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Overview of Possible Transmission Path of SARS-CoV-2 (2019-nCoV) and Outbreak of the COVID-19 in Chinese Mainland

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Abstract

The current study reviews the origin and outbreak process of the rampaging COVID-19 affecting Asia (Chinese mainland, Hong Kong, Macau, Taiwan, Singapore, Japan, Thailand, South Korea, Malaysia, Vietnam, Philippines, India, Cambodia, Sri Lanka, Nepal, UAE) and the rest of the world (Australia, Belgium, Canada, Finland, France, Germany, Italy, Russia, Spain, Sweden, United Kingdom, United States), depriving lives of more than 1000 people around the globe. Based on the empirical analysis, specific prevention measures are proposed for future reference.

Key words: Transmission path; 2019-nCoV; SARS-CoV-2; COVID-19; Prevention measures

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INTRODUCTION TO TERMINOLOGY

Ever since the origin and outbreak of this novel coronavirus, global media (*Xinhua, CCTV, NHK, CNN, Fox News, NPR, Radio Canada, Le Figaro, Le Parisien*) have adopted various terms, mixing up the virus itself with the disease (in most cases a kind of pneumonia or without symptoms at all), i.e., coronavirus, Wuhan virus, Wuhan coronavirus, China pneumonia, Wuhan pneumonia, and novel coronavirus, etc. Hong Kong Centre for Health Protection of Department of Health (2020) names it as Severe Respiratory Disease associated with a Novel Infectious Agent, which refers to the cluster of viral pneumonia cases occurring in Wuhan, Hubei Province, since December 2019. According to investigation by the Mainland health authorities, a novel coronavirus is found to be the causative agent. According to information provided by the Mainland health authorities, symptoms of the cases were mainly fever while a few had presented with shortness of breath. Some cases were in serious condition. Academic papers published in mainstream medical journals such as *Lancet* and *The New England Journal of Medicine* usually adopted the term "2019-nCoV" (cf. Zhu et al. 2020, Li et al. 2020, Holshue et al. 2020) or SARS-CoV-2 (cf. Lipsitch et al., & Zou, et al, 2020).

According to a report of the website of 24KG (2020), On February 9, the number of people infected with coronavirus in the PRC exceeded 37,000 people, 813 patients died , and The State Health Committee of China released a temporary name for the epidemic caused by 2019-nCov - Novel Coronavirus Pneumonia (NCP). Just 2 days later, the new coronavirus disease that was first identified in Wuhan has received an official name from the World Health Organization (2020): "COVID-19." "COVI" represents coronavirus. The letter "D" means "disease". The number 19 signifies the year of 2019, when the virus was first identified, in December. In the current research, we adopt the terms SARS-CoV-2 as well as 2019-nCoV to indicate this novel coronavirus, and COVID-19 to represent the disease associated with the novel coronavirus, despite the fact that they are often mixed up in news reports or other non-academic publications.

1. ORIGIN AND EARLY TRANSMISSION OF 2019-NCOV

December 31, 2019 - the last day of 2019, there came reports (Huang et al. 2020) on a mysterious viral

pneumonia that infected 27 people in Wuhan, capital city of Hubei (a province in central China). Several hospitals in the city treated a successive series of patients with unexplained pneumonia. A cluster of patients with pneumonia caused by a kind of unknown virus had direct links to the South China Seafood Wholesale Market (*hua nan hai xian pi fa shi chang*) in central China's Wuhan City.

Researchers (cf. Huang, et al, 2020; Zhu, et al, 2020; Chen, et al, 2020) analyzed the samples from patients with pneumonia and isolated a novel coronavirus and named it 2019-nCoV (which was re-named as COVID-19 by WHO on February 11, 2020), which was different from MERS-CoV and SARS-Cov, although they belonged to the same virus category.

