

The Early History of the SARS-CoV-2 outbreak and start of the COVID-19 Pandemic. Vol. 1: December 2019 to May 5, 2020. [Case Study Resources and Primary Source Reader]

K. Lee Lerner

Contact: kleelearner@alumni.harvard.edu



Introduction

This is a highly curated timeline and set of references intended to memorialize the evolution of scientific research and knowledge during a period covering the first public emergence of the SARS-CoV-2 starting late in December 2019 through the early months (until June 2020) of what some became the global COVID-19 pandemic. It is designed to be a scholarly academic resource for journalists and others researching the history of the SARS-CoV-2 outbreak and COVID-19 pandemic.

Although there are references early in this timeline to nCoV-2019 and/or the novel Wuhan coronavirus outbreak, the virus was soon officially named SARS-CoV-2 (also styled SARS-CoV2) and the disease associated with the virus was designated as COVID-19 (also styled as Covid-19).

While in some cases updates and additional resources are found indented below main entries. Readers should note that many entries and comments refer to intermediate findings and data later discarded or modified by subsequent research.

In creating this reference, I focused on essential articles from peer-reviewed journals but I have also added in some general news and opinion pieces that were important to understanding the evolution of government and public health policies (or the absence thereof). In general, I have avoided politics per se, but the timeline and archive should be useful to those wanting to provide context for stories (e.g., what was known and when).

I have also taken care to include scientific articles that addressed and debunked conspiracy theories related to SARS-CoV-2 and the COVID-19 pandemic that first appeared in the early months of the pandemic. I do not include exhaustive debunkings because that is beyond the scope of this project. In addition, it is my sad experience that no amount of resources provided can dissuade the conspiratorial mind. There are no set of facts that can't be twisted, cherry picked, dismiss, or ignored by the byzantine mind.

This thread also incorporates many of the articles --and some of my comments -- from a thread a thread I started on Facebook for friends and colleagues in January 2020. Alas, the platform does not allow me to transfer comments and so many questions and insights offered by friends and colleagues were lost in the formulation of this thread. Quite a few hat tips to Jay Flynn at Wiley were also lost and are owed for his suggestions and sharing of articles he posted to his own curated thread.

Thanks are also due to other publishers who, very early on, opened their archives to the world in order to facilitate communication among scientists, inform the public, and defeat both misinformation and disinformation.

A Creative Commons License (CC By-NC-ND 4.0) is granted with author attribution under the following term: No commercial use is permitted, and changes/derivatives are not authorized.

Articles listed are linked to their peer-reviewed source. In some cases where timing is critical, the date listed is the date submitted or a preprint posted rather than the journal publication date.

Full text .pdf copies of articles mentioned below are available for download at scholar.harvard.edu/kleelearner/blog/pandemic-reader.

--- K. Lee Lerner

kdesk@lernermedia.co.uk
kleelemer@alumni.harvard.edu
scholar.harvard.edu/kleelemer
harvard.academia.edu/KLeeLerner

An early evidence-based assessment of the COVID-19 pandemic (Taking Bearings, March 12, 2020.)

The World Health Organization has declared the outbreak of the novel SARS-CoV-2 virus and the spread of the COVID-19 disease caused by the virus to be a global pandemic

The early calculations of the R_0 (R naught) of the SARS-CoV-2 viral outbreak have ranged between 1.4 to 2.5.

R_0 (or R naught) is a measure of transmissibility, the number of people one person who is infected is expected to spread the $R_0 = \beta \kappa D$ where β equals the transmissibility of an infected person to a susceptible individual; κ equals the average number of contacts over time unit in healthy normal pop and D equals the average duration of infectivity. When the R_0 is greater than 1 ($R_0 > 1$) a viral disease will spread.

People often say "the R_0 of the virus is such-and-such, but R_0 is really a characteristic of the outbreak. A component, β , the transmissibility factor is related specifically to a virus and is a characteristic of the virus (i.e., some are more transmissible than others, etc.). But R_0 also depends on the normal number of contacts (κ) in a VULNERABLE population. Accordingly, if a highly contagious virus is introduced into a population that is not vulnerable (e.g., has resistance or immunity due to prior exposure or vaccination) then the R_0 would be zero. As this is a novel coronavirus, everyone is vulnerable. Over time, with an accumulating population of people with acquired immunity due to prior exposure, one would expect the R_0 to diminish. Conversely, in a cruise ship setting or nursing home where the number of contacts with vulnerable people is higher than one should see an elevated R_0 with a novel virus to which no one has resistance or immunity.

Early in the outbreak, the novel coronavirus quickly showed changes in transmissibility, meaning that either the data was faulty or that evolutionary mechanisms are allowing the novel coronavirus to find ways to become more easily transmissible (hence the R_0 's β factor might change as a virus evolves (e.g., produces variants) and an epidemic progresses.

During the first months of the current outbreak of COVID-19 the fatality rate has ranged between 2 and 3.4 percent. In terms of disease impacts, as I commented in January, this makes this novel coronavirus much more like the pandemic 1918 flu that killed millions than SARS or MERS.

However, we now have clinical supportive measures and antivirals that did not exist in 1918 and so this will be an interesting test of the global health response. The lethality rate would normally be expected to be higher in areas without adequate medical infrastructure, etc. Moreover, the lethality rate is usually an overestimate of the actual lethality rate because many cases are not confirmed, and in some areas, go unreported by individuals who are either asymptomatic or have mild case. We won't have a handle on the lethality of SARS-CoV-2 until we do more testing, including serotesting of those who die but who may not have been laboratory confirmed cases.

Even if the lethality drops to 1% that still means SARS-CoV-2 is 10 to 20 times more lethal than the typical seasonal flu. Harvard epidemiologists initially expected 40% to 70 percent of the world's population to become infected. Given the numbers above, the best case scenario for a world of 7.5 billion people is that if only 40 percent become infected at 1% lethality then that 3 billion infected with 30 million dead. At the other extreme at the currently observed 3.4% lethality we would expect 5.25 billion people infected with 178.5 million dead. Those are two very different worlds.

It would be good for the experts to be very wrong, but it is irresponsible to think that any of this is impossible or simply dystopian. Good public health measures — and shared community responsibility — can reduce the chances of either nightmare scenario manifesting.

---K. Lee Lerner. March 12, 2020

Relevant Prior Posts (RPP)

20141208 Nature - Gain-of-function experiments/ time for a real debate | Nature Reviews Microbiology
<https://www.nature.com/articles/nrmicro3405>

20181004 PLOS Pathogens - Inoculating science against potential pandemics and information hazards
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6171951/>

20190710 IOP Science Biofabrication - Multi-cellular engineered living systems/ building a community around responsible research on emergence <https://iopscience.iop.org/article/10.1088/1758-5090/ab268c>

Chronology of the outbreak and pandemic

December 2019

20191230 On the evening of Dec 2019 [Local], an "urgent notice on the treatment of pneumonia of unknown cause" was issued, which was widely distributed on the Internet by the red-headed document of the Medical Administration and Medical Administration of Wuhan Municipal Health Committee. Source: Finance Sina [machine translation] <https://finance.sina.cn/2019-12-31/detail-iihnzakh1074832.d.html?from=wap> (See Promed post 20191230 PROMED Undiagnosed pneumonia - China. Note date and time differences due to places of publication.

