Economics Knowledge for COVID-19 Measures: Applying Cognitive Bias to Policymaking

Ida Takanori, Professor at the Graduate School of Economics, Kyoto University

Key points

- The pessimism bias is stronger in Japanese people than in British people
- People who have pessimism bias understand the need for self-restraint
- Education needs to target young men and other groups at high risk of infection

Prof. Ida Takanori

More than a year since the outbreak of the pandemic, the COVID-19 catastrophe has still not abated. Coronavirus is not the only thing that has become prevalent. The academic term "behavior change," used in the behavioral sciences, has unexpectedly come into widespread use. Behavioral economics considers human rationality to be limited and cognition to be subject to biases, placing emphasis on "nudge" as a means of changing behavior for the better.

A declaration of a state of emergency issued in some areas on April 7, 2020, asked citizens to refrain from leaving the house for non-essential reasons and restricted the use of gaming arcades and entertainment facilities.

However, unlike the lockdowns implemented in Europe and the United States, this was not a mandate, only a request. As a result, many people may have been confused as to what behavior they should change and to what degree in order to achieve the maximum 80 percent reduction in contact desired by the government.

Behavioral economics is a discipline that aims to create a better society by correcting human biases and encouraging voluntary behavior change. Preventing the spread of infectious disease requires the cooperation of citizens, which requires their attention and intervention in line with individual habits of mind. Even if the COVID-19 catastrophe is contained, the next pandemic will surely strike. What will be needed then is behavioral economics based on targeting.

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Together with a team led by Kinoshita Shin, associate professor at Ryukoku University, and Sato Masayuki, professor at Kobe University, the author conducted a study in Japan and the UK exploring the cognitive bias and behavior change of citizens during the first wave of a state of emergency. A hot topic in the first wave was bottlenecks in the system for PCR tests. Inadequate testing systems meant that people were frequently unable to get tested.

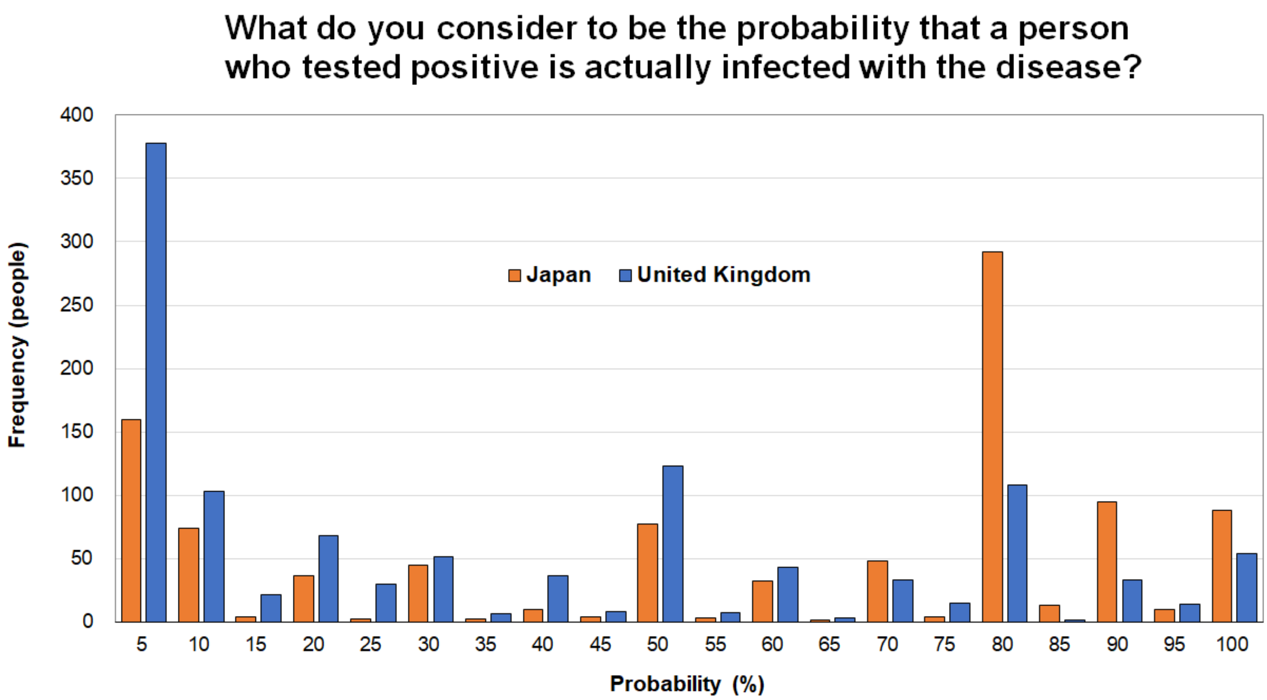
Tests are subject to errors. The PCR test ought to be accurate because it uses gene detection. However, even with careful handling, if the amount of virus in the body is low, or if the test is contaminated with virus, errors can occur.