Zhu et al.'s study (2020) reveals that in late December 2019, several local hospitals in Wuhan reported clusters of pneumonia patients caused by the mysterious virus which had epidemiological links to the South China Seafood Wholesale Market in Wuhan. Then Chinese CDC sent a response team to Wuhan and did epidemilogic investigations. Positive results were also obtained with use of a real-time RT-PCR assay for RNA targeting to a consensus RdRp region of pan β-CoV (although the cycle threshold value was higher than 34 for detected samples). Virus isolation from the clinical specimens was performed with human airway epithelial cells and Vero E6 and Huh-7 cell lines. The isolated virus was named 2019-nCoV" (Zhu, et al, 2020). "Following the pneumonia cases of unknown cause reported in Wuhan and considering the shared history of exposure to Huanan seafood market across the patients, an epidemiological alert was released by the local health authority on Dec 31, 2019, and the market was shut down on Jan 1, 2020. Meanwhile, 59 suspected cases with fever and dry cough were transferred to a designated hospital starting from Dec 31, 2019. An expert team of physicians, epidemiologists, virologists, and government officials was soon formed after the alert" (Huang, et al, 2020).

Huang et al. (2020) reported that "27 (66%) patients had direct exposure to Huanan seafood market (figure 1B). Market exposure was similar between the patients with ICU care (nine [69%]) and those with non-ICU care (18 [64%]). The symptom onset date of the first patient identified was Dec 1, 2019. None of his family members developed fever or any respiratory symptoms. No epidemiological link was found between the first patient and later cases. The first fatal case, which had continuous exposure to the market, was admitted to hospital because of a 7-day history of fever, cough, and dyspnoea. 5 days after illness onset, his wife, a 53-year-old woman who had no known history of exposure to the market, also presented with pneumonia and was hospitalized in the isolation ward."

Huang et al.'s (ibid) study implicates that no epidemiological link was found between the first patient and later cases. Their data also show that in total, 13 of the 41 cases had no link to the marketplace either. The incubation time between infection and symptoms emerging is believed to be 0-24 days according to recent studies. "Only 1.18% of patients had a direct contact with wildlife, whereas 31.30% had been to Wuhan and 71.80% had contacted with people from Wuhan. Fever (87.9%) and cough (67.7%) were the most common symptoms. Diarrhea is uncommon. The median incubation period was 3.0 days (range, 0 to 24.0 days)" (Guan et al. 2020). If the maximum value of incubation period were adopted, i.e. 24 days, the first case of infection could be traced to the middle of November 2019. The South China Seafood Wholesale Market might be just a path instead of source of the 2019-nCoV. The possible virus source might be somewhere else. The 2019-nCoV was thus transmitted into the market via some potential hosts (most probably bats (cf. Chen, et al. 2020), or snakes, bamboo rats, etc., and then started spreading outside the market via human-to-human transmission. However, we haven't obtained solid evidence to prove this hypothesis, although it's quite reasonable and theoretically logical.

2. OUTBREAK OF COVID-19 ASSOCIATED WITH 2019-NCOV

2.1 Transmission of 2019-nCoV From Hubei to the World

On 31 December, 2019 (ReliefWeb, 2020), WHO received alert from Chinese authorities about a cluster of pneumonia-like patients in the City of Wuhan. Some of the patients had direct links to the seafood market. "Of the 99 patients with 2019-nCoV pneumonia, 49 (49%) had a history of exposure to the Huanan seafood market" (Chen, et al, 2020). The disease was later named as COVID-19 by WHO, which was caused by the novel coronavirus — including fever, cough and shortness of breath.

According to the reports on websites of Science alert (2020) and Sound Health (2020), one month after the emerging of symptoms of the first patient, on January 1, 2020, the local authorities of Wuhan shut down the possible source of novel coronavirus - the South China Seafood Wholesale Market, which ever sold wild animals including bats, koalas, crocodiles, peacocks, snakes, bamboo rats and wolf pups. And bats were widely speculated as a possible host of 2019-nCoV. On January 9, 2020, the WHO said that the novel pneumonia outbreak in Wuhan caused by 2019-nCoV, which was a SARS-like virus. World Health Organization (2020) confirmed the mysterious virus originated in Wuhan was a new strain of coronavirus. Until then, 59 cases had been reported. Seven of them were in severe conditions. On January 11, a local hospital reported the first death case of the COVID-19 in Wuhan (Kiernan & Bardi, 2020).

