

13

The Geopolitics of Global Public Health Surveillance in the Twenty-First Century

Lorna Weir and Eric Mykhalovskiy

Social scientists, historians, infectious disease experts, and others generally recognize the period from the mid-1980s to the present as one of dramatic change in the global relations for knowing and responding to international infectious disease threats.¹ Some commentators have gone so far as to suggest that in the wake of the 2003 SARS outbreak, a near revolution is underway in the global governance of infectious diseases.²

Declarations of novelty can have their own infectious quality. Fortunately, historical argument has helped temper the debate about what is precisely new about the emerging field of global public health governance.³ Discussions typically recognize the origins of established features of current international infectious disease monitoring and surveillance – the International Health Regulations, the organizing principle of minimal disruption to international travel and commerce, the WHO (World Health Organization) structure, and so on – in the activities, emerging institutions, and framework of agreements arising out of the series of International Sanitary Conferences held between 1851 and 1903.⁴ In identifying novelty against this backdrop, much attention has been focused on transnational health risks that accompany the processes known as ‘globalization’, together with new anxieties about emerging infectious diseases, and the increasing political significance of non-state actors such as NGOs, the private sector and social movement organizations in global health.⁵

In this chapter we seek to characterize the specificity of current changes in global health governance through an analysis of new governmental techniques in global public health surveillance. Configured around the virtual technology of the Internet, mobilizing institutional networks centered around the WHO, and drawing fundamentally on health news as an information source, novel techniques of global surveillance are reconfiguring the relation between political borders and knowledge in global public health. Yet they have received little serious attention in the social science and historical literatures.

Our analysis is empirically focused on the history and current operations of GPHIN – the Global Public Health Intelligence Network – an early warning system for global public health events developed by Health Canada in collaboration with the WHO. Unlike prior approaches to global infectious disease surveillance, GPHIN systematically gathers, classifies, translates and distributes online news information rather than epidemiological case reports. It thus provides an important vantage point from which to explore the implications for global public health of shifts in the established boundaries of surveillance knowledge.

We argue that GPHIN constitutes a transformation in the social organization of knowledge of international infectious disease outbreaks. GPHIN is a knowledge technique with multiple effects. GPHIN has resulted in enhanced knowledge, action capacity, and authority for the WHO in the context of global infectious disease control.⁶

GPHIN is an information source beyond national control that gives the WHO the ability to have authorized knowledge of outbreaks globally and to respond to outbreaks while they are occurring. As an electronic early warning alert technique, GPHIN both speeds up the knowledge of outbreak and bypasses its previous routing through sovereign nations. Temporally, GPHIN enabled the WHO and other organizations to have knowledge of outbreak while outbreak is taking place. This temporal capacity has strengthened the WHO in global health governance. And geopolitically, prior to the existence of GPHIN, sovereign nations controlled what information they would share with the WHO in accordance with international agreements. The official country notifications received by the WHO were often years out-of-date and useful essentially for statistical purposes – and even then outbreaks went unreported. The simultaneity of outbreak with international knowledge of outbreak laid the basis for extending the action capacity of the WHO, for instance in sending response teams to sites of outbreak. Online early warning outbreak detection has thus inserted a knowledge technique into the international control of infectious diseases that has precipitated a new social organization of global health governance.

We begin our discussion by specifying the sense in which we understand the term ‘surveillance’, contextualizing GPHIN in the history of public health surveillance in the second half of the twentieth century. The discussion then moves to tracing the discursive preconditions for online global public health surveillance in the novel concept ‘emerging infectious diseases’. We describe how the term was popularized in North America in the early 1990s through the work of the US Institute of Medicine, inciting official and popular concern about ‘microbial threats’ to human health. We also suggest how the role of the WHO in the current institutional configuration of global infectious disease surveillance came about as a response to the perceived need for global leadership that surfaced when

emerging infectious diseases were problematized in relation to the 'spectre' of international microbial traffic.

We then turn to the development and operation of GPHIN based on interviews conducted with GPHIN staff and managers.⁷ We show that the initial concept for GPHIN was sparked by events surrounding the 1994 outbreak of pneumonic plague in Surat, India. In particular, we argue that the GPHIN concept arose as an attempt to recuperate international public health in the face of media expectations that it had the capacity to manage outbreak anywhere. Pressure on the WHO to change its way of managing infectious diseases thus had two conditions: 'emerging infectious diseases' and global health news.

We further describe how GPHIN's turn to online health news gave rise to two new related surveillance techniques: early warning outbreak detection and outbreak verification. We argue that their incorporation within the apparatus of global infectious disease surveillance has resulted in a 'post-Westphalian' sourcing and organization of knowledge and action about international infectious diseases.⁸ Previously, nation-states held authority over public health information within their borders, sharing information in relation to international treaties and agreements. Currently new distributions of power are being constituted, including links between global public health networks and local authorities, which transgress state boundaries of control over outbreak notification. In our concluding discussion we analyze the integration of global public health surveillance with anti-terrorism initiatives in the Global North, cautioning that this represents a neocolonial agenda that must be questioned for the sake of constituting public health as a global public good.

Problematizing emerging infectious diseases

'Surveillance' is a word freighted with many meanings in contemporary social scientific and historical writing. In this chapter, when we refer to GPHIN as a technique of 'public health surveillance', we follow the meaning of 'surveillance' found in our sources. 'Public health surveillance' was constituted as a field in national public health systems during the second half of the twentieth century. It was conventionally recognized to comprise four kinds of action: collecting, interpreting, disseminating and acting on health information by authorities.⁹ Surprisingly, the public health meaning of 'surveillance' as pertaining to continuous data collection about diseases on a population basis is relatively recent, dating to the mid-1950s. Of course, international cooperation in monitoring populations for infectious disease is not new, having been called for at the 1896 International Sanitary Conference.¹⁰ However the term 'surveillance' in public health was applied to individuals, not diseases, in the first half of the twentieth century. Until 1955, 'surveillance' meant closely observing the

contacts of a person who had an infectious disease such as plague, smallpox, typhus and syphilis. Contacts were followed to detect the first signs of infection, but without restricting their freedom of movement, until such time as they became symptomatic, at which point they were placed in isolation.¹¹

Our present meaning of surveillance as the gathering of population data about disease dates to the studies undertaken in 1955 by Alexander Langmuir at the Centers for Disease Control and Prevention (CDC) when a batch of polio vaccine became contaminated and began infecting children who had been inoculated with it. The collection and analysis of data about the polio outbreak traced the cases to a single source, with the result that the vaccination campaign continued after the contaminated batch had been destroyed.¹² Langmuir, the chief epidemiologist at the CDC during the 1950s and 1960s, is credited with reshaping the meaning of surveillance in public health by applying it to populations rather than individuals, separating surveillance from disease control, extending surveillance to non-infectious diseases, and tying surveillance data to action through dissemination and tactical alliances with government.¹³ National surveillance systems for infectious and non-infectious diseases in North America derive from Langmuir's conceptualization of disease surveillance, although the formation of national surveillance systems occurred slowly and fitfully in the second half of the twentieth century. Given that infectious diseases were thought to be essentially solved in industrialized countries from the 1950s until the 1990s, the growth of national systems often occurred in the crucible of disease outbreaks.¹⁴

