

Chronicle of a Pandemic Foretold: Lessons from the 2009 Influenza Epidemic

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Executive Summary

The A(H1N1) influenza epidemic provided the first indication of the effectiveness of the pandemic preparations that countries and international organizations initiated in the wake of the 2003 SARS epidemic. In the case of SARS, China was criticized for not reporting the outbreak quickly enough. This led to new reporting requirements under WHO regulations. In the case of the 2009 influenza epidemic, Mexico and the United States complied with their obligations to report outbreaks to the WHO as soon as they detected a problem. Nevertheless, this reporting was delayed due to the timing of the outbreak, which coincided with regular influenza season. The WHO declared a public health emergency of international concern within 48 hours of laboratory confirmation that the Mexican and US viruses were a new strain. While the WHO issued recommendations against trade and travel restrictions, a significant number of countries chose to ignore those recommendations. What was most worrying was the decision of many countries to apply more severe restrictions against Mexico than against the United States.

The initial lack of access to accurate testing equipment severely hampered Mexico's ability to confirm quickly the cause of deaths and illness. Moreover, Mexico kept the world informed of every development in the epidemic with honesty and transparency, in accordance with WHO guidelines and regulations. Mexico also applied mitigation measures quickly, broadly and decisively. Mexico's response to the outbreak led to the perception that Mexico's epidemic was far worse than the US epidemic. While Mexico initially reported *suspected* cases on a daily basis, the United States limited its release of information to *confirmed* cases. This reinforced the perception that Mexico was much more seriously affected and the likely point of origin. Once Mexico had the capacity to test samples, it limited its release of information to confirmed cases, as the United States had done from the beginning.

The response of many countries to Mexico's open and transparent reporting in this case may undermine WHO reporting requirements and encourage countries to be less open regarding future public health threats of international concern. Thus, the response of some countries to Mexico's exemplary handling of this situation may increase the health risks to all people in future pandemics.

Keywords

Mexico; Swine flu; Influenza; A(H1N1); World Health Organization; Infectious Disease Outbreaks; International Health Problems; Infectious Disease Reporting; Communications Strategy; Economic Factors; World Trade Organization.

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I. Introduction

The increasing frequency of global flu pandemics, together with the SARS outbreak of 2003, have highlighted the need to improve international coordination, share information and minimize the economic impact when such outbreaks occur. These concerns motivated the World Health Organization to adopt improved International Health Regulations (IHR, 2005) and to issue guidelines on communicating with the public during pandemics.¹ In theory, reforms to the IHR (2005) enhance the ability of the WHO to coordinate and implement a global response to global diseases and future pandemics. The IHR (2005) rules, particularly those regarding trade restrictions, take into account in their design the relevant law of the World Trade Organization (WTO) regarding the use of trade restrictions to address public health concerns. The mutually reinforcing features of the IHR (2005) and WTO law have been well analyzed.²

The effectiveness of the IHR (2005), which entered into force in 2007, has been enhanced by the advent of modern communications technologies, which facilitate the dissemination of news on outbreaks of infectious diseases. Rapid detection of public health emergencies is a critical element of international disease prevention and control, but there are several potential obstacles to effective implementation of the IHR (2005), including legal, political and economic issues.³ In theory, WTO law, together with modern communications technologies, may create incentives for countries to report outbreaks of infectious diseases in order to reduce the risk of disproportionate trade restrictions in response to outbreaks of infectious diseases. However, these incentives depend on rapid and effective WHO recommendations that, together with WTO law, would minimize the risk of economic harm caused by disproportionate trade restrictions.

The 2009 outbreak of swine flu demonstrated that even if WHO recommendations are issued relatively rapidly, they are unlikely to be effective in preventing the use of disproportionate trade and travel restrictions. Moreover, WTO law is unlikely to prevent states from taking measures whose appropriateness would only become clear with hindsight.

Article 2 of the IHR (2005) establishes the purpose and scope of the Regulations in the following terms: “to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade”. The objective of avoiding unnecessary interference with international traffic and trade reflects the concerns of countries regarding the negative economic impact of disproportionate responses to public health risks that lack scientific justification. There have been many such cases. Following an outbreak of cholera in

¹ Outbreak communication: Best practices for communicating with the public during an outbreak. Report of the WHO Expert Consultation on Outbreak Communications held in Singapore, 21–23 September 2004.

