

The University of Yamanashi battles COVID-19

Counting the undercounted: Just how many COVID-19 cases have gone overlooked?

Opinion

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1. Overlooked patients: A consequence of a PCR-testing framework on par with the developing world

In the last entry in this series, we explained that Japan’s PCR-testing system—similar in scale to the frameworks in developing countries—has undermined the country’s international credibility.¹⁾ This article probes the roots of the issue further, incorporating data analysis to examine how insufficient PCR testing plays into the rising numbers of COVID-19 cases in Tokyo, Osaka, and other major cities in Japan.

Table 1 is a selection of data from the Johns Hopkins University Coronavirus Resource Center, which provides daily updates on COVID-19 cases and other information for a total of 120 countries.²⁾ As we mentioned in Part 3, Japan had the 30th-most patients with positive PCR tests (confirmed cases) as of April 11, 2020. Japan’s COVID-19 fatality rate (the ratio of deaths to confirmed cases) was 1.6%, 90th of 120 in a tie with Taiwan and two other countries.

Considering that Japan’s total count of PCR tests—the “only way of testing for COVID-19”³⁾—sits at a level comparable with the regimens in emerging countries, we have strong doubts about whether the official numbers of confirmed COVID-19 cases and fatalities actually reflect the reality in Japan. Below, we delve deeper into that question from a statistical standpoint.

Table 1 shows the data for five countries with Healthcare Access and Quality (HAQ) Index scores [0-100] (a barometer of the quality of medical care available in a given country)⁴⁾ similar to Japan’s and fatality rates lower than Japan’s: Australia (HAQ Index score: 88), Israel (86), Singapore (86), New Zealand (86), and Qatar (85). While the five countries’ scores indicate levels of medical quality comparable with that of Japan (86), their fatality rates range between 0.3 and 0.9%—roughly half of Japan’s rate, at most.

Placing these values in context with the numbers from the University of Oxford’s “Our World in Data” resource⁵⁾ highlights a stark contrast. Australia’s PCR test count was 22.8 times Japan’s as of April 12. The data for the other countries shows similar disparities: the local PCR test total outnumbered Japan’s by 31.3 times in Israel (as of April 10), 28.0 times in Singapore (as of April 7), and 21.3 times in New Zealand (as of April 11). There was no data available for Qatar, but the numbers for the other countries have statistical implications. Administering more PCR tests leads to the discovery of more confirmed cases, thereby increasing the value of the denominator in the formula for determining fatality rate—and the higher the denominator is, the lower the fatality rate becomes. The significant difference between the fatality rates in the above countries and the comparatively high rate in Japan thus ties into that divergence in PCR test count, which ranged in size by a factor of anywhere from 21.3 to 31.3.

The numbers thus point to the significant possibility that Japan’s official number of confirmed cases is an underrepresentation, considering the country’s comparatively high fatality rate and strikingly low PCR test count. If one were to apply the COVID-19 fatality rate in the above five countries to the figures in Japan, dividing the number of fatalities by a lower percentage, one could deduce a range of confirmed-case estimates. If Japan’s actual fatality rate was 0.2%, the rate in Qatar, Japan’s estimated number of confirmed cases as of April 11 would grow to 49,500. Even applying a fatality rate on the highest end of the range, such as the 0.9% rate in Israel and Australia, produces a confirmed-case estimate of 11,000. Subtracting out the official number of confirmed cases (6,005) from those estimates reveals the possible scope of overlooked (actual but untested) cases: around 5,000 at the very least to as high approximately 43,000. In either case, one could fault Japan’s paltry PCR test count—on par with much of the developing world—for the discrepancy.

Table 1. COVID-19 confirmed cases, fatalities, and fatality rates in select countries

Country/region	Confirmed cases		Fatalities			Fatality rate per 100,000 people (%)
	No. (A) (cases)	Rank [0-120]	No. (B) (deaths)	Rate (B/A)(%)	Rank [0-120]	
Japan	6,005	30	99	1.6	90	0.08
Israel	10,743	18	101	0.9	108	1.14
Australia	6,303	28	57	0.9	108	0.23
Qatar	2,728	45	6	0.2	122	0.22
Singapore	2,299	49	8	0.3	120	0.14
New Zealand	1,312	61	4	0.3	120	0.08