On January 13 and 17, 2020, cases of the 2019-nCoV pneumonia were detected in Thailand and Japan

(Ibid), which were believed to be the first patients outside China. All the three patients claimed that they paid a visit to the City of Wuhan. On January 15, Chinese health commission still denied human-to-human transmission of the 2019-nCoV but admitted this possibility cannot be excluded (Andrew, 2020). On January 20, 2020, Chinese authorities announced a third death and over 100 new cases of COVID-19 (Novel Coronavirus Pneumonia), sparking fears before the annual Chinese New Year break from January 25 which saw the largest migration season in Chinese mainland. Meanwhile, more cases were detected and confirmed outside Hubei Province, ranging from Beijing to Shanghai, from Shenzhen to Seoul (Ibid).

According to the report by Feng & Chen (2020), on January 23, 2020, Chinese authorities put Wuhan under quarantine with only hours of prior notice, preventing people from leaving, and even halting public transit within the city. Shortly after the closure of Wuhan, other cities in Hubei Province followed suit, thus making Hubei a sealed-off "island" in central China. Authorities ordered control measures on public transport - Hubei province is all but cut off with more than 56 million residents confined indoors. Hong Kong SAR declared a maximum health alert.

Andrew (2020) reported that on January 28, Germany and Japan announced the first cases of direct transmission outside China. The US began development of potential vaccines. In the meantime, Coronavirus death toll in China rose to 106. The number of infections also increased by 1,771 and stood at 4,515. Among them, 976 people were said to be in serious condition (Ibid). On January 29, the total registered infections surpassed those of SARS as the first cases emerged in the Middle East (Mathew et al 2020). Some person-to-person spread of this virus outside China had been detected in late January. The United States reported the first confirmed instance of person-to-person spread with this virus on January 30, 2020 (Holshue, et al, 2020). Meanwhile, WHO (2020) issued a global health emergency. On February 2, the official toll stood at 304 deaths for more than 14,000 confirmed cases. Wenzhou, a city in East China, became the first city outside Hubei Province to be locked down. Meanwhile, the Philippines reported the first virus death to occur outside China (Andrew 2020). On February 3, it was announced that China's death toll from the COVID-19 had soared past 360 (Ibid). A cruise ship, the Diamond Princess, had been under quarantine in the Japanese port of Yokohama since February 4, 2020. Japanese health ministry said that there were 65 new cases of the coronavirus identified on the ship, bringing the total aboard to 135 (Denyer, et al, 2020). The new cases included 45 Japanese nationals and 11 Americans, as well as passengers or crew from several other countries, Japanese officials announced (Ibid).

On February 11, 2020, Chinese government fired two senior health officials in Hubei province, the epicenter of the coronavirus epidemic, placing Beijing in direct control of efforts there to contain the virus spread (Neuman, 2020a). February 14, 2020, Valentine's Day, an apartment block in South China's Guangzhou City was quarantined after 6 cases of COVID-19 were detected and confirmed; sparking fears of possible new transmission paths other than person-to-person transmission (Andrew 2020). China reported 889 new cases of novel coronavirus infection on February 21, 2020, including more than 200 from a prison, and an additional 118 deaths – all but three in the province of Hubei, bringing the total deaths in the country to more than 2,200. The latest count came as South Korea, with the highest number of cases outside China, reported another jump in infections to 204 (Neuman, 2020b).

2.2 Data Collection and Estimation of the Epidemic Outbreak in Chinese Mainland

Holshue et al.'s (2020) study discovers that approximately 80% of COVID-19 cases are relatively mild and don't need major medical interventions. Another 20% patients are in serious conditions. Until now there have been no efficient drugs which could kill this novel coronavirus in total. Doctors all around the globe usually adopt supportive care to treat the patients. The strategy of supportive care is to do whatever's possible to keep vital organ systems functioning. That means monitoring vitals such as temperature, blood pressure and oxygen levels. Any antiviral drug should not be regarded as a magic bullet in dealing with COVID-19 at the moment. In other words, patients' own immunology is the keystone in the phase of treatment and recovery.

