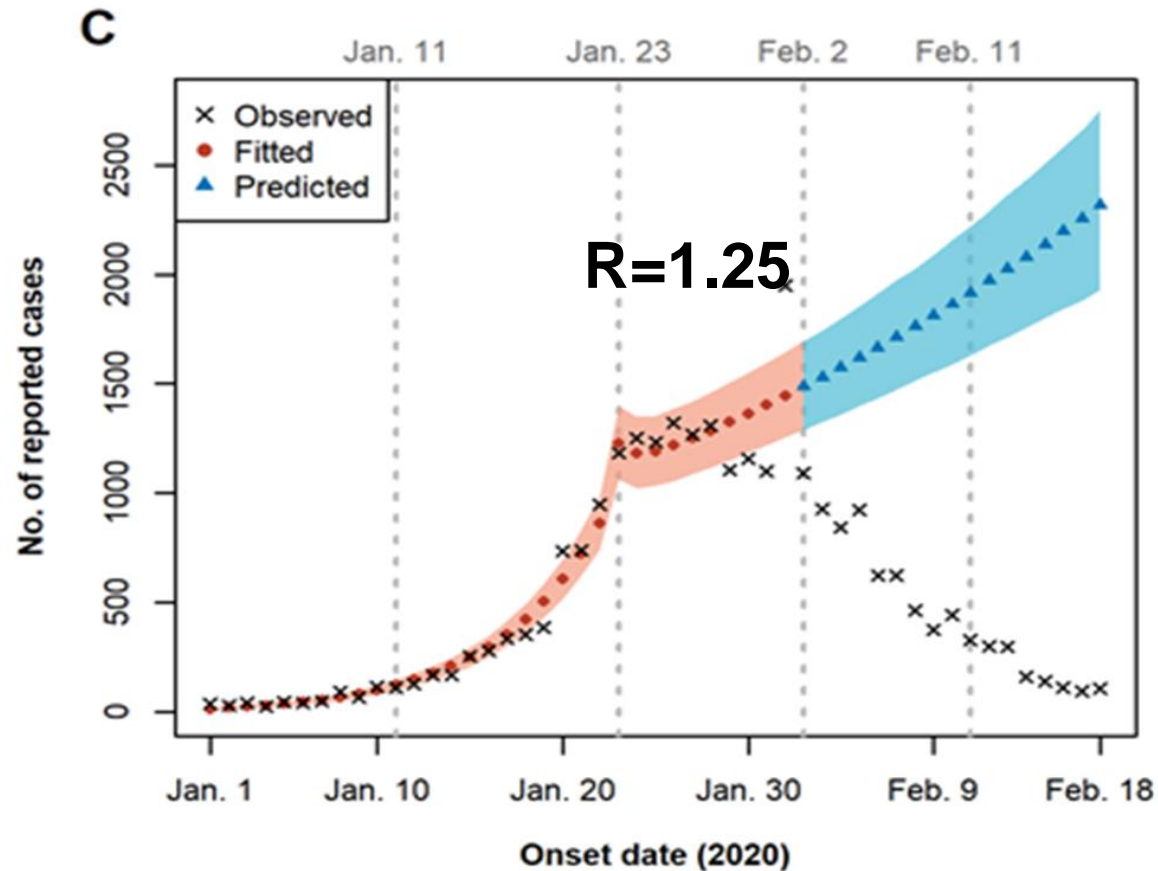
- Incubation period = 5.2 days
- Infection period = 2.3 days
- # of unascertained cases = # of ascertained cases at the initial stage
- 9 sensitivity analyses

Estimated Effective Reproducible Number R Using Extended SEIR Model



Blue = projected trajectory if there were no intervention

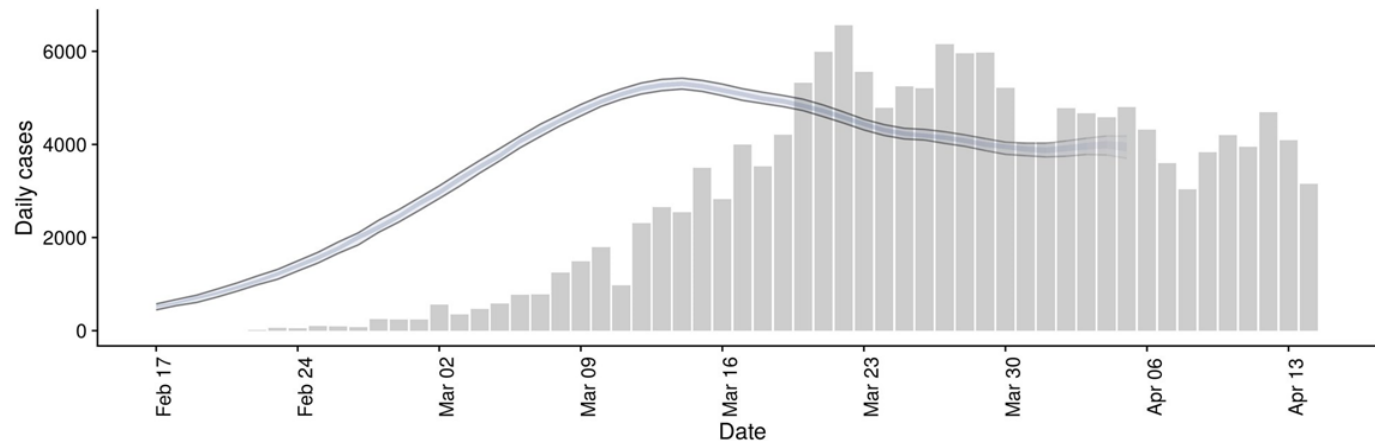
Lab-confirmed cases during lockdown with traffic ban and home quarantine between January 23-Feb 1, 2020



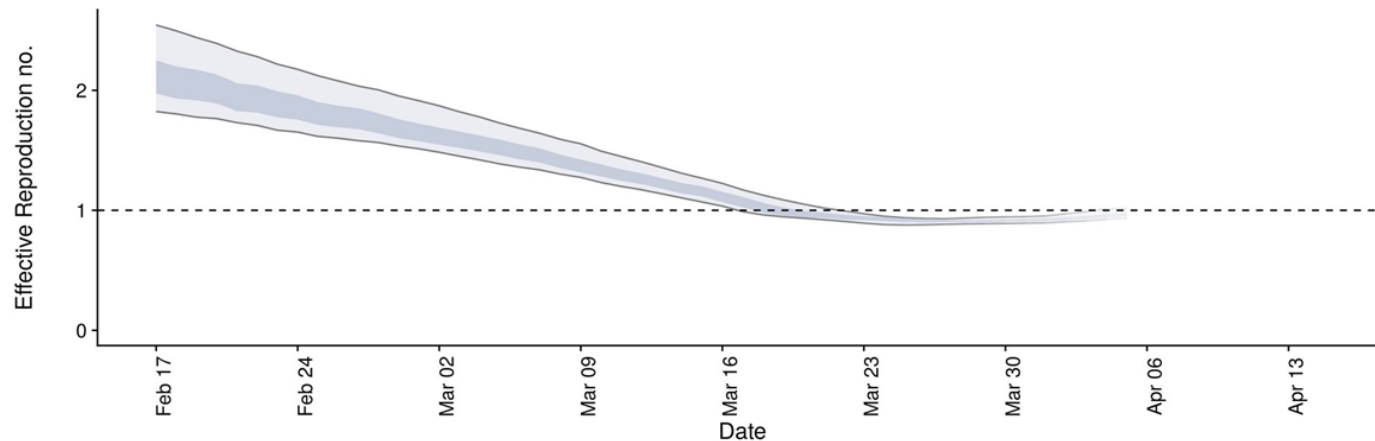
Blue = Projected trajectory if social distancing had continued.

The results that social distancing reduces R to linger around 1 have been replicated in many countries

Italy (Feb 17-April 13)

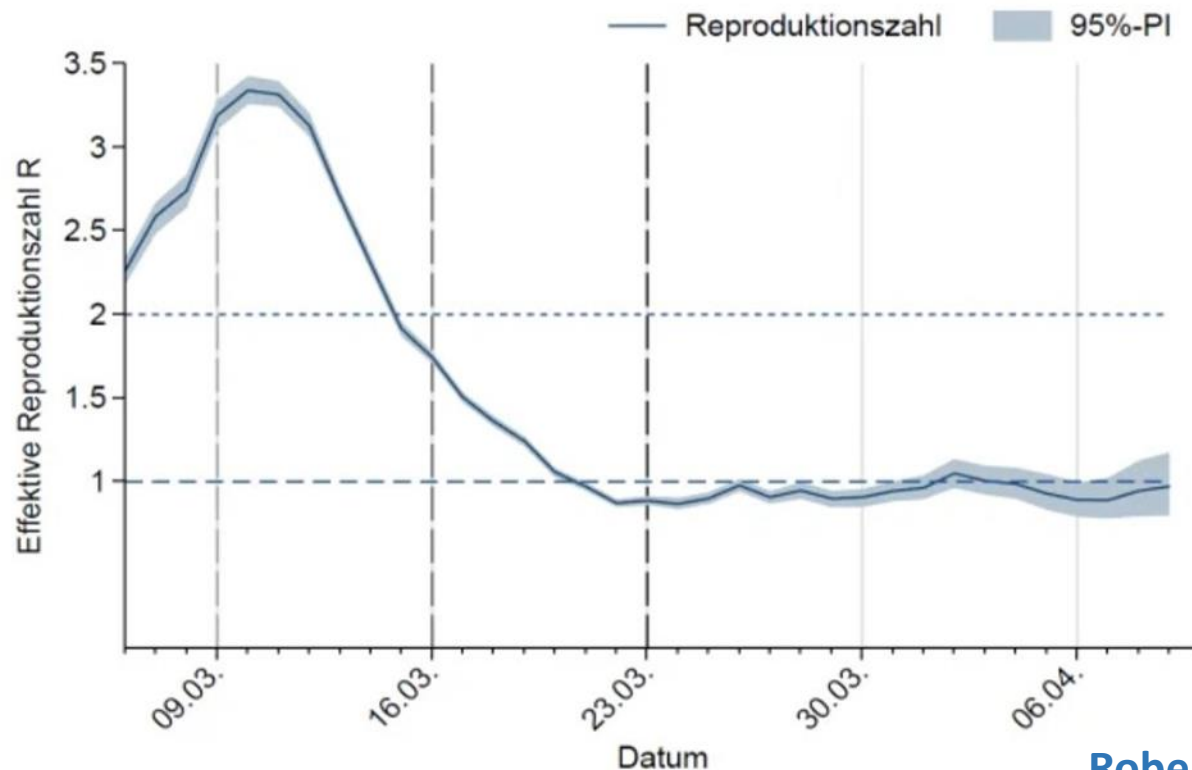


$R \approx 1$ for a month



The results that social distancing reduces R to linger around 1 have been replicated in many countries

Germany (Mar 8-April 6)



$R \approx 1$ for a month

Take home message #1: Social Distancing Greatly Helped Flatten the Curve but Was not Enough

- Social distance helps block community transmission (between-household transmission)
- Family transmission is common.
- Infected cases might infect family members and close contacts, who could infect others in the community.
- Social distancing helped reduce R to be around 1, but was not good enough

The Coronavirus Outbreak

LIVE

Latest Updates

Maps

Markets

U.S. Impact

Common Questions

Newsletter

Coronavirus Ravages 7 Members of a Single Family, Killing 4

March 18, 2020

The matriarch of the large New Jersey family died Wednesday night without ever knowing that her two oldest children had died before her.