30日晚间，一份名为《关于做好不明原因肺炎救治工作的紧急通知》，落款为武汉市卫生健康委员会医政医管处的红头文件在网络上广泛传播。

第一财经记者31日早间拨打武汉市卫生健康委员会官方热线12320得悉，该文件内容是真实的。

12320热线工作人员表示，本次在武汉出现的不明原因肺炎为何种类型肺炎，还有待查明。

上述文件称，根据上级紧急通知，武汉市部分医疗机构陆续出现不明原因肺炎病人。各医疗机构要强化门诊管理，严格执行首诊负责制，发现不明原因肺炎病人积极调动力量就地救治，不得出现拒诊推诿情况。

文件强调，各医疗机构要有针对性地加强呼吸、感染科、重症医学等多学科专业力量，畅通绿色通道，做好门诊和急诊之间的有效衔接，完善医疗救治应急预案。

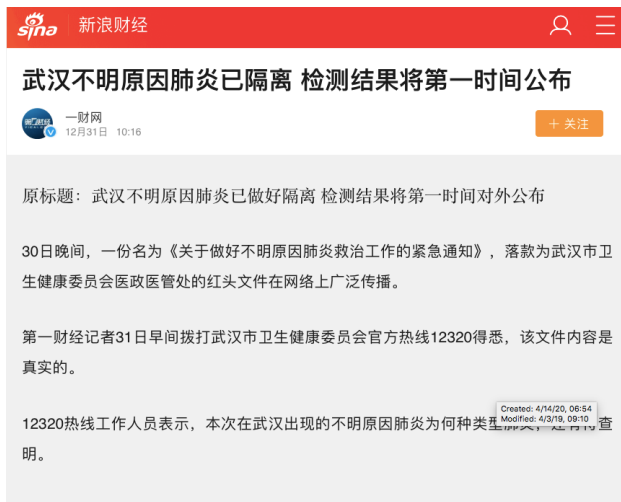
另一份名为《市卫生健康委关于报送不明原因肺炎救治情况的紧急通知》亦为真实的。这份文件称，根据上级紧急通知，我市华南海鲜市场陆续出现不明原因肺炎病人。

所谓不明原因肺炎病例是指同时具备以下4条不能做出明确诊断的肺炎病例：发热（ $\geq 38^{\circ}\text{C}$ ）；具有肺炎或急性呼吸窘迫综合征的影像学特征；发病早期白细胞总数降低或正常，或淋巴细胞分类计数减少；经抗生素规范治疗3~5天，病情无明显改善。

据了解，本次现身武汉的首例出现不明原因肺炎症状的患者来自武汉华南海鲜市场。

12320热线工作人员表示，武汉疾控部门第一时间前往救治医院采集患者标本，具体是何种病毒仍在等待最终的检测结果。

不明原因肺炎患者已做好隔离治疗的工作，不影响其他患者到医疗机构正常就医。武汉有着全国最一流的病毒研究机构，病毒检测结果一经查出将第一时间向公众对外公布。



20191231 20191230* PROMED Undiagnosed pneumonia - China. request for Information (RFI) <https://promedmail.org/promed-post/?id=6864153>. *Note date and time difference due to origin of publications.

Key items:

Chinese health officials and agencies confirm outbreaks and says China implements "public opinion control."

"On [31 Dec 2019], various hospitals in Wuhan held an emergency symposium on the topic of the treatment of patients with pneumonia of unknown cause in some medical institutions...." China health officials say that there is "a mature prevention and treatment system in place, and citizens need not panic."

On [31 Dec 2019], An official report from Hubei Province said: "Following the report of the Provincial Health and Health Commission, since December [2019], Wuhan has continued to monitor influenza and related diseases, and 27 cases of viral pneumonia have been found, all of which were diagnosed with viral pneumonia / pulmonary infection. Of the 27 cases, 7 were critically ill..."

"The investigation found that most of the cases were operated by South China Seafood City in Jiangnan District, Wuhan. The National Health and Health Commission has decided to send an expert group to our province to guide the epidemic disposal on the morning of [31 Dec 2019]."

At present, related virus typing, isolation treatment, public opinion control, and terminal disinfection are underway."

January 2020

20200101 SCMP - World Health Organisation in touch with Beijing after mystery viral pneumonia outbreak. <https://www.scmp.com/news/china/politics/article/3044207/china-shuts-seafood-market-linked-mystery-viral-pneumonia>

Key Points:

Mere suspicion of something unusual put Hong Kong on alert.

"Medical authorities in Hong Kong, which is about four hours from Wuhan by high-speed train, said late on Tuesday they had stepped up border screening and put hospitals in the city on alert. 'The situation in Wuhan is unusual, and we are not sure about the reasons behind the outbreak yet,' Hong Kong's Secretary for Food and Health Sophia Chan Siu-chee." "Since we are now in the holiday season, and Hong Kong has close transport ties with Wuhan, we must stay alert."

20200102 ProMed - Undiagnosed pneumonia - China wildlife sales, market closed, RFI
<https://promedmail.org/promed-post/?id=6866757>

20200103 PROMED -Undiagnosed pneumonia - China, updates, other country responses, RFI
<https://promedmail.org/promed-post/?id=6869668>

20200105 Promed - Undiagnosed pneumonia - China SARS, MERS ruled out, WHO, RFI
<https://promedmail.org/promed-post/?id=6872267>

20200105 In China the genomic sequence of the suspect novel coronavirus associated with the undiagnosed pneumonia is reported isolated and articulated on 5 January 2020.


The researcher, Yong-Zhen Zhang (https://www.researchgate.net/profile/Yong-Zhen_Zhang2) responsible — via the Shanghai Public Health Clinical Centre — reported his findings to China's National Health Commission along with a warning that that virus had a sequence close to others "previously found in bats" and a recommendation that "relevant prevention and control measures" be taken in public places.

After failing to receive a response, Zhang, via collaborating colleague Edward C. Holmes at University of Sydney, directly submits the sequence to GenBank and posts notice on virological.org.(see entry on 20200111, January 11, 2020).

Zhang's lab is closed the next day (January 12) for "rectification" by order of the Shanghai Health Commission.

Source: South China Morning Post (see 20200228 SMCP article [Chinese laboratory that first shared coronavirus genome with world ordered to close for 'rectification', hindering its Covid-19 research](#))

Novel 2019 coronavirus genome
Novel 2019 coronavirus

 **edward_holmes** 6 Jan 20

10h January 2020
This posting is communicated by Edward C. Holmes, University of Sydney on behalf of the consortium led by Professor Yong-Zhen Zhang, Fudan University, Shanghai.

The Shanghai Public Health Clinical Center & School of Public Health, in collaboration with the Central Hospital of Wuhan, Huazhong University of Science and Technology, the Wuhan Center for Disease Control and Prevention, the National Institute for Communicable Disease Control and Prevention, Chinese Center for Disease Control, and the University of Sydney, Sydney, Australia is releasing a coronavirus genome from a case of a respiratory disease from the Wuhan outbreak. The sequence has also been deposited on GenBank ([accession MT098347](https://www.ncbi.nlm.nih.gov/nuccore/MT098347)) and will be released as soon as possible.

Update: This genome is now available on GenBank and an updated version has been posted. (1/11)

Disclaimer:
Please feel free to download, share, use, and analyze this data. We ask that you communicate with us if you wish to publish results that use these data in a journal. If you have any other questions, then please also contact us directly.

Professor Yong-Zhen Zhang,
Shanghai Public Health Clinical Center & School of Public Health,
Fudan University,
Shanghai, China.
email: zhangyongzhen@shphcc.org.cn

https://www.researchgate.net/profile/Yong-Zhen_Zhang2

<https://www.scmp.com/news/china/society/article/3052966/chinese-laboratory-first-shared-coronavirus-genome-world-ordered>

20200106 CDC alert: Pneumonia of unknown cause in China.

<https://wwwnc.cdc.gov/travel/notices/watch/pneumonia-china> **CDC issues Level 1 "Watch" notice: US CDC issues three levels of travel notices: Level 1 / Watch - practice usual precautions; Level 2 / Alert - practice enhanced precautions; and level 3 / Warning - avoid nonessential travel.**

Key Points:

No deaths or human to human transmission reported (e.g., "no reports of spread from person to person or to healthcare workers.")

CDC recommends cautious approach to symptomatic patients with a history of travel to Wuhan." Patients should don surgical masks, be evaluated in private rooms with door closed. And medical personnel should use contact precautions and wear an N95 disposable facepiece respirator.

Watch - Level 1, Practice usual precautions

There is a cluster of cases of pneumonia in Wuhan, China. The cause is not yet known, nor is the mode of transmission. The cluster is centered at the Wuhan South China Seafood City (also called the South China Seafood Wholesale Market and the Hua Nan Seafood Market). The market has been closed since [1 Jan 2020] for cleaning and disinfection. Travelers to Wuhan, China, should avoid living or dead animals, animal markets, and contact with sick people.

The situation is evolving. This notice will be updated as more information becomes available.

What is the current situation?

