



Estimating the True Number of China's COVID-19 Cases

By Derek Scissors

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Key Points

- China's COVID-19 figures are not arithmetically sensible. The Communist Party has deliberately made estimation difficult, but, outside of Wuhan city and Hubei province, cases are low by a factor of 100 or more.
- In late January, Chinese media provided information about migrant outflow from Wuhan before quarantine. Using a lower number than theirs, then conservative figures for migrants' infection rate and time in circulation before national lockdown, generates an estimate of 2.9 million cases.
- This is partly due to China's huge population. That population can also hide COVID-19 among tens of millions of respiratory illnesses. Along with harshly enforced censorship, the population can hide tens of thousands of deaths.

In early April, headlines read that the global figure for COVID-19 cases had breached one million. At the same time, China rejected charges by US intelligence and others that it has lied about the extent of its outbreak.¹ Population size makes it almost certain that China's disinformation about what happened outside the original outbreak city of Wuhan is worse than the disinformation about what happened inside. A conservative estimation process, starting with numbers provided by the Communist Party, indicates that the world passed one million cases weeks ago, most of those in China.

Straight from the Party

China and its defenders will reject any and all evidence, but their task can be made a bit harder. Begin with an article on January 27 from a party-vetted state media outlet. The numbers from the

article, even making the most important one much smaller, shows China lying on a huge scale about COVID-19 outside Hubei province. The article reports:²

- Five million people left Wuhan in the three weeks before the lockdown;
- 30–40 percent, or 1.5–2 million people, left Hubei entirely; and
- About 465,000 people flew to the 10 listed cities outside Hubei.

The third item conforms to a 520,000-person monthly average in air travel from Hubei and is a direct count.³ Keep it.

The first figure is too round; five million is too easy for a politician to say when the truth is multiple millions. Doubting Wuhan's mayor in this instance keeps China's numbers lower, but, when

you question those numbers for a living, you cannot pick what you like. The article says 2.4 million people left Wuhan for a 2018 holiday, but there is no matching figure for 2019. Cut the 2020 level to three million. It might be more like four million, but five is too high.

Related, the share given as leaving Hubei may be accurate, just not for a total of five million. A top destination when leaving Hubei is Henan, which has both the largest population of the neighboring provinces and a city that sends the most migrants to Wuhan. The number of migrants from this city is 1.54 percent of Wuhan's population, about 170,000 people.

The flights graphic in the article has other popular cities for outbound travel. If fewer than half a million people flew to those and the most likely top city received no more than 170,000, it is unlikely 1.5 million left the province, much less two million. Use 1.2 million—still 40 percent, but of the lower estimated outflow of three million. (Same result from using the low end of 30 percent and an outflow of four million.)

Getting Past One Million

How many of these migrants were infected depends largely on when the outbreak began. December 30 is when Wuhan first called for help.⁴ November 17 has been mentioned as the possible first case.⁵ December 12 is probably the single best guess.⁶ COVID-19 began circulating at least four weeks, probably six weeks, and as many as nine weeks before quarantine. (It should be said that no country could have instantly known what was happening.)

Once the outbreak begins, there is a time series of departures. The number of infected migrants is very low if departures were concentrated in late December, higher if concentrated in mid-January. The likelihood of flight immediately before the quarantine date suggests a higher rate of infected migrants. China has provided no comprehensive data on tests, and infection rates appearing only now would be suspect. Countries testing and reporting now usually show high infection rates, but this overstates the situation versus Wuhan in December.

South Korea was the first aggressive, transparent testing country. It provides the best information about infection rates in other countries if testing

had been done (and published) early on, as in the early period in Wuhan. South Korea has also successfully limited COVID-19 spread compared to other high-test countries, making its use as a benchmark favorable for official Chinese COVID-19 figures. The positive rate in South Korea has been falling as testing expands while the virus remains checked. On April 6, it was about 2.3 percent.⁷

Estimating 1.2 million people leaving Hubei is conservative according to state media, and a 2.3 percent infection rate is the lowest useful one available. The combination is akin to a floor estimate: The rest of China started the post-Wuhan quarantine period January 23, with at least 27,000 cases from Wuhan migrants. Yet, as of April 6, the rest of China has reported about 15,200 cases, cumulative over time and supposedly including everyone at those locations.⁸

How many cases China is failing to acknowledge is less a matter of the number of initially infected migrants than the days they were in circulation.

The level China reports can be generated by cutting South Korea's already low infection nearly in half, but there is no justification to do so. Far worse, it would also require Wuhan migrants to have infected no one at all. China's number is not reasonable.

How many cases China is failing to acknowledge is less a matter of the number of initially infected migrants than the days they were in circulation. Even if the conservative estimate of 27,000 is too high, for early outbreak sites Germany, Italy, and Spain, it took fewer than four days to get from China's current 15,000 outside Hubei to 27,000 (and then go from there). Due to a late start to testing that affects all our numbers, the US took two days.⁹

Crucially, the days in circulation are not what China and its defenders imply or claim. Migrants from Wuhan to the rest of China initially faced no restrictions at all, since there was no crisis, then restrictions similar to those seen later in other countries. True lockdowns elsewhere began in Wenzhou and then spread to other cities over the

Figure 1. Calculation Summary



Source: Author.

week of February 2.¹⁰ Wuhan’s quarantine was not an instant national solution, never mind retroactive to December.