² See for example John D. Blum, *Law as Development: Reshaping the Global Legal Structures of Public Health*, 12 *Mich. St. J. Int'l L.* 207 (2004); David Byrne, *Is There a Lawyer in the House: The Law of Global Public Health*, 33 *J.L. Med. & Ethics* 19 (2005); Emily Lee, *The World Health Organization's Global Strategy on Diet, Physical Activity, and Health: Turning Strategy Into Action*, 60 *Food Drug L.J.* 569 (2005); Timothy J. Miano, *Understanding and Applying International Infectious Disease Law: U.N. Regulations During an H5N1 Avian Flu Epidemic*, 6 *Chi.-Kent J. Int'l & Comp. L.* 26 (2006); and Jason Sapsin, *International Trade Agreements: Vehicle for Better Public Health?* 33 *J.L. Med. & Ethics* 111 (2005).

³ Fidler D. *Influenza Virus Samples, International Law and Global Health Diplomacy*. *EID*. 2008 14:1 88-94.

Peru in 1991, even though the WHO and the US Centers for Disease Control found that there was no basis for travel or trade restrictions, the European Community and other countries imposed import bans on fish and other perishable foods, inspection requirements and restrictions on travelers from Peru. In 1994, after India reported a suspected outbreak of plague, even though the WHO had advised that no travel or trade restrictions were appropriate other countries canceled flights, closed borders to goods and people, and issued travel advisories.⁴ Such responses explain the past reluctance of countries to report public health threats.

Member States had until June 2009 to assess their ability to comply with the core surveillance requirements of the IHR (2005) and to implement a plan for ensuring compliance. Reducing the risk of disproportionate trade restrictions would enhance economic incentives to comply with surveillance requirements. While the IHR (2005) contain norms that discourage the use of disproportionate trade restrictions in response to disease outbreaks, health-related trade restrictions are regulated by the WTO. WHO risk assessments and recommendations are likely to influence the application of WTO rules to such cases. However, how to ensure that the incentives created by the international legal system function effectively in regulating responses to outbreaks of infectious diseases remains an open question.

This article is organized as follows. We first consider the problems that the IHR (2005) were meant to resolve, such as the need for rapid reporting of outbreaks, the related need to minimize disproportionate travel and trade restrictions in response to outbreaks and the need for international leadership to coordinate the global response. We then analyze how the IHR (2005) are designed to achieve this end and how effective a tool the IHR (2005) proved to be during the 2009 outbreak of swine flu. We also consider the WHO guidelines for communicating with the public during a pandemic and assess the effectiveness of the Mexican government's pandemic planning and communication strategy in addressing the swine flu epidemic. We also consider the role of WTO law in regulating the use of disproportionate trade restrictions in response to disease outbreaks, as well as regulating the use of compulsory licenses to lower the cost of stockpiling antiviral medications in preparation for a pandemic. In Appendix A, we provide a daily narrative of the unfolding saga of the 2009 outbreak of A (H1N1) virus. Unlike the story of Gabriel García Márquez, our narrative is strictly linear.

The Threat of Global Pandemics

In the summer of 2007, researchers from the University of Washington confirmed for the first time that the H5N1 influenza virus had been transmitted from human to human. A woman on the Indonesian island of Sumatra caught the virus from poultry in May of 2006 and transmitted the virus to her 10-year-old nephew, which was then transmitted to other relatives. Seven of eight family members who caught the disease died. This incident showed that there is a serious threat of an H5N1 influenza pandemic that could spread quickly and have a high and rapid mortality rate.⁵ Human-to-human transmission of the H5N1 influenza virus was also suspected in Pakistan in November 2007. These events left the world expecting the next influenza pandemic to emerge from Asia, based on the H5N1 influenza virus. Mexico's five phases of pandemic alert, shown in Table 1, illustrate this point.

⁴ von Tigerstrom B. The Revised International Health Regulations and Restraint of National Health Measures. *Health Law Journal*. 2005 13:35.

⁵ Waters J (2007) Bird flu could have become worldwide pandemic: study.

<http://www.abc.net.au/news/stories/2007/08/31/2021231.htm>. Accessed 31 August 2007.

Table 1: Mexico's five phases of pandemic alert

Level	Phase	Description
1	Pre-pandemic	National preparation activities.
2	Pandemic	Cases in Asia.
3	Pandemic	Cases on two continents, with the exception of the Americas.
4	Pandemic	Cases in the Americas.
5	Pandemic	Cases in Mexico.

