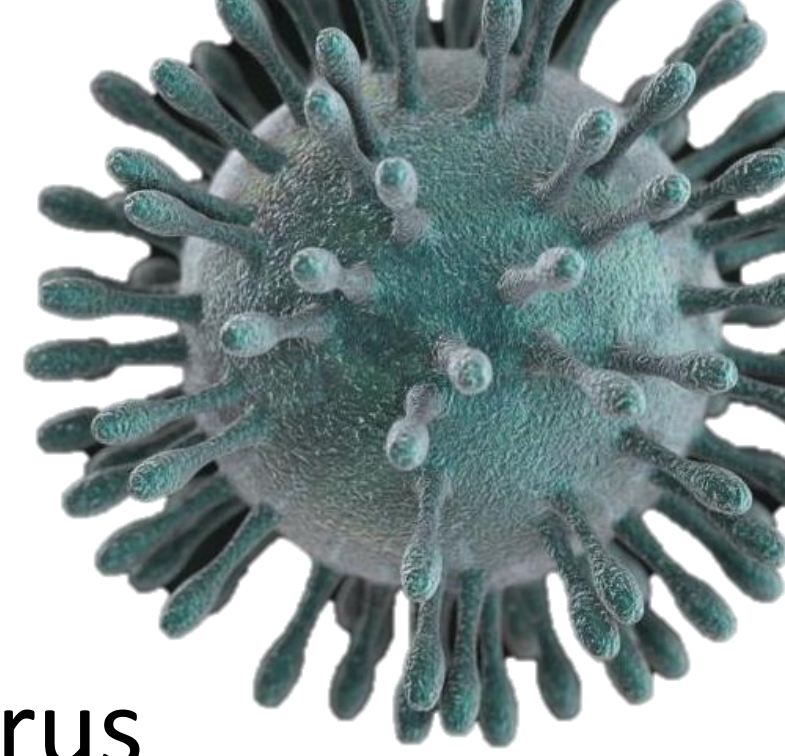

# Emerging Situation: Novel 2019 Coronavirus

R. Nicholas Staab, MD, MSPH
Medical Director
Bureau of Epidemiology and Disease Control
Arizona Department of Health Services

# Coronavirus

- Enveloped, non-segmented, positive-sense RNA viruses

Anthony R. Fehr and Stanley Perlman. Coronaviruses: An Overview of Their Replication and Pathogenesis. Methods Mol Biol. 2015; 1282: 1–23. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4369385/

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A β γ δ

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# 2019 Novel Coronavirus (2019-nCoV)

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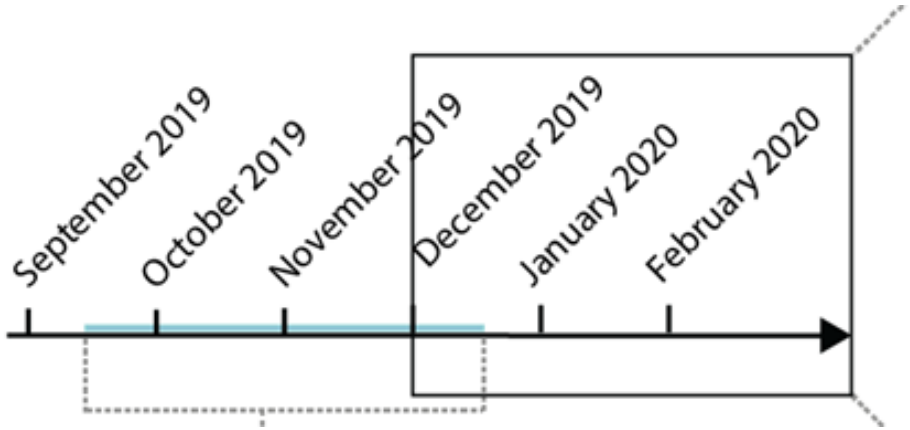


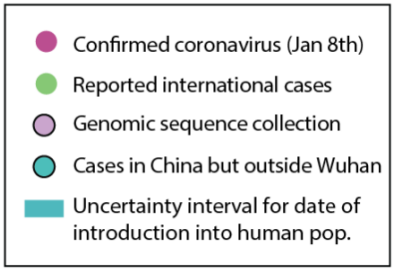

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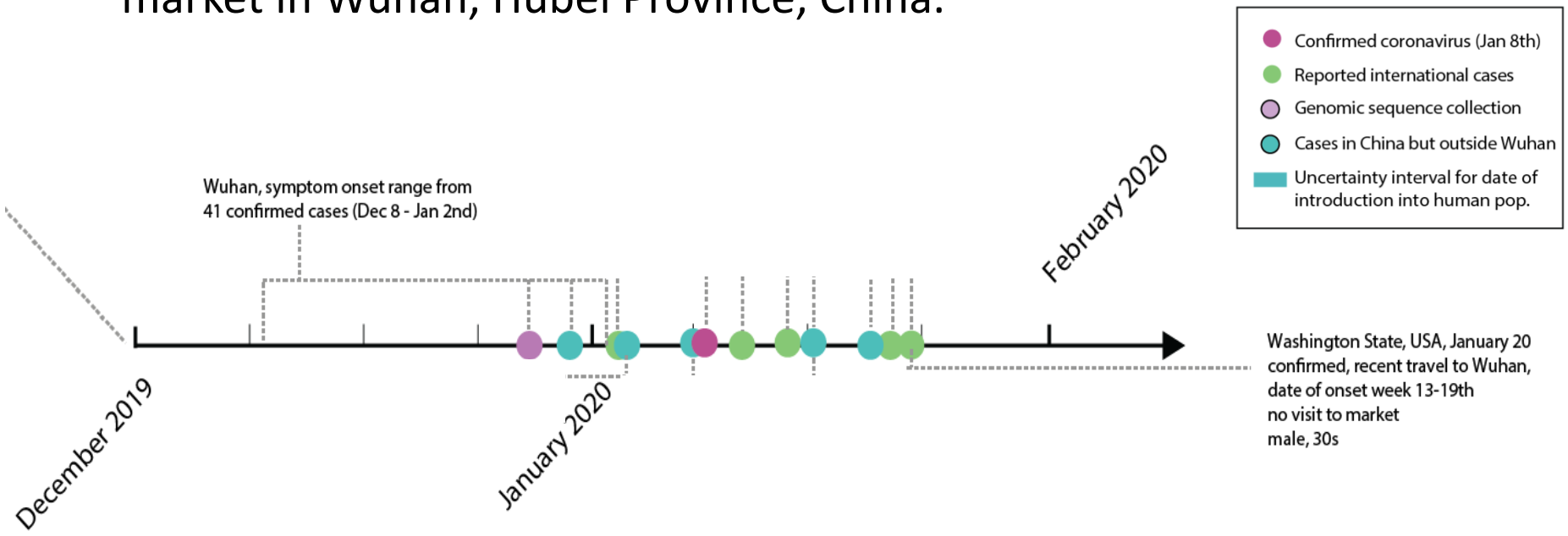

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@SamJVK


@Sam小K


@Sam小K

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- January 10, 2020, researchers from the Shanghai Public Health Clinical Center & School of Public Health and their collaborators released a full genomic sequence of 2019-nCoV
- Preliminary analyses indicate that 2019-nCoV has some amino acid homology to SARS-CoV and may be able to use ACE2 as a receptor. This has important implications for predicting pandemic potential moving forward.