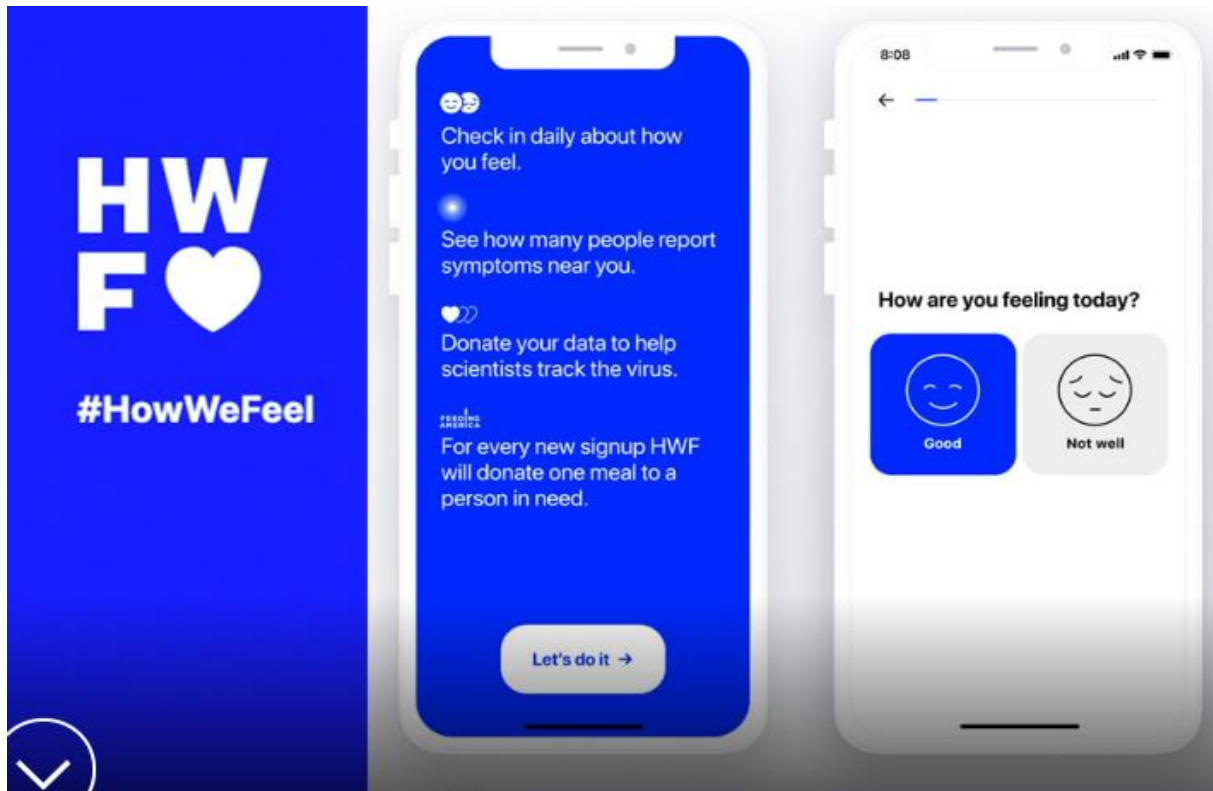


Family transmission is common

It is critical to develop strategies for preventing family members and close contacts from being infected

How We Feel Project

<https://howwefeel.org/>




Harvard PI: X Lin

- App for COVID symptoms and health status
- Launched on April 4
- Joint with Feng Zhang at Broad Institute and Ben Silberman at Pinterest
- >500K users and >3M responses in US.

Consortium for Coronavirus Census Collective

Building an International Consortium for Tracking Coronavirus Health Status

 Eran Segal, Feng Zhang,  Xihong Lin, Gary King,  Ophir Shalem,  Smadar Shilo, William E. Allen, Yonatan H. Grad, Casey S. Greene, Faisal Alquaddoomi, Simon Anders, Ran Balicer, Tal Bauman, Ximena Bonilla, Gisel Booman, Andrew T. Chan, Ori Ori Cohen, Silvano Coletti, Natalie Davidson, Yuval Dor, David A. Drew, Olivier Elemento, Georgina Evans, Phil Ewels, Joshua Gale, Amir Gavrieli, Benjamin Geiger, Iman Hajirasouliha, Roman Jerala, Andre Kahles, Olli Kallioniemi, Ayya Keshet, Gregory Landua, Tomer Meir, Aline Muller, Long H. Nguyen, Matej Oresic, Svetlana Ovchinnikova, Hedi Peterson, Jay Rajagopal, Gunnar Ratsch, Hagai Rossman, Johan Rung, Andrea Sboner, Alexandros Sigaras, Tim Spector, Ron Steinherz, Irene Stevens, Jaak Vilo, Paul Wilmes, CCC (Coronavirus Census Collective)

doi: <https://doi.org/10.1101/2020.04.02.20051284>

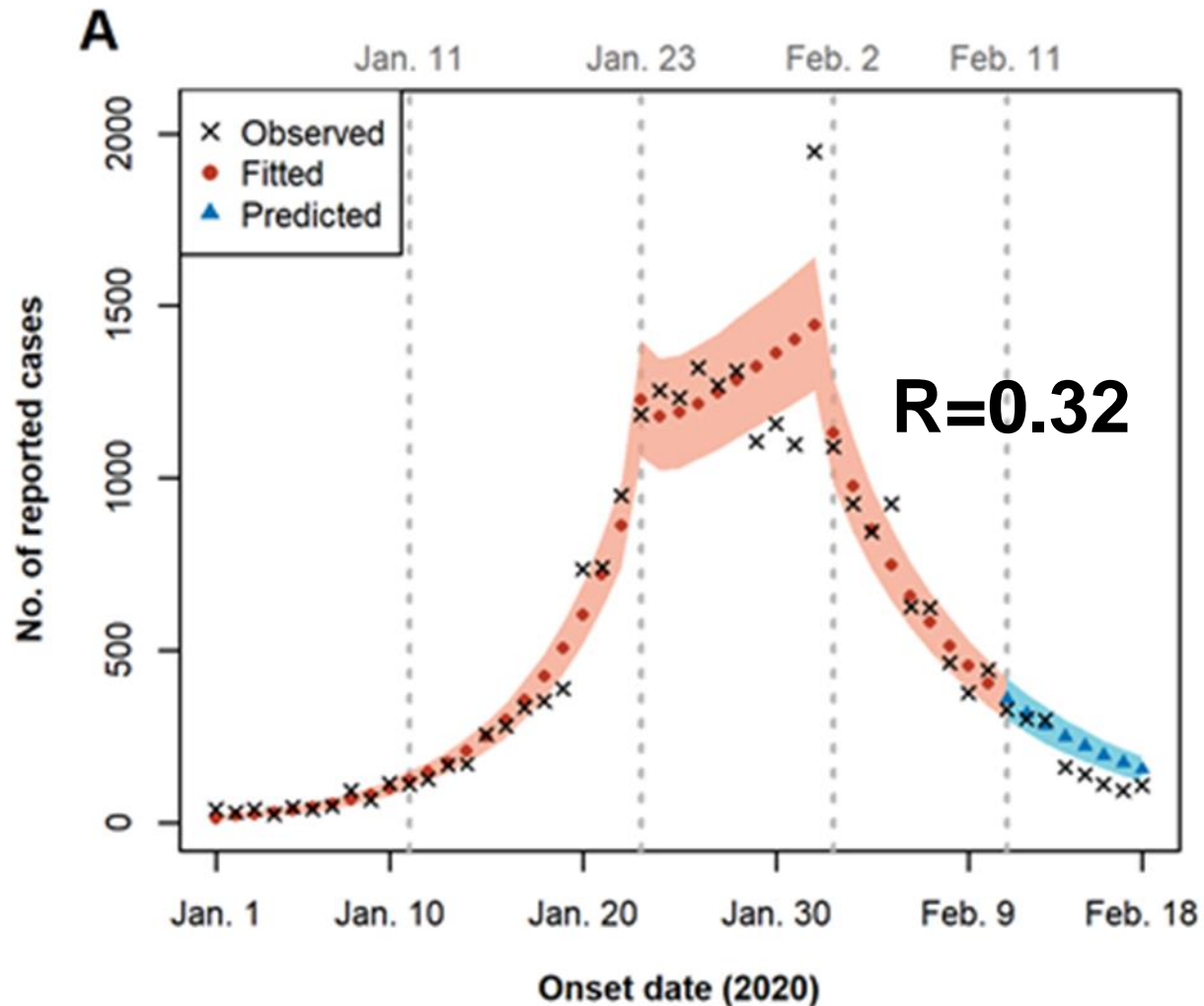
Nature Medicine, in Press

HWF: Estimated Household Transmission Rate



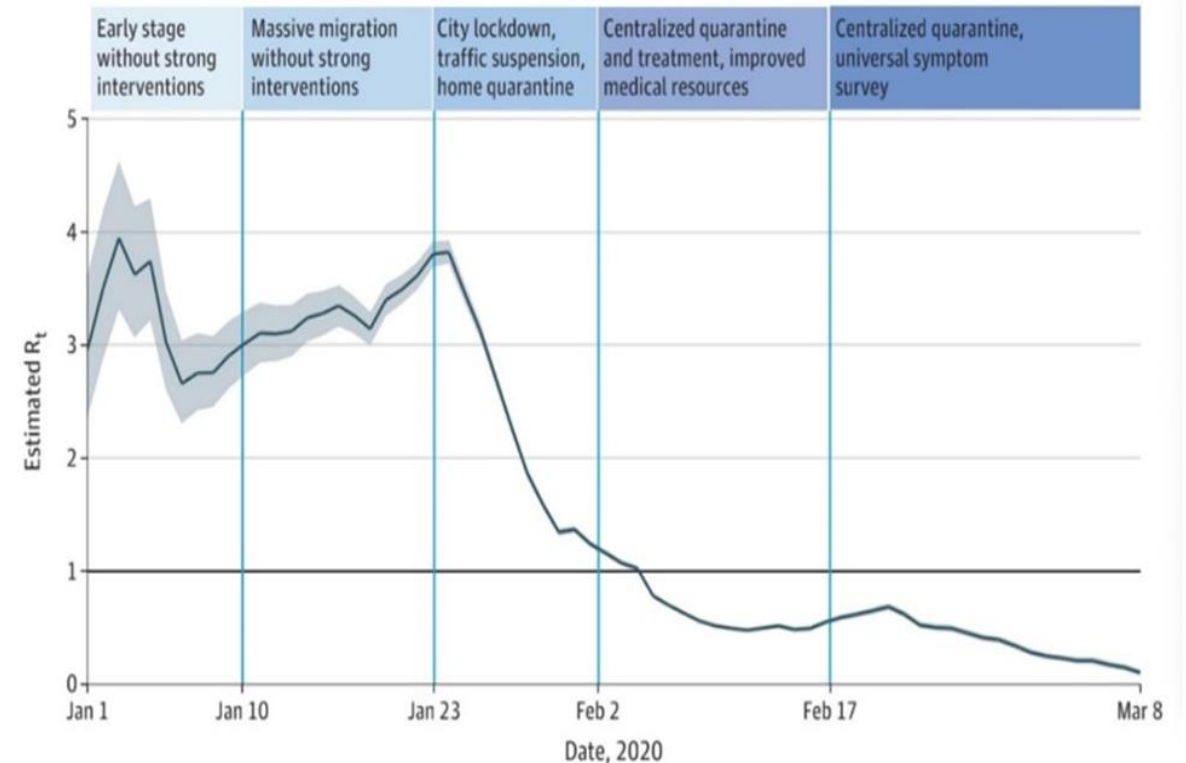
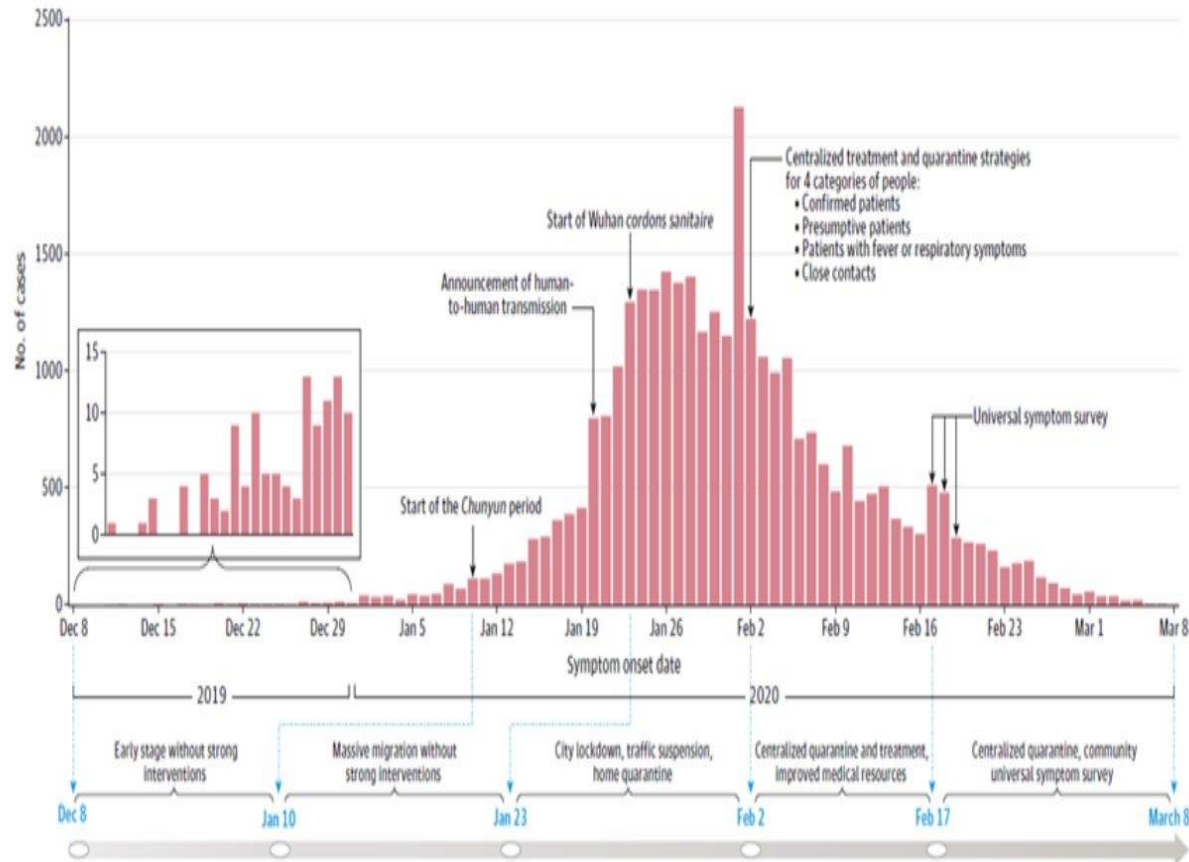
- Adjusted OR of positive test associated with infection in a household with infected members is 11 (CI=7.72 – 15.7).
- Household/congregated place transmission is common and needs to be blocked.