There is a cluster of cases of pneumonia in Wuhan, China. As of [5 Jan 2020], local, provincial, and national health commissions in China have reported a total of 59 cases with no deaths.

The cluster is centered at the Wuhan South China Seafood City (also called the South China Seafood Wholesale Market and the Hua Nan Seafood Market). In addition to seafood, the market sells chickens, bats, marmots, and other wild animals. The market has been closed since [1 Jan 2020] for cleaning and disinfection. Health authorities in China are monitoring more than 150 close contacts for illness. To date, there have been no reports of spread from person to person or to healthcare workers.

Symptoms include fever and difficulty breathing. Though the cause of this cluster is unknown, there is concern that it is a virus. Local authorities have reported negative laboratory results for seasonal influenza, avian influenza, adenovirus, and 2 specific coronaviruses known to cause respiratory illness (severe acute respiratory syndrome [SARS] and Middle East respiratory syndrome [MERS]).

What can travelers do to protect themselves?

Travelers to Wuhan should: Avoid animals (alive or dead), animal markets, and products that come from animals (such as uncooked meat). Avoid contact with sick people. Wash hands often with soap and water. If you traveled to Wuhan and feel sick, you should: Stay home. Except for seeking medical care, avoid contact with others. Don't travel while sick. Seek medical care right away. Before you go to a doctor's office or emergency room, call ahead and tell the doctor about your recent travel and your symptoms. Cover your mouth and nose with a tissue or your sleeve (not your hands) when coughing or sneezing.

Clinician information As of this posting, case-patients in the cluster reportedly have had fever, difficulty breathing, and bilateral lung infiltrates on chest radiograph. For patients with similar respiratory symptoms who recently traveled to Wuhan, consider pneumonia related to the cluster and notify infection control personnel and your local health department immediately.

Although the etiology and transmission dynamics have yet to be determined, the CDC recommends a cautious approach to symptomatic patients with a history of travel to Wuhan. A such patients to don a surgical mask as soon as they are identified. Conduct their evaluation in a private room with the door closed. Personnel entering the room to evaluate the patient should use contact precautions and wear an N95 disposable facepiece respirator. For patients admitted for inpatient care, implement contact and airborne isolation precautions, in addition to standard precautions, until further information becomes available.

20200108 Promed - Undiagnosed pneumonia - China Hong Kong surveillance, About USA CDC alert on Jan 6. <https://promedmail.org/promed-post/?id=6876648>

20200109 WHO -- Statement regarding cluster of pneumonia cases in Wuhan, China.pdf <https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china>

20200108 Promed- Undiagnosed pneumonia - China. Novel coronavirus identified. <https://promedmail.org/promed-post/?id=6877694>

Key points:

Health authorities in Singapore and Hong Kong, cities that have direct flights from Wuhan, have issued alerts and quarantined patients travelling from the region who show signs of fever or breathing difficulties.

In Hong Kong on Tuesday [7 Jan 2020], the government said it was taking precautions against a "severe respiratory disease associated with a novel infectious agent" that it is seeking to make a statutory notifiable infectious disease, meaning doctors would need to report any suspected cases, and patients evading quarantine could be fined or jailed.

The Chinese Center for Disease Control and Prevention is expected to make an announcement of its findings in the coming days, a person familiar with the matter said. The Chinese CDC couldn't be reached for comment late Tuesday [7 Jan 2020].

The pattern of the unexplained pneumonia cases linked to the market selling seafood and also live game strongly suggests that this is a novel microbe jumping from animal to human, said K.Y. Yuen, Chair Professor of Infectious Diseases at the University of Hong Kong's Faculty of Medicine.

The Wuhan strain is similar to bat coronaviruses that were a precursor to SARS, according to a person familiar with the new findings.

Given the marked advances in hospital isolation facilities, infection-control training and laboratory diagnostic capabilities in the past two decades, it is unlikely that this outbreak will lead to a major 2003-like epidemic, said K.Y. Yuen, Chair Professor of Infectious Diseases at the University of Hong Kong's Faculty of Medicine.

In Wuhan, which has China's 1st Biosafety Level 4 laboratory - a specialized research laboratory that deals with potentially deadly infectious agents like Ebola - the market at the center of investigations has been shut down since [1 Jan 2020].

In Hong Kong, badly hit by the SARS virus, which claimed 299 lives locally in 2003, residents have donned surgical masks on the streets and public transport in recent days, despite no local cases of the Wuhan infection being confirmed

20200110 Promed - UNDIAGNOSED PNEUMONIA - CHINA NOVEL CORONAVIRUS, MORE INFORMATION, FIRST FATALITY <https://promedmail.org/promed-post/?id=6883253>

20200111 In China Yong-Zhen Zhang's lab (a Level 3 biosafety facility) publishes the genome sequence of the novel coronavirus (later designated SARS-CoV-2) associated with the emerging outbreak in China on virological.org. See reply thread for link to genome sequence published (note, corrected versions were subsequently published) After failing to receive a response, on the 11th Zhang, via collaborating colleague Edward C. Holmes at University of Sydney, directly submits the sequence to GenBank and posts notice on virological.org. After Zhang's data is published to the world on open platforms, Chinese officials announce they will share the data. Zhang's lab is closed the next day (January 12) for "rectification" by order of the Shanghai Health Commission. Source: South China Morning Post (see 20200228 SMCP article in reply thread below)



Yong-Zhen Zhang's post genomic sequence of the novel coronavirus
[https://www.ncbi.nlm.nih.gov/nuccore/MN908947.3?report=gbwithparts&log\\$=seqview](https://www.ncbi.nlm.nih.gov/nuccore/MN908947.3?report=gbwithparts&log$=seqview)

20200112 WHO - Statement Novel Coronavirus <https://www.who.int/csr/don/12-january-2020-novel-coronavirus-china/en/>

Key Points:

"WHO is reassured of the quality of the ongoing investigations and the response measures implemented in Wuhan, and the commitment to share information regularly."

"At this stage, there is no infection among healthcare workers, and no clear evidence of human to human transmission. The Chinese authorities continue their work of intensive surveillance and follow up measures, as well as further epidemiological investigations.

China shared the genetic sequence of the novel coronavirus on 12 January, which will be of great importance for other countries to use in developing specific diagnostic kits.

20200114 WHO- Coronavirus No evidence of human-to-human transmission



20200116 SCIENCE CHINA Life Sciences, Volume 63, Issue 3: 457-460(2020) Evolution of the novel coronavirus from the ongoing Wuhan outbreak and modeling of its spike protein for risk of human transmission

<http://engine.scichina.com/publisher/scp/journal/SCLS/63/3/10.1007/s11427-020-1637-5?slug=fulltext>

20200122 bioRxiv preprint -- Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin

https://www.biorxiv.org/content/10.1101/2020.01.22.914952v2?fbclid=IwAR3uzgBA-vi7iP_f6wuKlvphMRyBfhnUCfDwDYWlia3MiNcPgD26UDDS018 (later printed 3 February in Nature - A pneumonia outbreak associated with a new coronavirus of probable bat origin <https://www.nature.com/articles/s41586-020-2012-7>)

Key Points: More on the natural reservoir... "Full-length genome sequences were obtained from 5 patients at the early stage of the outbreak. They are almost identical to each other and share 79.5% sequence identity to SARS-CoV. Furthermore, it was found that 2019-nCoV is 96% identical at the whole genome level to a bat coronavirus. The pairwise protein sequence analysis

of 7 conserved non-structural proteins show that this virus belongs to the species of SARSr-CoV. The 2019-nCoV virus was then isolated from the bronchoalveolar lavage fluid of a critically ill patient, which can be neutralized by sera from several patients. Importantly, we have confirmed that this novel CoV uses the same cell entry receptor, ACE2, as SARS-CoV."

20200122 On 22 January, the members of the World Health Organization (WHO) Emergency Committee expressed divergent views on whether the novel coronavirus outbreak constituted a Public Health Emergencies of International Concern (PHEIC) but decided the event did not constitute a PHEIC.

