An Overview and Generalization of the Coronavirus Within & Around China While Measuring the Effects of Moving Population

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Introduction:

The Relationship Between Coronavirus Infection and Moving Population in China

Throughout human history, there have been 26 pandemic incidents which find their origins in different parts of the world. Ranging from the "Spanish Flu" in the 20th century, the Cholera outbreak in the 19th century, the black death in the 14th century and so on. Although the sources and causes of these diseases are different, one thing in common is that they have all impacted a large population of people's lives. The latest and still ongoing pandemic (announced by the CDC that the COVOD-19 has been classified as a pandemic as of March 10th, 2020), the coronavirus has found its way from Wuhan, China to every continent in the world. Being one of the later countries to embrace this impact, the United States have seen a drastic increase in confirmed Coronavirus cases in the past week. This leaves people a daunting question, how did the virus travel across the globe? Is there a direct correlation between people traveling and increase cases of coronavirus?

The Coronavirus has been the biggest health topic within the past couple of months. Tenth of thousands of people have been diagnosed with the virus, and more than one thousand people have died from this fatal pandemic. China has been heightening their alert status due to the virus being fast-spreading, highly contagious and high death rate. Many experts and scientists have been investigating the origin of the virus, while many are trying to find a timely cure to put a hold on this situation. Many cities in China have put themselves into "lockdown" mode, meaning no one is able to go into the city and no one is allowed to come out of the city. Cities like Wuhan, where the virus started, was the first to do so (Jan 23rd, 2020). Many cities with important economic significances like Ningbo, Wenzhou and Hankou have been under lockdown, resulting in huge economic loses. Even though these cities are hundreds of miles

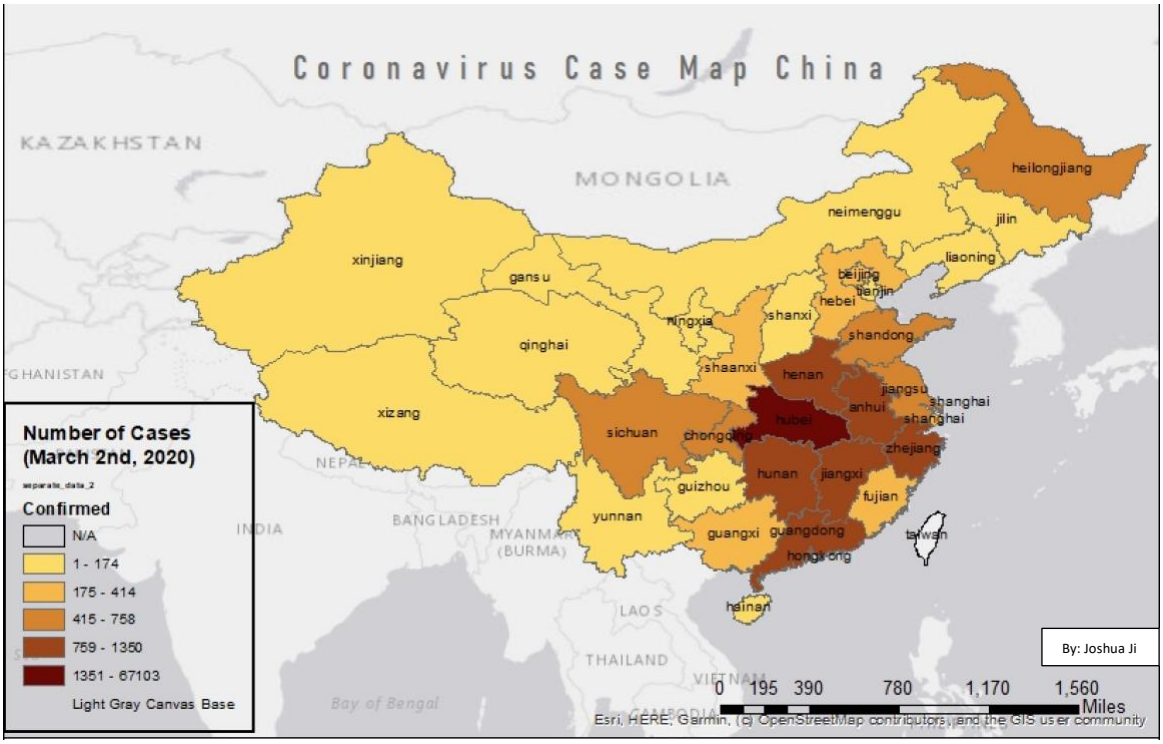
away from Wuhan, they are also experiencing severe coronavirus outbreaks. One thing these cities share in common is that fact they all have a large moving population. Many people suggested a complete lockdown of China to seal the deal on the coronavirus outbreak crisis. I want to use my map to find out whether "lockdown" is the best solution to contain this virus outbreak.