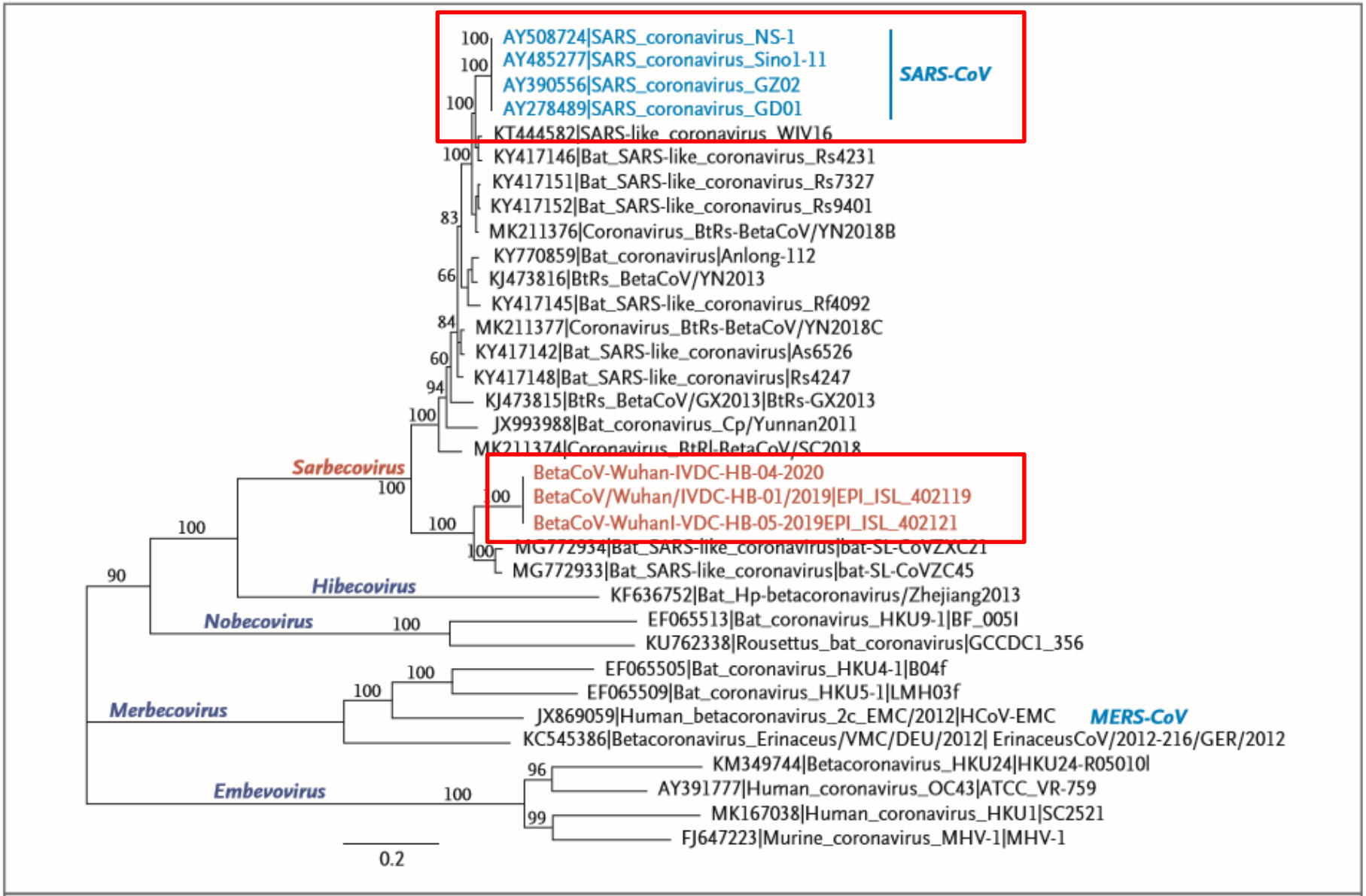



**Figure 4. Phylogenetic Analysis of 2019-nCoV and Other Betacoronavirus Genomes in the Orthocoronavirinae Subfamily.**

N Zhu, D Zhang, W Wang, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. New Eng J Med. Published 1/24/2020. https://www.nejm.org/doi/full/10.1056/NEJMoa2001017

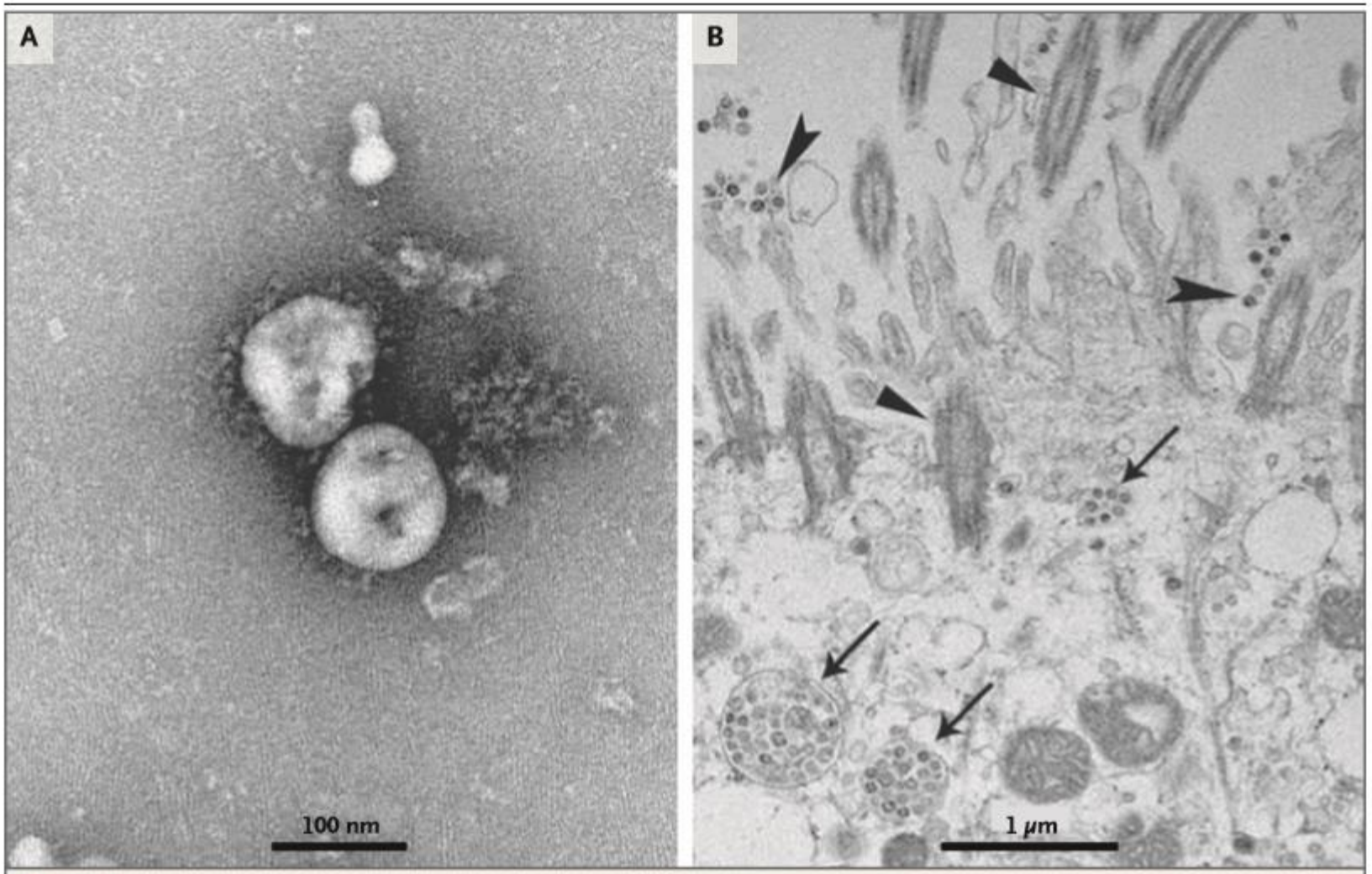
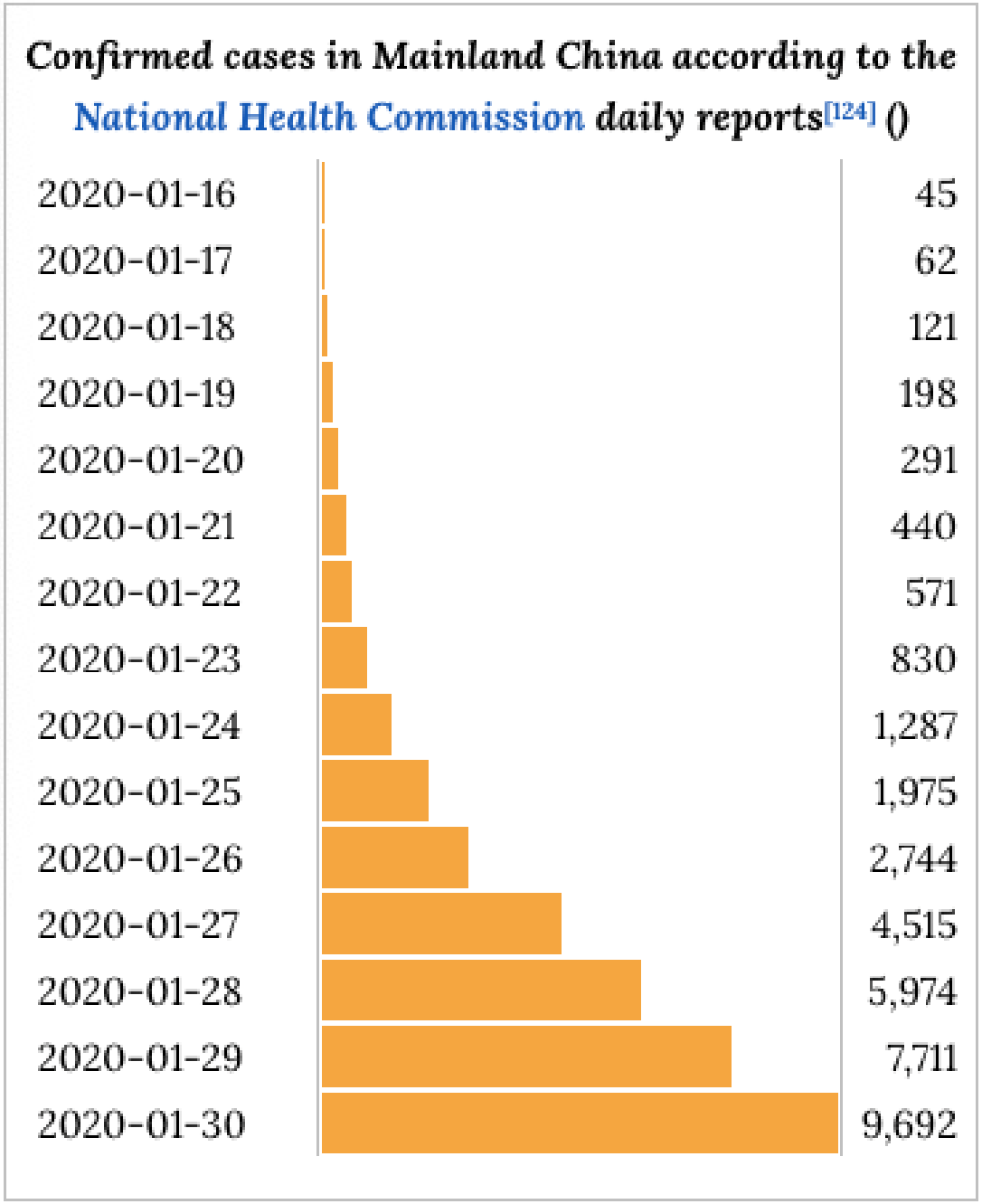