2.2.1 Training Data Collection

The current study started raw data collection from January 30, 2020. All data were downloaded from Hong Kong Centre for Health Protection of Department of Health (https://www.chp.gov.hk/en/features/102465.html). All information is based on that notified or reported by the National Health Commission, the Health Commission of Guangdong Province, Health Bureau of Macao Special Administrative Region, and Taiwan Centers for Disease Control and health authorities of overseas countries. We have focused on the following variables, namely, Mainland, Hubei, Beijing, Chongqing, Shanghai, Guangdong, and Nationwide (Chinese Mainland except Hubei Province). We put target on Hubei because it is the coronavirus epicenter. Chongqing is her adjacent neighbor along the Yangtze River, which is also the largest city in Southwest China. Beijing, the capital of China formerly known as Peking, is the political and cultural center of the world's most populous country. It is China's third largest city in terms of population and the largest in administrative territory. While Shanghai is the largest city in terms of population as well as GDP, as well as the financial and transportation center of China. As for Guangdong, it is the largest province in terms of population and GDP, creating millions and billions of products and jobs. Considering the conditions listed

above, the current research collected the corresponding data of infection numbers of those areas. The raw data are presented in the Table 1.

Table 1
Summary of variables

	Mainland	Nationwide	Hubei	Beijing	Chongqing	Shanghai	Guangdong
1	5974.00	2420.00	3554.00	102.00	147.00	96.00	272.00
2	7711.00	3125.00	4586.00	111.00	165.00	96.00	272.00
3	9692.00	3886.00	5806.00	139.00	211.00	135.00	436.00
4	11791.00	4638.00	7153.00	156.00	247.00	169.00	535.00
5	14380.00	5306.00	9074.00	168.00	262.00	177.00	604.00
6	17205.00	6028.00	11177.00	191.00	312.00	203.00	725.00
7	20438.00	6916.00	13522.00	228.00	344.00	219.00	813.00
8	24363.00	7685.00	16678.00	228.00	366.00	233.00	870.00
9	28018.00	8353.00	19665.00	274.00	400.00	257.00	970.00
10	31161.00	9049.00	22112.00	297.00	415.00	277.00	1034.00
11	34546.00	9593.00	24953.00	297.00	426.00	281.00	1075.00
12	40171.00	10540.00	29631.00	326.00	468.00	295.00	1151.00
13	42638.00	10910.00	31728.00	337.00	486.00	302.00	1159.00
14	44653.00	11287.00	33366.00	352.00	509.00	311.00	1219.00
15	59804.00	11598.00	48206.00	366.00	525.00	315.00	1241.00
16	63946.00	11960.00	51986.00	372.00	532.00	318.00	1261.00
17	66492.00	12086.00	54406.00	375.00	538.00	326.00	1294.00
18	68500.00	12251.00	56249.00	380.00	547.00	328.00	1316.00
19	70548.00	12366.00	58182.00	381.00	552.00	332.00	1322.00
20	74185.00	12503.00	61682.00	393.00	555.00	333.00	1331.00
21	74576.00	12545.00	62031.00	395.00	560.00	334.00	1332.00
22	75465.00	12803.00	62662.00	396.00	567.00	334.00	1333.00
23	76288.00	12834.00	63454.00	399.00	572.00	335.00	1339.00
24	76936.00	12852.00	64084.00	399.00	573.00	335.00	1342.00
25	77150.00	12863.00	64287.00	399.00	575.00	335.00	1345.00
26	77658.00	12872.00	64786.00	400.00	576.00	336.00	1347.00
27	78497.00	12901.00	65596.00	410.00	576.00	337.00	1347.00
28	78824.00	12910.00	65914.00	410.00	576.00	337.00	1348.00
29	79251.00	12914.00	66337.00	411.00	576.00	337.00	1349.00
30	79824.00	12917.00	66907.00	413.00	576.00	337.00	1349.00
31	80151.00	12934.00	67217.00	414.00	576.00	338.00	1350.00
32	80270.00	12938.00	67332.00	417.00	576.00	338.00	1350.00
Total N	32	32	32	32	32	32	32

2.2.2 Statistical Result and Analysis

With the help of IBM SPSS Statistics 20, we analyzed the raw data by computing paired samples correlations, correlations, and sequence charts, and the results are presented in the following tables.