As more and more cases are tallying up, and the seemingly inevitable trend of the virus spreading throughout the globe, government around the world are slowly picking up the pace of taking precaution actions to prevent the spread of the virus. I want to readdress the focus back to China for a moment. One cultural factor that contributed to the immense outbreak in China was that, the virus appeared in one of the largest cities in China right before the biggest Chinese traveling festival—Chinese New Year. During this time, people travel back to their hometowns as a tradition to celebrate the start of a new year with their family members. Over the span of a few days, millions of people with tenth of thousands of potential carriers left the city and entered their respective hometowns before the government could have executed the "lock down" action. And while they are home, small gatherings with families take place along with many visits to friends and relatives house. Without doubt this is the most "intimate time" in China. My Atlas will include maps that portrays the travel situation from Wuhan to other provinces in China, it will discuss the question whether a higher moving population correlates to a higher infection level.

Last but not least, my Atlas will also include maps that provide people with a general idea as of what does the infectious level currently looks like within and around China. This may provide people that have scarce knowledge about the spread in Asia with some basic background knowledge and allow people to understand the severeness of the virus. This atlas aims to help

people discuss the necessity of containing the virus, and the necessity of quarantining patients as of whether restricting forms of traveling would be an optimal action to reinforce.

Map 1: Coronavirus Confirmed Cases Within China