Source: <http://www.dgepi.salud.gob.mx/pandemia/influenza-diagrama.htm>

The Mexican system of pandemic alert proved unusable during the swine flu epidemic and remained at level 1 well into the epidemic.⁶

The WHO uses six phases of pandemic alert to estimate the level of a threat (see Table 2). At the beginning of the swine flu epidemic, it was in phase 3 (predominantly animal infections with few human infections), because H5N1 was a new influenza virus subtype that is causing disease in humans, but was not yet spreading efficiently and sustainably among humans. On April 27, the WHO raised the pandemic alert level to 4 (sustained human-to-human transmission) and on April 29 to level 5 (human-to-human spread of the virus into at least two countries in one WHO region). The swine flu epidemic drove home the point that there is no way of knowing when a pandemic might occur or where it might originate.

The six-point system was created in 2005 when the threat was H5N1 avian flu, which has a high fatality rate, and does not take into account a virus's lethality. Following the Sixty-second World Health Assembly meeting 18-22 May 2009, the WHO announced that it would amend its pandemic alert rules to include a criterion of "substantial risk of harm to people," not just the geographic spread. This would mean that the A (H1N1) virus would not reach level six as long as it remained a relatively benign virus. This change was in response to the complaints of some countries that the warning system created panic and pressure for border closings, even though the A (H1N1) virus was far less deadly than H5N1 avian flu. This change highlights the need to be careful about designing pandemic rules based on what may prove to be incorrect assumptions regarding the source of the next pandemic. Both the WHO and Mexico designed their pandemic alert systems based on the assumption that it would be used to address H5N1 avian flu.

⁶ As of 28 April 2009, the alert level on the web page remained at 1, well after the Mexican government introduced emergency measures and after the WHO raised its alert level to 4. The peak of the number of cases took place on April 26, 2009.

Table 2: Phases of the World Health Organization (WHO)

Phase Level	Description
1	In nature, influenza viruses circulate continuously among animals, especially birds. No viruses circulating among animals have been reported to cause infections in humans.
2	An animal influenza virus circulating among domesticated or wild animals is known to have caused infection in humans, and is therefore considered a potential pandemic threat.
3	An animal or human-animal influenza virus has caused sporadic cases or small clusters of disease in people, but has not resulted in human-to-human transmission sufficient to sustain community-level outbreaks. Limited human-to-human transmission possible.
4	Verified human-to-human transmission of an animal or human-animal influenza virus able to cause "community-level outbreaks." The ability to cause sustained disease outbreaks in a community marks a significant upwards shift in the risk for a pandemic. Indicates a significant increase in risk of a pandemic but does not necessarily mean that a pandemic is a forgone conclusion.
5	Human-to-human spread of the virus into at least two countries in one WHO region. Phase 5 is a strong signal that a pandemic is imminent and that the time to finalize the organization, communication, and implementation of the planned mitigation measures is short.
6	The pandemic phase, characterized by community level outbreaks in at least one other country in a different WHO region in addition to the criteria defined in Phase 5. Indicates a global pandemic underway.
Post Peak	Pandemic disease levels in most countries with adequate surveillance drop below peak observed levels. Pandemic activity appears to be decreasing, but additional waves of the disease possible. Previous pandemics have been characterized by waves of activity spread over months.
Post Pandemic	Influenza disease activity returns to levels normally seen for seasonal influenza. Maintain surveillance and update pandemic preparedness and response plans accordingly. An intensive phase of recovery and evaluation may be required.

Source: http://www.who.int/csr/disease/avian_influenza/phase/en/index.html

Figure 1 shows how often recorded influenza epidemics occurred during the second millennium and how they have increased in frequency over time. This pattern is not surprising because fast-moving pandemics require close contact between groups of people. Over time, people began living together in bigger groups in cities. They also increased interactions due to faster modes of transportation. These two factors played an important role in the spread of the 2009 swine flu epidemic, the first within Mexico City and the second from Mexico to the rest of the world. Mexico City became the hub the same way Hong Kong became the hub for the propagation of SARS in 2003. Unlike SARS, this 2009 outbreak is a close relative of the Spanish Flu of 1918-1919 that was the first true *global* pandemic.

Insert Figure 1 here.