Most discussions of the formation of a specifically *global* form of public health surveillance in our present privilege the formative role played by microbial disrespect of national borders in a globalizing era.¹⁵ The effects of globalization, we are told, speed up microbial traffic and heighten the need for disease monitoring at a supranational level. As the SARS epidemic of 2002–2003 demonstrated, and as other chapters in this book analyze, dramatic increases in the scale and pace of international travel can lead to cross-border movement of infectious disease agents without detection or forewarning. The globalization of the food supply, rapid deforestation, and large scale population movement during times of conflict further create conditions for the emergence and spread of infectious diseases across national borders, pointing to the need for strengthened disease surveillance at the global level.¹⁶

The development of GPHIN sheds light on other dimensions of the discursive and institutional preconditions of global public health surveillance. These relate primarily to the rise of global health news and its challenge to epidemiologically-based forms of official country notification of outbreak. But such health news and the forms of surveillance it feeds into require a robust object. The efforts of a group of virologists, public health officials

and other infectious disease experts, working in the US in the early 1990s, fashioned that object through the conceptual innovation, 'emerging infectious diseases'.

In the Global North, the problem of infectious disease generally commanded uneven public attention in the post-World War II period. This was not the case in the Global South, where bacterial, protozoal, viral and other infectious diseases have been consistently regarded as the leading cause of death across all age groups. By the end of the 1950s in the advanced capitalist world the problem of infectious disease was understood to have been more or less solved. This posed a challenge for ambitious infectious disease experts, requiring them to problematize infectious disease and encourage public concern about the threat posed by microbes to human health.

One of the most successful of such efforts was undertaken in the late 1980s and early 1990s in the United States. In 1989, under the leadership of Stephen Morse and with the assistance of Nobel Laureate Joshua Lederberg, a National Institute of Allergy and Infectious Diseases/National Institutes of Health conference on emerging viruses was convened. The conference brought together a group of infectious disease specialists to review evidence on the threats to human health posed by pathogenic microbes. The questions raised by the 1989 meeting were further addressed by a special panel organized by the Institute of Medicine, which in 1992 released the report *Emerging Infections: Microbial Threats to Health in the United States*.¹⁷

Emerging Infections marshals all of the characteristic arguments used to create concern about infectious diseases: overconfidence in medical progress, public health breakdown, microbial adaptation, and public complacency, all punctuated by the recurring trope of humanity's endless war with its unseen and relentless enemy, the microbe. But the Institute of Medicine report added something new. Drawing largely on the growing HIV epidemic, but also on the increased incidence, in the United States, of such infectious diseases as multidrug resistant TB and Lyme Disease, it popularized a new concept – emerging infectious disease – around which concerns about threats to human health could be focused.

The Report defines emerging infectious diseases as 'clinically distinct conditions whose incidence in humans has increased ... in the United States within the past two decades'.¹⁸ The new disease concept is a bountiful one, including within its terms infectious diseases affecting increasing numbers of people yearly (e.g. Lyme Disease), known diseases whose etiology is now understood to likely result from microbial infection, so-called 're-emerging' diseases which are well-known but whose incidence is escalating (e.g. TB), and diseases resulting from the introduction of new and existing infectious agents from other parts of the world (e.g. HIV, dengue, malaria).

As deployed in the Report, the new concept of emerging infectious diseases produces infectious disease as a current and future problem space. It

mobilizes concerns about the 'reality' of infectious disease threats, working against 'complacency' by underscoring the range of diseases, new and established, whose incidence is increasing within US territorial boundaries.

The more specific innovation introduced by *Emerging Infections* is its classification of infectious diseases not by agent – viral, bacterial and so on – but by the social and other conditions related to their emergence. Nearly half of the report is committed to a detailed analysis of the factors contributing to the emergence of infectious diseases. These are explored in terms of an ecological discourse that foregrounds how the fate of humans and microbes are bound together in complex cycles of interaction occurring at such overlapping sites as economic development and land use, technology and industry, international commerce and travel, public health collapse and human population change and behavior.

The combined force of positioning human activity as fully implicated in microbial emergence and the very notion of emergence, which constitutes infectious disease as an active or soon to be active presence, create a dynamism around infectious disease. The concept of emerging infectious disease relocates pathogenic microbes out of a history of long-conquered infections and into a present of persistent and always possible threats to human health, all the while constituting that present as open to human intervention.

The Institute of Medicine Report is a document committed to preserving the health of the nation. Its problematization of emerging infectious diseases as a serious US health threat is aided by representing developing countries as sources of infectious diseases and agents that easily travel across national borders. As a text written primarily for a domestic audience, its chief response to the new problem space of emerging infectious diseases is critique and rehabilitation of domestic public health surveillance and readiness. However, the Report repeatedly inscribes the specter of international microbial traffic and, as such, makes a strong call for coordinating infectious disease control at the global level.

One of the interesting features of the Report's discussion of global disease surveillance is the problem of jurisdiction and leadership. Global disease surveillance was in the very early stages of conceptualization at the time *Emerging Infections* was written. Its components, modes of communication, knowledge bases and lines of accountability were not fully delineated. Global surveillance was certainly not the responsibility of the US government, the Report's main addressee, nor did it easily fit within the established areas of responsibility of a given institutional authority. The WHO, the most obvious potential organization to lead an initiative to establish global infectious disease surveillance, is represented in *Emerging Infections* with ambivalence. The Report both lauds the WHO for its work on smallpox and criticizes it for lacking a mechanism to enforce the terms of the International Health Regulations.

Emerging Infections helped open up discussion about the WHO's potential leadership role in global disease surveillance. It specifically recommended that US representatives to the World Health Assembly bring the discussion forward at the WHO. A follow-up Report issued by the CDC, *Addressing emerging infectious disease threats: A prevention strategy for the United States*, put further pressure on the WHO to strengthen its global surveillance activities. The CDC report suggested that a global consortium of research centers for detecting, monitoring and investigating emerging infections be established, 'under the direction of an international steering committee, possibly chaired by the WHO'.¹⁹

The ambivalence towards the WHO found in both the Institute of Medicine and CDC Reports reflects broader concerns about its role in global surveillance that emerged as part of the problematization of emerging infectious diseases. Garrett's journalistic account of the period suggests the many ways that the WHO was found wanting. The WHO's capacity to intervene in member states to control local outbreaks was severely curtailed by the requirement to respect national sovereignty. The Geneva head office was also regarded as invariably at odds with poorly-staffed regional offices.²⁰ In addition, the WHO lacked an emergency response office for epidemics, which delayed the entry of international teams into the field and left them uncoordinated.²¹ WHO capacity to engage in infectious disease surveillance was thus framed as needing urgent change, with mounting pressures placed on the WHO to increase its surveillance and response capacity to make the control of emerging infections an organizational priority.

By the mid-1990s the WHO had begun to act. Most significantly, in response to the concerns raised in the Institute of Medicine report, the WHO recognized 'emerging infectious diseases as worldwide problems requiring global leadership'.²² In 1994 and 1995 two international meetings were held in Geneva to define the nature of the WHO's contribution to the challenge of emerging infectious diseases. By 1996 the WHO had developed a strategic plan for strengthening its activities in global disease surveillance based on a mandate it had received from the World Health Assembly in 1995. The WHO strategy adopted the main recommendations of the CDC Report and led to an expansion of laboratory, training and other WHO-coordinated global networks engaged in surveillance, that were linked primarily by the Internet.