Wuhan: Centralized Quarantine after February 1, 2020



Blue = Projected trajectory if this intervention continues.

Updated Analysis Using 32,000 Cases Until March 8 (JAMA, April 8)



$R=0.1$ on March 8

Method: Epiestim

Key Idea: Centralized Isolation of Infected and Centralized Quarantine of Suspected Cases and Close Contacts with Medical Care Provided

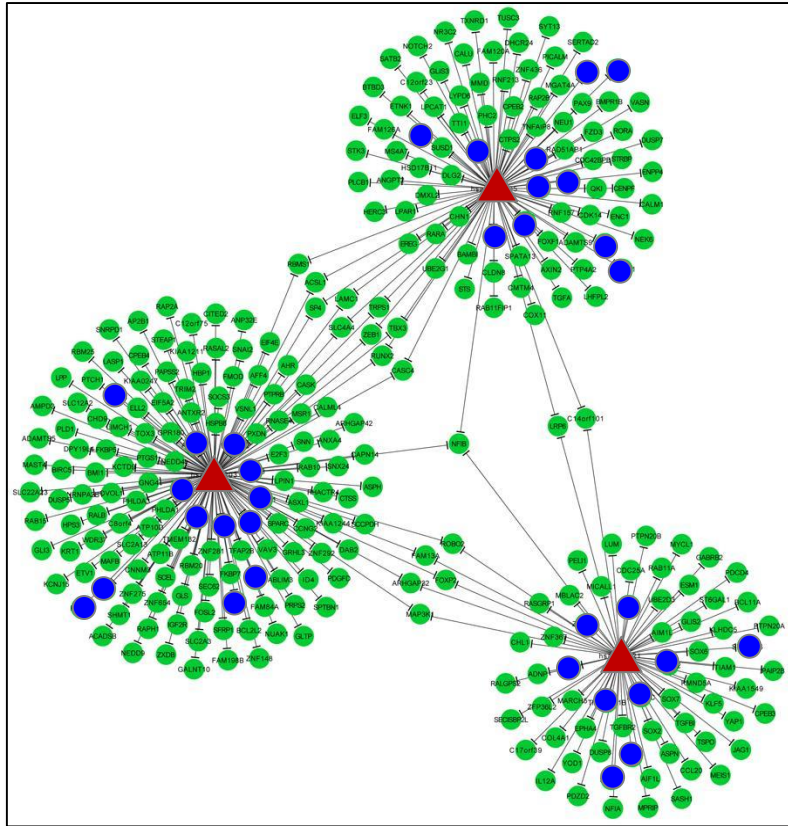
Control the source of infection



Reduce the number of new infections



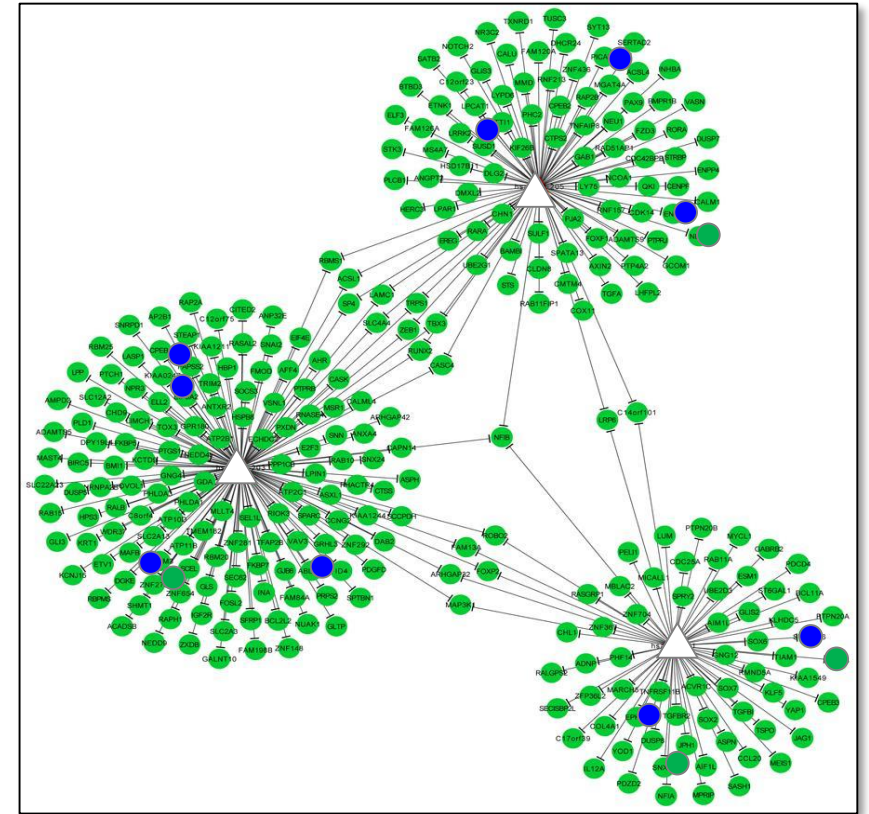
Stop the outbreak



Red: Infected index cases

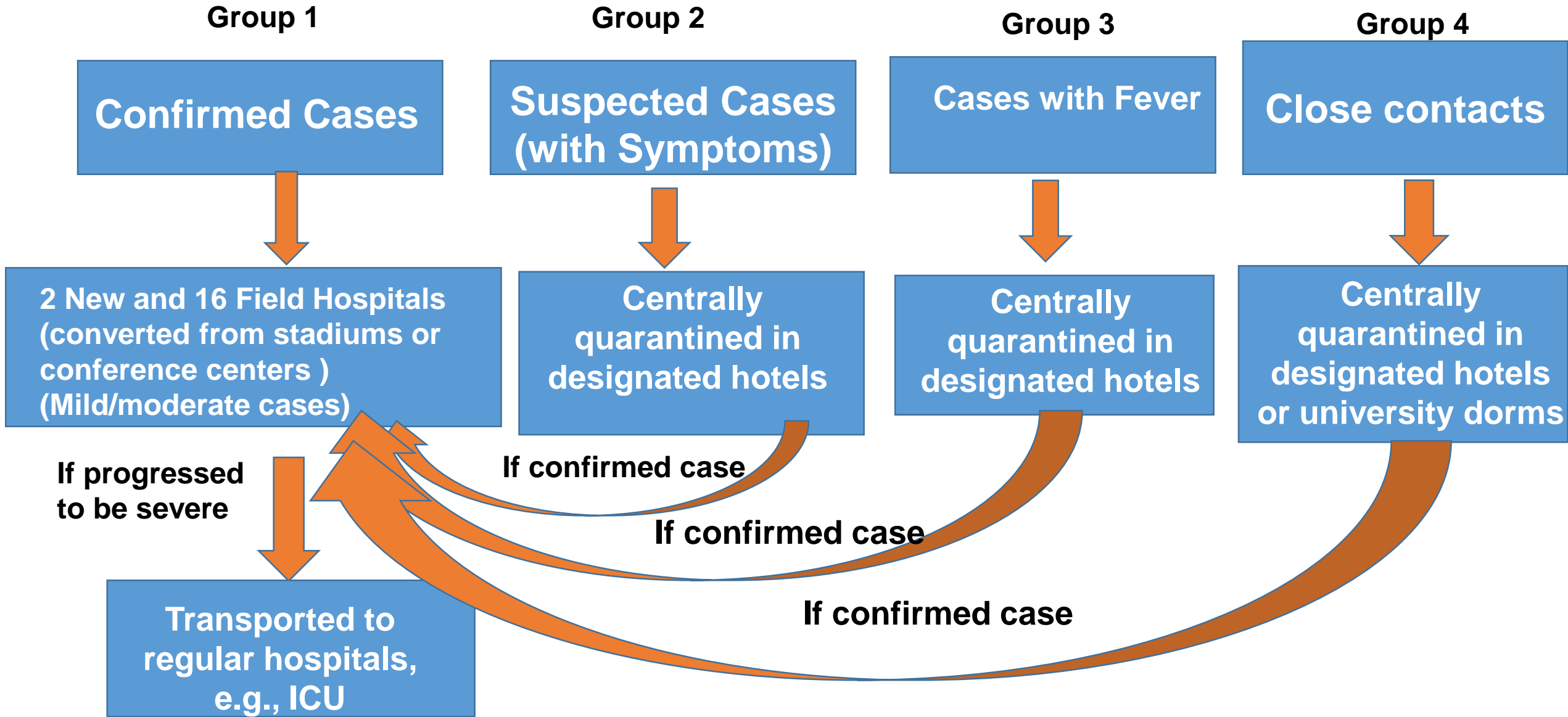
Blue: infected family members, close contacts and community members

Home Quarantine



Centralized Quarantine: Take infected and suspected cases out of home and family network and admit them to new or field hospitals for medical care

Centralized Quarantine Strategy After Feb 1, 2020



Take home message #2: Adding Centralized Isolation and Quarantine to Social Distancing Bended the Curve and Stopped the Epidemic

- **Block within-household transmission:** Prevent infected cases from infecting household members
- **Patients received medical care immediately**
- **Prevention of disease progression:** With timely medical care of mild cases, reduce the chance of progression to becoming severe cases.



