Local public health officials and COVID-19: Evidence from China

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Abstract

Understanding what contributes to the slowing down of COVID-19 in China is essential for other governments to better deal with the pandemic. Similar to their counterparts in the U.S. and the U.K., local public health authorities in China are responsible for monitoring infectious diseases and organizing the responses to public health emergencies. However they are not typically viewed as essential as China policymakers focus on economic growth. Only 38% of the heads of the public health departments of Chinese cities have a medical background. We find that cities with medical professionals as the head of public health departments had lower infection rates and death rates from COVID-19. The results were significant only at the start of the outbreak. Our results suggest to better combat a pandemic, local public health authorities should be led by competent people who have a medical background.

Keywords: COVID-19; public health administration; international aspect
Many states in the United States are struggling with how best to slow down the spread of the pandemic COVID-19. Examining China’s experience is useful for suggesting how other governments should handle the ongoing health crisis. This study investigated whether more professional local public health officials in China were associated with lower infection rates and deaths rate of COVID-19. This inquiry follows the stream of literature showing that the quality of public officials matter for economic development, political reform, and other policies (e.g., Jones and Olken 2005; Besley, Montalvo, and Reynal-Querol 2011; Dreher, Lamla, Lein and Somogyi 2009; He and Wang 2017).

Similar to their counterparts in the U.S., local public health departments in China are responsible for monitoring infectious diseases and organizing the responses to public health emergencies. As policymakers in China typically focus on economic growth, the public health departments are not viewed as important posts. More affluent areas potentially have more supply of qualified individuals to serve in the public health department and more demand for high quality of public service. It is critical for us to control for each area’s economic development to isolate the role of public health officials from the quality of the government in general. Another recent event introduced more random factors to who head a local public health department. In 2018, following the merger of Ministry of Health and National Population and Family Planning Commission at the national level, local public health offices also combined with local family planning commissions, which were created to enforce the one-child policy and were generally staffed by people without any medical trainings. The merger led many former bureaucrats from the family planning commissions to head the new public health departments, which potentially diluted their mission in disease prevention.
Chinese government locked down Wuhan, the epicenter of COVID-19 on January 23, 2020.¹ Soon after, all major cities followed suits and imposed strict staying-at-home orders. However, the first COVID-19 case was reported in December 2019 (Li et al. 2020). As the public questioned the slow response of the government, many local public health officials were disciplined for mishandling the epidemic. For example, the director of the public health authority of Huangguang, which had the second most confirmed cases in Hubei province, was dismissed for causing problems such as “insufficient screening for suspected cases, slow progress of tests and lack of testing personnel.”² The media noted that she studied law in college and had no working experience in healthcare. Would more competent local public officials make a difference in fighting COVID-19? Or were public health officials the scapegoats to deflect the public’s outrage against the central government?³ We make a systematic investigation using public health officials’ professional background as a proxy for competence.

Unit of analyses

In China, prefectures are administrative divisions that are smaller than provinces and bigger than counties. The epicenter of the COVID-19 outbreak, Wuhan, is a prefecture in Hubei province with more than 11 million residents. We chose prefectures as the unit of analyses because their public health departments carried out the tests of the virus and communicated with the local community about confirmed cases. The preventive measures, such as discouraging public gathering and closing restaurants and schools, were also announced by individual

¹ https://en.wikipedia.org/wiki/2020_Hubei_lockdowns, Accessed June 6, 2020.
² https://www.businessinsider.com/analysis-china-hubei-officials-sacked-xi-jinping-protected-2020-2. Accessed April 6, 2020.
³ https://www.latimes.com/world-nation/story/2020-01-27/xi-jinping-reputation-china-authoritarian-system-outbreak-coronavirus Accessed April 18, 2020.
prefecture governments. Since most prefectures are middle-sized cities, we refer to cities and prefectures interchangeably in the rest of this article.

Local public health chiefs with medical background

We collected the resumes of directors of the public health department from the individual city government’s website. China has 31 provinces. We excluded Xizang (Tibet) due to its special governance status and lack of information disclosed on its government website. Among 412 cities of the 30 provinces in China, we successfully identified the detailed background of the chief public health officials of 350 cities, which include 87% of the Chinese population. We coded public health officials as medical professionals if they had a medical degree or started their career in a hospital, epidemic prevention center, or other healthcare-related fields. Among the 350 public health chiefs, only 38% are medical professionals. Figure 1 reported the percentage of public health chiefs who are medical professionals and the average GDP per capita for each province. The graph indicated that affluent areas were more likely to appoint medical professionals as public health chiefs. The Pearson correlation was about 0.6 for these two variables. We plotted a linear regression line in the graph in Figure 1. Beijing and Guangdong, two places that suffered the most from the 2003 SARS outbreak, had a higher than expected proportion of medical professionals leading local public health departments. After experiencing a public health crisis, perhaps the local governments learned to appreciate the importance of qualified public health officials.