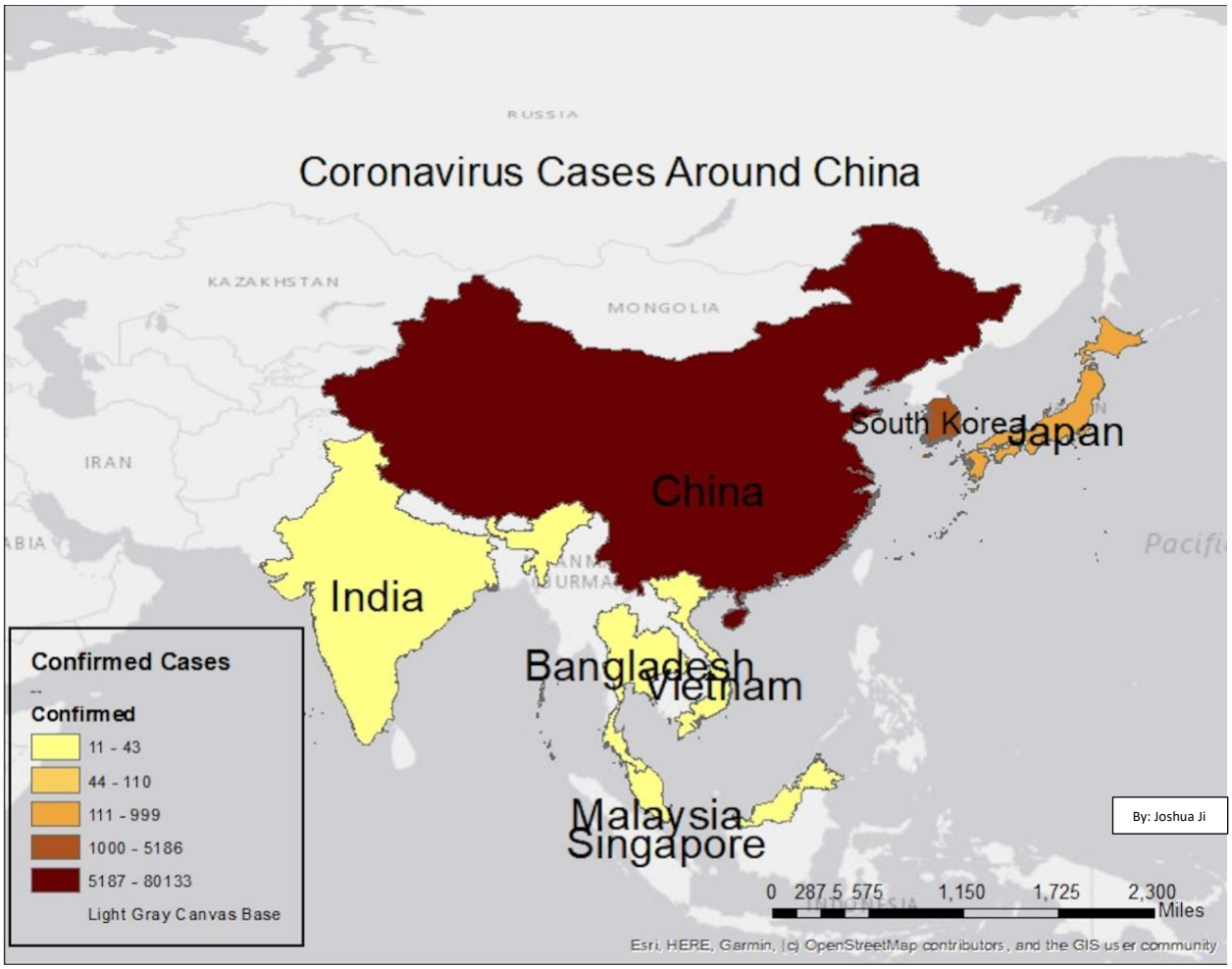
Because the Coronavirus being such a newly discovered disease with a strong tendency of spreading, all information regarding this Atlas will only concern data acquired before March 2nd, 2020. Map 1 shows the confirmed cases of the Coronavirus in China sorted by provinces. Being a choropleth map, I have decided to use darker colors to represent provinces with a higher number of infectious numbers. While we can see the center of the disease still remains to be in Hubei province (67103 cases), where the virus was first discovered. I want to note that confirmed cases in Hubei province has a large leading margin with the second most infected province, Guangdong (1350 confirmed cases). I also want to address the N/A slot in the Taiwan row. As of today, Taiwan remains legally

as a Chinese province, however, its government acts almost fully independent from Beijing, and while I was researching the coronavirus data in China, the website I searched up did not provide information regarding Taiwan. Hence, I decided to leave it as N/A to address the completed relationship between Taiwan and China. This data is collected from Baidu. This map was made on ArcGIS.

Province	Confirmed	Cured	Difference
anhui	990	894	96
beijing	414	282	132
chongqing	576	450	126
fujian	296	247	49
gansu	91	84	7
guangdong	1350	1034	316
guangxi	252	188	64
guizhou	146	114	32
hainan	168	151	17
hebei	318	294	24
heilongjiang	480	350	130
henan	1272	1205	67
hongkong	98	36	62
hubei	67103	33757	33346
hunan	1018	876	142
neimenggu	75	51	24
jiangsu	631	536	95
jiangxi	935	850	85
jilin	93	78	15
liaoning	122	103	19
macau	10	8	2
ningxia	74	69	5
qinghai	18	18	0
shaanxi	245	209	36
shandong	758	455	303
shanghai	337	292	45
shanxi	133	116	17
sichuan	538	378	160
taiwan	N/A	N/A	N/A
tianjin	136	111	25
xinjiang	76	64	12
xizang	1	1	0
yunnan	174	163	11
zhejiang	1205	1050	155