20200123 MIT Technology Review - Virus in Chinese outbreak is closest to one from bats, not snakes <https://www.technologyreview.com/2020/01/23/276097/virus-in-chinese-outbreak-is-closest-to-one-from-bats-not-snakes/>

20200123 WHO -Statement on the meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus 2019 (n-CoV) on 23 January 2020 [https://www.who.int/news-room/detail/23-01-2020-statement-on-the-meeting-of-the-international-health-regulations-\(2005\)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-\(2019-ncov\)](https://www.who.int/news-room/detail/23-01-2020-statement-on-the-meeting-of-the-international-health-regulations-(2005)-emergency-committee-regarding-the-outbreak-of-novel-coronavirus-(2019-ncov))

Key Points:

WHO welcomed the efforts made by China to investigate and contain the current outbreak.

WHO decided it was still too early to declare a Public Health Emergency of International Concern (PHEIC), given its restrictive and binary nature.

All countries should be prepared for containment, including active surveillance, early detection, isolation and case management, contact tracing and prevention of onward spread of 2019-nCoV infection, and to share full data with WHO.

Countries are required to share information with WHO according to the International health Regulations (IHR).

20200123 BioRxiv - Discovery of a novel coronavirus associated with the recent pneumonia outbreak in humans and its potential bat origin (later republished in Nature) <https://www.biorxiv.org/content/10.1101/2020.01.22.914952v2>

20200124 Lancet -- Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30183-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext)

Representation epidemiological exposures for the 41 patients discussed in 20200124 Lancet -- Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China [https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30183-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext)
epresentation epidemiological exposures for the 41 patients discussed in 20200124 Lancet -- Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China The data and the Ro characteristics of the outbreak indicate that the Wuhan market may not have been the site where the virus made the leap into humans. It was certainly an early point of dissemination but the actual origin could have been elsewhere in the region.



20200124 NEJM - A Novel Coronavirus from Patients with Pneumonia in China, 2019 <https://www.nejm.org/doi/full/10.1056/NEJMoa2001017>

20200124 K. Lee Lerner comment::

The early calculations of the Ro of this disease ranges between 1.4 to 2.5. This means it's transmissible and will spread. The fatality rate is about 3%. This makes this virus much more like the pandemic 1918 flu that killed millions than SARS. But. but.. but.. we now have clinical supportive measures and antivirals that did not exist in 1981 and so this will be an interesting test of the global health response. What worries me is that it is already showing 4th generation changes in transmissibility (IIRC SARS never went past 2nd generation)— that means this Wuhan coronavirus loves humans and is finding ways to become more easily transmissible (hence the Ro might change)."



Lee Lerner The early calculations of the Ro of this disease ranges between 1.4 to 2.5. The means its transmissible and will spread. The fatality rate is about 3%. This makes this virus much more like the pandemic 1918 flu that killed millions than SARS. But. but.. but.. we now have clinical supportive measures and antivirals that did not exist in 1981 and so this will be an interesting test of the global health response. What worried me is that it is already showing 4th generation changes in transmissibility (IIRC SARS never went past 2nd generation)— that means this Wuhan coronavirus loves humans and is finding ways to become more easily transmissible (hence the Ro might change).
<https://www.nejm.org/doi/full/10.1056/NEJMoa2001017>

NEJM.ORG
A Novel Coronavirus from Patients with
Pneumonia in China, 2019 | NEJM

A key thing yet unknown about 2019-nCoV is whether it is transmissible before symptoms appear. SARS was stemmed in part because it wasn't very transmissible before symptoms appeared. Hence people knew they were sick and sought treatment and/or could be quarantined before spreading the virus. How quickly health care workers can get on top of 2019-nCoV will depend greatly on when symptoms of exposure (illness from exposure) first appear.



Lee Lerner A key thing yet unknown about 2019-nCoV is whether it is transmissible before symptoms appear. SARS was stemmed in part because it wasn't bvery transmissible before symptoms appeared. Hence people knew they were sick and sought treatment and/or could be quarantined before spreading the virus. How quickly health care workers can get on top of 2019-nCoV will depend greatly on when symptoms of exposure (illness from exposure) first appear.

20200124 Updated WHO advice for international traffic in relation to the outbreak of the novel coronavirus 2019-nCoV <https://www.who.int/news-room/articles-detail/updated-who-advice-for-international-traffic-in-relation-to-the-outbreak-of-the-novel-coronavirus-2019-ncov-24-jan>

20200124 A comment in Lancet highlights the important of accurate data sharing in response to these outbreaks ...[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30184-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30184-7/fulltext)

Wiley, Elsevier, Springer, and other major publishers and university presses, open their archives with regard to articles needed to understand the 2019-nCoV outbreak. Following a consensus developed since SARS that the best way to defeat misinformation is with accurate, vetted, well-sourced information that reflects the best science and, most importantly, the evolution of scientific knowledge.

In so doing publishers and other entities are following the important recommendations set forth following the Event 201 exercises last October at the Johns Hopkins Bloomberg School's Center for Health Security. Such openness by researchers and publishers is essential to combating misleading information.
<http://www.centerforhealthsecurity.org/event201/>

Due to misinterpretation of the exercise the Event 201 organizers issued the following clarification: Statement about nCoV and our pandemic exercise: "In October 2019, the Johns Hopkins Center for Health Security hosted a pandemic tabletop exercise called Event 201 with partners, the World Economic Forum and the Bill & Melinda Gates Foundation. Recently, the Center for Health Security has received questions about whether that pandemic exercise predicted the current novel coronavirus outbreak in China. To be clear, the Center for Health Security and partners did not make a prediction during our tabletop exercise. For the scenario, we modeled a fictional coronavirus pandemic, but we explicitly stated that it was not a prediction. Instead, the exercise served to highlight preparedness and response challenges that would likely arise in a very severe pandemic. We are not now predicting that the nCoV-2019 outbreak will kill 65 million people. Although our tabletop exercise included a mock novel coronavirus, the inputs we used for modeling the potential impact of that fictional virus are not similar to nCoV-2019." <https://www.centerforhealthsecurity.org/newsroom/center-news/2020-01-24-Statement-of-Clarification-Event201.html>

As of this date, making the rounds of fringe media -- and occasionally rising to the the level of mainstream broadcasters like the BBC -- are assertions (offered without evidence, without context, or contrary to existing evidence) that:

- (1) 2018-nCoV hss a citing a 25% lethality rate for 2019-nCoV;
- (2) the outbreak is a CIA plot to overthrow the Chinese government;
- (3) the outbreak was the result of an accidental release from the "Wuhan Virology Institute". This would be the most difficult to disprove and so holds the most promise for a void in which conspiracy theories might gain traction. Moreover, because accidental releases do happen, an accidental release is possible; Genetically engineered viruses (shaped deliberately or via experimentation) are relatively easy to distinguish from those shaped by evolutionary mechanisms.
- (4) the Chinese might consider nuking Wuhan to eliminate the virus.

20200126 Science -- Wuhan seafood market may not be source of novel virus spreading globally <https://www.sciencemag.org/news/2020/01/wuhan-seafood-market-may-not-be-source-novel-virus-spreading-globally>

20200126 K. Lee Lerner Comment on China Health official's assessment that 2019-nCoV is transmissible before symptoms appear (See BBC article cited):

“London Imperial College estimated the 2019-nCoV R_0 at 2.6 as of 18 January. Not good news. To stop a virus with this R_0 from spreading China will need to block at least 60 percent of those currently infected from infecting others. Hence the largest quarantine in history. The latest estimates regarding 2019-nCoV transmissibility greatly complicates this effort because control of the disease relies on isolation before transmission. Many people are not put into isolation until they are symptomatic, and the latest --but still preliminary--reports on 2019-nCoV are that it is transmissible before symptoms appear.”
<https://www.bbc.com/news/world-asia-china-51254523>

20200126 BBC - China coronavirus 'spreads before symptoms show'
<https://www.bbc.com/news/world-asia-china-51254523>

20200129 Infection, Genetics and Evolution (via ScienceDirect) -- Full-genome evolutionary analysis of the novel corona virus (2019-nCoV) rejects the hypothesis of emergence as a result of a recent recombination event)
<https://www.sciencedirect.com/science/article/pii/S1567134820300447?via%3Dihub> Key Point: Evidence that the hypothesis of emergence of 2019-nCoV as a result of a recent recombination event is rejected.