Take home message #2: Adding Centralized Isolation and Quarantine to Social Distancing Bended the Curve and Stopped the Epidemic

- **Monitor Progression:** If a patient progressed to become a severe case in a field hospital, he/she was transferred to an ICU in a main hospital.
- **Relief of burden on health care system and ICU:** By reducing the number of new infected cases, it relieved the enormous pressure on the healthcare system, e.g. a lack of ICU capacity, and a shortage of PPEs.

All the 16 Field Hospitals in Wuhan were closed on March 10, 2020: Cleared All Patients



Closing Ceremony

Congratulations, Wuhan!

March 18: No new confirmed cases in Hubei Province

April 8: Wuhan reopened the city



Nature News & Comment 
@NatureNews



On 18 March, Hubei, the Chinese province at the centre of the coronavirus outbreak recorded no new cases of COVID-19 for the first time since the beginning of the epidemic.



Acknowledgement

Huge thanks go to all the citizens of Wuhan, the local healthcare workers, and the 30,000+ healthcare workers cross the country who went to help Wuhan, for their tremendous sacrifice and efforts.

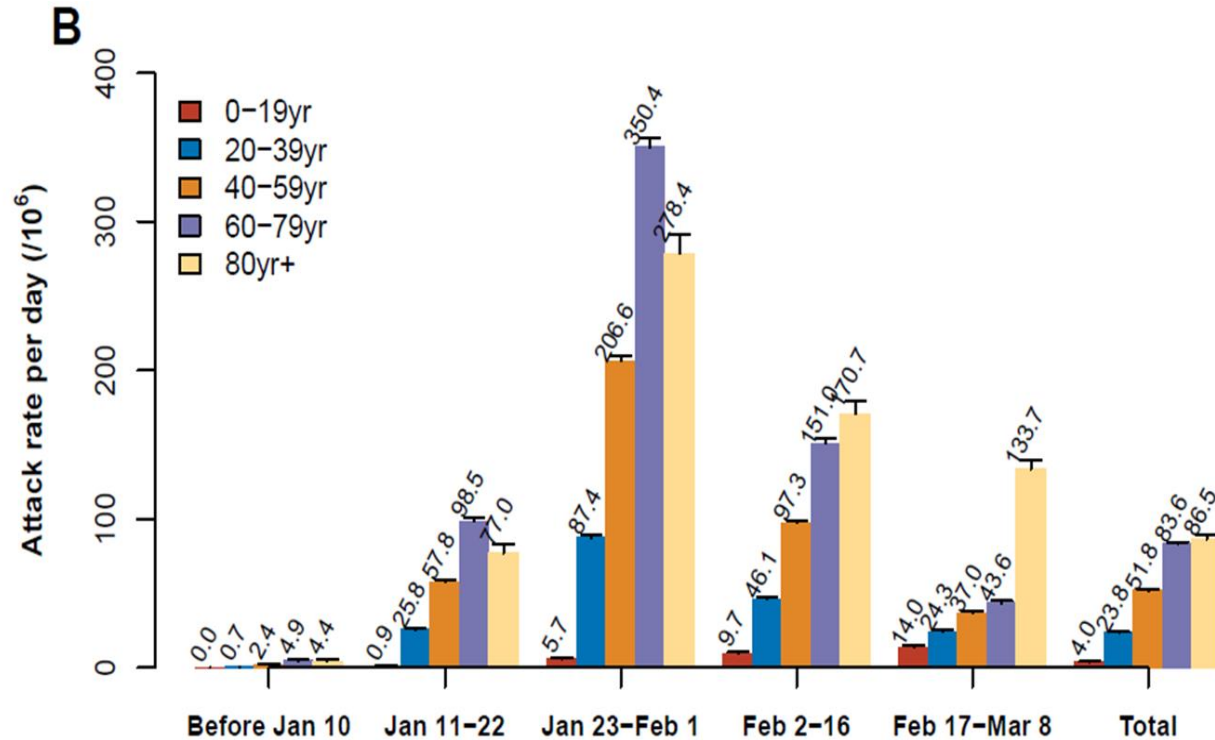


They are my heroes



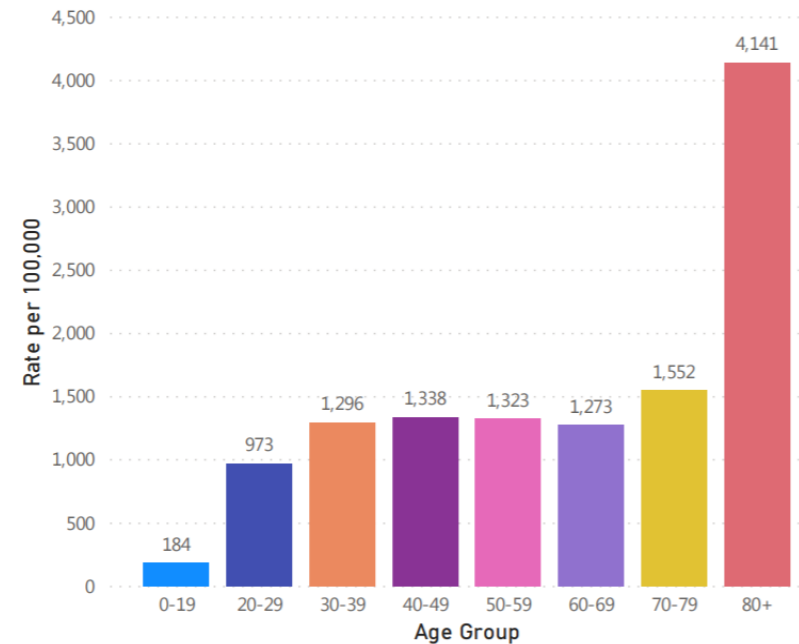
Epidemiological Characteristics of 32,000+ Lab-Confirmed COVID-19 Cases

Infection Rates by Age



Wuhan

Rate (per 100,000) of Confirmed COVID-19 Cases by Age Group



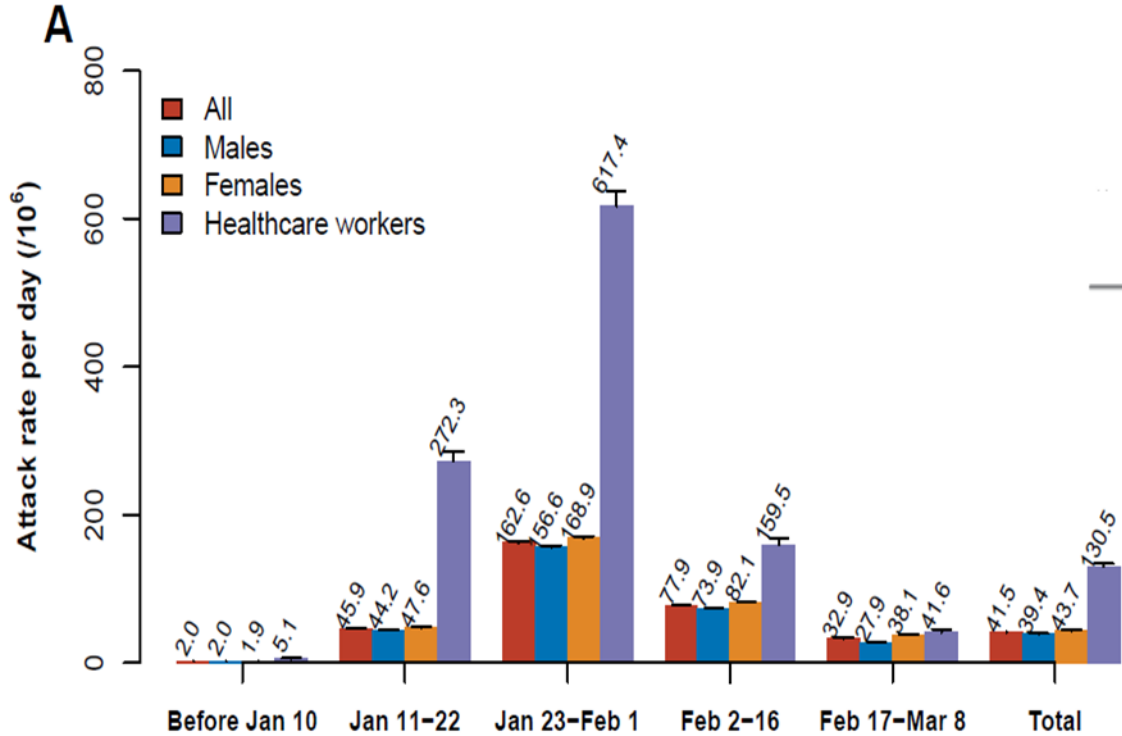
Average age of
COVID-19 Cases

53

MA

<https://www.mass.gov/doc/covid-19-dashboard-may-12-2020/download>

Infection Rates by Gender, Health Care Workers and Essential Workers



Wuhan

| Predictor | Baseline | Log Odds Ratio | Odds Ratio | 95% CI (Lower, Upper) |
|------------------------|---------------|----------------|------------|-----------------------|
| healthcare worker | non-essential | | 2.10 | 1.46 3.02 |
| other essential worker | essential | | 1.72 | 1.14 2.58 |

HowWeFeel

Take home message #3: Protection of Health Care Workers with Comprehensive PPEs, Training and PPE Supplies

Petition · Hospital Administrators: US Physicians/Healthcare Workers For Personal Protective Equipment in COVID-19 Pandemic (DO NOT DONATE!) ·

[Change.org](#)



Sign the Petition

US Physicians/Healthcare Workers For Personal Protective Equipment in COVID-19 Pandemic

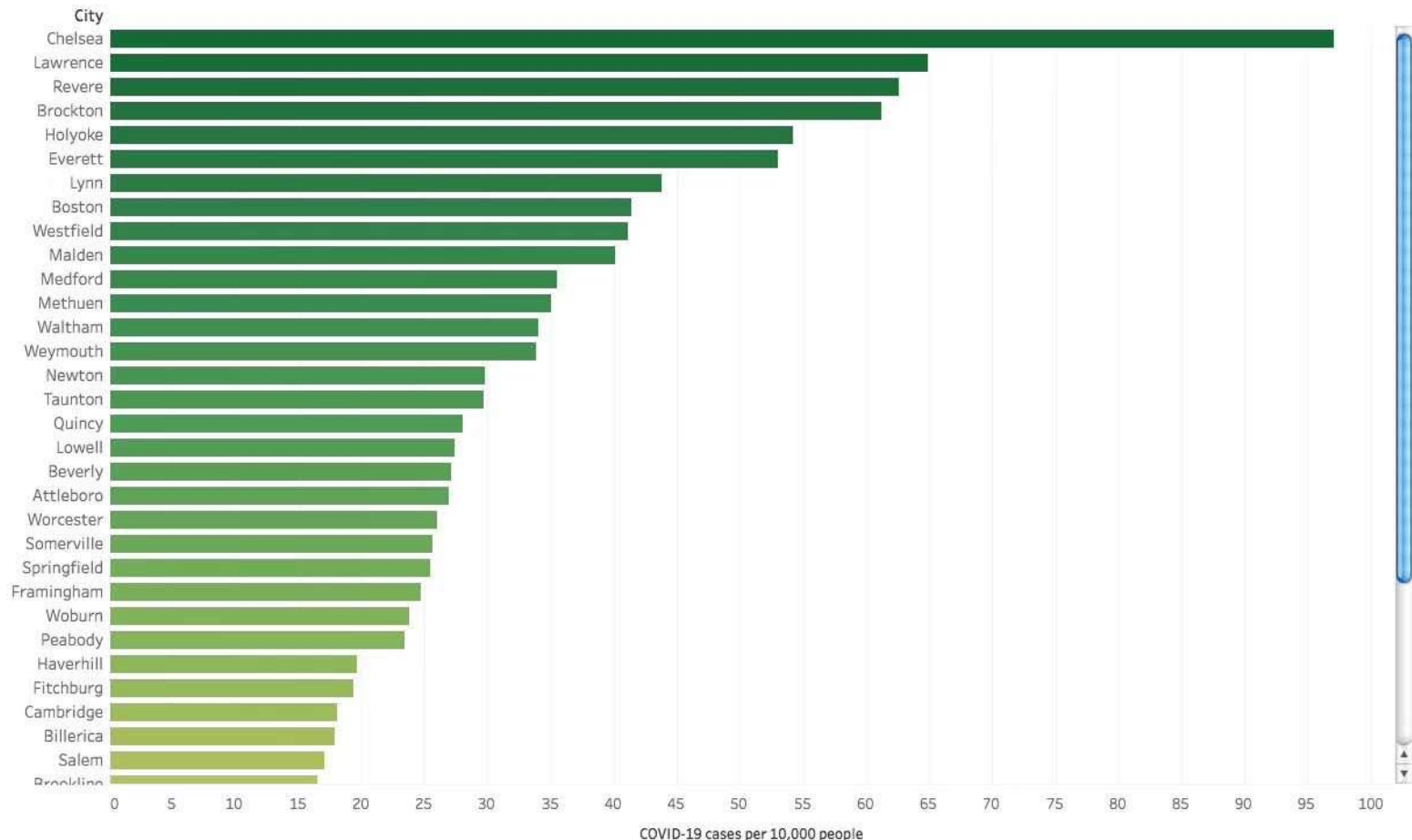
[change.org](#)

**Launched on March 16,
1.7M people have signed.**

- **Comprehensive PPE Protection:** masks, protective suit, medical goggle, cap, face shield, and two layers of gloves.
- **Training:** “This is the penultimate lesson we learned from Ebola. Training on donning/doffing of PPE is key to prevention of infection” – *an MD I got to know in March*
- **Speed up supplies in PPEs:** A shortage in PPEs .