**Figure 3. Visualization of 2019-nCoV with Transmission Electron Microscopy.**

Negative-stained 2019-nCoV particles are shown in Panel A, and 2019-nCoV particles in the human airway epithelial cell ultrathin sections are shown in Panel B.

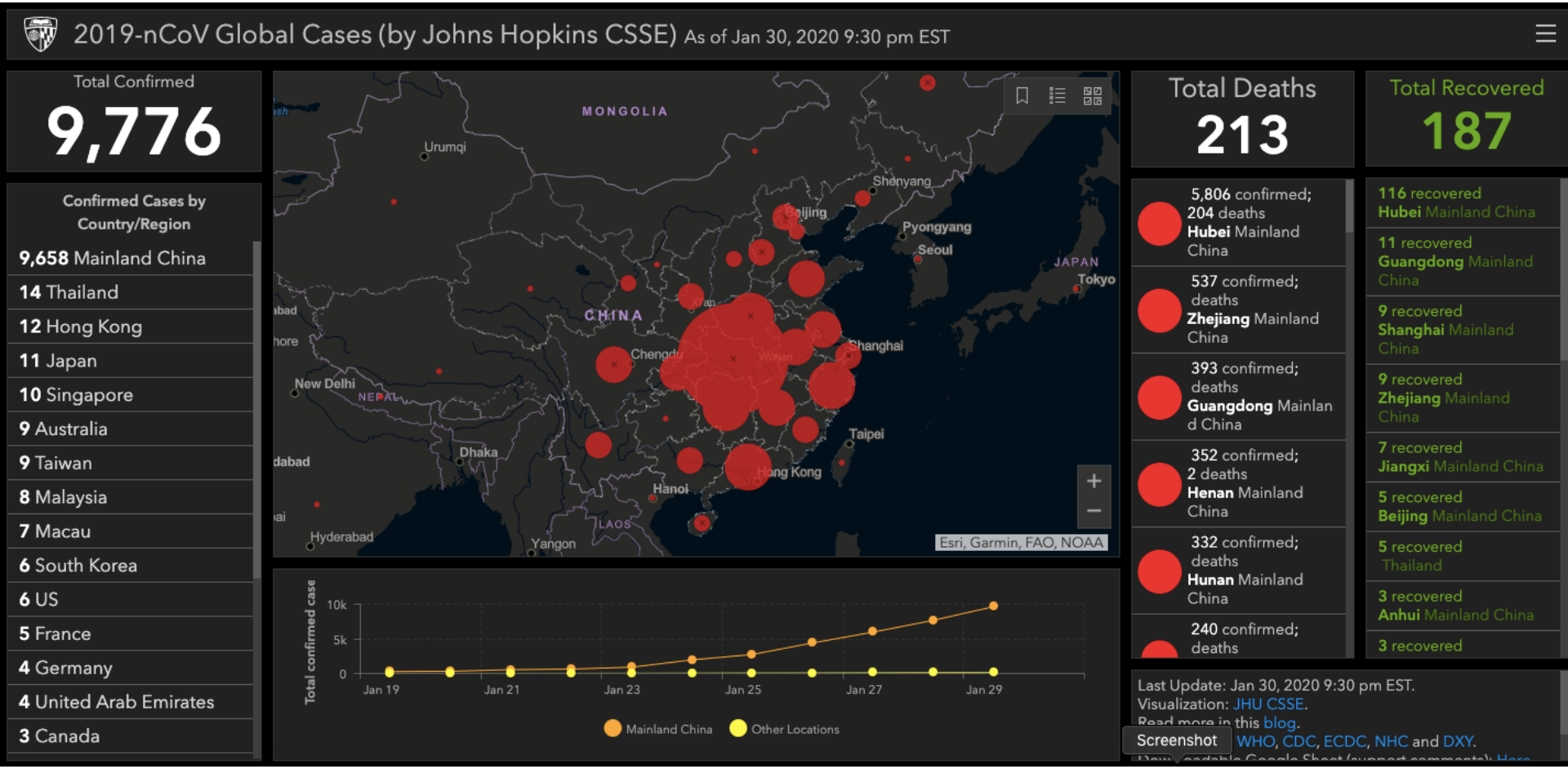
N Zhu, D Zhang, W Wang, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. New Eng J Med. Published 1/24/2020. https://www.nejm.org/doi/full/10.1056/NEJMoa2001017

Construction site of Huoshenshan Hospital as of 1/24




https://www.wikiwand.com/en/2019%E2%80%9320_Wuhan_coronavirus_outbreak accessed 1/30/2020

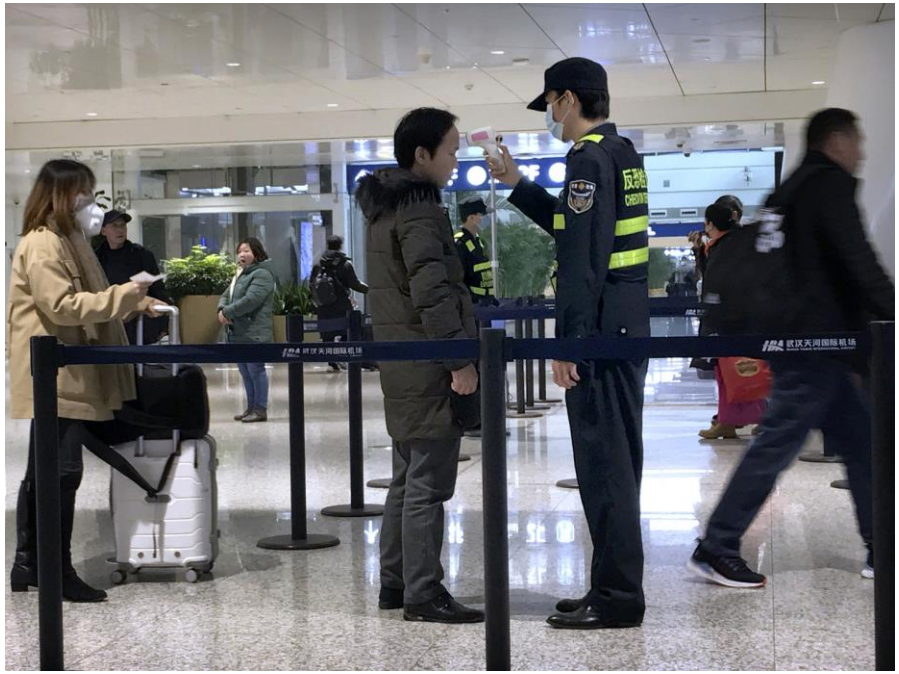
JOHNS HOPKINS
WHITING SCHOOL of ENGINEERING
Center for Systems Science and Engineering




https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
Accessed 1/30/2020

# 2019-nCoV in the US

- Airport screening was initiated at 3 US airports receiving the majority of direct flights from Wuhan (JFK, LAX, SFO)