In addition, in 1994, the WHO established the Division of Emerging and other Communicable Diseases Surveillance and Control²³ to improve national surveillance systems and coordinate relations with NGOs, expert advisors and collaborating centers. In 1997, the WHO initiated the formation of the Global Outbreak Alert and Response Network (GOARN) which was formally launched in 2000.²⁴ GOARN links institutions and existing networks to pool human and technical resources and coordinate responses

to outbreaks considered to have international public health significance.²⁵ It currently coordinates field teams for more than 50 outbreaks per year and has 120 institutional partners worldwide.²⁶

GPHIN and the changing geopolitical borders of infectious disease surveillance

At roughly the same time that infectious diseases specialists at the CDC and elsewhere in the United States were debating the potential leadership and parameters of a global system of infectious diseases surveillance, a group of enterprising public health officials from Canada was developing its own vision of global public health surveillance. Our analysis of interviews with the founders and current staff and managers of GPHIN suggests how the initiative arose in response to shifts in the conditions for knowing infectious diseases of potential international significance. More specifically, the initial GPHIN concept was invented in relation to overlapping concerns about dramatic increases in the scale and pace of international travel, the limitations of the established WHO-coordinated system of official country notification of outbreak, and challenges posed to official notification by the widespread emergence of online global health news.

Like their US counterparts, the originators of GPHIN were concerned about the potential heightened spread of infectious disease across territorial boundaries enabled by globalization. Unlike the leadership of the infectious disease community in the US, however, the solution they formulated transgressed the established knowledge relations of infectious disease surveillance.

The developing vision of global surveillance advanced by the Institute of Medicine and CDC reports as well as the WHO strategic plan was firmly rooted in the conventional knowledge sources of existing national programs of disease surveillance. It was based fundamentally in the epidemiological case report and called for an expansion of international networks of diagnostic and laboratory infrastructure, trained personnel, and revamped linkages with academic and research institutes to facilitate the identification of disease agents, case definition, and the conduct and dissemination of epidemiological field research.

For the originators of GPHIN, by contrast, global public health surveillance would need to be decoupled from an exclusive reliance on traditional epidemiological methods. One member of GPHIN expressed this sentiment, emphasizing how quarantine measures and the use of established epidemiological surveillance had been rendered all but redundant under conditions of contemporary air travel. Under earlier circumstances of cross-Atlantic travel by ship, the identification of outbreak and the application of preventative quarantine measures were typically signaled by the appearance of disease symptoms. Ship-based travel provided plenty of time for passengers with infectious diseases to become sick and show visible signs of

illness.²⁷ With the time compression of air travel, however, people with infectious diseases cross international borders in a matter of hours, often before the clinical manifestation of disease. When travel cycles occur well within infectious disease incubation periods, outbreak investigation and surveillance can no longer rely on traditional epidemiological investigation. What was required were approaches that would alert public health authorities to the prospect of outbreak more quickly than was possible through epidemiological confirmation of clinical cases.

The understanding shared by the founders of GPHIN that global infectious disease surveillance would require a substantial improvement in the speed with which outbreaks became known was further supported by their critique of the system of international surveillance occurring under the auspices of the WHO. One might describe that system as a Westphalian one.²⁸ Under its terms, sovereign nations controlled what information they would share with the WHO in accordance with the international agreements into which they entered. International news of outbreak and epidemic was regulated primarily by the International Health Regulations which required signatories to report, within a 24-hour period, outbreaks for only three diseases: plague, yellow fever and cholera.²⁹

In contemporary public health, the surveillance system that existed at the WHO from the 1940s to the mid-1990s has come to be called a 'passive' system. One of our research participants emphasized the limitations of passive surveillance due to its reliance on state sources:

I should back up and say that the system that was in place for years and decades is a kind of passive surveillance system. The local area in a country is expected to report to some kind of regional area health district and they're supposed to report up to the national government and then the national government, if they so elect, will contact WHO... The WHO had to be very passive about that for political reasons. Although offline there would be insistence that the country please report, so that WHO could say something about it, that could be on relatively frequent occasions ignored by the countries.³⁰

WHO's system of official country notification was beset by problems of delay, incompleteness and occasional concealment on the part of member states due to weak national public health surveillance systems and the fear of the often enormous economic and political consequences of revealing information about local outbreaks.³¹ Twenty-four hour country notification of the WHO was required solely for yellow fever, cholera and plague, leaving out other communicable diseases, notably the emerging infectious diseases of concern to the Global North. WHO responses to local outbreaks were organized through focal point groups responding to the three internationally reportable infectious diseases. Non-official local information as well as

specimens would also be sent to the WHO and its collaborating centers by NGOs such as *Médecins Sans Frontières*. Country inquiries were sometimes initiated through WHO diplomatic channels. Older 'passive surveillance' had active elements, yet outbreaks were often reported months, even years, after an event had occurred or were included as part of annual statistics. As another research participant suggested of the latter practice, outbreak reports made 'behind the curve' might have held some value for future prevention work but did nothing to help respond to the reported outbreak.

For the originators of GPHIN, an alternative to the cumbersome, limited, and delayed system of extant international surveillance was first suggested through their experience of the 1994 outbreak of bubonic plague in Surat, India. The Surat outbreak received widespread media coverage. CNN, set up in 1985 to broadcast global news 24/7,³² covered the epidemic, releasing footage of people fleeing the city. The CNN coverage fed widespread public fear of plague, generating the need for public health officials to monitor events:

And we were watching that [CNN coverage – EM & LW] and of course that immediately gave rise to some anxiety in Canada because we have such a large Indian community and we have so much travel between the two countries. Even to the point where...we recognized that there was already a flight en route to Toronto by Air India and it threatened work stoppage at the Pearson Airport because this plane might be hauling plague... So...we tried to monitor this thing.³³

The efforts of Canadian public health officials to monitor the bubonic plague epidemic in Surat were hampered by poor international surveillance information. The federal government of India refused to publicly acknowledge the outbreak despite the CNN coverage³⁴ and delayed its official report to the WHO.³⁵ The WHO, consequently, was initially shut out of local events in Surat. Through their experiences with the 1994 outbreak, the originators of GPHIN came to recognize how their own monitoring efforts were being triggered not by international surveillance information, but by international news coverage. As one research participant put it 'the media was so far ahead of the health sector in monitoring and reporting...that the media was driving the reaction, not the World Health Organization'.³⁶

In their ongoing efforts to monitor the situation in Surat, the GPHIN founders made online contact with a physician based there. The resulting email exchange brought into relief possibilities for exchanging information about outbreak through electronic media that could outpace official country reports:

We started to have an Internet conversation with him and he'd tell us every day how many new patients had been admitted to hospital. And

all of a sudden it dawned on myself and another gentleman here...that we had information the government and media didn't have. And it was all informal. And it occurred to us that maybe the world was changing and that maybe there were other ways to get information besides waiting for the government.³⁷

The events in Surat were a pivotal moment in the formulation of GPHIN as a contribution to global infectious disease surveillance. They clearly called into question the authority of international public health authorities to communicate with the media, and to monitor and report outbreak. An alternative source and form of information – global health news – had stolen the initiative. Not only had global health news outpaced official public health reporting, it had driven public response to the outbreak.