20200129 Lancet - Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China/a descriptive study
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30211-7/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30211-7/fulltext)

20200130 Lancet - Genomic characterization and epidemiology of 2019 novel coronavirus/ implications for virus origins and receptor binding [https://www.thelancet.com/article/S0140-6736\(20\)30251-8/fulltext](https://www.thelancet.com/article/S0140-6736(20)30251-8/fulltext)

20200130 As of 30 January, 2020 Coronavirus Confirmed Cases: 8,288 Deaths: 171 Fatality rate per 100 cases = 2.06. Here is a vetted site from JHU (with WHO, CDC, NHC and DXY data) that helps visualize the most current data...
<https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6>



20200130 Issues in Science and technology - Clarity, Please, on the Coronavirus Statistics | Issues in Science and Technology.pdf https://issues.org/clarity-please-on-the-coronavirus-statistics/?fbclid=IwAR0IJ7Lx_OuSXHVMSoc5e30xBGH3aOd6eGxDLQhXI7j4VZyHvu_MRdNbLvc

20200131 NEJM - First Case of 2019 Novel Coronavirus in the United States | NEJM.pdf <https://www.nejm.org/doi/full/10.1056/NEJMoa2001191>

February 2020

20200201 IJID - The continuing 2019-nCoV epidemic threat of novel coronaviruses to global health — The latest 2019 novel coronavirus outbreak in Wuhan, China - International Journal of Infectious Diseases.pdf [https://www.ijidonline.com/article/S1201-9712\(20\)30011-4/fulltext?fbclid=IwAR0IJ7Lx_OuSXHVMSoc5e30xBGH3aOd6eGxDLQhXI7j4VZyHvu_MRdNBLvc](https://www.ijidonline.com/article/S1201-9712(20)30011-4/fulltext?fbclid=IwAR0IJ7Lx_OuSXHVMSoc5e30xBGH3aOd6eGxDLQhXI7j4VZyHvu_MRdNBLvc)

20200201 EJMED - View of The Emerging of The 2019 Novel Coronavirus 2019-nCoV.pdf https://ejmed.org/index.php/ejmed/article/view/169/69?fbclid=IwAR14TGBfyOKIT6ZFZFmHPuo32_be3Ty_eFs45V3QcQtpH_sc7IOLD3zaqLM

20200203 Nature - A New Coronavirus Associated With Human Respiratory Disease in China <https://www.nature.com/articles/s41586-020-2008-3>

20200214 AAAS BioWorld - Researchers trace COVID-19's family tree to battle outbreak and infodemic. <https://www.bioworld.com/articles/433087-article-headline>

KEY POINTS:

"From everything I've looked at, there is zero evidence for genetic engineering; it looks like normal evolution," said Trevor Bedford, a computational biologist at Fred Hutchinson Cancer Research Center,

A key paper promoted by conspiracy theory proponents that SARS-CoV-2 was genetically engineered was never peer reviewed, had shoddy research, and was quickly withdrawn from Biorxiv.

"Based on the genetic analysis, the likelihood is that the virus was transmitted by a bat to another mammal between 20 and 70 years ago. That as-yet-unidentified intermediary passed the virus on to its first human host in the city of Wuhan in late November or early December 2019."

See also:

Generic epidemiology for SARS-CoV-2 <https://nextstrain.org./ncov/global>

20200217 CCDC - The Epidemiological Characteristics of an Outbreak of 2019 Novel Coronavirus Diseases (COVID-19) — China CDC.

<http://weekly.chinacdc.cn/en/article/id/e53946e2-c6c4-41e9-9a9b-fea8db1a8f51>

20200218 Lancet - Li Wenliang Obituary

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30382-2/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30382-2/fulltext)

"Ophthalmologist who warned about the outbreak of COVID-19. Born in Beizhen, China, on Oct 12, 1986, he died after becoming infected with SARS-CoV-2 in Wuhan, China, on Feb 7, 2020, aged 33 years.

On Dec 30, 2019, Li Wenliang sent a message to a group of fellow doctors warning them about a possible outbreak of an illness that resembled severe acute respiratory syndrome (SARS) in Wuhan, Hubei province, China, where he worked. Meant to be a private message, he encouraged them to protect themselves from infection. Days later, he was summoned to the Public Security Bureau in Wuhan and made to sign a statement in which he was accused of making false statements that disturbed the public order.

20200219 NID - Field Briefing/ Diamond Princess COVID-19 Cases

<https://www.niid.go.jp/niid/en/2019-ncov-e/9407-covid-dp-fe-01.html>

20200226 Science - 'A completely new culture of doing research.' Coronavirus outbreak changes how scientists communicate | Science | AAAS.pdf

<https://www.sciencemag.org/news/2020/02/completely-new-culture-doing-research-coronavirus-outbreak-changes-how-scientists>

20200227 JACEP (via Wiley Online Library) - Coronavirus disease 2019/ International public health considerations - Greene - - Journal of the American College of Emergency Physicians.pdf
https://onlinelibrary.wiley.com/doi/10.1002/emp2.12040?fbclid=IwAR3jnKH_XqTz0y5SM1_WjnsPsdW6awwGlxV8M4UAWGE-DnDvs41mBirHBzM&sid=SCITRUS

20200228 Lancet - Feasibility of 20200228 Lancet - Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts.
[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(20\)30074-7/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30074-7/fulltext)

20200228 NEJM - Clinical Characteristics of Coronavirus Disease 2019 in China | NEJM
https://www.nejm.org/doi/10.1056/NEJMoa2002032?fbclid=IwAR19bmNVlv3Zf9q3Z9-_r1FgoZbX6sWro7c9fUKuhlqVWpHLuDH38rx5r9c

20200228 NEJM - Bill Gates, Responding to Covid-19 — A Once-in-a-Century Pandemic? | NEJM.pdf <https://www.nejm.org/doi/full/10.1056/NEJMp2003762>

Related Article: RPP_20201019 JHU, WEF, BMGF - Event 201, Public-Private Cooperation for Pandemic Preparedness.pdf <https://www.centerforhealthsecurity.org/event201/event201-resources/200117-PublicPrivatePandemicCalltoAction.pdf>

20200229 MedRxiv (Preprint) - Evaluation of the clinical characteristics of suspected or confirmed cases of COVID-19 during home care with isolation/ A new retrospective analysis based on O2O | medRxiv.pdf
<https://www.medrxiv.org/content/10.1101/2020.02.26.20028084v1?fbclid=IwAR1EW0hjG7Yv639KbEeHrEwsVjeJMZcPc2sMwZE9gp7w-4DWx4PyQjWm3Hw>

20200229 Science - In bid to rapidly expand coronavirus testing, U.S. agency abruptly changes rules | Science | AAAS.pdf <https://www.sciencemag.org/news/2020/02/bid-rapidly-expand-coronavirus-testing-us-agency-abruptly-changes-rules?fbclid=IwAR1r1qrZyjXA0zimmzDzUkopZf7mrYyenk5ihe3CZZ5rg2yAAIGq7xZ9Rkl>

March 2020

20200307 Lancet - Statement in support of the scientists, public health professionals, and medical professionals of China combatting COVID-19 - The Lancet.pdf

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30418-9/fulltext#%20](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30418-9/fulltext#%20)

Excerpt: "We stand together to strongly condemn conspiracy theories suggesting that COVID-19 does not have a natural origin. Scientists from multiple countries have published and [analysed genomes](#) of the causative agent, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), and they overwhelmingly conclude that this coronavirus originated in wildlife as have so many other emerging pathogens. This is further supported by a letter from the presidents of the US National Academies of Science, Engineering, and Medicine and by the scientific communities they represent. Conspiracy theories do nothing but create fear, rumours, and prejudice that jeopardise our global collaboration in the fight against this virus."