*Emily Wang/AP*

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- The first infection with 2019-nCoV in the United States was reported on January 21, 2020 in Washington State

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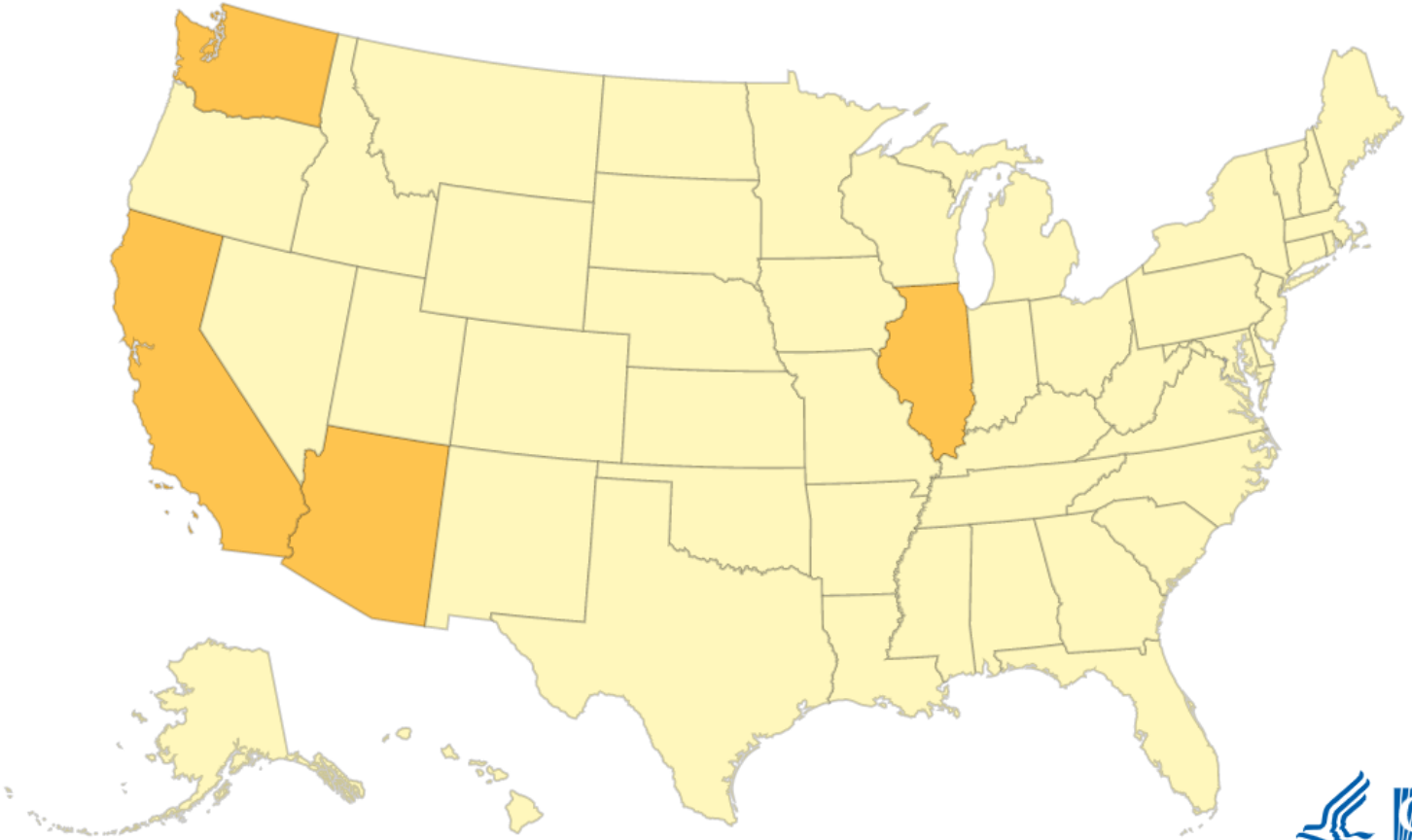
- The first infection with 2019-nCoV in the United States was reported on January 21, 2020 in Washington State
- The first case of person-to-person transmission was reported by Illinois on 1/30/2020

# States with confirmed 2019-nCoV cases



## Patients Under Investigation (PUI) in the United States*†‡

*As of 1/29/2020*

| | |
|---|---|
| **Positive** | 5 |
| **Negative** | 68 |
| **Pending§** | 92 |
| **Total** | 165 |

*Cumulative since January 21, 2020.
† Numbers closed out at 7 p.m. the night before reporting.
‡ Excludes those with contact to a known case.
§Includes specimens received and awaiting testing, as well as specimens in route to CDC.

**Number of states with PUI: 36**

https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html accessed 1/30/2020

# 2019-nCoV in AZ

- The first infection with 2019-nCoV in Arizona was reported on 1/26 in an adult living in Maricopa County with recent travel to Wuhan, China

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- The first infection with 2019-nCoV in Arizona was reported on 1/26 in an adult living in Maricopa County with recent travel to Wuhan, China
- MCDPH, ADHS and CDC have coordinated the local response
- Case contact identification, PUI classification and arrangement of testing with CDC

THE LANCET

# Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China

*Chaolin Huang*, Yeming Wang*, Xingwang Li*, Lili Ren*, Jianping Zhao*, Yi Hu*, Li Zhang, Guohui Fan, Jiuyang Xu, Xiaoying Gu, Zhenshun Cheng, Ting Yu, Jiaan Xia, Yuan Wei, Wenjuan Wu, Xuelei Xie, Wen Yin, Hui Li, Min Liu, Yan Xiao, Hong Gao, Li Guo, Jungang Xie, Guangfa Wang, Rongmeng Jiang, Zhancheng Gao, Qi Jin, Jianwei Wang†, Bin Cao†*

www.thelancet.com **Published online January 24, 2020** **https://doi.org/10.1016/S0140-6736(20)30183-5**