While the epidemic in Surat had shown that the WHO lacked basic knowledge of outbreak worldwide and had weak relations with an increasingly global media, it also suggested to those who developed GPHIN the possibilities of using 'non-traditional' forms of information for global surveillance of infectious disease. The proliferation of the Internet and global health news could be turned into an ally if public health authorities were to use it as a source of information, creating the possibility for a new technique of global infectious disease surveillance – early warning outbreak detection.³⁸ Actively pursuing media reports of potential public health events could overcome the limitation of passive surveillance and help close the gap between the moment of outbreak and the time of reporting. The new surveillance system harnessed new capabilities by interiorizing global health news as its information source.

When, in 1996, the Canadian federal Treasury Board announced a competition among federal departments to encourage uses of the Internet, the public health officials who had been involved in the Canada-Surat email exchange in 1994 seized the opportunity. The proposal to Treasury Board was successful and work began on the GPHIN 1 prototype in 1997, with the system becoming operational in 1998. The GPHIN concept was formulated at that time as an electronic monitoring tool for early warning outbreak detection based on online news sources. The concept was distinct from a related electronic initiative, ProMED-mail, that had already broken with reliance on epidemiological reports for global outbreak detection.

Established in 1994, ProMED-mail is a medically-moderated chat line that brings together and distributes a mix of news reports, online summaries, official and local observer reports, and subscriber information in order to hasten the process by which public health authorities in the USA and internationally receive reports of outbreak.³⁹ GPHIN, by contrast, is fundamentally sourced in news. The information it scans is publicly available, does not rely on member postings, and is not subject to the processing delays involved in editorial monitoring of a chat line.

GPHIN is perhaps best described as a secure Internet-based global monitoring system for outbreak alert. GPHIN collects information on disease outbreaks and related public health events by monitoring global media on a 24-hour-a-day 7-days-a-week basis. GPHIN's main sources of outbreak information are the online global news aggregators Factiva and Al Bawaba. GPHIN uses an automated scanning system with a custom-built taxonomy of key words and Boolean search syntaxes to identify news items of potential relevance. The GPHIN system currently scans six key areas for news of global public health events: infectious diseases, biologics, and chemical, environmental, radioactive and natural disasters. The automated processes of scanning, filtering for relevancy and categorizing information are evaluated and supplemented by the work of GPHIN's six analysts. In November 2004, the multilingual GPHIN II was launched. Through the use of an automated translation technology developed through a collaborative research agreement between GPHIN and Nstein technologies, GPHIN now functions in all official language of the United Nations. On any given day GPHIN retrieves approximately 2,000 to 3,000 news items of which roughly one-quarter to one-third are discarded as duplicative or irrelevant. The remaining items are sorted by GPHIN analysts and posted on GPHIN's secure website for use by its over 100 users nationally and internationally.⁴⁰

GPHIN is sometimes disparaged as a monitoring device designed for intervention, lacking a basis in case reports, and devoid of analysis, rather than a true surveillance tool rooted in the rich soil of clinical and laboratory diagnoses.⁴¹ It is said that using news as a source is less reliable than case reports, the benchmark of public health surveillance. Yet news is more accurate than is often supposed. For example, an analysis of a 7-month period of ProMED mail reports indicated that 1.7 per cent of official outbreak reports were retracted because of inaccuracy compared with only a slightly greater 2.6 per cent of media reports.⁴² An internal GPHIN study showed that it had a 95 per cent accuracy rate.⁴³

The news reports upon which GPHIN is based are unofficial sources of information that do not fall within the warrant of governmental or scientific truth. GPHIN developers thus faced the problem of devising a mechanism of authorizing unverified news reports in order for the system to be of broad public health relevance. Their answer took the form of a new application for a concept that had previously been used during the WHO's smallpox eradication campaign:⁴⁴ outbreak verification. In an interview, one of the founders of GPHIN emphasized that the initiative could not be sourced fully within Canada. Canada, or any nation-state for that matter, lacked the capacity to provide the kind of verification that was needed. In his words,

You could not call the Minister of Thailand, or wherever, as the director of GPHIN and say 'we've been getting these reports of outbreaks in Thailand'.

The Minister could turn and say, 'Well, we have no responsibility to do anything or to respond to your call in any particular way'.⁴⁵

The only possible organization to provide the required verification was the WHO since it alone had the international diplomatic mandate to make inquiries of its national member states through the country representatives of the World Health Assembly. After a two-year period of collaboration and implementation begun in 1999, the WHO and Health Canada, on behalf of GPHIN, entered into an agreement that GPHIN would supply the WHO with monitoring data and the WHO would verify the reports through its official country contacts.

The combination of GPHIN's online early warning outbreak detection and the WHO's verification capacity provided an effective response to the global health media's challenge to the credibility of international public health authorities. The collaboration created a means of bypassing what had become an ineffectual system of international outbreak notification based on official country reports, speeding up public health knowledge of outbreak so that it coincided with the time of outbreak. While infectious disease surveillance had since the 1950s drawn on news sources,⁴⁶ GPHIN's exclusive sourcing of surveillance in news is without precedent.

At the same time, GPHIN has weakened national control over the announcement of outbreak, constructing a global space with national relays. The collaboration between GPHIN and the WHO created an alternative to the state-controlled 'pyramid' of epidemiological reporting from local to regional to national and international health authorities. As a member of GPHIN observed: 'We were squashing the pyramid down to a flat plain in which information could come from any particular place at any time. And governments were no longer in control of their information'.⁴⁷ The GPHIN-WHO collaboration unsettles the borders of state secrecy and control over public health information. At the present time, sovereign states are no longer able to contain news of outbreak within their borders, as the People's Republic of China came to understand during the SARS outbreak, which GPHIN first called to the attention of WHO in November 2002. Of course, sovereign control over domestic public health information has not been fully eclipsed. GPHIN's technological innovation has been responded to by China, for example, in the form of censoring domestic internet information.⁴⁸

The move from 'pyramid' to 'flat plain' further marked a shift in the action capacity from launching infrequent responses to outbreak to the potential for intervention at the time of outbreak, a profound change in global response capacity. The collaboration between GPHIN's online early warning outbreak alert capacity and the WHO's outbreak verification capacity created the conditions for the emergence of the WHO as the pre-eminent authority in global public health surveillance, albeit with national rivals.