20200309 JAMA - Diagnostic Testing for the Novel Coronavirus | Global Health | JAMA | JAMA Network.pdf

https://jamanetwork.com/journals/jama/fullarticle/2762951?fbclid=IwAR0IJ7Lx_OuSXHVMSoc5e30xBGH3aOd6eGxDLQhXl7j4VZyHvu_MRdNbLvc

20200310 Annals Int Med -The Incubation Period of COVID-19 From Publicly Reported Confirmed Cases | Annals of Internal Medicine | American College of Physicians.pdf

https://annals.org/aim/fullarticle/2762808/incubation-period-coronavirus-disease-2019-covid-19-from-publicly-reported?fbclid=IwAR09dcbW5gtzSeXnMHAzuT_1sw69HFUF6yxb5Vh2S_cCpBMEEGU3D5Vmhtw

20200311 Scientific American - How China's "Bat Woman" Hunted Down Viruses from SARS to the New Coronavirus - Scientific American.pdf Wuhan-based virologist Shi Zhengli has identified dozens of deadly SARS-like viruses in bat caves, and she warns there are more out there. <https://www.scientificamerican.com/article/how-chinas-bat-woman-hunted-down-viruses-from-sars-to-the-new-coronavirus1/>

20200313 Nature - How much is coronavirus spreading under the radar?.pdf

https://www.nature.com/articles/d41586-020-00760-8?fbclid=IwAR0WdeLBH58J_tU8QkWNIXbJCGi_RJkVFb95_9nhCwgEoBIO2rfKzHKWZuY

20200313 Ariadne Labs, By Asaf Bitton, MD, MPH (via Medium) - Social Distancing/ This is Not a Snow Day <https://medium.com/@ariadnelabs/social-distancing-this-is-not-a-snow-day-ac21d7fa78b4>

20200314 Emerging Microbes and Infections - Full article/ A tug-of-war between severe acute respiratory syndrome coronavirus 2 and host antiviral defence/ lessons from other pathogenic viruses.pdf
<https://www.tandfonline.com/doi/full/10.1080/22221751.2020.1736644?fbclid=IwAR0QY3C6yTMwGVZI8NE1kQ17WhHWPrKgs30zC5QmymypdaKjOEexqCZZnCc8&>

20200315 The Independent - When will a coronavirus vaccine be ready? | theindependentbd.com.pdf <http://www.theindependentbd.com/post/241043> Comment: Scientifically sound overview of the process and perils.

20200316 Science - Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV2) | Science.pdf
https://science.sciencemag.org/content/early/2020/03/24/science.abb3221?fbclid=IwAR3JRjPPzsDdfOFwnL88CWlbaLGy5L7KQjBKuy_iaW0VXEYL9-APw2bv5dA

20200316 Imperial College COVID-19 Response Team Report 9 - Impact of non-pharmaceutical interventions (NPIs) to reduce COVID-19 mortality and healthcare demand.pdf
<https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-NPI-modelling-16-03-2020.pdf>

20200316 Science -- Disease experts call for nationwide closure of U.S. schools and businesses to slow coronavirus | Science | AAAS
<https://www.sciencemag.org/news/2020/03/infectious-disease-experts-call-nationwide-closure-us-schools-and-business-slow?fbclid=IwAR2cWPIZ0jYHKZBhWnrqQB2tfHYkH8zzAF431B2Y0bKT1qBqomCw2r7funM>

20200317 NATURE- The proximal origin of SARS-CoV-2 | Nature Medicine
<https://www.nature.com/articles/s41591-020-0820-9> Key Points: "Our analyses clearly show that SARS-CoV-2 is not a laboratory construct or a purposefully manipulated virus,"

20200317 Scripps Research - The COVID-19 coronavirus epidemic has a natural origin, scientists say | Scripps Research. <https://www.scripps.edu/news-and-events/press-room/2020/20200317-andersen-covid-19-coronavirus.html>

20200317 Science - Coronavirus cases have dropped sharply in South Korea. What's the secret to its success? | Science | AAAS https://www.sciencemag.org/news/2020/03/coronavirus-cases-have-dropped-sharply-south-korea-whats-secret-its-success?fbclid=IwAR0WdeLBH58J_tU8QkWNIXbJCGi_RJkVFb95_9nhCwgEoBIO2rfKzHKWZuY

20200317 NEJM - Epidemiology of Covid-19 in a Long-Term Care Facility in King County, Washington | NEJM.pdf <https://www.nejm.org/doi/full/10.1056/NEJMoa2005412>

20200317 JAMA - Coronavirus Disease 2019 (COVID-19) in Italy | Critical Care Medicine | JAMA | JAMA Network https://jamanetwork.com/journals/jama/fullarticle/2763401?fbclid=IwAR1AKrVJlua1ZI8C7KUefcL78hy_Bk5To-0yw1vqRskDaxLkYQRVWeulls8

20200317 NEJM - Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1 | NEJM.pdf <https://www.nejm.org/doi/10.1056/NEJMc2004973>

20200318 Nature - Coronavirus vaccines - five key questions as trials begin.pdf https://www.nature.com/articles/d41586-020-00798-8?fbclid=IwAR0_UL9vZCpaGBInrtngF5wby0fbUMbxRPfwJc-x4rEuMvZPuJyAruX0YjU

20200318 NEJM -A Trial of Lopinavir–Ritonavir in Adults Hospitalized with Severe Covid-19 | NEJM.pdf https://www.nejm.org/doi/full/10.1056/NEJMoa2001282?fbclid=IwAR2jlGpsX_EFOsUBYVopf0Li3scGgnjqSHLqgRf5RMV6Dz5QVeakV0fQxU Excerpt: In conclusion, we found that lopinavir–ritonavir treatment did not significantly accelerate clinical improvement, reduce mortality, or diminish throat viral RNA detectability in patients with serious Covid-19.

20200318 NEJM - SARS-CoV-2 Infection in Children | NEJM.pdf https://www.nejm.org/doi/10.1056/NEJMc2005073?fbclid=IwAR01JGw_zFI-cfYJp4cJDM-MB3Ht8hegyzXYVMAIIVa1UKJ7vd0JIWePhWs#article_citing_articles

20200319 Nature - Estimating clinical severity of COVID-19 from the transmission dynamics in Wuhan, China | Nature Medicine.pdf <https://www.nature.com/articles/s41591-020-0822-7>

20200319 AP - China exonerates doctor reprimanded for warning of virus.
<https://apnews.com/6f2e666485e9abae4bb112251eca77be>

20200320 BioRxiv (NPR Preprint) - An orally bioavailable broad-spectrum antiviral inhibits SARS-CoV-2 and multiple endemic, epidemic and bat coronavirus | bioRxiv
https://www.biorxiv.org/content/10.1101/2020.03.19.997890v1?fbclid=IwAR14TGBfyOKIT6ZFZFmHPuo32_be3Ty_eFs45V3QcQtpH_sc7IOLD3zaqLM Abstract Excerpt: Based on study in mice: “Herein, we show that the ribonucleoside analog β -D-N4-hydroxycytidine (NHC, EIDD-1931) has broad spectrum antiviral activity against SARS-CoV 2, MERS-CoV, SARS-CoV, and related zoonotic group 2b or 2c Bat-CoVs, as well as increased potency against a coronavirus bearing resistance mutations to another nucleoside analog inhibitor.”

20200320 *International Journal of Antimicrobial Agents (Preprint via Science Direct) - Hydroxychloroquine and azithromycin as a treatment of COVID-19/ results of an open-label non-randomized clinical trial -
<https://www.sciencedirect.com/science/article/pii/S0924857920300996?fbclid=IwAR2bv9zXFTw68eCEAejfjayBeO1N9iuJczAFs4rJaY0OkGaidYR2arQFc6Y> *SEE CONTRARY STATEMENTS ABOUT THIS FRENCH STUDY.

20200322 Commentary: Lerner, K. Lee. “Hydroxychloroquine and the allure and perils of abandoning evidence-based science and policy in times of crisis. (SARS-CoV-2, Covid-19 pandemic)” Online at: https://scholar.harvard.edu/kleelerner/publications/dangers-it-may-work-it-may-not-and-what-do-you-have-lose-hydroxychloroquine?admin_panel=1

April 2020

20200401 Lancet - Feasibility of controlling COVID-19 outbreaks by isolation of cases and contacts - The Lancet Global Health.pdf
[https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(20\)30074-7/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30074-7/fulltext)

20200407 Promed – CORONAVIRUS DISEASE 2019 UPDATE (88) GERMANY, ANIMALS, RESEARCH, PIG, CHICKEN, BAT, FERRET <https://promedmail.org/promed-post/?id=7196506>

Key Point: A preliminary not-yet-peer-reviewed preliminary report of research said, In summary, “pigs and chickens could not be productively infected by SARS-CoV-2 under these experimental conditions, an information that is relevant for a solid risk assessment. Furthermore, virus replication in ferrets resembles the situation of a mild human infection and this species might serve as a useful model for further studies e.g. testing vaccines or antivirals.” Includes references to prior reports of infections in cats and other animals.