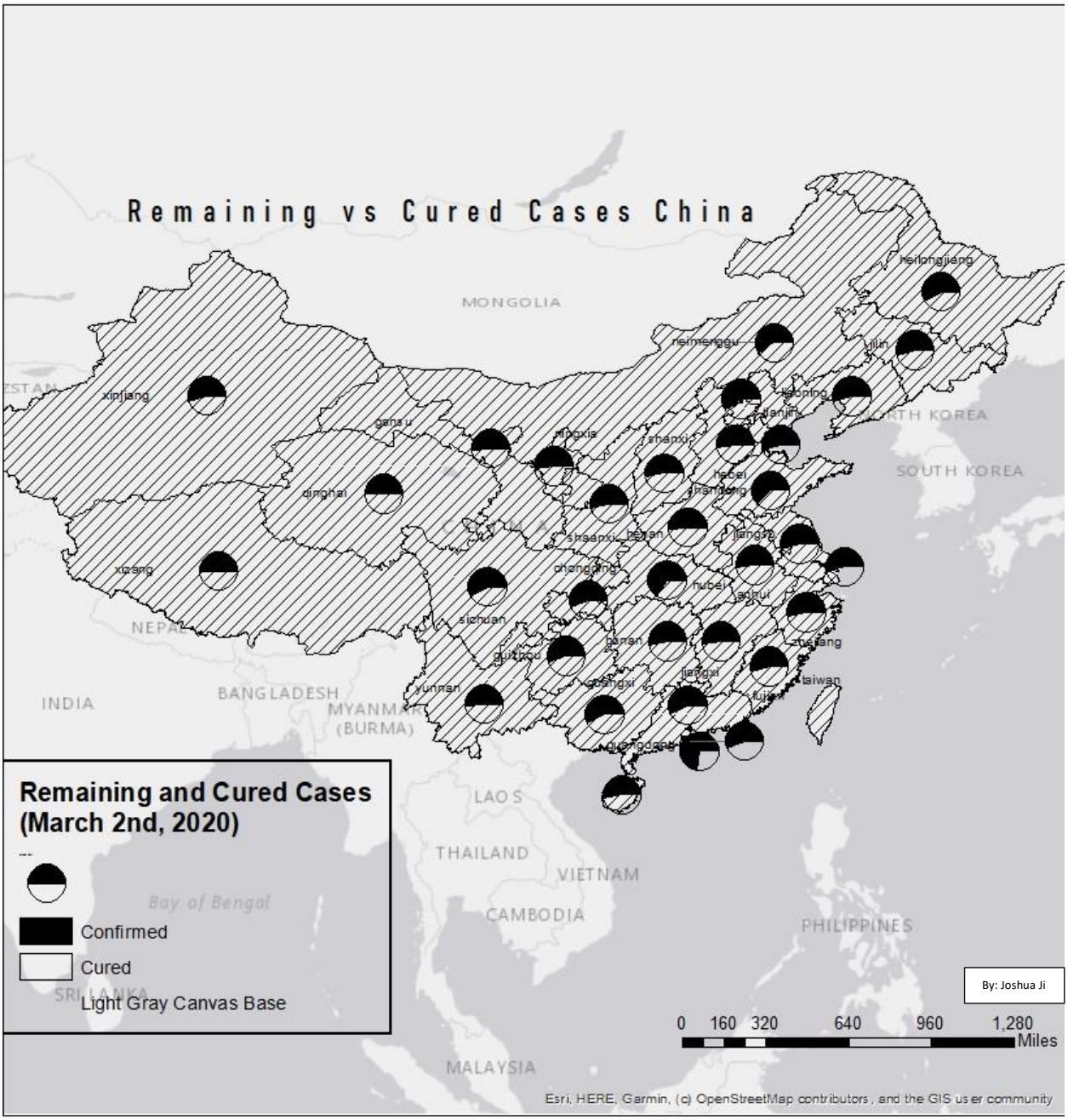
(The attached table is the break-down of the confirmed Coronavirus cases by province in China)

Map 2: Confirmed Coronavirus cases in countries around China



Once again this is a choropleth map and I have used the same guidelines as before by using darker degree colors to represent countries with a higher number of confirmed cases. The data is collected from both WHO's and CDC's database. Here we can see only China remains with the darkest degree of color. These are the countries that have over 10 confirmed cases by the day I created this map. While there is a surplus amount of unconfirmed cases in these countries, I focused on the confirmed numbers where people have received positive test results. This map was made on ArcGIS.