The lowest number of days the migrants were in national circulation is 11, and that only if leaving Wuhan on January 22—when they have the highest infection rate—for Wenzhou. In the 11 days after Italian cases reached 27,000, the case number roughly tripled, despite a second set of broad Italian restrictions being imposed nearly a week earlier.¹¹ Among countries with a high number of cases early on, Italy is the most favorable comparison for the official Chinese position. From 27,000, Germany’s cases more than triple in 11 days. Spain’s quadruples. And the number of cases in the US increased at twice Spain’s speed.

Average circulation time in China was obviously longer than 11 days. It again depends on the time series of out-migration. The state media article goes back 24 days before quarantine. The full range is back to the (December 12?) start of the outbreak.

Determining days in circulation weighted by number of infected migrants is challenging, but presently overtaken by data limits. At time of writing and using 27,000 cases as the starting point, the maximum days of circulation from even a partly reliable source is Italy at 21. After weeks of national restrictions and slowing spread, 21 days from 27,000 cases pushed Italy passed 130,000. Germany is trending worse, Spain is already worse than Italy in a shorter period, and the US is worse than Spain.

That makes 130,000 another conservative estimate. By itself, it would leave the official tally off by close to a factor of nine. Of course, China is

different. It has become common to hear assertions that Chinese cultural superiority enables arithmetic-defying results. Nonetheless, here is a bit more arithmetic: Merely the top four cities for the migrant flights from Wuhan in the state media article match Italy’s population. Henan’s population alone is 50 percent larger. In total, China ex-Hubei is nearly 23 times more populous than Italy.

While a good chunk of China is minimally exposed to Wuhan migrants, the outbreak is also geographically concentrated in other high-case countries—Lombardy, Madrid, and New York/New Jersey—making those data relevant. The raw number of Chinese cases must be considerably higher than anywhere other than India due to population size, even granting a far superior policy response to the infection and a resulting infected share of the population that is much lower.

Simply scaling 130,000 up for population size yields *over 2.9 million cases* outside Hubei. (See Figure 1.) *A superior Chinese infection response is already incorporated in this figure* by limiting circulation time to 21 days, when it is almost surely longer. Cutting yet more days off circulation time, to simulate a miraculous Chinese response, would reduce the estimate to only 150 times larger than the barely 15,000 cases Beijing reports.

Can Millions Make Sense?

A natural reaction to figures in the low millions: China is plainly lying but not by nearly that much, because the Communist Party cannot hide 2–3 million cases. Yes, it can. Flu illnesses in the US neared 20 million before the end of January—before

COVID-19 was widespread here, with two months left of flu season, and at less than one-fourth of China's population. Chinese respiratory illnesses of all kinds could easily exceed 100 million, hiding 2.9 million COVID-19 cases.¹²

The Centers for Disease Control and Prevention estimate for US COVID-19 hospitalization is 12 percent, but that is cautioned to be low. A more recent unofficial estimate is similar but also incomplete.¹³ At 2.9 million cases, 12 percent would be 350,000 hospital beds. To more than compensate for the understated American numbers, arbitrarily double China's true hospitalizations to 700,000 beds. China appears to have around six million hospital beds.¹⁴ A serious strain, if people facing severe movement restrictions were admitted to hospitals at that rate. But those movement restrictions and censorship backed by arrest mean any such strain would be unlikely to become public.

Mortality remains sadly unsettled,¹⁵ but China's size would obscure even a high rate. Hubei's COVID-19 mortality should be quite high, due to the obvious inability to prepare and being initially overwhelmed. It is 4.7 percent. If extended over the rest of China—which is thankfully an exaggeration—that would produce 136,000 deaths over what is now more than three months. In a typical three-month period in ex-Hubei China before COVID-19, nearly 2.5 million people died.¹⁶ Even that many deaths would be easily obscured.

What about the economy? The party admitted the economy was terrible through February but claims a steady recovery. How can that be possible with so many COVID-19 cases? January to February notwithstanding, China frequently misleads about its economy. In the reform era, many trees have been

devoted to showing overstated Chinese gross domestic product growth.¹⁷ More pertinent for this, Beijing does not even pretend to measure unemployment correctly because, like COVID-19, it is politically sensitive.¹⁸ There are other examples, such as official urban and rural income growth being inconsistent with national gains.¹⁹

The early February extension of shutdowns beyond Hubei does mean the heaviest economic blow started then. The economy is stronger in early April (time of writing) than just four weeks earlier. However, "stronger" lacks perspective. Near the end of March, only 76 percent of small firms had resumed operations, much less running near capacity. At the end of March, corporate invoice volume was 18 percent smaller than during the same period of 2019.²⁰ The National Bureau of Statistics will likely trumpet recovery in its benchmarks, but, if not for February, March would be a leading candidate for the worst month of performance since the 1970s.

Bottom Line

It is the party's intent that no estimate of Chinese COVID-19 cases can be entirely convincing. Getting to 2.9 million cases starts with information offered by state media, uses the lowest available infection rate, applies days in circulation with a deliberately reduced figure to reflect a superior Chinese virus response, then stirs in the 1.39 billion people. Or you can believe that 1.2 million travelers from ground zero of a pandemic, some freely circulating for weeks, resulted in national contagion of a little over 15,000 cases.

About the Author

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Notes

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