COVID-19 Health Disparity: Top 7 MA towns with the highest infection rates are all low income towns with high % of URM

COVID-19 cases per 10,000 people in MA's 40 largest municipalities

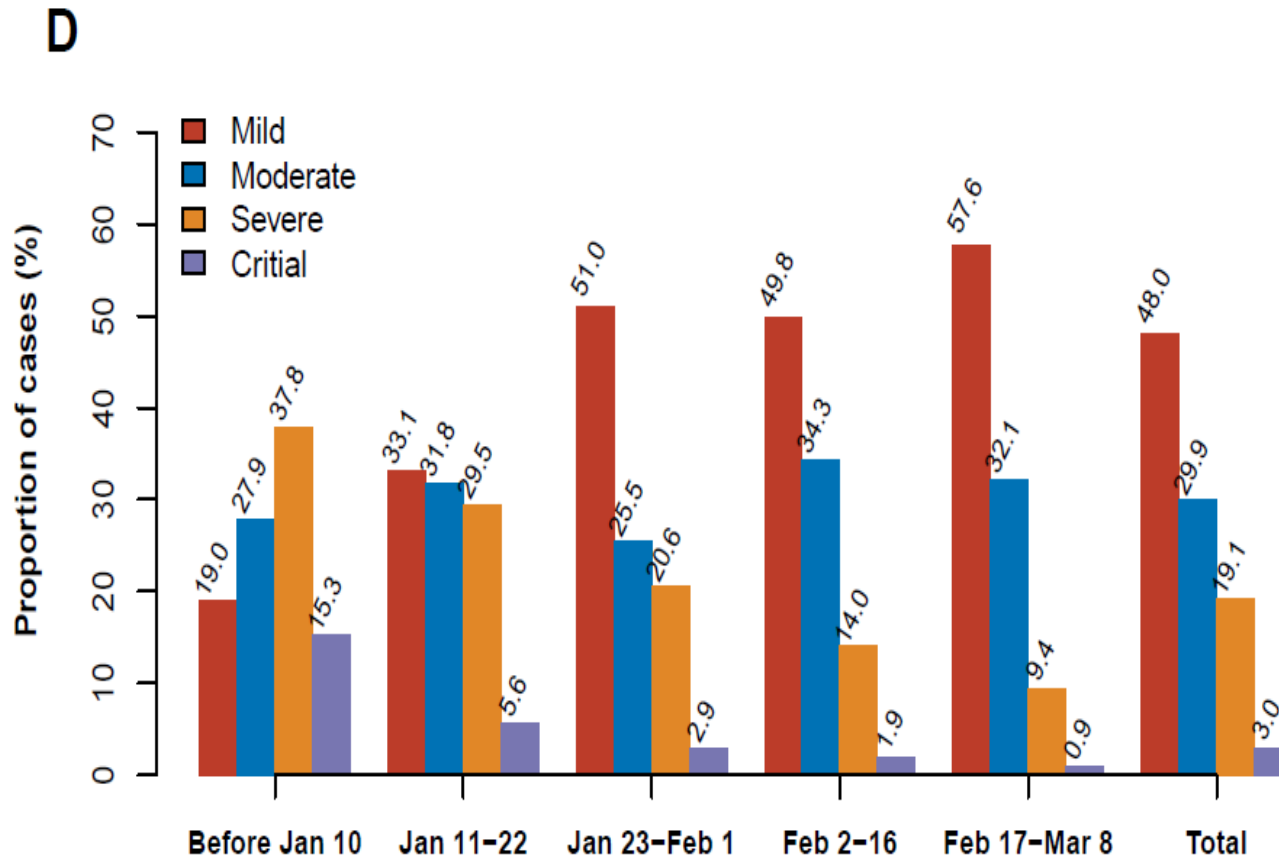


- **Chelsea**
- **Lawrence**
- **Revere**
- **Brockton**
- **Holyoke**
- **Everett**
- **Lynn**

Take home message #4: Protect the Five Vulnerable Groups

- Healthcare workers
- Elderly people
- Family members and close contacts of infected cases
- Essential workers
- Low income families, especially those under-represented minorities: They usually have poor housing conditions and need to go to work

Wuhan: Severity Risk Factors



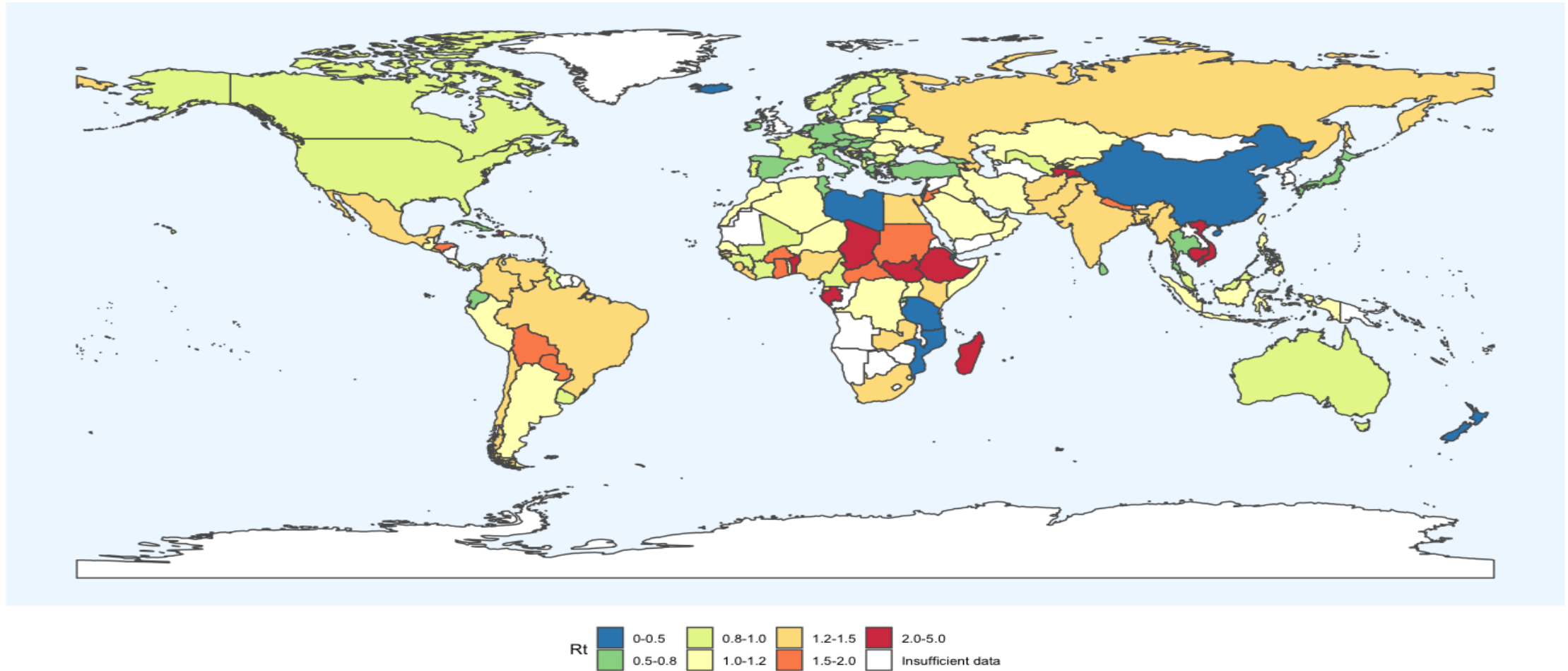
- **Elderly** are at a much higher risk of becoming severe (RR=3 for 60-79 and RR=6 for 80+, p-value<0.0001)
- Similar age results using MA data.
- **Women** have a lower risk of becoming severe than men (RR=0.9, p-value=0.002)