The 1918-1919 global flu pandemic caused 50 million deaths.⁷ The 1918-1919 influenza virus had a mortality rate of 2.5%, significantly higher than previous influenza epidemics, which were less than 0.1%.⁸ Moreover, unlike other flu pandemics, almost half of the influenza-related deaths were in young adults, 20–40 years of age (see Figure 2).⁹ While both male and young adults died in excess, the virus hit younger men harder. In this regard, the 1918-1919 virus was like HIV/AIDS, which also affected young adults in the most productive years of their lives and has a correspondingly greater economic impact.

Insert Figure 2 here.

Both the 2009 swine flu epidemic and the Spanish Flu epidemic have one important common element—they both affected (mostly) adults. They did not affect primarily the young and the old with weak immune systems, as had happened in the case of other epidemics like the plague in the fourteenth century. If the excess deaths occur mainly among the very young and the very old, the economic implications are different, since the young have not accumulated much human capital and society has not spent many resources on them yet. Similarly, if the very old die, they do not affect production in a society. However, when adults die in the prime of their productive years, it reduces economic growth significantly.

It is still unclear why the Spanish Flu affected the most able-bodied persons at a higher rate. One plausible hypothesis is that the flu itself was not the cause of their deaths. Rather, the virus produced a reaction that caused the patients' own organs to attack the body. Since able-bodied persons have the most vigorous organs, they were affected the most. It is also important to remember that the Spanish Flu was not identified as flu until more than a decade later. Thus, most of what we know today about the Spanish Flu is the result of postmortem analysis of the disease.

In the case of the Spanish Flu, the impact was swift. Everything happened within a span of three years. The 1918-1919 influenza virus spread along trade routes and shipping lines, along with the frontlines of World War I.¹⁰ A century later, trade routes have increased dramatically, as have the means for transporting humans around the globe. Figure 3 shows the dramatic increase in international passengers and reduction in the time it takes to circumnavigate the globe in commercial vehicles. These factors raised concerns that a new influenza pandemic could unfold much more rapidly and cause many more deaths than the 1918-1919 pandemic.

Insert Figure 3 here.

In the face of the challenges posed by pandemics in the 21st century, the hope was that the evolution of science and international institutions over the past century would be mitigating factors that could help to contain the effects of a fast-moving global pandemic. However, as the experience with severe acute respiratory syndrome (SARS) showed, modern air travel means that contagious diseases can spread rapidly

⁷ Taubenberger JK, Morens DM (2006) 1918 influenza: the mother of all pandemics. *Emerging Infectious Diseases*. <http://www.cdc.gov/ncidod/EID/vol12no01/05-0979.htm>. Accessed 23 October 2007.

⁸ Taubenberger JK, Morens DM (2006). Billings M (1997) The Influenza Pandemic of 1918. <http://virus.stanford.edu/uda/>.

⁹ Taubenberger JK, Morens DM (2006).

¹⁰ Billings (1997).

around the globe (see Figure 4). Even with modern antiviral and antibacterial drugs, vaccines, and prevention knowledge, the return of a pandemic virus equivalent to the virus of 1918-1919 would probably kill more than 100 million people worldwide, and a pandemic virus with the pathogenic potential of the H5N1 virus could cause substantially more deaths.¹¹

Insert Figure 4 here.

The Economics of SARS

On April 30, Mexico's Secretary of Finance declared that the impact of the virus on the Mexican economy would be in the order of magnitude of 0.3 to 0.5 percent of the Gross Domestic Product (GDP).¹² Such estimates come straight out of the experience of SARS.

SARS provides a glimpse into a set of policy responses from policymakers in the developed world. It jolted them to take many unprecedented steps, after an initial lack of response. SARS emerged in southern China in November 2002. It spread rapidly along international air routes in early 2003, as far away as Canada. Asian countries had the most cases (7,782) and deaths (729). SARS challenged Asian health care systems, disrupted Asian economies and tested the effectiveness of the International Health Regulations of the World Health Organization (WHO). Worldwide, there were 8,437 people infected and 813 deaths. Outside Asia, the country most affected by SARS was Canada. There were 250 infected people in Canada, resulting in 38 deaths.

The WHO implemented extensive actions to respond to SARS. Its response was delayed by an initial lack of cooperation from officials in China. The WHO activated its global infectious disease network. It deployed public health specialists to affected areas in Asia to provide technical assistance. The WHO also established international teams to identify the cause of SARS and to provide guidance for managing the outbreak. Its ability to respond to SARS in Asia was limited by its authority under the existing International Health Regulations.