Table 2
Paired samples correlations

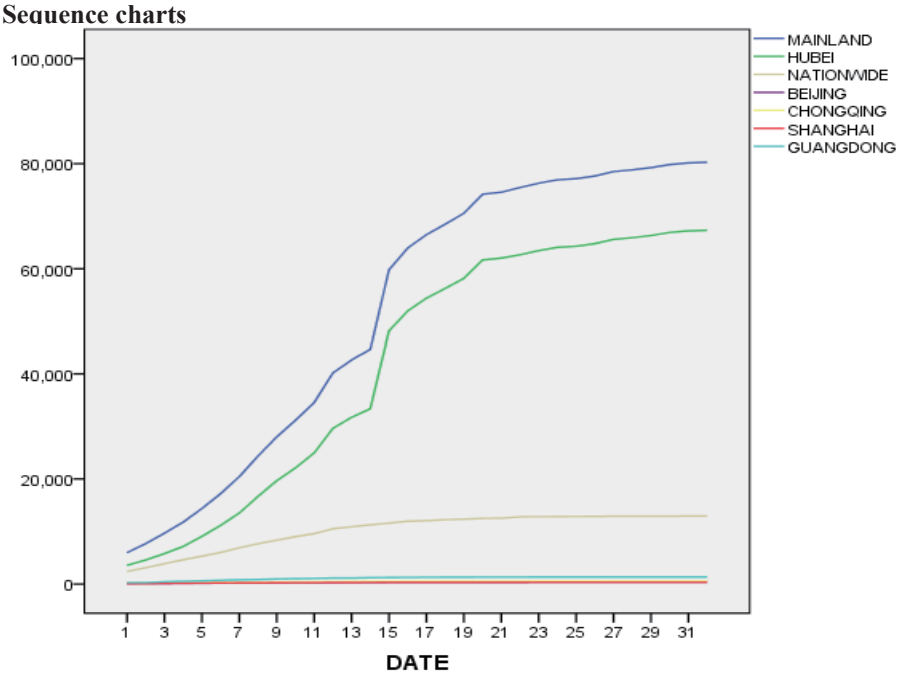
		Paired differences					t	df	Sig. (2-tailed)
		Mean	Std. deviation	Std. error mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Mainland - Hubei	10211.96875	3381.16753	597.71162	8992.92786	11431.00964	17.085	31	.000
Pair 2	Mainland - Nationwide	42010.09375	24071.13420	4255.21556	33331.52441	50688.66309	9.873	31	.000
Pair 3	Hubei - Nationwide	31798.12500	20907.80636	3696.01291	24260.05696	39336.19304	8.603	31	.000
Pair 4	Hubei - Beijing	41687.09375	23974.33860	4238.10435	33043.42294	50330.76456	9.836	31	.000
Pair 5	Hubei - Chongqing	41544.90625	23942.00519	4232.38856	32912.89288	50176.91962	9.816	31	.000
Pair 6	Hubei - Shanghai	41727.71875	24002.91767	4243.15646	33073.74409	50381.69341	9.834	31	.000
Pair 7	Hubei - Guangdong	40915.37500	23757.15551	4199.71144	32350.00705	49480.74295	9.742	31	.000
Pair 8	Nationwide - Beijing	9888.96875	3279.79809	579.79187	8706.47544	11071.46206	17.056	31	.000
Pair 9	Nationwide - Chongqing	9746.78125	3244.58980	573.56786	8576.98188	10916.58062	16.993	31	.000
Pair 10	Nationwide - Shanghai	9929.59375	3306.44045	584.50162	8737.49485	11121.69265	16.988	31	.000
Pair 11	Nationwide - Guangdong	9117.25000	3040.12490	537.42323	8021.16809	10213.33191	16.965	31	.000

Table 3
Correlations

		Mainland	Nationwide	Hubei	Beijing	Chongqing	Shanghai	Guangdong
Mainland	Pearson Correlation	1	.957**	.999**	.964**	.957**	.922**	.932**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
	N	32	32	32	32	32	32	32
Nationwide	Pearson Correlation	.957**	1	.944**	.998**	.999**	.992**	.995**
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	32	32	32	32	32	32	32
Hubei	Pearson Correlation	.999**	.944**	1	.953**	.945**	.906**	.917**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	32	32	32	32	32	32	32
Beijing	Pearson Correlation	.964**	.998**	.953**	1	.997**	.988**	.991**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	32	32	32	32	32	32	32
Chongqing	Pearson Correlation	.957**	.999**	.945**	.997**	1	.993**	.996**
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	32	32	32	32	32	32	32
Shanghai	Pearson Correlation	.922**	.992**	.906**	.988**	.993**	1	.999**
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	32	32	32	32	32	32	32
Guangdong	Pearson Correlation	.932**	.995**	.917**	.991**	.996**	.999**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	
	N	32	32	32	32	32	32	32