Infection rates and death rates from COVID-19
We exclude Wuhan from the following analysis because of its extreme situation.\textsuperscript{4} As of February 20, 2020, the confirmed cases in Wuhan were 70 percent greater than those in the rest of our sample areas combined. The deaths from COVID-19 in Wuhan were more than three times greater than those of the rest of our sample areas. Including Wuhan would distort this study’s inference.

We analyzed the infection rate over time to assess the impact of the role of local public health officials. As the number of confirmed cases climbed, all local governments mimicked each other and adopted the same policy. If competent local public health officials had any impact, more likely it would be observed in the early period of the COVID-19 outbreak.

The spread of COVID-19 was highly associated with the number of people who migrated from Wuhan (Zhan, Tse, Fu, Lai, and Zhang 2020; Qiu, Chen, and Shi 2020). Accordingly, we controlled for total number of people who traveled from Wuhan to each city between January 1 and January 22, 2020. The data were provided by Baidu, one of the largest internet companies in China, which reported aggregate migration data among cities based on users’ map applications. Wuhan is the capital city of Hubei province. To capture the close connection among prefectures in Hubei, we included a Hubei indicator. Since affluent cities were more likely to appoint former medical practitioners to head their public health departments, we included a city’s GDP per capita to isolate the impact of professional public health officials from an area’s economic development. When analyzing the death rates from COVID-19, we also included the number of beds per thousand to proxy for a city’s medical resources. In sum, here are the models we use:

\textsuperscript{4} The dire situation in Wuhan can be traced to the local government’s incompetency. https://www.wsj.com/articles/china-contends-with-questions-over-response-to-viral-outbreak-11579825832.
COVID-19 Cases Per Million = α + β₁ PublicHealthHeadᵢ (Medical Professional=1) + β₂ Hubei Indicator + β₃ Log People Travelling from Wuhan To the Cityᵢ + β₄ Most Recent GDP Per Capitaᵢ + Errorsᵢ                  (1)

COVID-19 Death Per Million = α + β₁ PublicHealthHeadᵢ (Medical Professional=1) + β₂ Hubei Indicator + β₃ Log People Travelling from Wuhan To the Cityᵢ + β₄ Most Recent GDP Per Capitaᵢ + β₅ Hospital Beds Per Thousandᵢ + Errorsᵢ                                   (2)

**Descriptive statistics**

Table 1 reports the descriptive statistics of all variables in our analyses. As of January 31, 2020, the average infected cases per 10 million in each city other than Wuhan were 54, with 6426 cases in total. New cases increased to 122 per 10 million in the ten days ending on February 10, with 14,845 cases in total. In the next ten days, only 55 new cases per 10 million were reported, with 5,558 cases in total. As of February 20, 2020, there were four deaths per 10 million resulting from COVID-19 (464 deaths in total). From January 1 to January 22 of 2020, Baidu recorded that people traveled from Wuhan to other cities of China more than 91 million times. We took the natural logarithm of this variable to deal with the skewness. The average GDP per capita was $8,900 at the end of 2017, the latest number available. On average, there were 5 hospital beds per thousand people in each city.

**Results**

We use a multivariate regression to explain the confirmed cases and deaths from COVID-19. As shown in Table 2, professional public health chiefs were associated with 21 fewer confirmed cases of COVID-19 as of January 31, 2020 (two-tailed p-value=0.02), and 58 fewer new cases between February 1 and February 10, 2020 (two-tailed p-value=0.05). For the next 10 days, professional public health chiefs were not significantly associated with fewer new COVID-19
cases. The results were consistent with the hypothesis that the impact of professional public health chiefs was more critical in the early days of the pandemic episode.

As of February 20, 2020, cities whose public health chiefs had medical backgrounds experienced three fewer deaths per 10 million people from COVID-19 (two-tailed p-value=0.08). Figure 2 presents these estimates more vividly. The numbers were generated by STATA’s margins command, which estimated the infected cases and deaths for the two groups of cities holding all other variables at the mean value. We didn’t graph the estimates from February 11 to February 20, 2020, since the difference between the two groups of cities was not statistically significant.