20200409 Nature reviews - The COVID-19 vaccine development landscape.

https://www.nature.com/articles/d41573-020-00073-5?utm_source=Nature%20Briefing&utm_campaign=98c3a376d1-briefing-dy-20200409&utm_medium=email&utm_term=0_c9dfd39373-98c3a376d1-43707245&fbclid=IwAR1qM1xFc3QPb5PytcblW0mmfrvIGL1ZNhMWzbzRKV7kf7gZohan_YC9-x0

20200410 STAT - Covid-19 'immunity certificates'/ practical and ethical conundrums - STAT.pdf

https://www.statnews.com/2020/04/10/immunity-certificates-covid-19-practical-ethical-conundrums/?utm_source=STAT+Newsletters&utm_campaign=2551c7206a-Daily_Recap&utm_medium=email&utm_term=0_8cab1d7961-2551c7206a-152075613

20200410 MedRxiv (NPR Preprint) - Efficacy of hydroxychloroquine in patients with COVID-19/ results of a randomized clinical trial | medRxiv

https://www.medrxiv.org/content/10.1101/2020.03.22.20040758v3?fbclid=IwAR0_UL9vZCpaGBInrtngF5wby0fbUMbxRPfwJc-x4rEuMvZPuJyAruX0YjU Abstract Excerpt: “Studies have indicated that chloroquine (CQ) shows antagonism against COVID-19 in vitro. However, evidence regarding its effects in patients is limited. This study aims to evaluate the efficacy of hydroxychloroquine (HCQ) in the treatment of patients with COVID-19.... Among patients with COVID-19, the use of HCQ could significantly shorten TPCR and promote the absorption of pneumonia. Note: NPR Non-peer reviewed preprint of s study conducted in China.

20200413 CDC MMWR - Timing of Community Mitigation and Changes in Reported COVID-19 and Community Mobility — Four U.S. Metropolitan Areas, February 26–April 1, 2020 |

MMWR.pdf <https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e2.htm>

20200414 Harvard Crimson - As Coronavirus Spreads, False Theories Linking Harvard Professor Lieber to Disease’s Origin Proliferate Online | The Harvard Crimson.pdf

<https://www.thecrimson.com/article/2020/4/15/harvard-coronavirus-lieber-conspiracy-theories/>

20200414 Science - Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period.
https://science.sciencemag.org/content/early/2020/04/14/science.abb5793?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosam&stream=top

20200414 WAPO - State Department cables in January 2018 warned of safety issues at Wuhan lab studying bat coronaviruses. <https://www.washingtonpost.com/opinions/2020/04/14/state-department-cables-warned-safety-issues-wuhan-lab-studying-bat-coronaviruses/>

Related Articles (See Appendix for relevant prior publications (RPP) published prior to December 2019)

RPP_20151112 Nature - Engineered bat virus stirs debate over risky research / Nature News & Nature News and Comment " Editors' note, March 2020: We are aware that this story is being used as the basis for unverified theories that the novel coronavirus causing COVID-19 was engineered. There is no evidence that this is true; scientists believe that an animal is the most likely source of the coronavirus." <https://www.nature.com/news/engineered-bat-virus-stirs-debate-over-risky-research-1.18787>

RPP_20180912 Emerg Microbes Infect - Genomic characterization and infectivity of a novel SARS-like coronavirus in Chinese bats <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6135831/>

20200414 Science - Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period <https://science.sciencemag.org/content/early/2020/04/24/science.abb5793>
See also: Harvard Gazette - Warm weather may have no impact on COVID-19 – Harvard Gazette <https://news.harvard.edu/gazette/story/2020/04/covid-19-may-not-go-away-in-warmer-weather-as-do-colds/?fbclid=IwAR11p4er7OAFvWLCEO-7Bo3VtGaQVDhsFISYy9ygdAhiOWBkz74CTNzkIPI>

[K. Lee Lerner Comment:] SARS-CoV2 is a novel coronavirus so, in theory, everyone is vulnerable. They may not however be equally vulnerable. Preexisting antibody based theories are not outlandish, but it not likely to be the reason Africa is apparently lagging in terms of cases and deaths. For example, some studies suggest infection with other coronaviruses (HKU1 and OC43 may convey initial protection against SARS-CoV-2 infection. However, those viruses trigger only short- term immunity, usually under a year and so if there is something similar in play in Africa the lag phenomena may be short-lived. Most epidemiologists suspect that Africa's apparent case lag is a combination of many factors including limited testing, historic reporting irregularities, varying criteria for attributing deaths, etc. Warm weather can't be discounted, as it may tamp down the infection spread, but the data is still inconclusive. Coronaviruses are currently infecting people in warm climates, and if the rate of spread subsides in summer months it may roar back in the winter, possibly with a mutated virus. Something similar happened in 1918 where a mutated strain proved more lethal.

The United Nations Economic Commission for Africa anticipates Africa will follow Brazil and Latin America as a global hotspot, Based on Imperial College London, they are

predicting a minimum of 300,000 deaths in Africa this year with worst case scenarios ranging to 3.3 million deaths. Africa already faces severe strains from malaria and other diseases and so damage to fragile health care systems due to the COVID-19 pandemic could greatly exacerbate deaths due to other causes.

20200415 Nature - China is tightening its grip on coronavirus research

<https://www.nature.com/articles/d41586-020-01108-y>

20200415 AP - China didn't warn publicly of the pandemic for 6 key days.

Key Points: As the record above documents, the delay was not a singular event but part of a pattern and practice of delay and deception. In sum, such delays and deceptions cost the world far more than just six days at a time early in the outbreak — especially during a holiday season with people traveling — when every day was crucial.

https://apnews.com/68a9e1b91de4ffc166acd6012d82c2f9?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosam&stream=top

20200415 CBS Boston - CDC reviewing 'stunning' universal testing results from Boston

homeless shelter <https://www.boston25news.com/news/cdc-reviewing-stunning-universal-testing-results-boston-homeless-shelter/Z253TFBO6RG4HCUAARBO4YWO64/>

Key Points :

"We don't have enough data on universal testing to understand how many asymptomatic people are contagious." "Of the 397 people tested, 146 people tested positive. Not a single one had any symptoms." "Stunning" because this is a population with high co-morbidities.

20200416 AP - China's virus death toll revised up sharply after review.pdf

https://apnews.com/599338c54097ab68a1f2eda09c2d8a3b?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosam&stream=top&fbclid=IwAR2I8Asy2n4YONgS0Eg rk8tu1O5-tdA7abl3INo6UvghmO3OjrnXIYQ4IpE

20200416 Reuters - Coronavirus clue? Most cases aboard U.S. aircraft carrier are symptom-

free - Reuters <https://www.reuters.com/article/us-health-coronavirus-usa-military-sympt/coronavirus-clue-most-cases-aboard-us-aircraft-carrier-are-symptom-free-idUSKCN21Y2GB>

20200416 MedRxiv (NPR Preprint) - A serological assay to detect SARS-CoV-2 seroconversion

in humans | medRxiv.pdf <https://www.medrxiv.org/content/10.1101/2020.03.17.20037713v2>

20200416 Cyberscoop - Coronavirus scientists are big targets for foreign cyber-espionage, FBI says. <https://www.cyberscoop.com/coronavirus-research-cyber-espionage-fbi-warning/>

20200417 Johns Hopkins Biosecurity - Global Progress on COVID-19 Serology-Based Testing.pdf <https://www.centerforhealthsecurity.org/resources/COVID-19/serology/Serology-based-tests-for-COVID-19.html>

20200417 Xinhua -Full text of Wuhan's notification on revising numbers of confirmed COVID-19 cases, deaths - China.org.cn.pdf http://www.china.org.cn/china/Off_the_Wire/2020-04/17/content_75943843.htm

Key points:

China raises the total number of confirmed COVID-19 cases in Wuhan as of 16 Apr 2020 by 325 to 50 333, and the number of fatalities up from 1290 to 3869.