# Clinical data from Wuhan, China: 32% of hospitalized patients (n=41) required ICU care.

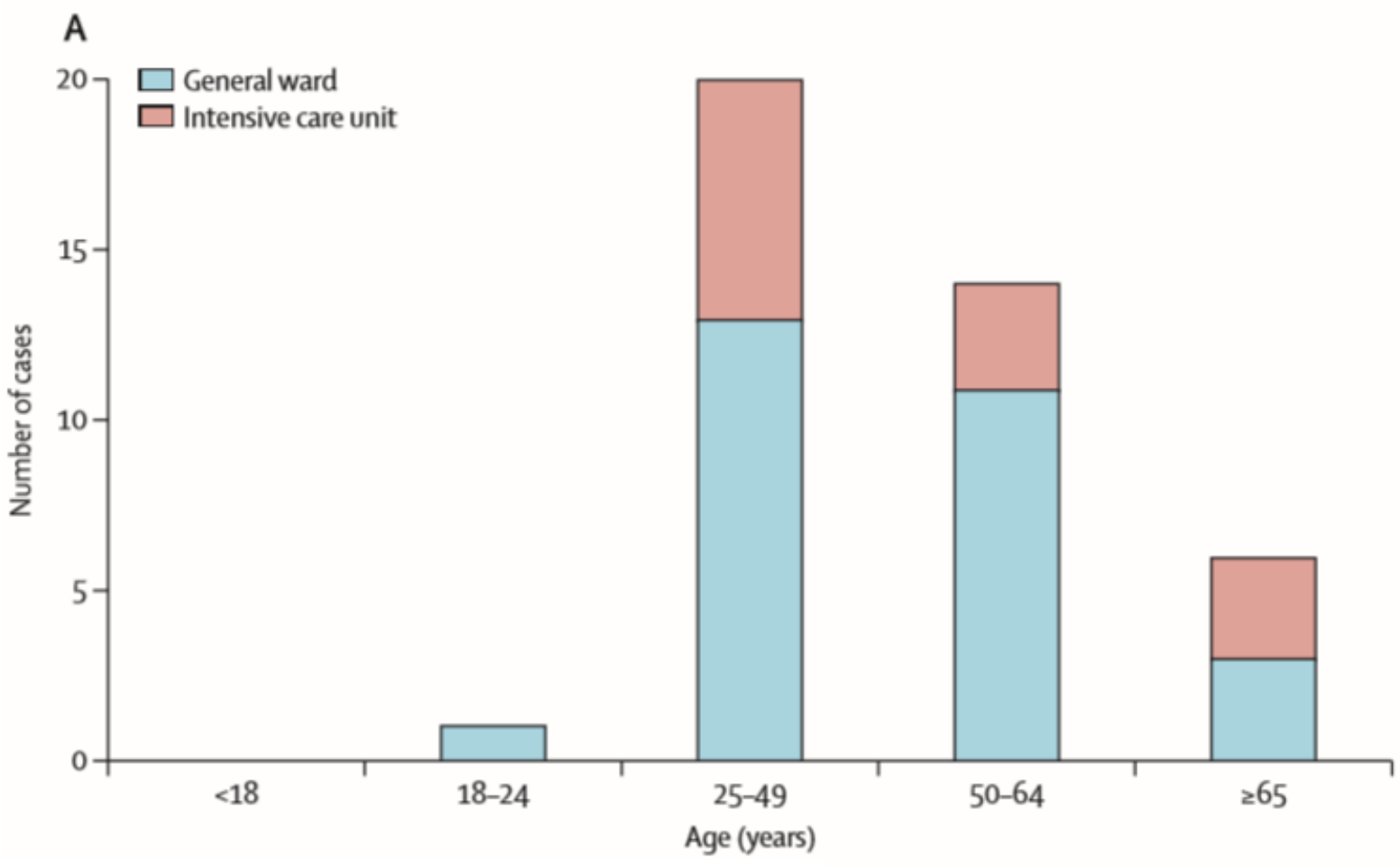



***Figure 1:*** **Date of illness onset and age distribution of patients with laboratory-confirmed 2019-nCoV infection**

(A) Number of hospital admissions by age group. (B) Distribution of symptom onset date for laboratory-confirmed

C Huang, Y Wang, X Li, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. Published 1/24/2020. https://www.sciencedirect.com/science/article/pii/S0140673620301835?via%3Dihub#!

# Clinical data from Wuhan, China: Most patients had a fever and cough. 55% had dyspnea.

| Characteristics | All patients (n=41) | ICU care (n=13) | No ICU care (n=28) | p value |
|---|---|---|---|---|
| Signs and symptoms | | | | |
| Fever | 40 (98%) | 13 (100%) | 27 (96%) | 0·68 |
| Highest temperature, °C | .. | .. | .. | 0·037 |
| <37·3 | 1 (2%) | 0 | 1 (4%) | .. |
| 37·3–38·0 | 8 (20%) | 3 (23%) | 5 (18%) | .. |
| 38·1–39·0 | 18 (44%) | 7 (54%) | 11 (39%) | .. |
| >39·0 | 14 (34%) | 3 (23%) | 11 (39%) | .. |
| Cough | 31 (76%) | 11 (85%) | 20 (71%) | 0·35 |
| Myalgia or fatigue | 18 (44%) | 7 (54%) | 11 (39%) | 0·38 |
| Sputum production | 11/39 (28%) | 5 (38%) | 6/26 (23%) | 0·32 |
| Headache | 3/38 (8%) | 0 | 3/25 (12%) | 0·10 |
| Haemoptysis | 2/39 (5%) | 1 (8%) | 1/26 (4%) | 0·46 |
| Diarrhoea | 1/38 (3%) | 0 | 1/25 (4%) | 0·66 |
| Dyspnoea | 22/40 (55%) | 12 (92%) | 10/27 (37%) | 0·0010 |
| Days from illness onset to dyspnoea | 8·0 (5·0–13·0) | 8·0 (6·0–17·0) | 6·5 (2·0–10·0) | 0·22 |
| Days from first admission to transfer | 5·0 (1·0–8·0) | 8·0 (5·0–14·0) | 1·0 (1·0–6·5) | 0·002 |
| Systolic pressure, mm Hg | 125·0 (119·0–135·0) | 145·0 (123·0–167·0) | 122·0 (118·5–129·5) | 0·018 |
| Respiratory rate >24 breaths per min | 12 (29%) | 8 (62%) | 4 (14%) | 0·0023 |

Data are median (IQR), n (%), or n/N (%), where N is the total number of patients with available data. p values comparing ICU care and no ICU care are from $\chi^2$ test, Fisher's exact test, or Mann-Whitney U test. 2019-nCoV=2019 novel coronavirus. ICU=intensive care unit.

***Table 1:*** **Demographics and baseline characteristics of patients infected with 2019-nCoV**

C Huang, Y Wang, X Li, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. Published 1/24/2020. https://www.sciencedirect.com/science/article/pii/S0140673620301835?via%3Dihub#!

# Clinical laboratory data from Wuhan, China:

| | All patients (n=41) | ICU care (n=13) | No ICU care (n=28) | p value |
|---|---|---|---|---|
| White blood cell count, ×10⁹/L | 6·2 (4·1–10·5) | 11·3 (5·8–12·1) | 5·7 (3·1–7·6) | 0·011 |
| <4 | 16/40 (25%) | 1/13 (8%) | 9/27 (33%) | 0·041 |
| 4–10 | 18/40 (45%) | 5/13 (38%) | 13/27 (48%) | .. |
| >10 | 12/40 (30%) | 7/13 (54%) | 5/27 (19%) | .. |
| Neutrophil count, ×10⁹/L | 5·0 (3·3–8·9) | 10·6 (5·0–11·8) | 4·4 (2·0–6·1) | 0·00069 |
| Lymphocyte count, ×10⁹/L | 0·8 (0·6–1·1) | 0·4 (0·2–0·8) | 1·0 (0·7–1·1) | 0·0041 |
| <1·0 | 26/41 (63%) | 11/13 (85%) | 15/28 (54%) | 0·045 |
| ≥1·0 | 15/41 (37%) | 2/13 (15%) | 13/28 (46%) | .. |
| Haemoglobin, g/L | 126·0 (118·0–140·0) | 122·0 (111·0–128·0) | 130·5 (120·0–140·0) | 0·20 |
| Platelet count, ×10⁹/L | 164·5 (131·5–263·0) | 196·0 (165·0–263·0) | 149·0 (131·0–263·0) | 0·45 |
| <100 | 2/40 (5%) | 1/13 (8%) | 1/27 (4%) | 0·45 |
| ≥100 | 38/40 (95%) | 12/13 (92%) | 26/27 (96%) | .. |
| Prothrombin time, s | 11·1 (10·1–12·4) | 12·2 (11·2–13·4) | 10·7 (9·8–12·1) | 0·012 |
| Activated partial thromboplastin time, s | 27·0 (24·2–34·1) | 26·2 (22·5–33·9) | 27·7 (24·8–34·1) | 0·57 |
| D-dimer, mg/L | 0·5 (0·3–1·3) | 2·4 (0·6–14·4) | 0·5 (0·3–0·8) | 0·0042 |
| Albumin, g/L | 31·4 (28·9–36·0) | 27·9 (26·3–30·9) | 34·7 (30·2–36·5) | 0·0066 |
| Alanine aminotransferase, U/L | 32·0 (21·0–50·0) | 49·0 (29·0–115·0) | 27·0 (19·5–40·0) | 0·038 |
| Aspartate aminotransferase, U/L | 34·0 (26·0–48·0) | 44·0 (30·0–70·0) | 34·0 (24·0–40·5) | 0·10 |
| ≤40 | 26/41 (63%) | 5/13 (38%) | 21/28 (75%) | 0·025 |
| >40 | 15/41 (37%) | 8/13 (62%) | 7/28 (25%) | .. |
| Total bilirubin, mmol/L | 11·7 (9·5–13·9) | 14·0 (11·9–32·9) | 10·8 (9·4–12·3) | 0·011 |
| Potassium, mmol/L | 4·2 (3·8–4·8) | 4·6 (4·0–5·0) | 4·1 (3·8–4·6) | 0·27 |
| Sodium, mmol/L | 139·0 (137·0–140·0) | 138·0 (137·0–139·0) | 139·0 (137·5–140·5) | 0·26 |
| Creatinine, μmol/L | 74·2 (57·5–85·7) | 79·0 (53·1–92·7) | 73·3 (57·5–84·7) | 0·84 |
| ≤133 | 37/41 (90%) | 11/13 (85%) | 26/28 (93%) | 0·42 |
| >133 | 4/41 (10%) | 2/13 (15%) | 2/28 (7%) | .. |
| Creatine kinase, U/L | 132·5 (62·0–219·0) | 132·0 (82·0–493·0) | 133·0 (61·0–189·0) | 0·31 |
| ≤185 | 27/40 (68%) | 7/13 (54%) | 20/27 (74%) | 0·21 |
| >185 | 13/40 (33%) | 6/13 (46%) | 7/27 (26%) | .. |
| Lactate dehydrogenase, U/L | 286·0 (242·0–408·0) | 400·0 (323·0–578·0) | 281·0 (233·0–357·0) | 0·0044 |
| ≤245 | 11/40 (28%) | 1/13 (8%) | 10/27 (37%) | 0·036 |
| >245 | 29/40 (73%) | 12/13 (92%) | 17/27 (63%) | .. |
| Hypersensitive troponin I, pg/mL | 3·4 (1·1–9·1) | 3·3 (3·0–163·0) | 3·5 (0·7–5·4) | 0·08 |
| >28 (99th percentile) | 5/41 (12%) | 4/13 (31%) | 1/28 (4%) | 0·017 |
| Procalcitonin, ng/mL | 0·1 (0·1–0·1) | 0·1 (0·1–0·4) | 0·1 (0·1–0·1) | 0·031 |
| <0·1 | 27/39 (69%) | 6/12 (50%) | 21/27 (78%) | 0·0029 |
| ≥0·1 to <0·25 | 7/39 (18%) | 3/12 (25%) | 4/27 (15%) | .. |
| ≥0·25 to <0·5 | 2/39 (5%) | 0/12 | 2/27 (7%) | .. |
| ≥0·5 | 3/39 (8%) | 3/12 (25%)* | 0/27 | .. |
| Bilateral involvement of chest radiographs | 40/41 (98%) | 13/13 (100%) | 27/28 (96%) | 0·68 |