The securitization of global public health

Ilona Kickbusch, one of the leading commentators in the emerging field of global public health governance, has argued that the increasing focus on the narrow issue of infectious diseases within global public health has been accompanied by a move, particularly in US policy, to distance development health aid from its former humanitarian rationale. Funding to global health is increasingly viewed through the lens of national economic, political and security interests. Within the field of public health surveillance measures, security concerns predominate, fueled by the experience of the intentional spread of anthrax in the USA after the destruction of the World Trade Center.⁴⁹

Although there was increasing integration of public health surveillance with US national defense after the events of 9/11, the concept of 'emerging infectious diseases' had from the first been formulated in relation to US national interests. As mentioned earlier, the watershed report from the National Institute of Medicine in Washington, DC, had tellingly been titled, *Emerging Infections: Microbial Threats to the United States*⁵⁰ and was followed by the CDC's 1994 report, *Addressing Emerging Disease Threats: A Prevention Strategy for the United States*.⁵¹ A decade prior to 9/11, then, 'emerging infectious diseases' were spatialized in geopolitical terms as 'threats' to the 'American nation'. ProMED-Mail was established to detect and protect the USA against the intentional spread of pathogens.⁵² The interdigitation of 'emerging infectious diseases' and bioterrorism continued in the mid-1990s, when, in the aftermath of the collapse of the Soviet Union, the extent of the Soviet biological weapons program first became known.⁵³ Western powers were concerned that Soviet stocks of biological weapons and Soviet expertise might fall into the hands of national states and independent groups hostile to Western interests. The 'microbial threats' might potentially be militarized as 'microbial hostiles'. One indication of the pre-9/11 concern with the intentional release of pathogens was the 1997 speech of Dr David Henderson to the First International Conference on Emerging and Infectious Diseases held in 1998, where he spoke publicly for the first time on bioterrorism.⁵⁴ As the former director of the global smallpox eradication campaign at the World Health Organization, Henderson placed his enormous prestige in the service of defining bioterrorism as a public health issue.

After the destruction of the World Trade Center and the subsequent anthrax outbreak the binding together of infectious disease surveillance with military intelligence proceeded with a new level of intensity. In the US, public health became part of the national policy agenda at the new, post-9/11 Department of Homeland Security.⁵⁵ In December 2001 the US Congress allocated US\$918,000,000 to state and local public health authorities through the CDC to improve their capacity to respond to bioterrorist attacks

and public health emergencies.⁵⁶ The Public Health Security and Bioterrorism Preparedness and Response Act (2002) was passed with the intent of preventing the use of biological weapons on US soil, and bolstering response capacity in the event of their deployment. The development of new techniques for infectious disease surveillance systems, including 'syndromic surveillance', has been funded through these post-9/11 opportunities. Syndromic surveillance was being developed in the late 1990s,⁵⁷ but has flourished under post-9/11 financing. However, as Fidler discusses in chapter 11, the focus since 2001 on emerging infectious diseases and bioterrorism in the CDC's infectious disease control research and programming⁵⁸ together with the attendant monies flowing into bioterrorism preparedness in the US public health system, have both been criticized for competing with and undermining core public health practices throughout the United States.⁵⁹

Like GPHIN, syndromic surveillance is an online early warning outbreak detection technique. In the United States, syndromic surveillance has been richly funded as a technique that might provide early warning of bioterrorist events. The techniques of syndromic surveillance have, like GPHIN, been driven by the pressure for 'timeliness', that is, the earliest possible outbreak alert. The demand for 'timeliness' has led to the fashioning of online techniques that *push detection prior to diagnosis*. This is the case with the new 'syndromic surveillance' techniques, which attempt to recognize outbreaks by identifying unanticipated clusters of data. In public health scholarship, the technique of syndromic surveillance contrasts with what is increasingly called 'traditional' infectious disease surveillance based on case reports of suspected or diagnosed cases of specific diseases that are brought to the attention of public health authorities.⁶⁰ One 'practical guide' for setting up syndromic surveillance systems makes clear the breadth of data sources that may be used:

The principal underlying premise of these systems is that the first signs of covert biological warfare attack will be clusters of victims who change their behaviour because they begin to become symptomatic... When people become sick, they may make purchases such as facial tissues, orange juice, and over-the-counter remedies for colds, asthma, allergies, intestinal upsets and so on. They may not report to school or work. Less traditional data sources include work and school absenteeism and retail sales of groceries and over-the-counter medication, including electrolyte products for pediatric gastroenteritis. The next level of detectable activity is likely to be encounters with the health care system. Patients may phone in to nurses or physicians. They may visit sites of primary care, activate 911 emergency medical services, visit emergency departments or be hospitalized. They may have laboratory tests ordered. Some may die. All of this activity may precede the first confirmed diagnosis of a bioterrorism victim.⁶¹

Now buying facial tissues and skipping school are social practices with many potential meanings. Within public health epidemiology, syndromic surveillance has been criticized as intrinsically flawed by a lack of specificity, that is, too many false positives, too many false alarms.⁶²

GPHIN and other early warning online outbreak detection techniques such as syndromic surveillance can only exist under conditions where electronic data is widely available. Such electronic data streams characterize the Global North rather than the Global South, and thus syndromic surveillance cannot at this point in time or for the foreseeable future be used for global surveillance. Unlike GPHIN, syndromic surveillance is organized around *national* needs, defense needs. Again, unlike GPHIN, syndromic surveillance is quantitative rather than based on the analysis of news sources. Global public health surveillance cannot be based on case reports because national surveillance systems are weak outside the richest countries of this world; it is unlikely that large parts of Africa, Asia and South America will have online infectious disease data in the foreseeable future, nor is it desirable in public health terms that this expenditure should be prioritized. Under these conditions, global online news substitutes for 'traditional' surveillance. It is GPHIN rather syndromic surveillance that has weakened national control over the announcement of outbreak, constructing a global knowledge articulated to national sovereignty.

Canada has not escaped the securitization of public health that has characterized the Global North post-9/11, with the fear of bioterrorism being keyed into the rationale for renewal of the national public health system.⁶³ The securitization of public health, focused as it has been on infectious disease surveillance, has predictably implicated GPHIN, which is institutionally located in the Division of Counter Terrorism Coordination and Health Information Network at the Centre for Emergency Preparedness and Response (CEPR), in the Public Health Agency of Canada.

GPHIN's potential for intelligence uses first became evident during the SARS outbreak in Toronto during 2003, when GPHIN drew national and international publicity as an information source. During the outbreak, GPHIN supplied updates on the numbers of SARS cases internationally to each daily meeting at the Centre for Emergency Preparedness and Response. As the outbreak continued, GPHIN was asked by the Minister of Health to provide information about airport measures and visa restrictions affecting Canadian passengers traveling internationally. The SARS outbreak raised GPHIN's profile within the Canadian government, and since 2003 GPHIN has responded to requests by Ministers for updates on a variety of topics, for instance avian flu. During the SARS outbreak, the multifunctionality of GPHIN's electronic data became evident to GPHIN and to government agencies in Canada and worldwide. GPHIN's data could be processed in multiple ways to serve the goals of differing users.

The SARS outbreak drew the attention of intelligence agencies to GPHIN, an interest that created a conflict of interest between GPHIN and the WHO, its collaborating partner, as one of our research participants made clear:

Now a lot of intelligence communities got interested as well and that created a bit of a dilemma because WHO said, 'We cannot be associated with intelligence communities'.

EM and LW: Why is that?

Political. Because WHO services all countries equally. And so they can't afford to be associated with any particular intelligence group in any way that would compromise their ability to another country that might be at odds with the West or maybe not. You know Cuba's a member of the WHO, for example. So the armed forces medical intelligence committee wanted to subscribe. That's the intelligence in the United States and WHO was very adamant that they could not be associated with that... They said, 'We can't partner with an organization that might also be serving the needs of the intelligence community'. So we said, 'OK. You're not a partner, you're a client'.⁶⁴

As an international agency, the WHO could not compromise its neutrality by aligning with, or being perceived to align with, the spying agencies and defense needs of its individual member states. The legal and diplomatic needs of the WHO drew a boundary between it and the civilian and military intelligence of nations in the Global North. GPHIN, however, wished to develop its capacity for intelligence, doing so by revising its agreement with the WHO, transforming the WHO from a partner to a 'client'.