The results also indicated that the Hubei indicator and the number of times people traveled from Wuhan were positively associated with the confirmed cases and the deaths from COVID-19. The number of hospital beds was negatively associated with the deaths from COVID-19, indicating areas with more medical resources could better handle severe cases. The adjusted $R^2$, which captured the overall model fit, declined from 0.73 to 0.70 and 0.36 in explaining the infection rates over time. The change indicated that over time the spread of COVID-19 was less associated with imported cases from Wuhan.

**Conclusions:** We find that Chinese cities whose public health chiefs had medical backgrounds were associated with fewer infections from COVID-19, especially in the early period of the outbreak. Though the evidence is indirect, it is consistent with the conjecture that competent public health chiefs slowed down the spread of COVID-19. In western countries, where local governments have more discretion in responding to a pandemic, competent public health officials might play an even bigger role in fighting a public health crisis.
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We collected the resumes of the directors of public health departments of 350 prefectures (cities) from 30 provinces in China, which include 87% of the Chinese population. For each province, we calculated the percentage of directors with a medical background and the average GDP per capita.

The estimates were made based on the multivariate regression models in Table 2. They were generated by STATA’s margins command. All other variables were taken at their average value.
Table 1 Descriptive statistics for 349 prefectures (excluding Wuhan)

| Variables | mean | median | std  | p25  | p75  |
|-----------|------|--------|------|------|------|
| COVID-19 cases per 10 million as of 01/31/2020 | 54   | 18     | 155  | 7    | 41   |
| New cases per 10 million 02/01/2020 -02/10/2020 | 122  | 30     | 470  | 12   | 69   |
| New cases per 10 million 02/11/2020 -02/20/2020 | 55   | 8      | 337  | 0    | 21   |
| COVID-19 deaths per 10 million as of 02/20/2020 | 4    | 0      | 25   | 0    | 0    |
| Public health dept. headed by medical professional (Yes=1) | 0.38 | 0.00   | 0.48 | 0.00 | 1.00 |
| Located in Hubei Province (Yes=1) | 0.03 | 0.00   | 0.18 | 0.00 | 0.00 |
| Natural log of people (000) traveling fr. Wuhan 01/01-01/22 | 4.07 | 4.12   | 1.32 | 3.12 | 4.87 |
| GDP per capita (000 $) | 8.90 | 7.20   | 5.74 | 5.05 | 10.80 |
| Hospital beds per thousand people | 5.2  | 5.0    | 1.7  | 4.2  | 5.7  |

Note: confirmed cases and deaths of COVID-19 from each city were gathered from dingxiangyuan (ncov.dxy.cn), a professional healthcare website whose primary resource is newspapers and national and local governments. The city population and Gross Domestic Product (GDP) were from the 2018 China Statistical Yearbook. The number of times that people traveled from Wuhan to each city from January 1, 2020 to January 22, 2020 (before Wuhan was quarantined) was reported by Baidu, a leading internet company in China, which aggregated users’ location data on a daily basis. The number of hospital beds was from CEIC Data, a data provider of Chinese statistics.

Table 2
Multivariate regression to explain the COVID-19 infection rates and death rates among 349 Chinese cities

| VARIABLES | (1) COVID-19 cases as of 01/31/2020 | (2) New cases btw 02/01 and 02/10 | (3) New cases btw 02/11 and 02/20 | (4) deaths as of 02/20 |
|-----------|------------------------------------|----------------------------------|----------------------------------|------------------------|
| Public health head is medical professional | -21.3** (0.023) | -57.6** (0.050) | -35.7 (0.154) | -3.3* (0.083) |
| Located in Hubei Province | 612*** (0.000) | 1,953*** (0.000) | 1,038*** (0.010) | 99*** (0.000) |
| Ln of people travelling from Wuhan | 21.0*** (0.000) | 39.2*** (0.000) | 16.1*** (0.010) | 1.0** (0.023) |
| GDP per capita | 1.07 (0.148) | 2.29 (0.233) | 1.91 (0.395) | 0.17 (0.274) |
| Hospital beds per thousand | | | | -0.69* (0.060) |
| Constant | -54*** (0.000) | -103*** (0.000) | -50 (0.115) | -0.3 (0.831) |
| Observations | 349 | 349 | 349 | 349 |
| Adj R-squared | 0.73 | 0.70 | 0.36 | 0.55 |

Robust p-value in parentheses; All variables are defined in Table 1
*** p≤0.01, ** p≤0.05, * p≤0.10