



THE RIGHT COMBINATION OF CARROTS AND STICKS

ENCOURAGING SURVEILLANCE AND REPORTING OF EMERGING PANDEMICS

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THE H1N1 "SWINE FLU" VIRUS OUTBREAK THIS YEAR HAS GENERATED

a strong response from governments and public health agencies around the world. Travel advisories and restrictions have been put in place in many countries, and deaths have been reported from around the world. As of August 2009, 182,000 laboratory-confirmed cases of pandemic influenza H1N1 and 1,799 deaths, in 177 countries and territories, have been reported to the ► World Health Organization (WHO). Although H1N1 has proved to be less deadly than was initially feared, it is an example of prompt disease reporting by the country of origin, quick response by public health authorities and the media, and the rapid development of a potential vaccine.

Contrasting the H1N1 timeline of events with the story of Severe Acute Respiratory Syndrome (SARS) only a few years ago offers useful insights into how not to react to the threat of an epidemic. In November 2002, local authorities in China's Guangdong Province reported a cluster of atypical pneumonia cases to China's health ministry. In late February 2003, an infected man from Guangdong spent a night in a Hong Kong hotel, where he infected at least 16 other people, including a tourist from Toronto, a flight attendant from Singapore, and a businessman going to Vietnam. By May, SARS had infected 8,000 people in 32 countries. By June, when the contagion was brought under control, more than 800 people had died.

China failed to report the outbreak promptly and allow WHO experts to help contain it, but luckily, biology intervened. A pathogen that was more virulent and transmissible than either SARS or the recent H1N1 could have done far more damage. However, current strategies to contain a potentially deadly influenza pandemic similar to the one experienced in 1918 are contingent on recognition of human-to-human transmission within approximately three weeks

of the initial case. Next time, it may not be so easy to quickly get the genie back in the bottle. It is therefore vitally important to understand what factors motivate or discourage government reporting of disease outbreaks.

Incentives and Disincentives

WHO TRIES TO CONTAIN EPIDEMICS THROUGH RAPID VACCINATION AND QUARANTINE—AN APPROACH that presupposes early detection of an outbreak. Unfortunately, many countries, including Iran, Nigeria, Sudan, Tunisia, and Turkey, do not abide by the recently strengthened WHO International Health Regulations that require countries to promptly report disease outbreaks. Even signatories to the regulations may not be entirely forthcoming in reporting outbreaks or may play them down.

When a country uncovers evidence of an outbreak within its borders, it faces the decision whether or not to report it. By reporting an infectious disease outbreak, a country may obtain international medical assistance. But it also faces a disincentive to look for and report outbreaks: trading partners may impose trade and travel sanctions in hopes of stopping the disease at the border. These “reporting sanctions” can impose large economic costs on the reporting country.


Incentives to report an outbreak, however, are only half the story. A country must first detect an outbreak and it can improve the probability of detection by investing in disease surveillance. The types of incentives a country faces with respect to the reporting of disease outbreaks will affect its decision on how much to allocate to surveillance. The greater the return for reporting an outbreak, the greater the return will be for detecting the outbreak in the first place.

In order to better understand the incentives for countries to report disease outbreaks, and how these incentives are influenced by factors such as the speed of transmission of the disease, the quality of surveillance data, and availability of vaccines, we built a game-theory model to capture those basic dynamics that are common to many other dilemmas. It applies to the case of a hospital deciding whether to report medical errors to public health authorities. Reporting may reduce patient demand or decrease insurance reimbursements, but facilitate efforts by the medical staff to reduce errors. Our work also applies to the decision of individuals to disclose a disability or mental illness. Disclosure may invite discrimination but it also facilitates accommodation.

We arrived at three conclusions. First, not all sanctions discourage reporting. If countries expect that a trading partner is not likely to reliably report an outbreak, they are likely to contract or limit their trade in expectation of an unreported outbreak—in other words, they impose a kind of preemptive sanction. With such a measure in place, sanctions in response to a positive report of an outbreak are likely to be less onerous and therefore less likely to discourage reporting.

Second, improving the quality of detection technology may not promote the disclosure of private information about an outbreak because more informative reports also trigger harsher sanctions. Third, an important source of information about disease outbreaks is rumors. WHO, in fact, actively monitors rumors, even though this so-called rumor surveillance is prone to error, especially false positives. We find that informal surveillance can be an important supplemental channel or backstop for detecting outbreaks. It serves as an independent public signal that is less likely to discourage disclosure than better technology. Informal surveillance can also correct false positives by pointing out that there was no outbreak to begin with.

Our findings shed light on why countries have failed to cooperate fully on surveillance and reporting, and also point the way toward better cooperation. More valuable medical assistance and perhaps financial transfers to offset the cost of reporting sanctions would be useful; limits on sanctions, especially sanctions based on fears of undetected outbreaks, are not. Public health organizations—WHO, the UN Food and Agriculture Organization, the U.S. Centers for Disease Control and Prevention—have called for improved diagnostic technologies, especially the sensitivity of tests, to identify and contain



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avian flu outbreaks. WHO's strategy of improving detection technology and using rumor surveillance has both pros and cons. More informative signals of disease outbreak are, naturally, more informative and helpful to the country in accessing international medical assistance. But more revealing signals can increase sanctions and reduce countries' incentives to look for and report outbreaks.

Sanctions and **the Public Good**

IN A SEPARATE PAPER, WE USED A BIOECONOMIC MODEL TO STUDY THE EFFECT OF INCENTIVES ON surveillance and reporting. Sanctions that are proportional to the size of the outbreak at the time of reporting could improve surveillance by rewarding timely reporting. Similarly, increasing the capacity for outbreak control either with domestic resources or with external assistance can encourage reporting because countries are more likely to invest in surveillance for diseases that they can control. However, when the capacity for outbreak control is high, countries are less likely to take preventive measures. Outbreak control capacity can create the risk of moral hazard in the same way that bailing out banks can encourage excessively risky lending. Finally, the speed of disease transmission can influence optimal surveillance investments. Countries are less likely to invest in surveillance for diseases that are likely to spread either rapidly or very slowly because there is less pay-off either way. Enhancing countries' capacity for outbreak control expands the range of transmission intensities over which countries will invest in surveillance.

To summarize, our work indicates that international institutions should take into account the incentives that countries have to look for and report disease outbreaks, notwithstanding legal obligations. As with other global public goods, failure on the part of any single country to act promptly could have serious consequences for the whole world. ■

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