Data are median (IQR) or n/N (%), where N is the total number of patients with available data. p values comparing ICU care and no ICU care are from $\chi^2$, Fisher's exact test, or Mann-Whitney U test. 2019-nCoV=2019 novel coronavirus. ICU=intensive care unit. *Complicated typical secondary infection during the first hospitalisation.

**Table 2: Laboratory findings of patients infected with 2019-nCoV on admission to hospital**

C Huang, Y Wang, X Li, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. Published 1/24/2020.
https://www.sciencedirect.com/science/article/pii/S0140673620301835?via%3Dihub#!

# Clinical data from Wuhan, China: Some serious manifestations 7+ days from illness onset.

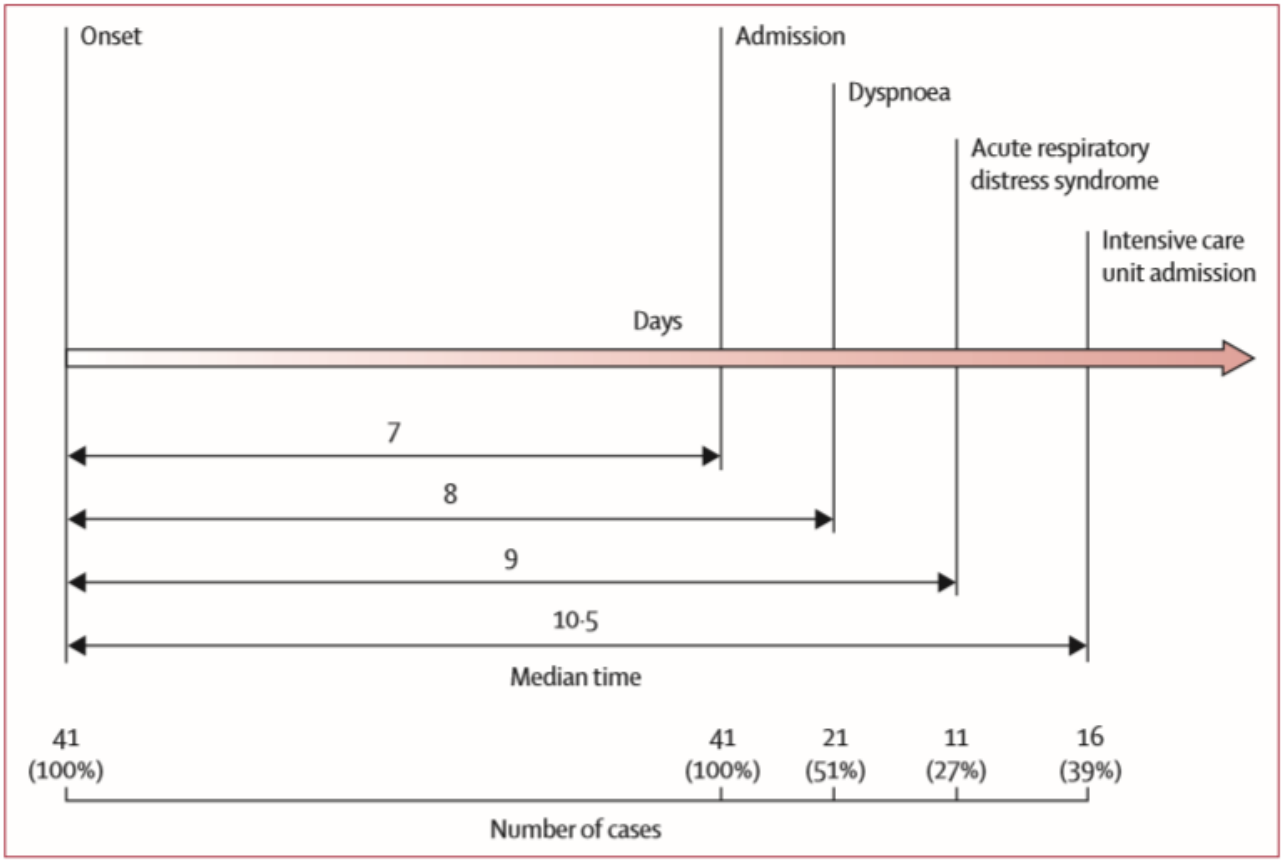



*Figure 2:* Timeline of 2019-nCoV cases after onset of illness

C Huang, Y Wang, X Li, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. Published 1/24/2020.
https://www.sciencedirect.com/science/article/pii/S0140673620301835?via%3Dihub#!

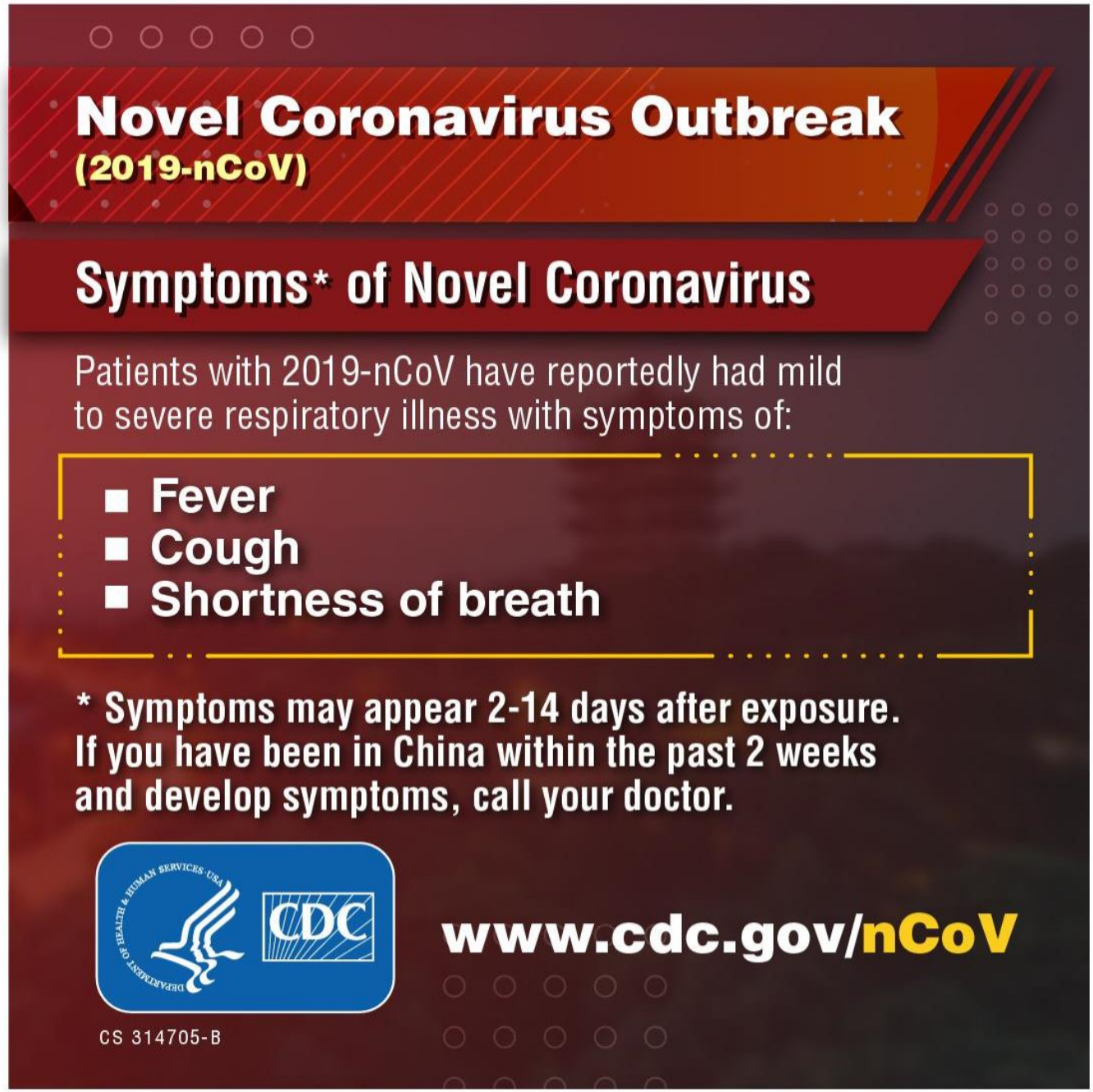
# Clinical data from Wuhan, China: 100% had PNA, 15% died.