Take home message #5: Early Diagnosis and Early Medical Care

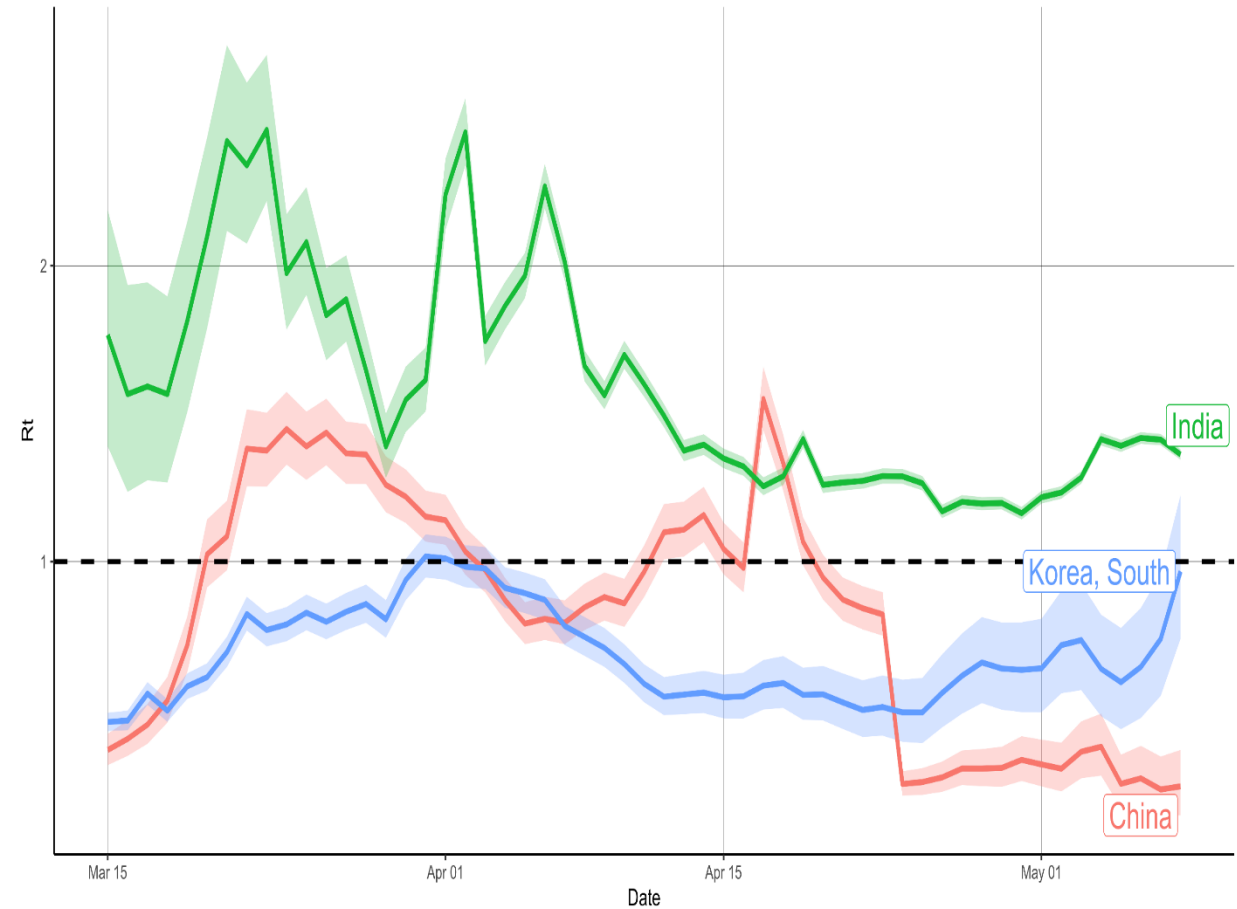
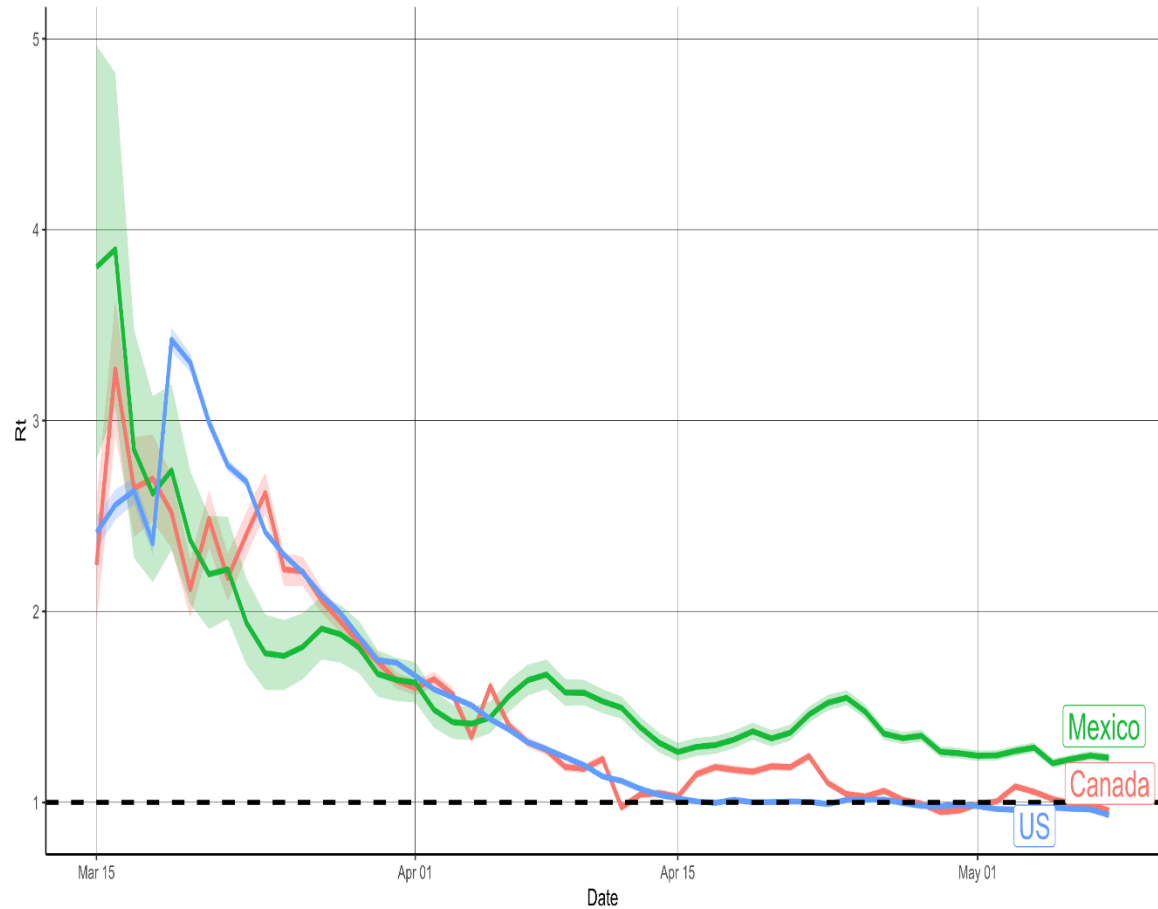
- Early diagnosis and early medical care will help prevent cases from progressing to become severe cases, who have a much higher risk of death, like ARDS patients
- Especially for the five vulnerable groups.

Estimated R Values Around the World (May 8, 2020)

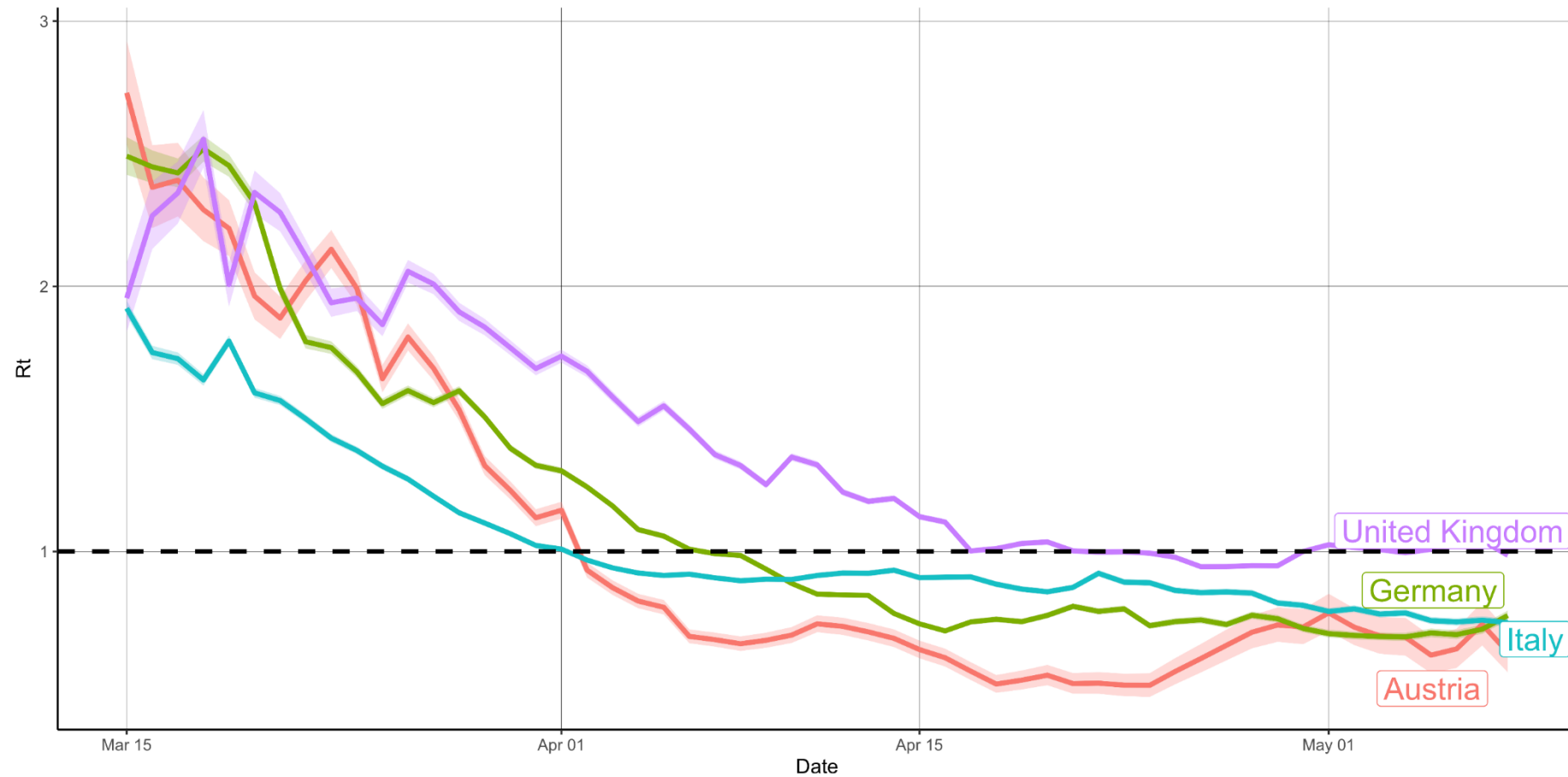
Global Rt as of 2020-05-08



Estimated R Curves in America and Asia (May 8, 2020)



Estimated R Curves in Europe (May 8, 2020)



Take home message #6: A Multi-pronged Approach is needed to control the epidemic

Six pillars:

- Mask wearing
- Social distancing
- Widespread testing
- Contact tracing
- Isolation and quarantine
- Treat infected patients

The New York Times

Opinion

The United States Needs a 'Smart Quarantine' to Stop the Virus Spread Within Families

Evidence from around the world shows that stay-at-home orders take us only so far.

By Harvey V. Fineberg, Jim Yong Kim and Jordan Shlain
Dr. Fineberg, Dr. Kim and Dr. Shlain specialize in public health.