GPHIN's ongoing funding needs undermined its partnership with the WHO. In order to cover its operational budget, GPHIN moved to a cost recovery system in September 2004, charging its users a subscription fee, and tailoring its online services to meet client needs. The research and development costs for state-of-the-art software capable of functioning in all six languages of the WHO – a second phase of GPHIN's development – were in part funded through a collaborative research agreement with the private sector and a US foundation, the Nuclear Threat Initiative. Consistent government underfunding of GPHIN has required it to initiate innovative public-private sector collaborations and creative approaches to the meaning of 'procurement' between the ministries of differing nations. GPHIN is often touted internationally as a great Canadian contribution to global public health, but its funding needs have met with minimal domestic support.⁶⁵

The situation with respect to GPHIN under-funding has led to it sell its services to organizations that were in a position to pay. At the time of our field research in July 2004, GPHIN had close to one hundred users, mainly health and defense ministries. Military intelligence, including the US

Armed Forces, has access to GPHIN, which has developed the capacity to develop 'warning area alerts' directed to intelligence uses for its clients:

More recently we are able to provide warning area alerts... For example, Honduras has recently reported several times that they have found training camps within Honduras that are Al-Qaeda supported so this type of information we would provide to our military intelligence officer, Dr. ____, and to other users of GPHIN who would find this information valuable.⁶⁶

The results of chemical spills, which might be either intentional or non-intentional, would be communicated to CSIS (the Canadian intelligence agency), or outbreaks in areas where Canadian troops were stationed overseas would be communicated to the Ministry of Defense.

The sophisticated automated translation capacity found in the new GPHIN platform that was activated in September 2004 gave GPHIN new capacities with potential intelligence uses that would make it attractive to clients with sufficient budgets. One possible area of future intelligence interest in GPHIN involves its capacity to track bioterrorist outbreaks in countries of the Global South that act as transportation hubs for traffic into the Global North. The weak national surveillance systems in the Global South would make these regions vulnerable to bioterrorist events, whereas such events would be quickly identified by the national surveillance capacities of the Global North.⁶⁷ Thus, GPHIN's multilingual capacity would provide early warning detection of bioterrorist events that could spread to the Global North via airline travel from the Global South, a feature that would make GPHIN attractive for the biosecurity purposes of the Global North.

The tactics of securing the Global North against bioterrorism have given new meaning to health protection. Where health protection is formulated as a matter of security against terrorism, civilian public health becomes informed by the relevances of defense policy, coordinated with twenty-first century intelligence and the military. One might wonder how this will affect the institutional form, priorities, personnel and actions of global public health with respect to future infectious disease control. At issue here are the tactical valences of global public health surveillance in the twenty-first century, specifically whether it will serve the growth of global democracy and peace in the twenty-first century or the defense and military needs of the Global North. The stakes ultimately involve the politico-ethical form of global biopolitics, specifically whether it shall be run by an elite minority in the Global North in an oligarchic fashion or whether it will serve the health and democratic needs of the people globally.

Conclusion

In this chapter we have described and analyzed the formation of global public health surveillance through a case study of the Global Public Health Intelligence Network. Contemporary global public health surveillance differs from the international knowledge of infectious disease during the period 1945–1990 with respect to its organization of time, social action and geopolitical borders. GPHIN is a technique that enables timeliness of report, that is, a speeding up of international reports of outbreak to a point when outbreak occurs and intervention is possible. GPHIN and other forms of online early warning outbreak detection have created a truly global knowledge of outbreak concurrent with the time of outbreak. Because global public health surveillance operates in that specialized temporal interval known as ‘real time’, it makes possible an expansion in the volume and institutional significance of previously existing forms of WHO action: official country inquiries and field response. With respect to geopolitical borders, GPHIN created a source of knowledge that was an alternative to official country notification of outbreak. Online early warning outbreak detection not only bypasses national control, it permits the WHO to have an expanded knowledge of many kinds of outbreak in excess of the reportable diseases that required compulsory country notification in the early 1990s: cholera, plague, and yellow fever. In this sense, GPHIN has been vital to the revision of the International Health Regulations which have expanded the scope of international disease reporting to include all public health emergencies considered to be of international concern.⁶⁸ The WHO thus has a source of knowledge beyond national control that it uses to act as a lever to pressure countries to divulge information about outbreak.

Global public health surveillance takes apart national secrecy about outbreak and epidemic as well as national ignorance of these events. However, it must not be imagined that global public health proceeds without reference to the space of the nation and national health systems. Rather, global public health surveillance is a level of governmental knowledge that only becomes authoritative and actionable when it is articulated to national verification as well as national consent to the entry of response teams organized through the WHO. The global space of public health surveillance operates *through* national health systems. What we see in the case study of GPHIN is an example of the increasing density of global public health in terms of its knowledge forms and institutional action.

The governmental techniques of early outbreak detection and verification together with global field response are distinct from older, colonial forms of ‘containment’ through *cordons sanitaires*. Our contemporary concern is less to contain pre-existing epidemics than to identify and directly intervene in local outbreaks regarded as potential or actual interna-

tional health emergencies. This is not simply a new function for international health response capacity. At its normative best, global public health surveillance aims to protect global population rather than national or colonial ones. It is a new spatial organization of the geopolitical borders of infectious disease control. Global public health surveillance is not organized around a concept of an external frontier to be defended. It is 'empire' without an outside rapidly being integrated into the intelligence needs of the Global North.⁶⁹

Notes

This text is produced with the equal contribution of both authors. We alternate first author position in our joint publications for the purpose of equally distributing public perceptions of primary authorship.