- 41/41 had PNA.
- 28/41 eventually discharged.
  - Based on fever abatement x 10 days, improvement of CXR, viral clearance resp samples
- 6/41 at time of publication, had died.

C Huang, Y Wang, X Li, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet. Published 1/24/2020.
https://www.sciencedirect.com/science/article/pii/S0140673620301835?via%3Dihub#!

## Clinical data from U.S.: Still watching, but majority have milder manifestations.

- 6 confirmed cases in the U.S.
  - Most admitted to hospital
  - No deaths
  - 1 case without travel to Wuhan




https://www.cdc.gov/coronavirus/2019-ncov/about/symptoms.html

# Person Under Investigation (PUI) Criteria

| Clinical Features | & | Epidemiologic Risk |
|---|---|---|
| Fever[1] **and** symptoms of lower respiratory illness (e.g., cough, difficulty breathing) | and | In the last 14 days before symptom onset, a history of travel from Wuhan City, China.<br>*– or –*<br>In the last 14 days before symptom onset, close contact[2] with a person who is under investigation for 2019-nCoV while that person was ill. |
| Fever[1] **or** symptoms of lower respiratory illness (e.g., cough, difficulty breathing) | and | In the last 14 days, close contact[2] with an ill laboratory-confirmed 2019-nCoV patient. |

# 2019-nCoV Treatment

- Biomedical researchers are initiating countermeasure development for 2019-nCoV using SARS-CoV and MERS-CoV as prototypes
- Broad-spectrum antivirals, such as **remdesivir**, an RNA polymerase inhibitor, as well as **lopinavir/ritonavir** and **interferon beta** have shown promise against MERS-CoV in animal models and are being assessed for activity against 2019-nCoV
- Messenger RNA (mRNA) vaccine based on shared genome is under development with optimistic roll out in ~1 year

C Paules, H Marston, A Fauci. Coronavirus Infections—More Than Just the Common Cold. JAMA. Published online January 23, 2020. doi:10.1001/jama.2020.0757 Accessed 1/28/20 https://jamanetwork.com/journals/jama/fullarticle/2759815

# Guidance for AZ Clinicians

**Healthcare providers caring for a patient with fever and/or acute respiratory symptoms should:**

- Isolate and mask patients presenting with acute respiratory illness and recent travel from Wuhan City, China in the last 14 days.
- **Immediately notify your local health department and healthcare facility's infection control personnel.**
- Healthcare personnel encountering a suspect patient should use standard precautions, contact precautions, airborne precautions, and eye protection (e.g., goggles or a face shield).
- Obtain a detailed travel history for patients being evaluated with fever and acute respiratory illness.
- Consider testing for seasonal respiratory illnesses, like influenza. The viral respiratory pathogen panels available at this time often include endemic coronaviruses. **IF A PATIENT TESTS POSITIVE FOR CORONAVIRUS ON THESE TESTS IT IS NOT 2019-nCoV.**
- Coordinate with the local health department for specimen collection, transport, and testing for suspect cases.

# Guidance for AZ Clinicians

- Counsel patients on the current understanding of the 2019-nCoV:
  - Only individuals with travel to Wuhan City, China in the past 14 days before symptom onset or close contact with someone being investigated for infection with 2019-nCoV are considered at risk for 2019-nCoV.
  - Testing for 2019-nCoV is only available at CDC and after approval for patients meeting criteria for a person under investigation
  - The risk to the Arizona public is considered to be relatively low, in comparison to other more common respiratory illnesses that infect residents every year.
  - If located in Maricopa County, there is a public hotline for further questions: 602-747-7099.
  - Counsel patients that there is current widespread, influenza virus and other seasonal respiratory illnesses in Arizona.
  - Arizonans are recommended to get a flu shot and follow basic prevention guidelines.

# Quickly Changing Situation

- Diagnostics/Treatment/Vaccine

# Quickly Changing Situation

- Diagnostics/Treatment/Vaccine
- Report of asymptomatic transmission – implications for screening travelers

# Quickly Changing Situation

- Diagnostics/Treatment/Vaccine
- Report of asymptomatic transmission – implications for screening travellers
- Mild to Severe infections

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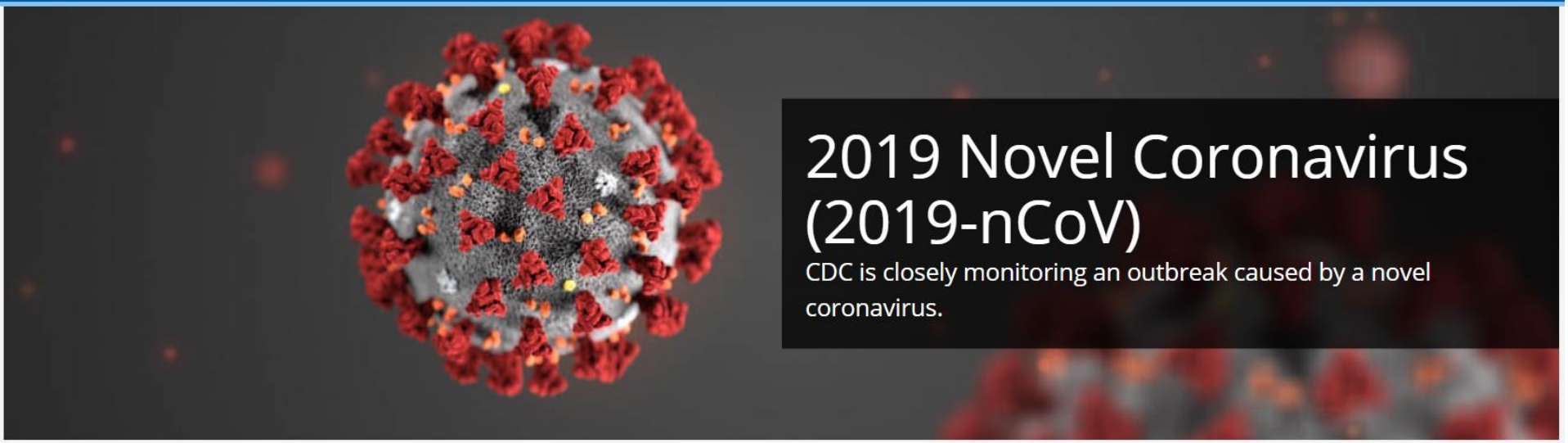