April 7, 2020



THE
NEW YORKER

MEDICAL DISPATCH

IT'S NOT TOO LATE TO GO ON OFFENSE AGAINST THE CORONAVIRUS

By Jim Yong Kim
April 20, 2020

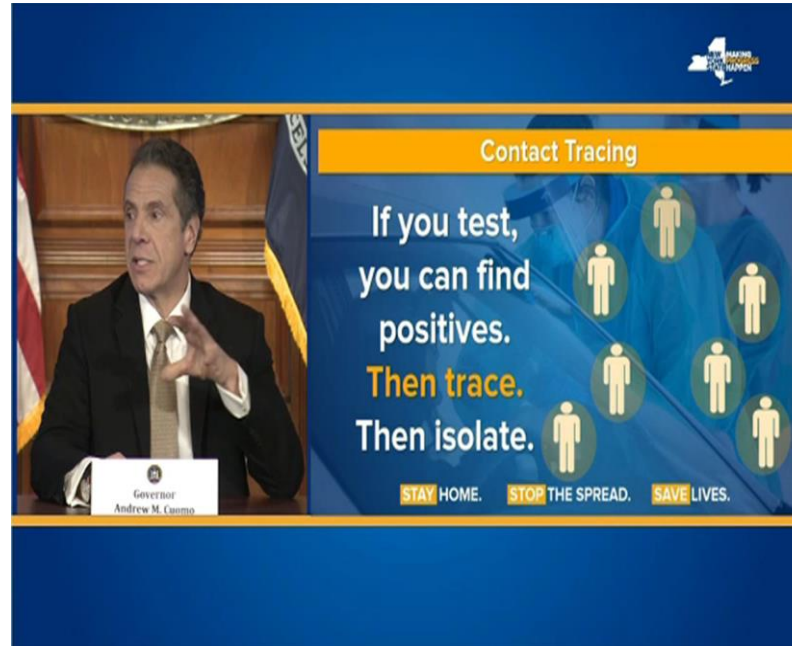
Test-Trace-Isolate: Bend the Curve

Community Tracing Collaborative



Partners
In Health

**MA launched the
first contact tracing
program**

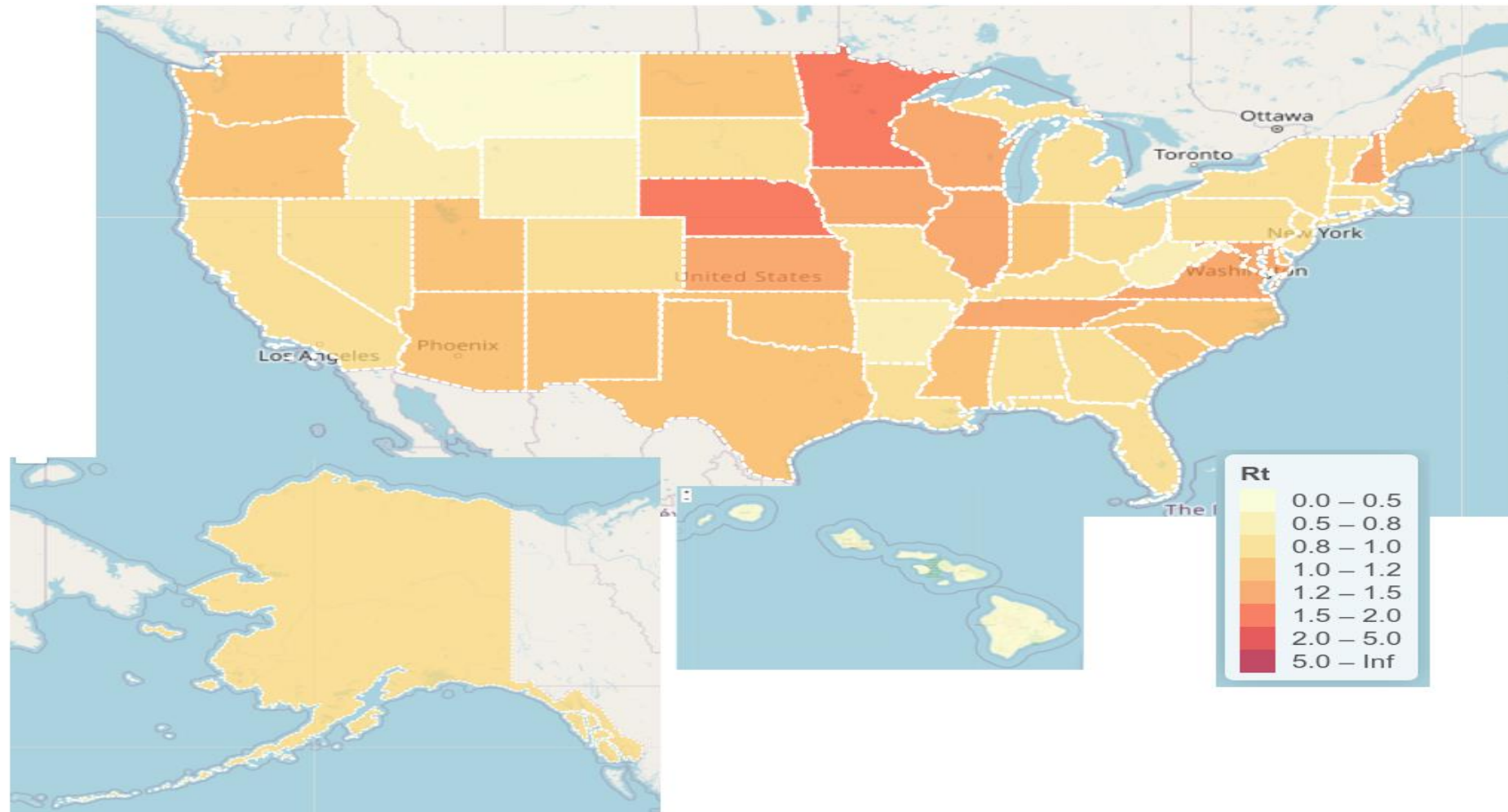


**Tri-states (MA, NJ, NY)
launched COVID test
and trace programs**



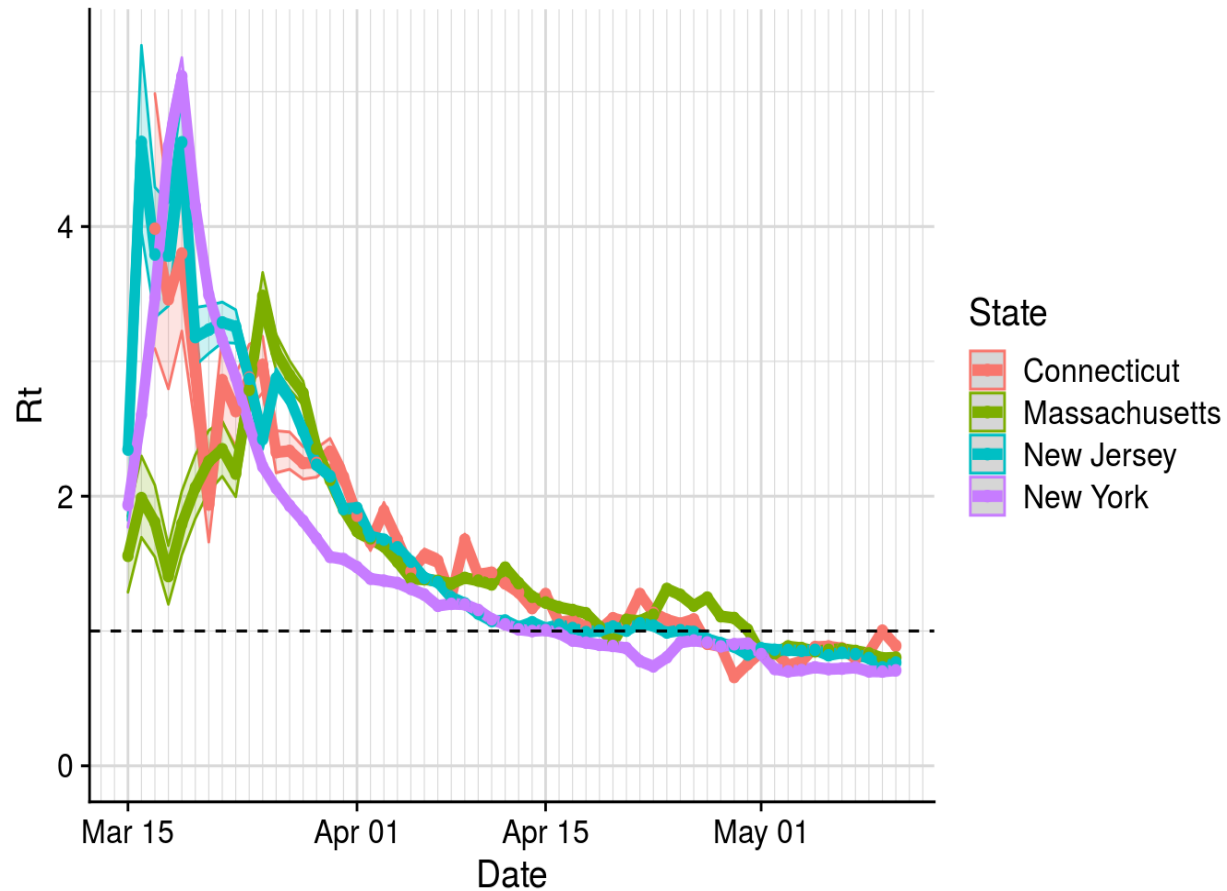
WHO

Estimated R-Value Map in US (May 8, 2020)

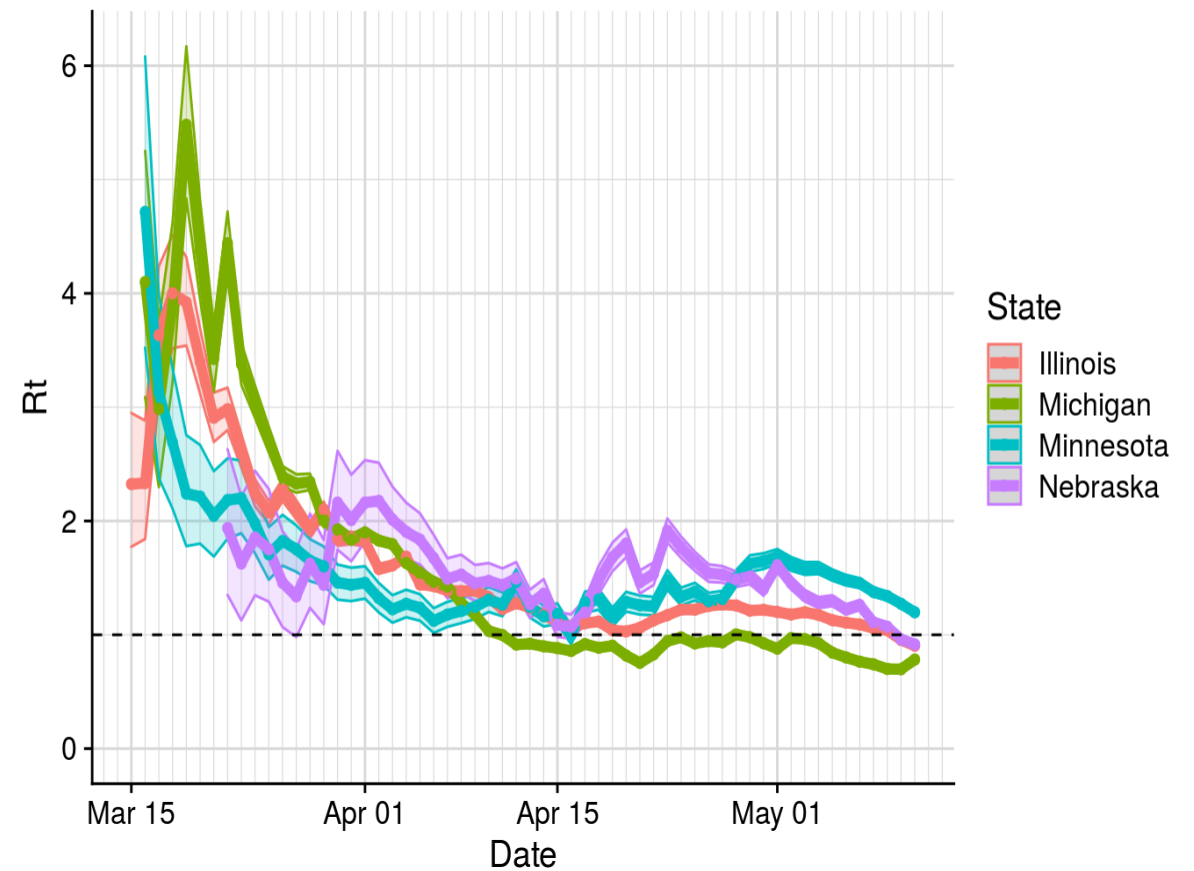


Estimated R Curves in US: East Coast and Midwest (May 8, 2020)