- 1 D.L. Heymann and G.R. Rodier, 'Hot Spots in a Wired World: WHO Surveillance of Emerging and Re-emerging Infectious Diseases', *The Lancet Infectious Diseases*, 1 (2001): 345–535; T.W. Grein et al., 'Rumours of Disease in the Global Village: Outbreak Verification', *Emerging Infectious Diseases*, 6 (2000): 97–102; D.P. Fidler, 'Emerging Trends in International Law Concerning Global Infectious Disease Control', *Emerging Infectious Diseases*, 9 (2003): 285–90; B. Fantini, 'International Health Organizations and the Emergence of New Infectious Diseases', *History and Philosophy of the Life Sciences*, 15 (1993): 435–57.
- 2 D.P. Fidler, 'Germs, Governance, and Global Public Health in the Wake of SARS', *Journal of Clinical Investigation*, 113 (2004): 799–804.
- 3 K. Loughlin and V. Berridge, *Global Health Governance: Historical Dimensions of Global Governance* (London and Geneva: London School of Hygiene & Tropical Medicine and World Health Organisation, 2002).
- 4 The Conferences were established in response to European anxiety about infectious diseases from the East, especially cholera and yellow fever. Authorities were concerned about the effectiveness of established quarantine measures to deal with the increased movement of goods and people across national borders that had arisen as part of increased international trade. For a discussion of the conferences see N.M. Goodman, *International Health Organizations and their Work* (Edinburgh: Churchill Livingstone, 1971).
- 5 K. Lee (ed.), *Health Impacts of Globalization: Towards Global Governance* (London: Palgrave, 2003); M. Reich (ed.), *Public-Private Partnerships for Public Health* (Cambridge, Mass.: Harvard Center for Population and Development Studies, Distributed by Harvard UP, 2002); K. Buse and G. Walt, 'The World Health Organisation and Global Public-Private Health Partnerships: In Search of 'Good' Global Governance', in Reich (ed.), *Public-Private Partnerships for Public Health*, pp. 169–98; K. Lee, K. Buse and S. Fustukian (eds), *Health Policy in a Globalising World* (Cambridge: Cambridge University Press, 2002); R. Dodgson, K. Lee and N. Drager, *Global Health Governance: A Conceptual Review* (London and Geneva: London School of Hygiene & Tropical Medicine and World Health Organization, 2002); I. Kickbusch, 'The Development of International Health Policies – Accountability Intact?', *Social Science & Medicine*, 51 (2000): 383–9.
- 6 Eric Mykhalovskiy and Lorna Weir, 'The Global Public Health Intelligence Network and Early Warning Outbreak Detection: A Canadian Contribution to Global Health', *Canadian Journal of Public Health* 97 (2006): 42–4. *Special issue on Global Health*.

- 7 On 26–27 July 2004 we interviewed 10 staff and managers of the Global Public Health Intelligence Network (GPHIN). The interviews took place at the Centre for Emergency Preparedness (Health Canada) in Ottawa, Canada. In order to protect the personal confidentiality of the research participants, we have chosen to identify interviewees solely as ‘GPHIN Interview, 26–27 July 2004’. All interviews were taped and later transcribed.
- 8 David Fidler was the first to use the concept of Westphalian and post-Westphalian surveillance of infectious disease. See D. Fidler, ‘SARS: Political Pathology of the First Post-Westphalian Pathogen’, *Journal of Law, Medicine and Ethics*, 31 (2003): 485–505.
- 9 See for example the definition of public health surveillance in the Report of the CDC (Centers for Disease Control and Prevention – Bethesda, Maryland) Guidelines Working Group, *Updated Guidelines for Evaluating Public Health Surveillance Systems* (2001), p. 2, where it is construed as ‘...the ongoing, systematic collection, analysis, interpretation, and dissemination of data regarding a health-related event for use in public health action to reduce morbidity and mortality to improve health’.
- 10 Lenore Manderson has done groundbreaking work documenting international reports of outbreak at the Eastern Bureau of the League of Nations Health Organization from 1925 to 1942. The areas of East Asia and Australia were connected via telegraph and radio. See L. Manderson, ‘Wireless Wars in the Eastern Arena: Epidemiological Surveillance, Disease Prevention and the Work of the Eastern Bureau of the League of National Health Organisation, 1925–1942’ in P. Weindling (ed.) *International Health Organizations and Movements, 1918–1939* (Cambridge: Cambridge University Press, 1995).
- 11 A.D. Langmuir, ‘The Surveillance of Communicable Diseases of National Importance’, *The New England Journal of Medicine* 268 (1963): 182–92 and ‘William Farr: Founder of Modern Concepts of Surveillance’, *International Journal of Epidemiology* 5 (1976): 13; S.B. Thacker, ‘Historical Development’ in S. Teutsch and R.E. Elliott (eds), *Principles and Practice of Public Health Surveillance* (Oxford: Oxford University Press, 2000) p. 11; S.B. Thacker and R.L. Berkelman, ‘Public Health Surveillance in the United States’, *Journal of the American Medical Association*, 249 (1988): 166.
- 12 S.B. Thacker and M.B. Gregg, ‘Implementing the Concepts of William Farr: The Contributions of Alexander D. Langmuir to Public Health Surveillance and Communications’, *American Journal of Epidemiology*, 144 (8 Suppl) (1996): S23.
- 13 *Ibid.*, p. S26.
- 14 For a discussion of the 1973 smallpox outbreak and its impact on disease surveillance in Britain, see G. Pollock, *Fevers and Cultures: Lessons for Surveillance, Prevention and Control* (Abingdon: Radcliffe Medical Press, 2003) p. 27.
- 15 O. Aginam, ‘International Law and Communicable Diseases’, *Bulletin of the World Health Organisation*, 80 (2002): 946–50; J. Fricker, ‘Emerging Infectious Diseases: A Global Problem’, *Medicine Today*, 6 (2000): 334–445; D.P. Fidler, ‘Public Health and National Security in the Global Age: Bioterrorism, Pathogenic Microbes and Realpolitik’, *George Washington International Law Review*, 25 (2003): 787–856; Heymann and Rodier, ‘Global Surveillance of Communicable Diseases’, *Emerging Infectious Diseases*, 4 (1998): 362–65; Heymann and Rodier, ‘Hot Spots in a Wired World’.
- 16 Heyman and Rodier, ‘Global Surveillance of Communicable Diseases’.
- 17 J. Lederberg, R.E. Shope and S.C. Oaks Jr. (eds), *Emerging Infections: Microbial Threats to Health in the United States* (Washington, DC: National Academy Press, 1992).

- 18 *Ibid.*, p. 34.
- 19 Centers for Disease Control and Prevention, *Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States* (1994), http://www.cdc.gov/ncidod/publications/eid_plan/Default.htm. (accessed 4 May 2006)
- 20 L. Garrett, *The Coming Plague: Newly Emerging Diseases in a World Out of Balance* (New York: Farrar, Straus and Giroux, 1994), pp. 604–651.
- 21 World Health Organisation, *Global Outbreak Alert and Response: Report of a WHO Meeting* Department of Communicable Diseases Surveillance and Response (Geneva WHO, 2000) <http://who/cds/csr/2000.3>, pp. 7–9 (accessed 4 May 2006)
- 22 J.W. Leduc, 'Action Plan of the World Health Organisation', *Global Issues: An Electronic Journal of the United States Information Agency* 1, 17 (Nov. 1996), <http://usinfo.state.gov/journals/itgic/1196/ijge/gj-7.htm>. (accessed 4 May 2006).
- 23 'WHO at Fifty. 4 Highlights of Activities from 1989 to 1998', *World Health Forum* 19 (1998): 452.
- 24 D.L. Heymann and G.R. Rodier, 'Global Surveillance, National Surveillance, and SARS', *Emerging Infectious Diseases*, 10 (2004): 173–5.
- 25 Global Outbreak and Response Network, Webpage, <http://www.who.int/csr/outbreaknetwork/en/> (accessed 4 May 2006).
- 26 Heymann and Rodier, 'Global Surveillance'.
- 27 Interestingly, similar arguments about the effectiveness of quarantine and reduced travel times associated with the introduction of steam ships surfaced during the deliberations of the international sanitary conferences (see Loughlin and Berridge, *Global Health Governance*).
- 28 For our purposes, a Westphalian system of world health existed from the period after World War II until the mid-to-late 1990s, that is, from the dissolution of colonial empires to the invention of global public health surveillance and response.
- 29 M. Hardiman, 'The Revised International Health Regulations: A Framework for Global Health Security', *International Journal of Antimicrobial Agents*, 21 (2003): 207–11.
- 30 GPHIN Interview, 26–27 July 2004.
- 31 For example, it is estimated that the 1991 cholera outbreak in South America cost Peru approximately US\$150 million in lost tourism and \$750 million in lost trade. Estimates of the cost of the 1994 bubonic plague in India are in the range of US\$2 billion. See R.A. Cash and V. Narasimhan, 'Impediments to Global Surveillance of Infectious Diseases: Economic and Social Consequences of Open Reporting', *Bulletin of the World Health Organisation*, 78 (2000): 1358–67.
- 32 M. Medina, 'Time Management and CNN Strategies (1980–2000)' in A.B. Albarran and A. Arrese (eds), *Time and Media Markets* (Mahwah, New Jersey: Lawrence Erlbaum, 2003) pp. 81–95.
- 33 GPHIN Interview, 26–27 July 2004.
- 34 M.W. Zacher, 'Global Epidemiological Surveillance: International Cooperation to Monitor Infectious Diseases' in I. Kaul, I. Grunberg and M. Stern (eds), *Global Public Goods: International Cooperation in the 21st Century* (Oxford: Oxford University Press, 1999) pp. 266–83.
- 35 Cash and Narasimhan, 'Impediments to Global Surveillance of Infectious Diseases'.
- 36 GPHIN Interview, 26–27 July 2004.
- 37 GPHIN Interview, 26–27 July 2004.