The revision raises Wuhan's confirmed case fatality percentage from 2.6 percent to 7.7 percent, a figure much more in line with data from Europe and America.

The reasons cited for data discrepancies:

- (1) "a surging number of patients at the early stage of the epidemic overwhelmed medical resources and the admission capacity of medical institutions. Some patients died at home without having been treated in hospitals;
- (2) during the height of their treating efforts, hospitals were operating beyond their capacities and medical staff were preoccupied with saving and treating patients, resulting in belated, missed and mistaken reporting;
- (3) due to a rapid increase of designated hospitals for treating COVID-19 patients, including those administered by ministries, Hubei Province, Wuhan city and its districts, those affiliated to companies, as well as private hospitals and makeshift hospitals, a few medical institutions were not linked to the epidemic information network and failed to report their data in time;
- (4) the registered information of some of the deceased patients was incomplete, and there were repetitions and mistakes in the reporting."

KLL Comment: China has "corrected" for Wuhan, not for the country. Now that the CCP has cover from stark figures elsewhere (and global eye turned inward) they will gradually keep correcting their case and death counts to make them more mathematically plausible. The math still doesn't work out with regard to the R_0 and case fatality rates observed elsewhere. China has a history of going big on such deceptions. When between 2 to 20 million people died during the Cultural Revolution (and the range of those estimates ought to tell you everything you need to know) the CCP initially claimed a million dead. When between 15 to 45 million died during the Great Famine (and the range of those estimates ought to tell you everything you need to know), the CCP started at one million before —after many years — confessing to the death of at least 15 million people. Look for the same magnitude of errors, and dedication to the truth in counting COVID -19 victims.

See also: AP-China's virus death toll revised up sharply after review

https://apnews.com/599338c54097ab68a1f2eda09c2d8a3b?utm_source=newsletter&utm_medium=email&utm_campaign=newsletter_axiosam&stream=top&fbclid=IwAR3VJAbwkQ5Wv7yuGOsKhXNMGUVD-JMJ8aviABuvYMacv0R_IH3s3zBD6XA

20200417 Science - How does coronavirus kill? Clinicians trace a ferocious rampage through the body, from brain to toes | Science | AAAS https://www.sciencemag.org/news/2020/04/how-does-coronavirus-kill-clinicians-trace-ferocious-rampage-through-body-brain-toes?utm_source=Nature%20Briefing&utm_campaign=4525e04069-briefing-dy-20200421&utm_medium=email&utm_term=0_c9dfd39373-4525e04069-43707245&fbclid=IwAR1YgN1XPdrRepE0hfO27Fw6zc5yDLycBB_0XNfok0mEA1-30dsESmvMlXo

20200420 Contagion - Discovering COVID-19 Countermeasures Without Discarding Scientific Method. <https://www.contagionlive.com/news/discovering-covid19-countermeasures-without-discarding-scientific-method>

20200420 Journal of Biomolecular Structure and Dynamics -- Novel 2019 Coronavirus Structure, Mechanism of Action, Antiviral drug promises and rule out against its treatment. <https://www.tandfonline.com/doi/full/10.1080/07391102.2020.1758788>

20200421 Santa Clara County Public Health — County of Santa Clara Identifies Three Additional Early COVID-19 Deaths <https://www.sccgov.org/sites/covid19/Pages/press-release-04-21-20-early.aspx> See Also: Reuters - First U.S. coronavirus death occurred in early February in California <https://www.reuters.com/article/us-health-coronavirus-usa-california/first-u-s-coronavirus-death-occurred-in-early-february-in-california-idUSKCN2240Z6>

20200422 MedRxiv (Not yet peer reviewed) -- Outcomes of hydroxychloroquine usage in United States veterans hospitalized with Covid-19. <https://doi.org/10.1101/2020.04.16.20065920>

KLL Comment: U.S. President Trump and others (including a mix of physicians and political commentators in China, Europe and the U.S.) have recently promoted use of the anti-malarial drug hydroxychloroquine for treatment of COVID-19. A new study (not yet peer reviewed but a more fundamentally sound study than earlier ones cited to tout the drug) based on analysis of data from 368 patients found significantly elevated death rates in those who received the drug, even when combined with the antibiotic azithromycin. The U.S. National Institute of Health has recommended doctors not use the malaria drug, which has the potential to induce cardiac arrhythmia.

See also: Reuters - Drug championed by Trump for coronavirus shows no benefit, possible harm in study awaiting validation <https://www.reuters.com/article/us-health-coronavirus->

[hydroxychloroquine/drug-championed-by-trump-for-coronavirus-shows-no-benefit-possible-harm-in-study-awaiting-validation-idUSKCN2233AN?fbclid=IwAR1AaAtoM2QIITuPKqe6rhMcQKW5M5cOICvODoj2Lo1XJEQ9mCZH0b10Qd0](https://www.bloombergenvironment.com/news/articles/2020-04-21/u-s-virus-treatment-guidelines-reject-trump-backed-drug-combo?fbclid=IwAR0HmS8haxQ533D3ZgvlyX3tFDvN8vOEhz-pvOYijXmawbiQscK4M-gOT8c) and Bloomberg - U.S. Virus Guidelines Reject Trump-Backed Drug Combination <https://www.bloombergenvironment.com/news/articles/2020-04-21/u-s-virus-treatment-guidelines-reject-trump-backed-drug-combo?fbclid=IwAR0HmS8haxQ533D3ZgvlyX3tFDvN8vOEhz-pvOYijXmawbiQscK4M-gOT8c>

20200423 Science - Against pandemic research exceptionalism | Science.

<https://science.sciencemag.org/content/early/2020/04/22/science.abc1731> Abstract: Crises are no excuse for lowering scientific standards

20200425 FDA -- FDA cautions against use of hydroxychloroquine or chloroquine for COVID-19 outside of the hospital setting or a clinical trial due to risk of heart rhythm problems.pdf

<https://www.fda.gov/media/137250/download>

20200502 Lancet -- A global health crisis? No, something far worse - The Lancet.pdf

[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)31017-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)31017-5/fulltext)

20200504 Nature -Profile of a killer/ the complex biology powering the coronavirus pandemic.

[https://www.nature.com/articles/d41586-020-01315-](https://www.nature.com/articles/d41586-020-01315-7?utm_source=Nature+Briefing&utm_campaign=9192d57656-briefing-dy-20200505&utm_medium=email&utm_term=0_c9dfd39373-9192d57656-43707245)

[7?utm_source=Nature+Briefing&utm_campaign=9192d57656-briefing-dy-](https://www.nature.com/articles/d41586-020-01315-7?utm_source=Nature+Briefing&utm_campaign=9192d57656-briefing-dy-20200505&utm_medium=email&utm_term=0_c9dfd39373-9192d57656-43707245)

[20200505&utm_medium=email&utm_term=0_c9dfd39373-9192d57656-43707245](https://www.nature.com/articles/d41586-020-01315-7?utm_source=Nature+Briefing&utm_campaign=9192d57656-briefing-dy-20200505&utm_medium=email&utm_term=0_c9dfd39373-9192d57656-43707245)

20200505 20200505 Infection, Genetics, Evolution -- Emergence of genomic diversity and

recurrent mutations in SARS-CoV-2 <https://phys.org/news/2020-05-mutations-sars-cov-insights-virus-evolution.html>

KLL Comment: "This rules out any scenario that assumes SARS-CoV-2 may have been in circulation long before it was identified, and hence have already infected large proportions of the population." — Francois Balloux, University College London

It is important to note that for a number of reasons there are claims circulating that the virus was in Europe and the US before what we now consider the first reported cases. This is both possible and reasonable.

The first documented case in China with regard to the onset of symptoms was December 1, 2019 meaning the infection could easily have been circulating in China in November. As asymptomatic carriers can still be contagious, it is possible that infected travelers from China started spreading the virus globally as early as late November 2019.

Resulting infections —still at low levels in terms of numbers of cases -- might have been confused with flu in December. This would account for the number of early patients who were confirmed positive for SARS-CoV-2 who had no relationship to the seafood market in Wuhan.