The key elements here are sensitivity, specificity, and positive predictive value. Sensitivity is the percentage of people infected with the disease who test positive. The numerical value of the sensitivity subtracted from 1 gives a false-negative rate. Specificity is the percentage of people infected with the disease who test negative. The numerical value of the specificity subtracted from 1 gives a false-positive rate. The positive predictive value is the percentage of people who test positive who are actually infected with the disease.

The sensitivity and specificity of the PCR test were set at 80% and 99.9%, respectively, in line with previous studies. It was also assumed that 0.1% of citizens (1 in 1,000) is infected in their city of residence. This numerical value is called prior probability.

Consider the following question: If a person tests positive on a PCR test, what is the probability that the person is actually infected?

Even clinicians find it difficult to answer this question. In order to do so, we need to use "Bayes' theorem." Of 1,000 people tested, only one is infected, so only 1 x 0.8 = 0.8 of those infected will test positive. The number of non-infected people who test positive is 999 x (1-0.999) = 0.999. In this case, the positive predictive value is 0.8 / (0.8 + 0.999) = 0.44. This means there is a 44% probability that a person who tests positive is infected. If we ignore prior probability and test everyone randomly, we may produce false positives.



Source: Survey of 1,000 people in Japan and 1,000 people in the UK conducted by Kyoto University in November

Let us consider the results for Japanese respondents. The mean value for responses is 56%, which is around 10% higher than for the correct responses. This higher bias indicates that Japanese people have a pessimistic attitude toward the test results. When the response results for Japan are displayed graphically, the highest frequency is 80% (see figure). Many people erroneously equate the sensitivity of 80% with the target rate.

When the same question was asked of the British respondents, the mean value for responses is 34%, which is around 10% lower than the correct responses. This lower bias indicates that British people have an optimistic attitude toward the test results. When the response results for the UK are displayed graphically, most people responded that the infection rate is 5% or less.

The number of infections and deaths in the UK has been far higher than in Japan. The rate of mask-wearing in Japan is over 90%, compared with only 70% in the UK. While causality is not known, a correlation may exist between attitudes to test results and damage from infection. Professor Yamanaka Shinya of Kyoto University considers the low incidence of infection damage in Japan despite weak restrictions on behavior to be a mystery, labeling the reason for this the "x-factor." One possibility may be the difference in attitudes between Japan and the UK.

Examination of the relationship between biases and personal attributes in the Japanese sample also found that pessimism bias was greater in those who were in good physical condition at the time, those who had poor mental health, women, the elderly, and those with a high level of education.

We examined correlations between these biases and evaluations of infection control, rates of contact reduction, and attitudes to vaccination. The more the biases inclined from optimism to pessimism, the more people viewed health as more important than the economy, and the more they viewed a state of emergency as necessary and valued its effectiveness. Likewise, as biases increased, the degree of reduction in the frequency of outings and in the number of contacts with other people during the first wave also increased. In addition, the larger the biases, the stronger the intention to vaccinate.

These are interesting findings. Those who had a pessimism bias and overreacted to the test results were more positive about proactive infection control and tried to exercise self-restraint. Since the virus has the negative externality (impact) of spreading from person to person, it may be deduced that a group with a pessimism bias will be less likely to spread the virus, thus allowing infection damage to be controlled from an early stage. In other words, even if a cognitive bias exists at the individual level, proactive behavior change can be in the public interest.

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This raises a difficult question: Should we use the criterion of rationality to correct cognitive bias? Or should we refrain from intervening in the cognitive biases of individuals if it leads to the welfare of society as a whole? The answer depends on the assumed values, but economics has focused on social welfare as a consequence.

In the case of optimism bias, biases should be corrected because individual behavior change is inadequate and does not serve the public interest in preventing infection. In the case of pessimism bias, biases should not be corrected because individual behavior change is more than adequate and serves the public interest in preventing infection. In behavioral economics, changing the intervention in response to the type of bias is called "asymmetric paternalism."

In the aforementioned case, optimism bias is greater among young men and those with lower levels of education, and behavior change is inadequate. There is significant social value in targeting this specific group by conducting courses at universities and workplaces to educate them about the risks of infection and to bring to their attention the need for infection prevention. Behavioral economics is changing direction from a universal nudge for all to a personal nudge optimized for each individual.

As in the case of the state of emergency in the recent COVID-19 catastrophe, we should aim for a new economics in which a targeting policy is finely tuned to produce different effects, rather than imposing blanket restrictions on behavior without consideration for the outcome.

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IDA Takanori, Ph.D.
Professor at the Graduate School of Economics, Kyoto University

Born 1965. Graduated from Kyoto University with a Bachelor's Degree in Economics. Doctorate in Economics (Kyoto University). Specializes in Applied Economics.