- 38 Heymann and Rodier, 'Global Surveillance of Communicable Diseases'; D.L. Heymann, *Food Safety, an Essential Public Health Priority* (2002), http://www.foodsafetyforum.org/global/opening3_en.htm. (accessed 4 May 2006).
- 39 J.P. Woodall, 'Global Surveillance of Emerging Diseases: The ProMED-mail experience', *Cad Saude Publica*, 17 (Suppl.) (2001): 147–54; M. Hugh-Jones, 'Global Awareness of Disease Outbreaks: The Experience of ProMED-mail', *Public Health Reports*, 116 (Supplement 2) (2001): 27–31.
- 40 GPHIN interview, September 26, 2005 and R. St. John, GPHIN Presentation (2004), http://www.dtra.mil/ASCO/wpc/session3/St%20John.%20GPHIN%20Presentation_%20Jan%2020%202004.pdf. (accessed 4 May 2006).
- 41 GPHIN Interviews, 26–27 July 2004.
- 42 L. Garrett, 'Understanding Media's Response to Epidemics', *Public Health Reports*, 116 (Supplement 2) (2001): 88.
- 43 GPHIN Interview, 26–27 July 2004.
- 44 David Henderson, 'Surveillance of Smallpox', *International Journal of Epidemiology*, 5 (1976): 19–28.
- 45 GPHIN Interview, 26–27 July 2004.
- 46 It is a misperception to read the history of public health surveillance as based in its entirety on case-reports. News has been a component of public health surveillance since the 1955 polio outbreak when CDC epidemiologists used newspaper reports as part of their data (A. Langmuir, 'The Surveillance of Communicable Diseases of National Importance', *New England Medical Journal*, 268 (1963): 182–92). During the 1980s, public health epidemiology began to draw on telephone surveys (S.B. Thacker, R.L. Berkelman and D.F. Stroup, 'The Science of Public Health Surveillance' *Journal of Public Health Policy* 10 (1989): 190.
- 47 GPHIN Interview, 26–27 July 2004.
- 48 'China and the Internet', *The Economist* (27 April 2006); Andy Ho, 'China Bug – Is It Ebola-like Bird Flu?' *Yale Global Online* <http://yaleglobal.yale.edu/display.article?id=6077> (accessed 2 May 2006).
- 49 Centers for Disease Control and Prevention, 'Update on Emerging Infections: Syndromic Surveillance for Bioterrorism Following the Attacks on the World Trade Centre – New York City, 2001', *Annals of Emergency Medicine*, 41 (2003): 414–18; A. Reingold, 'If Syndromic Surveillance is the Answer, What is the Question?', *Biosecurity and Bioterrorism: Biodefense Strategy, Practice and Science*, 1, 2 (2003): 77–81.
- 50 Lederberg et al., 'Emerging Infections: Microbial Threats to Health in the United States'.
- 51 Centers for Disease Control and Prevention, *Addressing Emerging Infectious Disease Threats: A Prevention Strategy for the United States*.
- 52 ProMED-Mail Interview, 27 July 2005.
- 53 L. Garrett, *Betrayal of Trust: The Collapse of Global Public Health* (New York: Hyperion, 2000), pp. 486–550.
- 54 *Ibid.*, p. 450.
- 55 I. Kickbusch, 'The Contribution of the World Health Organization to a New Public Health and Health Promotion', *American Journal of Public Health*, 93 (2003): 383–9.
- 56 S.W. Marmagas, L.R. King and M.G. Chuk, 'Public Health's Response to a Changed World: September 11, Biological Terrorism, and the Development of an Environmental Health Tracking Network', *American Journal of Public Health*, 93 (2003): 1228.

- 57 J. Koplan, 'CDC's Strategic Plan for Bioterrorism Preparedness and Response', *Public Health Reports*, 116 (Supplement 2) (2001): 13; D.M. Sosin, 'Syndromic Surveillance: The Case for Skilful Investment', *Biosecurity and Bioterrorism: Biodefense Strategy, Practice and Science*, 1 (2003): 247.
- 58 J. Koplan, 'CDC's Strategic Plan for Bioterrorism Preparedness and Response', p. 9
- 59 Reingold, 'If Syndromic Surveillance Is the Answer, What Is the Question?'
- 60 M.S. Green and Z. Kaufman, 'Surveillance for Early Detection and Monitoring of Infectious Disease Outbreaks Associated with Bioterrorism', *Israel Medical Association Journal*, 4, 7 (2002): 503; Sosin, 'Syndromic Surveillance: The Case for Skilful Investment', p. 247.
- 61 K.D. Mandl et al., 'Implementing Syndromic Surveillance: A Practical Guide Informed by the Early Experience', *Journal of the American Medical Informatics Association*, 21 (November 2003): 11.
- 62 Reingold, op. cit.; M.A. Stoto, M. Schonlau and L.T. Mariano, 'Syndromic Surveillance: Is It Worth the Effort?', *Chance*, 17, 1 (2004): 19–24.
- 63 National Advisory Committee on SARS and Public Health, *Learning from SARS: Renewal of Public Health in Canada* (Ottawa: National Advisory Committee on SARS and Public Health, 2003), p. 2
- 64 GPHIN Interview, 26–27 July 2004.
- 65 Mykhalovskiy and Weir 'The Global Public Health Intelligence Network and Early Warning Outbreak Detection', pp. 42–4.
- 66 GPHIN Interview, 26–27 July 2004.
- 67 GPHIN Interview, 26–27 July 2004.
- 68 M. Hardiman 'The Revised International Health Regulations: A Framework for Global Health Security'. *International Journal of Antimicrobial Agents*, 21 (2003): 207–10.
- 69 On 'empire without an outside' see M. Hardt and A. Negri, *Empire* (Cambridge, Mass.: Harvard University Press, 2000).