

Pandemic Preparedness and Response

STELLA R. QUAH
Duke-NUS Graduate Medical School, Singapore

The battle against infectious disease epidemics must be fought simultaneously on two fronts. The first front is obviously at the laboratory, where scientific researchers confront the clinical and public health challenges of the world's most deadly diseases. The second front, no less crucial, is located outside the lab, in the wide social context that involves governance and the daily attitudes and actions of ordinary individuals, groups, and institutions. People's perception of a disease influences their feelings toward illness, and may even become part of the community's folklore. Research by medical sociologists and other social scientists indicates that many factors – including the public image of the disease, the political will to intervene, and cultural norms on disease causation, diagnosis, and treatment (e.g., social stigma, privacy issues, and ability to obtain prompt and affordable medical care) – influence people's behavior and the level of success in preventing and containing an infectious disease epidemic (Quah 2007a).

Considerable efforts have been and continue to be invested in improving the prevention of pandemics around the world. Research and policy analysis cooperation in early warning alert and response is such an important aspect that an early warning alert and response network (EWARN) has been set up. Agencies like the World Health Organization (WHO) and the United States Centers for Disease Control (CDC) are closely

involved in preparing and disseminating information and recommending procedures on risk assessment, preparedness tools, and other relevant aspects. One example of this work is the "International Surveillance for Pandemic Preparedness" offered online (<http://www.cdc.gov/flu/pdf/international/2010-influenza-intl-activities.pdf>). For more detailed background and discussion of current standard procedures for pandemic preparedness and control, the reader may refer to the article on disease surveillance and global health security in this Encyclopedia and the guidelines prepared by the WHO (<http://www.who.int/influenza/preparedness/pandemic/en/>).

In contrast to the standard information available, this entry addresses a different aspect of pandemic preparedness: primary surveillance. Although the range of approaches to the prevention of epidemics and pandemics is wide, there is considerable agreement internationally with the WHO's emphasis on early warning surveillance. Yet the most basic and vital aspect of pandemic preparedness has been neglected: primary surveillance for pandemic prevention. To critically examine the nuances of international collaboration we need to see infectious disease pandemics as consisting of two phases, the prevention or preparedness phase, and the epidemic phase. Governments are compelled to follow international guidelines when a disease outbreak develops into an epidemic and expands into a pandemic, but early warning surveillance is still underdeveloped. It is important to determine if the absence of primary surveillance impairs a country's ability to collaborate effectively with other countries in the management and control of a pandemic. Put differently, there

are two types of surveillance: primary surveillance and routine surveillance. Epidemic and pandemic control starts with the prevention phase, of which primary surveillance is the first component. More importantly, a major obstacle to international collaboration is the fact that countries differ significantly in their concern for primary surveillance and in their ability to implement it as part of a comprehensive plan of pandemic preparedness.

What is *primary surveillance*? Briefly put, it means the earliest possible warning, but to define primary surveillance further we must first look into routine surveillance. The standard public health definition of routine surveillance consists of three related stages: (1) “systematic and active collection of pertinent data of targeted disease” or diseases; (2) “assessment and practical report of these data”; and (3) “the timely dispatch of such reports to individuals responsible for the formulation of action plans” (Arita, Nakane, and Nakano 2008, 276; WHO 2010). Applying the essential requirements for successful governance of epidemics (Quah 2007a, 113–33) to the scrutiny of each of these three stages reveals the notion of primary surveillance and the building blocks of international collaboration.

The first stage of *routine surveillance*, “the systematic and active collection of pertinent data of targeted diseases” is typically understood by the international expert community as the job of field public health personnel (WHO 2005). This step is nearly always activated by the news of an outbreak in the mass media or, as an analyst aptly put it, by a “worst case scenario” or “an unfolding disaster” (Doshi 2009). It is at this point that an early warning alert and response network, or EWARN, may step in “to rapidly detect and respond to signals that might indicate outbreaks and clusters of epidemic-prone diseases” as the WHO (2012, 9) proposes. It is significant that the EWARN involves “all individuals responsible for disease

surveillance activities at all levels”: “health facility staff, surveillance officers, epidemiologists, data analysts and statisticians, government health officials, sanitarians, managers of the Expanded Programme on Immunization [EPI], public health officers, laboratory personnel and community health workers” (WHO 2012, 5). This personnel list is significant because of what it misses: the lay community informants (or “whistle blowers,” if there are efforts to conceal the first signs of infection). The EWARN guidelines define the “primary source of surveillance data” as “health facilities where patients seek care” (WHO 2012, 42). While care seeking appears to be a logical starting point, the flaw of this choice is that people seldom seek biomedical care as their first option when feeling ill. The typical responses to symptoms are “wait and see”; self-medication; discussion of the problem with a loved one, best friend, or other members of one’s informal network; and possible consultation with traditional healers (Quah 2007a; 2007b; 2008). If the problem is an infectious disease, crucial time would be spent without medical treatment and contaminating others.