.. Correlation is significant at the 0.01 level (2-tailed)

Table 4
Sequence charts



2.2.3 Discussion and Estimation

Table 2 indicates that Hubei has made up the majority of the infection cases of Chinese Mainland, which is in consistency with its status of coronavirus epicenter, while the infection cases of Beijing and Shanghai are consistent with the value of nationwide. It explains that the transmission of virus first took place in the Hubei Province (possibly around Wuhan City) and then spread around China by travelers from there. Geographical factors are quite important in virus transmission. From

January 31 to 14 February 14, the infected cases of Beijing and Shanghai were confined at a quite low level (Andrew 2020), which means that the two cities' prevention efforts were effective and successful. The Pearson correlations in Table 3 also supports the observation which was deduced in Table 2, i.e., infection cases of Hubei is in highly consistency with Chinese Mainland. While the cases of infection in Beijing and Shanghai are at the average level nationwide. While the epidemic situation at Chongqing and Guangdong is relatively worse than Beijing and Shanghai.

Table 4 reveals a gigantic rise in infection cases on Day 15 and Day 16 because China on February 13, 2020 reported a unique cluster of more than 13,000 new coronavirus cases and a major spike in deaths due to new criteria for rooting out the disease in Hubei Province. Hubei officials decided to confirm cases on the basis of chest imaging instead of relying on lab-confirmation alone, according to the World Health Organization. The new block of "clinically diagnosed" cases may date back days or weeks. The total number of infected cases is relatively consistent with the models adopted by research teams at Imperial College London and University of Hong Kong. Compared with the increasing velocity of Hubei Province, the nationwide velocity shows a tendency of slowing down after February 12, 2020, which proves that the quarantine measures adopted in January are quite effective in confining the spread of 2019-nCoV nationwide. The average increasing velocities of MAINLAND, HUBEI, and NATIONWIDE are 3623.25 persons/day, 3027 persons/day, and 596 persons/day. It's hard to predict the peak of infection cases in Chinese Mainland right now, but the data indeed implicate that the increasing velocity of other areas outside Hubei Province is slowing down after February 12.

CONCLUSION

Until February 21, 2020 when we were composing this review, the outbreak of COVID-19 already deprived 1382 lives in Chinese Mainland, which surpassed the death toll of SARS outbreak 17 years ago. "Newly-emerging pathogens almost always jump from animals to humans. Ebola virus came from fruit bats or some other, yet unknown reservoir. SARS coronavirus came from palm civets, HIV-1 from chimpanzees and influenza A virus from waterfowl" (Kekulé, 2015).

1) Among the possible hosts of SARS-CoV-2, bat is the primary possible suspect. Wild animals must be well protected instead of captured, transacted, and consumed illegally. Corresponding law making and law enforcement must be strictly conducted and implemented.

2) Viruses do not jump to human beings immediately, i.e., the origin and transmission of SARS-like viruses usually need a period in a particular area. Effective surveillance and early warning system is crucially important to stop the early transmission of the virus. But unfortunately, the early warning system of epidemic in Wuhan was not effective enough in late December, 2019. Large public social gatherings still took place there in January, which accelerated the spread of SARS-CoV-2 (cf. Lipsitch, et al., 2020). Effective early warning system shall and must be established through international cooperation.

3) Immediate first response and isolation are also very effective in cutting off the spread of epidemic. But the local officials did not realize the severity of the novel coronavirus pneumonia until January 20 and decided to shut down the City of Wuhan three days later (cf. Neuman, 2020b). Should the Trump administration follow suit of the quarantine and prevention measures adopted by China, the total infections in the U.S. might not have bypassed 1 million in late April, 2020.

We propose that an integrated mechanism of epidemic prevention should be created in order to avoid such kind of tragedy in future.