Asian governments initially struggled to recognize the SARS emergency and to organize an appropriate response. They ultimately established control once the very negative economic impact SARS produced became clear. Their initial response was hindered by a number of problems: (1) poor communication; (2) ineffective leadership; (3) inadequate disease surveillance systems; and (4) insufficient public health capacity. Improved screening, rapid isolation of suspected cases, enhanced hospital infection control, and quarantine of close contacts ultimately helped to end the outbreak. The SARS outbreak added impetus to the process of revising the International Health Regulations (IHR). The WHO and its member states have since expanded the scope of required disease reporting to include all public health emergencies of international concern and devised a system for better cooperation with WHO and other countries. It has also setup an emergency response system. The SARS crisis temporarily dampened consumer confidence in Asia, costing Asian economies USD 11 to 18 billion. SARS had significant, but temporary, negative impacts on a variety of economic activities, especially travel, tourism and manufacturing.

The estimated impact of the short term effects of SARS can be split into three broad categories: the demand side effect, the effect of rising cost and the country risk

¹¹ Taubenberger and Morens (2006).

¹² http://www.bloomberg.com/apps/news?pid=20601086&sid=aJPzRD.u3qjY&refer=latin_America. A week after that, the Foreign Secretariat of Mexico raised the impact to 1 percent of GDP. Given the experience of SARS, this seems unusually high.

effect. Lee and McKibbin (2003)¹³ estimated the impact. Their model is a general equilibrium model that has the virtue of taking into account compensatory effects. For example, if tourists shun Hong Kong as the preferred destination, they might go to Maldives, thereby compensating one country's loss by another country's gain. Not surprisingly, Hong Kong suffered the biggest loss (see Table 3).

There have been a number of single country studies as well. For example, Darby (2003)¹⁴ examines the case of Canada and concludes that Canadian losses amounted to 1.5 billion Canadian dollars or 0.15 percent of Canadian GDP, with the Toronto area being the hardest hit.

Table 3: Temporary Shock of SARS as a Percentage of GDP

	Total Effects	Demand Shift	Cost Rise	Country Risk
United States	-0.07	-0.01	-0.06	0.00
Japan	-0.07	-0.01	-0.06	0.00
Australia	-0.07	0.00	-0.06	0.00
New Zealand	-0.08	0.01	-0.08	0.00
Indonesia	-0.08	0.01	-0.09	0.00
Malaysia	-0.15	0.01	-0.16	0.00
Philippines	-0.10	0.04	-0.14	0.00
Singapore	-0.47	-0.02	-0.45	0.00
Thailand	-0.15	0.00	-0.15	0.00
China	-1.05	-0.37	-0.34	-0.33
India	-0.04	0.00	-0.04	0.00
Taiwan	-0.49	-0.07	-0.41	-0.01
Korea	-0.10	-0.02	-0.08	0.00
Hong Kong	-2.63	-0.06	-2.37	-0.20
OECD	-0.05	0.00	-0.05	0.00
OPEC	-0.07	-0.01	-0.05	0.00
Canada	-0.10	-0.09	-0.01	0.00

Source: G-Cubed (Asia Pacific) Model version 50n. Lee JW, McKibbin W (2003) Globalization and Disease: The Case of SARS. Working Paper No. 2003/16, Australian National University (see also Darby, 2003).

The entire episode of SARS lasted just a few weeks. It did not kill many people. Yet the negative economic impact was sharp and swift. This episode and the subsequent bird flu outbreaks in different parts of the world prompted the Congressional Budget Office to produce a potential impact study. It considered two scenarios: Mild (where 25 percent of the population is affected but not seriously ill, with 1.4 percent fatality) and Severe (where 30 percent of the population is affected and a third of them are seriously ill, with 2.5 percent fatality). They estimated that the supply side impact of a potential

¹³ Lee JW, McKibbin W (2003) Globalization and Disease: The Case of SARS. Working Paper No. 2003/16, Australian National University

¹⁴ Darby P (2003) The Economic Impact of SARS. The Conference Board of Canada

pandemic on GDP would be about 4.25 percent in the severe scenario and about 1 percent in the mild scenario (Congressional Budget Office, 2006)¹⁵.