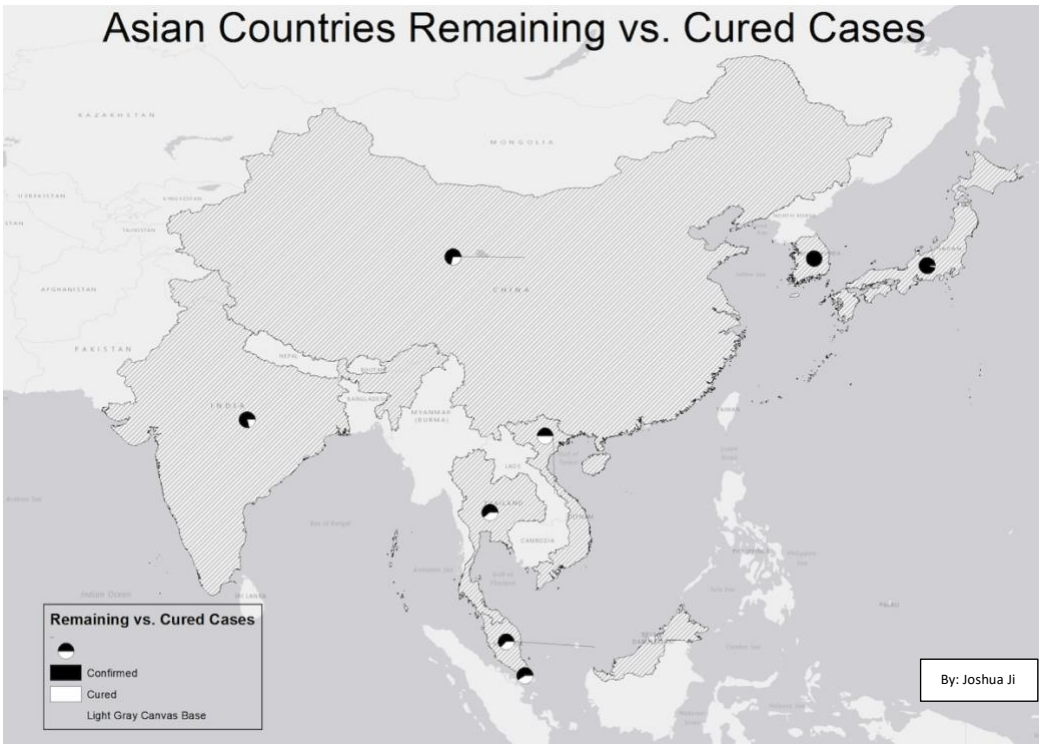
Map 3: Remaining Cases vs Cured Cases in China



Map 3 shows the current differences in the remaining confirmed cases and cured cases within each province of China. I used a pie chart to showcase a direct comparison with each other provinces. I think a pie chart best represent the different because some provinces have more confirmed cases than the other and would definitely have a higher

number of cured cases. I think what's more important is to show the ratio of whether the province is seeing a higher cured rate or aggregation rate. This helps guide users and health authorities to further assess the gross of the coronavirus in the near future. We can see in most provinces, there are still a larger remaining confirmed rate, with some provinces like Xinjiang and Qinghai have seen an equal amount of confirmed and cured cases meaning there are no patients anymore. The data is collected from Baidu. This is a pie chart map. This map was made on ArcGIS.