Rt for US East Coast

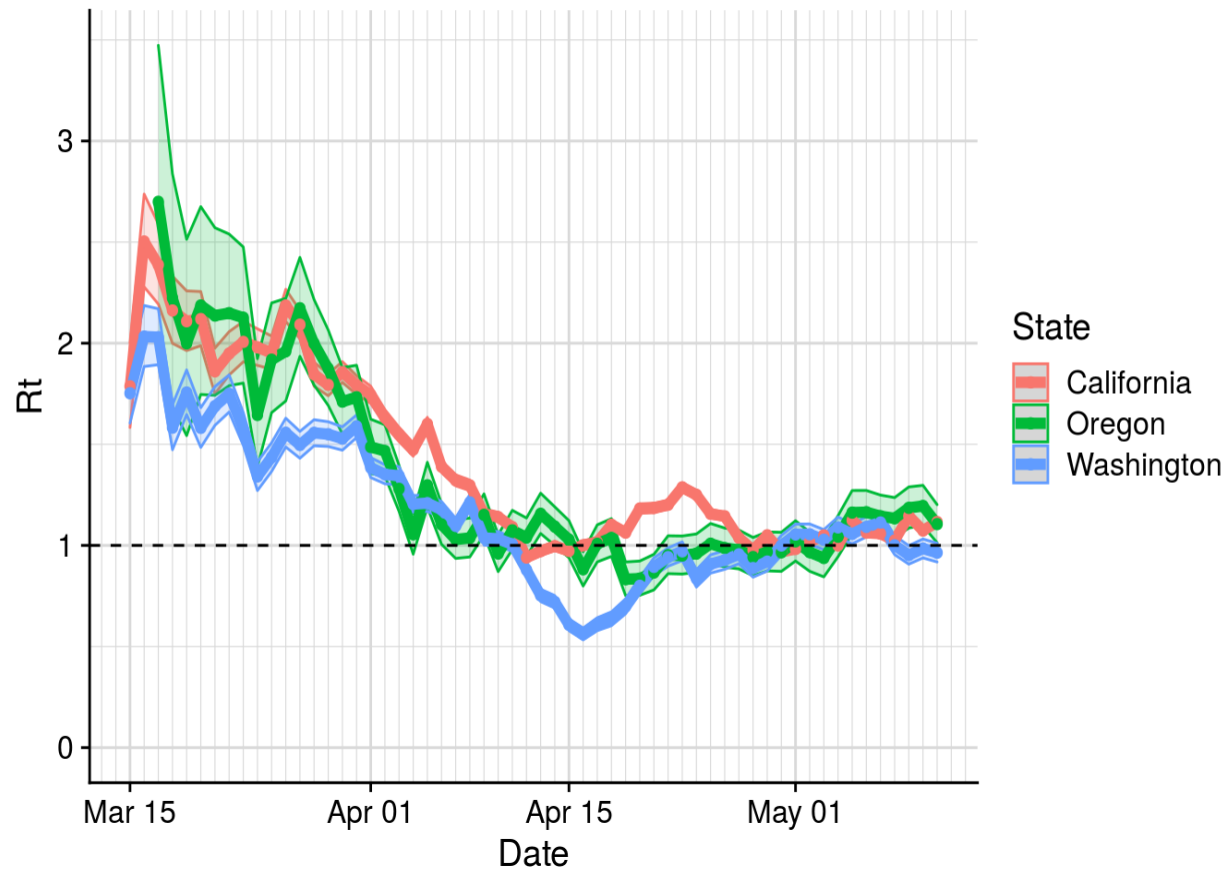


Rt for US Midwest

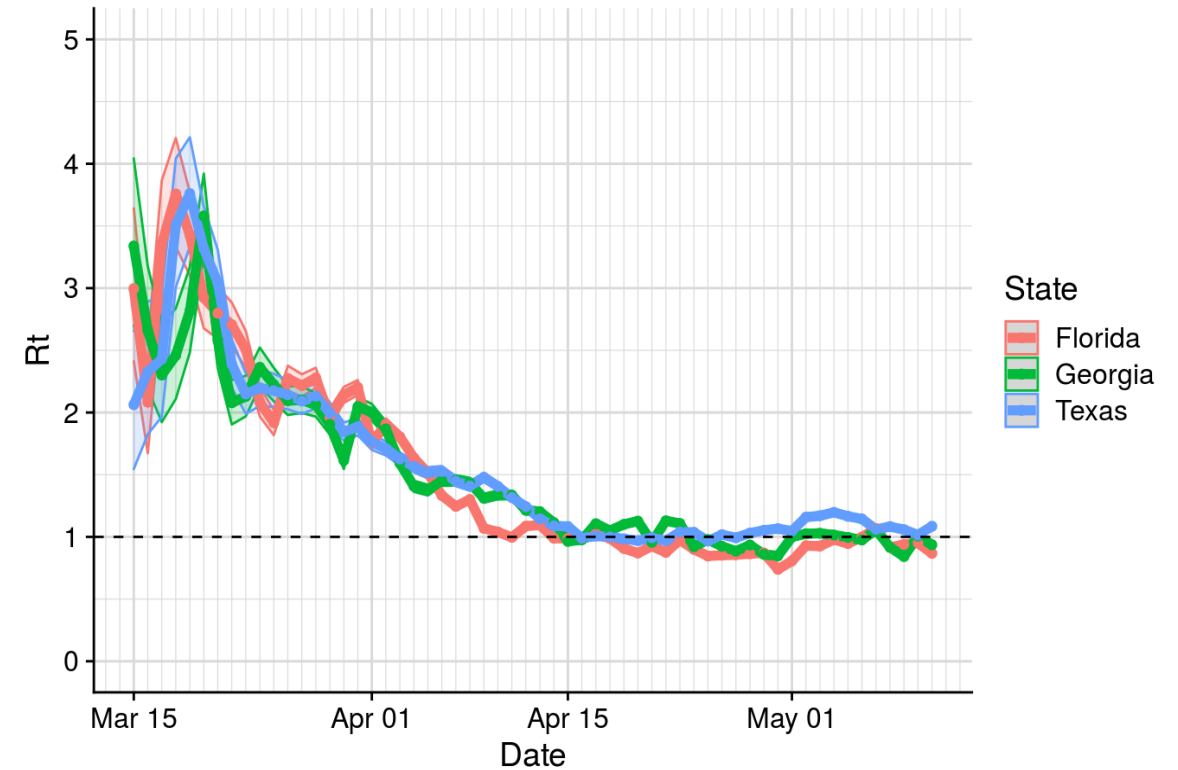


Estimated R Curves in US: West coast and South (May 8, 2020)

Rt for US West Coast



Rt for US South

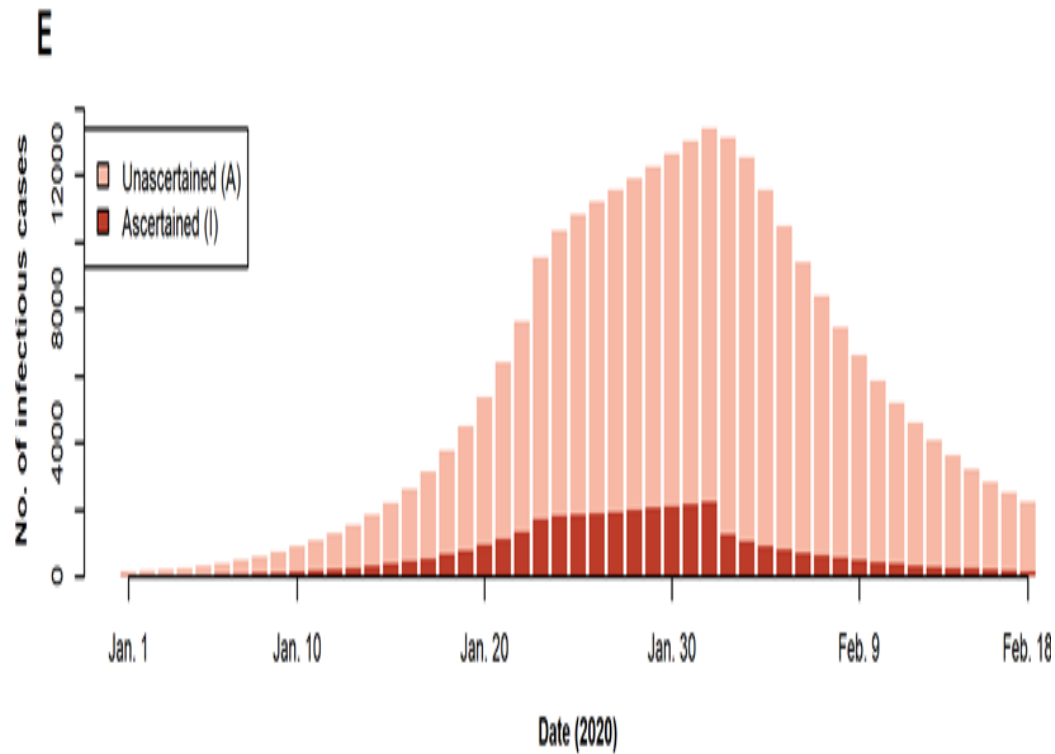


Take home message #7: Give testing priority to the five vulnerable groups including asymptomatic and pre-symptomatic cases

- Shortage of testing capacity and supplies, e.g., swabs
- Current testing priorities: symptomatic subjects
- With increasing testing capacity, consider giving priority to the five vulnerable groups, especially asymptomatic and pre-symptomatic cases.

Testing

Wuhan: Estimated Proportion of Ascertained and Un-ascertained Cases



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Full-spectrum dynamics of the coronavirus disease outbreak in Wuhan, China: a modeling study of 32,583 laboratory-confirmed cases

Xingjie Hao, Shanshan Cheng, Degang Wu, Tangchun Wu, Xihong Lin, Chaolong Wang

doi: <https://doi.org/10.1101/2020.04.27.20078436>

This article is a preprint and has not been peer-reviewed [what does this mean?]. It reports new medical research that has yet to be evaluated and so should not be used to guide clinical practice.

>60% of daily new cases were unascertained (asymptomatic or with mild symptoms)

PRC Tests and Antibody Tests

- PCR test: tell whether a person is currently infected.
- Antibody (IgG and IgM) test:
 - Tell whether a person was infected before
 - Does not tell whether a person is currently exposed

Antibody \neq Immunity

- Very good sensitivity of antibody tests using ELISA **after 20 days** of symptom onset.
- Serological study (Antibody test): Estimate % of population with antibody -> prevalence estimation

Take home message #8: Wide contact tracing is critical and can be empowered by integrating humanity and technology

- Protect privacy
- Human manpower and humanity
- Leverage technology
- Address fear of immigrants

Contact Tracing



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COVID-19 Digital Contact Tracing: Apple and Google Work Together as MIT Tests Validity

Developers are building and testing an opt-in automated system to slow the spread of the coronavirus. But will anyone use it?

By Megan Scudellari



Take home message #9: Develop feasible and effective isolation strategies

- Allow for in-home isolation for those with sufficiently good housing conditioning + strong social and medical support
- Provide out-of-home isolation facilities to those whose housing conditioning is insufficient.
- Address fear of immigrants

Isolation

City of New York COVID-19 Hotel Program



Print

The City of New York's COVID-19 Hotel Program provides free hotel stays to eligible New Yorkers who cannot isolate where they live and frontline workers in the healthcare industry who wish to reduce the risk of transmission at home. This will help New York City stop the spread of COVID-19.

- If you are a healthcare worker or volunteer in a healthcare setting and are unable to live apart from others in your household, [make your hotel reservation](#).
- If you are a healthcare provider authorized to refer patients to hotels, access the [healthcare providers portal](#).

In a Crowded City, Leaders Struggle to Separate the Sick From the Well

The New York Times

Chelsea, Mass., has an infection rate higher than any other community in the state. With families in cramped housing, it is difficult to contain the spread.



Take home message #10: Important to effectively educate and communicate with the general public

- **Effective public education and communication** is critically important by sharing gained and understandable scientific knowledge with the general public to help them make good decisions for themselves, loved ones, and communities.
- Because every country is different, effective implementation of the six control measures must be **adapted to each country's situation and culture** via public health implementation, health care implementation, and society implementation.

Be United: Everyone is a team member to fight for COVID-19



Go Boston!

- Wuhan experience helps us not start from zero.
- Let the data speak and use evidence-based strategies
- **Single take home message:**
 - Unite the community.
 - Everyone is a team member to contribute and work together
 - Multi-stakeholder approach: Government, international organizations, academia, business, community and citizens

Help Fight COVID-19 by Using the HowWeFeel App



#HowWeFeel

In collaboration with



BILL & MELINDA
GATES foundation

CHARTIO

and researchers from



Check in daily & see how other people feel near you.



Donate your data to help scientists track the virus.



You choose what you report.
No sign-in required.



For every new signup, HWF will donate a meal to people in need.*

*up to 10M meals, \$1 helps provide at least 10 meals secured by Feeding America on behalf of local member food banks.



<http://howwefeel.org>

Acknowledgement

HSPH

- Sheila Gaynor
- Andy Shi
- Zilin Li
- Jingwen Zhang

How We Feel

- Feng Zhang
 - Ben Silberman
 - David Cheng
 - Ryan Probasco
 - William Allen, Harvard Society of Fellows
 - Han Altae-Tran, Broad Institute/MIT
 - James Briggs, Broad Institute
 - Xin Jin, Harvard Society of Fellows
 - Mireille Kamariza, Harvard Society of Fellows
 - Glenn McGee, Harvard School of Public Health
 - Rumya Raghavan, Broad Institute/MIT
 - Andy Shi, Harvard School of Public Health
 - Christine Tedijanto, Harvard School of Public Health
- + Many other team members