Created using data from the Johns Hopkins University Coronavirus Resource Center

2. Japan plays Russian roulette

Recent developments have lent credence to that notion. The April 15 episode of NHK's *Close-up Gendai Plus* reported the results of a big data–driven study by Professor Hiroaki Miyata (Department of Health Policy and Management, School of Medicine, Keio University) and other researchers. Using the smartphone app LINE, the investigation collected health-related information from roughly 25 million residents across Japan on March 31 and April 1.⁶⁾ According to the results, around 27,000 respondents indicated that they had run a persistent temperature of 37.5°C or higher for at least four days (See [“The ‘3 Cs’ prove challenging for certain lines of work: Large numbers report temperatures of 37.5°C or higher for at least four days”](#)). While not every person reporting a fever has COVID-19, obviously, the 27,000 respondents with symptoms characteristic of the disease comes extremely close to the average of the two overlooked-patient estimates—24,000 (the mean of 5,000 and 43,000)—that we derived from fatality rates in countries with similar levels of medical quality. One could very well interpret the study's findings as indicative of an overlooked patient population stemming from an inadequate PCR-testing program. In its coverage of the story, NHK also noted the presence of a correlation between increasing numbers of people with fever symptoms and growing numbers of people with positive PCR-test results. Assuming that relationship is true, one could conjecture that a substantial proportion of people reporting fevers are potential COVID-19 cases.

The above discussion opens the door to another conclusion. If the official number of confirmed COVID-19 cases in Japan has indeed overlooked some individuals, the official COVID-19 fatality count may also be an underrepresentation to a certain degree.

One can find support for that hypothesis in an interesting phenomenon that emerged in February and March. The National Institute of Infectious Diseases operates a data system that provides users with up-to-date information on influenza-related deaths. According to the system's mortality figures for influenza and pneumonia,⁷⁾ Tokyo reported “excess mortality” levels for weeks 8 and 9 of the 2020 calendar year—a result that went against the trends in the 20 other major cities in the system's dataset. “Excess mortality” is an “estimate of the extent to which deaths from influenza or pneumonia increased as a result of an influenza epidemic.”⁸⁾ As an estimate with no definitive value, the “excess mortality” label does not necessarily signify a specific increase in fatality count at a certain time. However, the timing of the excess-mortality phase did not seem to correspond with an increase in influenza cases. Tokyo actually saw a *decrease* in the number of reports of influenza per sentinel from late February to early March, with the value dropping from 3.58 to 2.33.⁹⁾ As of March 1, there were just 39 confirmed cases of COVID-19 in Tokyo; the number of new cases per day was still hovering under 3. Judging from a simultaneous combination of “excess mortality” in influenza, falling numbers of influenza patients, and low official counts of COVID-19 patients, one could reason that the elevated influenza fatality rates actually came from deaths among a “hidden” population of overlooked COVID-19 patients. Incorporating these types of fatalities into the total

number of COVID-19 deaths would naturally lead to an even higher estimate of potential COVID-19 cases, assuming the same fatality rate.

The available data implies that the number of Japan's inadequate PCR-testing framework may have obscured the actual number of COVID-19 cases in the country, essentially overlooking a significant population of "potential cases" outside the official numbers of confirmed cases and fatalities. In-hospital infections have now hit numerous medical institutions in Tokyo, including Eiju General Hospital,¹⁰⁾ Keio University Hospital,¹¹⁾ the Jikei University Hospital,¹²⁾ Nakano Egota Hospital,¹³⁾ and even Tokyo Metropolitan Bokutoh Hospital¹⁴⁾—a designated medical institution for class-I infectious diseases. At the root of these pressing issues is not something specific to Tokyo but rather a shortcoming at the national level: a PCR-testing framework with the quality of a system in a developing country. For hospitals across Japan, the situation has basically turned into a game of Russian roulette: a potentially catastrophic COVID-19 case could be in their midst at any time, but the lack of testing makes it impossible to locate the threat. The Japanese medical system is teetering on the brink of collapse due less to an overabundance of patients than to the possibility of in-hospital infections, disaster from within. Expanding PCR testing at the pre-hospitalization stage would be one of the best ways to rectify the situation, which the government needs to address as quickly possible.

The next report plumbs more data to delineate the factors behind Japan's bleak reality and discusses a viable approach to overcoming the difficulties at hand.

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