Consequently, to be effectively preventive, the first surveillance stage must be the earliest possible warning, that is, *primary surveillance*. More specifically, primary surveillance is the first surveillance step where early data are provided directly to the health authorities by the original sources or informants: by individuals who experience the symptoms of the infectious disease; and/or by the closest observer of those symptoms, usually a close family member (spouse, parent, adult child, or sibling). In the case of animal-origin infectious diseases such as avian influenza virus H5N1 and the swine-origin A H1N1 virus (Doshi 2009; Garten et al. 2009; Neumann, Noda, and Kawaoka 2009), the closest observers of symptoms are farmers, livestock handlers, and people who work with or handle animals routinely.

Naturally, the cooperation of regular residents in the vulnerable population as original sources of data is a vital prerequisite of primary surveillance. Yet, symptomatic individuals and closest observers can only be effective sources of early warning if they (1) know what signs to look for; (2) are willing to report those symptoms; and (3) know how to reach the relevant health authorities. Previous studies of public response to epidemics (Quah 2007b) suggest that the cooperation of regular residents in primary surveillance is most likely to occur when a set of five elements are in place: transparency in the health authorities' decisions and regulations, community involvement, consensus building mechanisms, trust in the health authorities, and collective informed consent. A resident's willingness to collaborate depends on several factors including his/her subjective perception of and understanding of the problem, which is usually associated with the person's level of formal education (Quah 2007a). Some efforts have been made to educate the public through interactive websites run by international organizations, including the WHO, health authorities in many countries, and private entrepreneurs (see, e.g., Phelps 2009). These efforts are commendable but they reach people who are not only literate in an international language but also Internet-literate and have access to computers and Internet connections. These conditions exclude unskilled and low-income people who are the vital implementers of primary surveillance in developing countries.

The second stage of routine surveillance is the "assessment and practical report" of the relevant data collected in the first stage by public health personnel (Arita, Nakane, and Nakano 2008). Within the primary surveillance framework, the second stage requires well-trained and qualified teams of "street level" health officials or inspectors who are capable of collecting and

verifying information from primary surveillance residents (in the neighborhood, village, city, county, province, and nation) systematically, conducting the data assessment, and writing practical reports following clear and transparent procedures. The scarcity of funding, qualified personnel, and analytical tools – software and hardware – represent another set of obstacles to the collaboration of many developing countries in internationally epidemic preparedness.

The third stage of routine surveillance is "the timely dispatch of such reports to individuals responsible for the formulation of action plans" (Arita, Nakane, and Nakano 2008). In primary surveillance, this stage requires a clear set of transparent procedures and technology for rapid and reliable communication, and well-trained personnel at all levels. Simplification of procedures is essential to facilitate understanding by the population, minimize opportunities for distortion, and enhance accuracy. Compared to a decade ago, today's technology advances allow a wider range of communication options including direct reporting online to top officials, follow-ups, and stipulated deadlines between reporting levels. But the level of technology and what the WHO sees as "the heterogeneous nature" of what is understood as surveillance – following the 2009 Report of the WHO Consultation on Surveillance for Pandemic Influenza 2007 – are yet again conditions that vary widely across countries and hinder international collaboration in epidemic preparedness.

In sum, the *sine qua non* of epidemic control is prevention or preparedness whereby primary surveillance commences with the cooperation of individual members of the community as well-informed and collaborative primary sources of data. It is essential that the elements of the three stages of surveillance (above) be in place in a country for its preventive efforts to be effective and for the country to be able to collaborate internationally

in epidemic prevention. Experience from previous epidemics shows that countries differ from each other substantially in the efficacy of the three stages of surveillance and thus in their readiness for international collaboration in epidemic prevention.

One final aspect of pandemic preparedness deserves mention. It is clear to governments, civil society, the scientific community, professionals, and economic organizations alike that international collaboration is vital to pandemic preparedness. But while the ideas of early warning and international collaboration are widely supported, their implementation faces multiple and serious obstacles. In addition to the protection of national interests, including the economy and national security, another challenge to international collaboration on pandemic preparedness is scientific collaboration. Countries with different levels of economic development may regard as unfavorable the terms of scientific cooperation like virus sharing, a vital procedure in vaccine development, diagnosis, and other aspects (Leung 2007). One illustration is the concern about proprietary rights over tissue samples, scientific precedent, and intellectual copyright. These obstacles to scientific collaboration have led to the recommendation to set up new facilitating institutions such as the Global Public Health Research Network (Leung 2007, 150). Along these lines, the WHO recently presented its proposed pandemic preparedness framework to coordinate and regulate scientific material transfers and intellectual property rights as “a transparent process” (Chan 2009). These challenges to international collaboration are often discussed at policy and scientific forums and the expert literature is growing (e.g., WHO 2012).