REFERENCES

24KG. (2020). *Coronavirus gets temporary name - Novel Coronavirus Pneumonia (NCP)*. Retrieved from https://24.kg/english/143098__Coronavirus_gets_temporary_name_-_Novel_Coronavirus_Pneumonia_NCP/

Andrew, S. (2020). *What we know about the coronavirus cases in the US.* Retrieved from https://www.cnn.com/2020/01/27/health/coronavirus

Chen, et al. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*, Retrieved from https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30211-7/fulltext

Denyer, et al. (2020). *Coronavirus live updates: Cruise-ship infections surge as thousands remain quarantined.* Retrieved from https://www.msn.com/en-us/news/world/coronavirus-live-updates-cruise-ship-infections-surge-as-thousands-remain-quarantined/ar-BBZPBqf

Feng, E., & Cheng, A. (2020). *In quarantined Wuhan, hospital beds for coronavirus patients are scarce.* Retrieved from https://health.wusf.usf.edu/post/quarantined-wuhan-hospital-beds-coronavirus-patients-are-scarce#stream/0

Guan, et al. (2020). Clinical characteristics of 2019 novel coronavirus infection in China. *MedRxiv*, Retrieved from https://www.medrxiv.org/content/10.1101/2020.02.06.20020974v1

Holshue, et al. (2020). First case of 2019 novel coronavirus in the United States. *The New England Journal of Medicine*, https://www.nejm.org/doi/full/10.1056/NEJMoa2001191?query=recirc_mostViewed_railB_article

Hong Kong Centre for Health Protection of Department of Health. (2020). *What is COVID-19?*. Retrieved from

https://www.coronavirus.gov.hk/eng/index.html#What_is_COVID-19

Huang, et al. (2020). Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *The Lancet*. Retrieved from https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext

Kekulé, A. S. (2015, Jul.). Learning from Ebola Virus: How to Prevent Future Epidemics. *Viruses*, *7*(7), 3789-3797.

Kiernan, & Bardi (2020). *Timeline of the coronavirus.* Retrieved from https://www.thinkglobalhealth.org/article/updated-timeline-coronavirus

Li, et al. (2020). Early transmission dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia. *The New England Journal of Medicine*, Retrieved from https://www.nejm.org/doi/full/10.1056/NEJMoa2001316?query=recirc_mostViewed_railB_article

Lipsitch, et al. (2020). Defining the epidemiology of Covid-19 — studies needed. *The New England Journal of Medicine*. Retrieved from https://www.nejm.org/doi/full/10.1056/NEJMp2002125?query=featured_home

Mathew, et al. (2020). *Coronavirus outbreak: Death toll rises to 490*. Retrieved from https://gulfnews.com/world/asia/coronavirus-outbreak-death-toll-rises-to-490-1.1580458011305

Neuman, Scott. (2020). *Coronavirus found In China prisons, as cases spike in South Korea*. Retrieved from https://www.npr.org/sections/goatsandsoda/

Neuman, Scott. (2020a). *Beijing takes direct control over coronavirus response in Hubei Province.* Retrieved from https://wysu.org/content/npr/beijing-takes-direct-control-over-coronavirus-response-hubei-province

ReliefWeb. (2020). *2019 novel coronavirus (2019-nCoV): Strategic preparedness and response plan (Draft as of 3 February 2020)*. Retrieved from https://reliefweb.int/report/world/2019-novel-coronavirus-2019-ncov-strategic-preparedness-and-response-plan-draft-3

Science alert. (2020). *Here's everything you need to know about the coronavirus spreading from China*. Retrieved from https://www.sciencealert.com/here-s-everything-you-need-to-know-about-china-s-mysterious-virus

Sound. Health. (2020). *Deadly coronavirus outbreak DID start at Wuhan animal market*. Retrieved from https://www.soundhealthandlastingwealth.com/health-news/deadly-coronavirus-outbreak-did-start-at-wuhan-animal-market/

World Health Organization. (2020). *Novel coronavirus (2019-nCoV)*. Retrieved from https://www.who.int/emergencies/diseases/novel-coronavirus-2019.

Zhu, et al. (2020). A novel coronavirus from patients with pneumonia in China, 2019. *The New England Journal of Medicine*, Retrieved from https://www.nejm.org/doi/full/10.1056/NEJMoa2001017?query=featured_home

Zou, et al. (2020). SARS-CoV-2 viral load in upper respiratory specimens of infected patients. *The New England Journal of Medicine*. Retrieved from https://www.nejm.org/doi/full/10.1056/NEJMc2001737?query=featured_home