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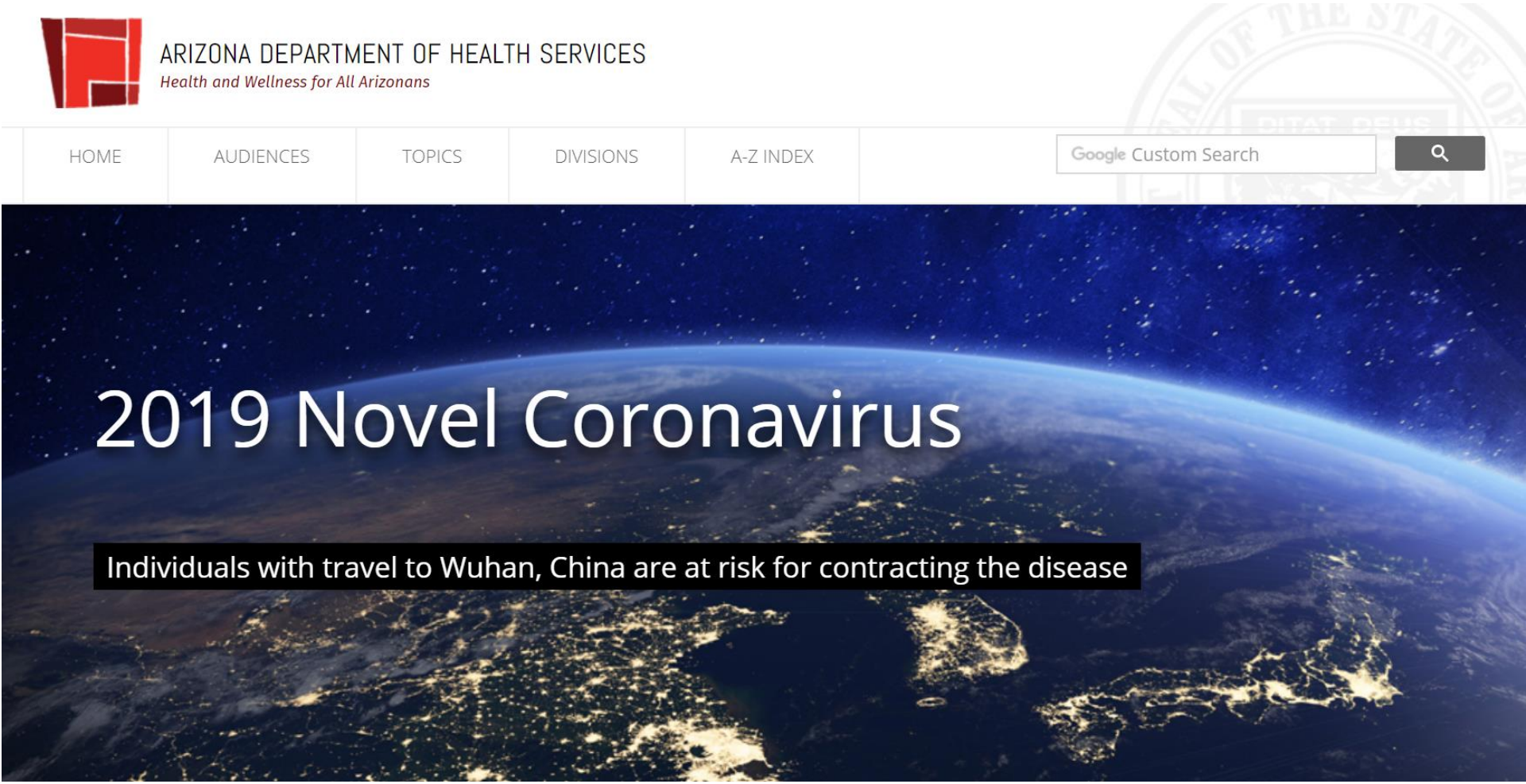


azhealth.gov/coronavirus


and feedback -
State of Arizona - Calendar
2019–20 Wuhan coronaviru
AzHAN
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han.health.azdhs.gov
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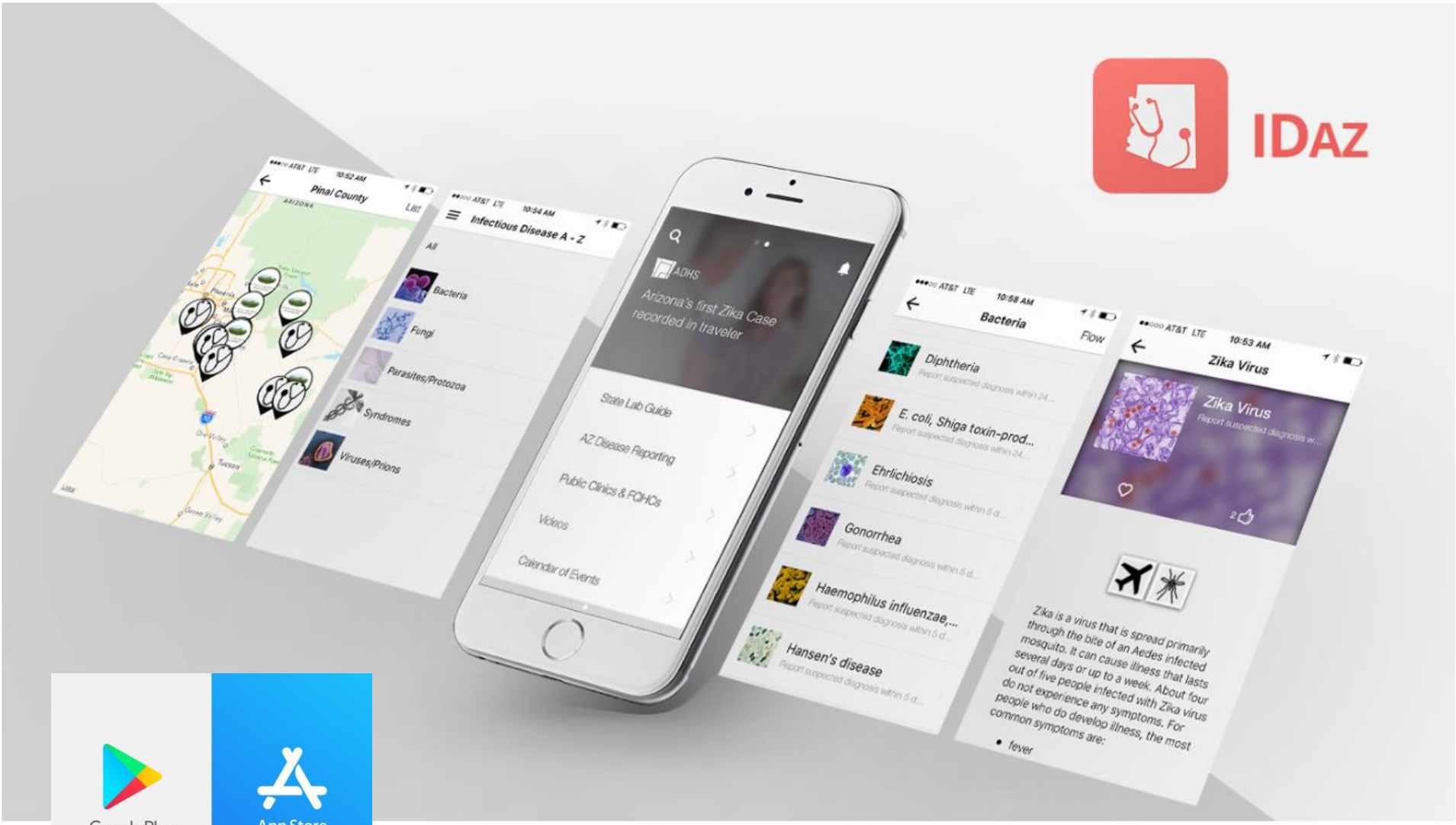
IDAZ
Pinal County
Infectious Disease A - Z
All
Bacteria
Fungi
Parasites/Protozoa
Syndromes
Viruses/Prions
ADHS
Arizona's first Zika Case recorded in traveler
State Lab Guide
AZ Disease Reporting
Public Clinics & FQHCs
Videos
Calendar of Events
Bacteria
Flow
Diphtheria
E. coli, Shiga toxin-prod...
Ehrlichiosis
Gonorrhea
Haemophilus influenzae,...
Hansen's disease
Zika Virus
Zika Virus
Zika is a virus that is spread primarily through the bite of an Aedes infected mosquito. It can cause illness that lasts several days or up to a week. About four out of five people infected with Zika virus do not experience any symptoms. For people who do develop illness, the most common symptoms are:
fever
Google Play
App Store

# Take Home

- Obtain travel history

# Take Home

- Obtain travel history
- Appropriate isolation

# Take Home

- Obtain travel history
- Appropriate isolation
- Call public health

# Take Home

- Obtain travel history
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- Encourage what we CAN control, Flu Shots

# Take Home

- Obtain travel history
- Appropriate isolation
- Call public health
- Encourage what we CAN control, Flu Shots
- Non-pharmaceutical interventions

# Questions?

- If you have any questions about this presentation, please contact flu@azdhs.gov
- If you have any clinical or PUI-related questions, please contact your local public health department.