SEE ALSO: Disease Surveillance and Global Health Security; Epidemics; Infectious Disease; Public Health

REFERENCES

- Arita, I., Nakane, M., and Nakano, T. 2008. “Surveillance of Disease: Overview.” In *International Encyclopedia of Public Health*, vol. 6, edited by H. K. Heggengougen and S. R. Quah, 275–289. Amsterdam: Elsevier.
- Chan, M. 2009. “Director-General’s Consultation with Member States: Proposals to Finalize Remaining Elements of the ‘Pandemic Influenza Preparedness Framework for Sharing Influenza Viruses and Access to Vaccines and Other Benefits.’” Document HSE/GIP/PIP/2009.1. Geneva: World Health Organization.
- Doshi, P. 2009. “How Should We Plan for Pandemics?” *British Medical Journal* 339: 603–605.
- Garten, R. J., Davis, C. T., Russell, C. A., et al. 2009. “Antigenic and genetic characteristics of swine-origin influenza viruses circulating in humans.” *Science* 325: 197–201.
- Leung, G. M. 2007. “Global Public Health Research Preparedness against Emerging and Re-emerging Infectious Diseases.” In *Crisis Preparedness: Asia and the Global Governance of Epidemics*, edited by S. R. Quah, 135–161. Stanford, CA: Walter H. Shorenstein Asia-Pacific Research Centre, Stanford University.
- Neumann, G., Noda, T., and Kawaoka, Y. 2009. “Emergence and Pandemic Potential of Swine-Origin H1N1 Influenza Virus.” *Nature* 459: 931–939.
- Phelps, R. 2009. “H1N1 (Swine Flu): Know the Emergency Warning Signs.” <http://emsolutionsinc.wordpress.com/2009/09/30/h1n1-swine-flu-flu-exploding-in-the-us-cdc-releases-new-flu-flyers-brochures-and-fact-sheets-h1n1-vaccine-safety-concerns-and-faq/>. Accessed April 17, 2013.
- Quah, S. R. 2007a. “On Trust and Health Consensus Building in the Governance of Epidemics.” In *Crisis Preparedness: Asia and the Global Governance of Epidemics*, edited by S. R. Quah, 113–133. Stanford, CA: Walter H. Shorenstein Asia-Pacific Research Centre, Stanford University.
- Quah, S. R. 2007b. “Public Image and Governance of Epidemics: Comparing HIV/AIDS and SARS.” *Health Policy* 80: 253–272.
- Quah, S. R. 2008. “In Pursuit of Health: Pragmatic Acculturation in Everyday Life.” *Health Sociology Review* 17(4): 419–421.

- WHO. 2005. *WHO Checklist for Influenza Pandemic Preparedness Planning*. WHO/CDS/GIP/2005.4. Geneva: World Health Organization, Department of Communicable Disease Surveillance and Response, Global Influenza Programme.
- WHO. 2009. *Pandemic Influenza Preparedness and Response*. Geneva: World Health Organization. http://apps.who.int/iris/bitstream/10665/44123/1/9789241547680_eng.pdf. Accessed April 22, 2013.
- WHO. 2010. "Surveillance Recommendations for Member States in the Post Pandemic Period." August 12. Geneva: World Health Organization.
- WHO. 2012. *Outbreaks Surveillance and Response in Humanitarian Emergencies: WHO Guidelines for EWARD Implementation*. Geneva: World Health Organization. http://whqlibdoc.who.int/hq/2012/WHO_HSE_GAR_DCE_2012_1_eng.pdf. Accessed April 17, 2013.

FURTHER READING

- Chan, E. H., Sahai, V., Conrad, C., and Brownstein, J. S. 2011. "Using Web Search Query Data to Monitor Dengue Epidemics: A New Model for Neglected Tropical Disease Surveillance." *PLoS Neglected Tropical Diseases* 5(5): e1206.
- Christakis, N. A., and Fowler, J. H. 2010. "Social Network Sensors for Early Detection of Contagious Outbreaks." *PLoS ONE* 5(9): e12948.
- Keawcharoen, J., van de Broek, J., Bouma, A., Tiensin, T., Osterhaus, A. D. M. E., and Heesterbeek, H. 2011. "Wild Births and Increased Transmission of Highly Pathogenic Avian Influenza (H5N1) among Poultry, Thailand." *Emerging Infectious Diseases* 17(6): 1016.
- Nicoll, A., Ammon, A., Amato, A., Ciancio, B., Zucs, P., et al. 2010. "Experience and Lessons from Surveillance and Studies of the 2009 Pandemic in Europe." *Public Health* 124: 14–23.
- WHO. 2009. *Report of the WHO Consultation on Surveillance for Pandemic Influenza, 2007*. Geneva: World Health Organization.
- WHO. 2011. "FluNet." http://www.who.int/influenza/gisrs_laboratory/flunet/en/. World Health Organization. Accessed April 22, 2013.