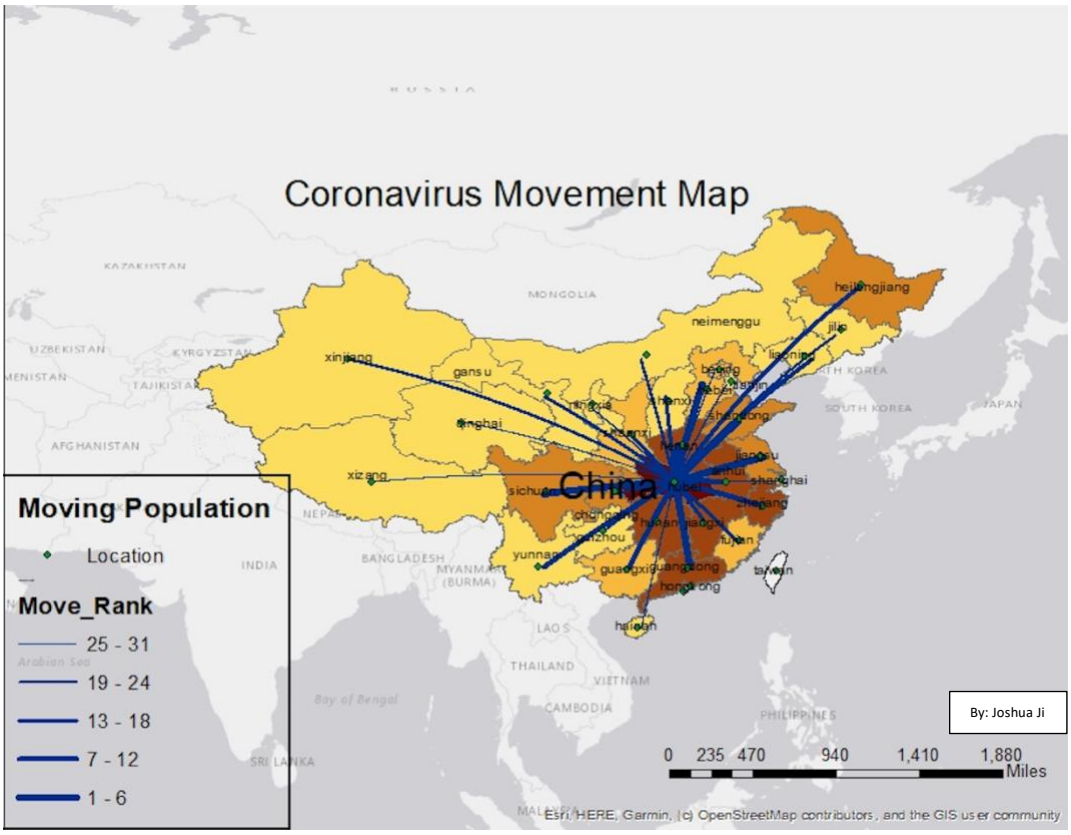
Map 4: Confirmed vs. Cured Cases in countries around China



Map 4 shows the difference between confirmed cases and cured cases in China and countries around China. This data is collected from CDC and WHO. This map is a pie chart map. I have used the same countries as Map 2 and followed the same guideline as Map 3 in representing confirmed cases and cured cases. Some interesting points of this

map I want to point out is data regarding Korea. We can see the circle is almost completely blacked out, meaning there are no cured cases found yet. This is because the day I gathered the data was right after the outbreak starting to pick up in Korea, leaving them the fastest growing country by rate. Thousands of new cases were confirmed compared the previous day when there were only around 100 confirmed cases. Same goes to Japan where the confirmed cases are way higher than the cured cases. This is due to the low number of confirmed cases in general outweighing the cured cases by ratio. And therefore, a more filled up circle does not mean the country is doing a bad job in curing patients. This map can be deceiving to read without these further descriptions. This map was made on ArcGIS.

Map 5: Population Movement Map



Map 5 shows the transportation of population from Wuhan to different provinces in China two weeks before the city went through the lockdown (Jan 23rd, 2020). The moving data was collected from Baidu. This is a choropleth map combined with lines. Like I mentioned in the introduction, the outbreak happened right before the largest traveling festival in China and potentially aided the spread of the coronavirus. Why I chose to only find data regarding the traveling history 2 weeks before the lockdown is because the virus is reported to have an up-to two weeks hibernation period before someone starts showing symptoms. Hence, I gathered this data and ranked each province from the most amount of people to the least amount of people coming from Wuhan in an ascending order. With higher moving population having a thicker stroke. From the map we can see that generally with more people coming from Wuhan, the province is seeing a higher number of confirmed cases by March 2nd. This map was made on ArcGIS.

Citations

Coronavirus Cases Database. (2020). Baidu. [Table]. Website. Retrieved from: https://voice.baidu.com/act/newpneumonia/newpneumonia

Moving Population This Chinese New Year Season. (2020). Baidu. [Table]. Website. Retrieved from:https://baike.baidu.com/item/%E4%B8%AD%E5%9B%BD%E5%9F%8E%E5%B8%82%E4%BA%BA%E5%8F%A3%E6%8E%92%E5%90%8D%E8%A1%A8/16620508?fr=aladdin

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