Globalization, Climate Change and Pandemics

Globalization, together with global climate change, also means that diseases that were formally confined to tropical developing countries are now spreading to temperate developed countries. This is occurring through a combination of vector migration—the movement of mosquitoes from the tropics to temperate regions—and human travel. West Nile virus, which is transmitted by mosquitoes, is now found throughout the continental United States and Canadian provinces. Chikungunya, a tropical disease that is related to dengue fever, is normally found in the Indian Ocean region. However, in the summer of 2007, a chikungunya epidemic occurred in northern Italy, where tiger mosquitoes now can thrive in the warming climate of southern Europe. An Italian, who had traveled to Kerala, India, returned to Italy with chikungunya in his blood, where it was spread by the tiger mosquitoes. This was the first epidemic of a tropical disease in a developed, European country in modern times (Rosenthal 2007).¹⁶ The movement of developing country diseases to developed countries provides another reason to view developing country diseases, which have been largely neglected, as a global problem that requires a global response.

Infectious diseases can also originate in developed countries. In November 2007, a new and virulent strain of adenovirus was reported in parts of the United States. The US Centers for Disease Control and Prevention (CDC) reported that two of the ten people who died from the new strain were infants and 50 of the 140 affected people were hospitalized, including 24 admitted to intensive care units. The new strain of adenovirus first appeared in May 2006 in New York, and spread to Oregon, Washington state and Texas. This particular adenovirus can make healthy young adults severely ill, which is unusual for an adenovirus.¹⁷

Understanding past outbreaks of diseases can lead to new public health measures and other interventions to more effectively address existing diseases and to better prepare the world for the future diseases. Sherman has examined how several diseases have influenced society, politics and culture and spawned new ways to address diseases and their consequences: (1) porphyria and hemophilia, which affected the royal families of Europe, influenced the political fortunes of England, Germany, Russia and the United States; (2) late blight, which caused the Irish potato famine in the 1850s, led to a wave of immigration that changed the politics of the United States; (3) cholera, which prompted sanitary measures, promoted nursing and led to the discovery of oral rehydration therapy; (4) smallpox led to a vaccine that eradicated the disease; (5) bubonic plague, which caused the “Black Death” in the fourteenth century, promoted quarantine measures; (6) syphilis led to a cure through chemotherapy; (7) tuberculosis led to attenuated vaccines; (8) malaria and yellow fever provided the basis for vector control; and (9) influenza and HIV/AIDS, two pandemics that continue to challenge humanity.¹⁸

¹⁵ Congressional Budget Office (2006) A Potential Influenza Pandemic: Possible Macroeconomic Effects and Policy Issues. Washington

¹⁶ Rosenthal E (2007) As Earth Warms Up, Tropical Virus Moves to Italy. <http://www.nytimes.com/2007/12/23/world/europe/23virus.html?hp>. Accessed 23 December 2007.

¹⁷ Dunham W (2007) Virulent form of cold virus spreads in U.S. Reuters, 15 November 2007.

¹⁸ Sherman IW (2007) Twelve Diseases That Changed Our World. American Society for Microbiology Press.

As we will discuss below, the 2009 A(H1N1) epidemic demonstrates the importance of close technical cooperation with developing countries such as Mexico in order to facilitate rapid responses to diseases that are neither limited to developing nor developed countries. It also demonstrates the importance of financial assistance, where needed, as an investment in preventing or mitigating the consequences of pandemics in both donor and recipient countries.

International Health Regulations and Disease Surveillance

An important objective of the WHO's regulatory powers is to harmonize national behavior through international standards based on scientific and public health principles.¹⁹ The 1969 International Health Regulations (IHR (1969)), which focused on relatively passive notification and control measures for cholera, plague, yellow fever and smallpox, were ineffective with respect to more recent global public health crises, including HIV/AIDS, SARS and the threat of an influenza pandemic. The IHR (1969) also limited the WHO's ability to respond to new outbreaks of disease by requiring the WHO to rely on official state notifications, rather than other sources. WHO member states often did not comply with the IHR (1969), failing to notify the WHO of cases of diseases and applying excessive health measures beyond those permitted by the IHR (1969).²⁰ The risk of economic losses due to disproportionate trade and travel restrictions created a disincentive to report outbreaks of infectious diseases.

The IHR (2005) introduced a new surveillance system for all diseases and health events that may constitute a "public health emergency of international concern".²¹ The IHR (2005) expand disease coverage, notification requirements, and the sources of information that the WHO can use regarding disease outbreaks. The IHR (2005) also set standards for public health responses to the international spread of disease, but leave States with considerable discretion regarding their implementation at the national level.

The central obligation of countries is to report outbreaks of disease, broadly defined, to the WHO. Article 6 of the IHR (2005) requires States to notify the WHO of all events which may constitute a public health emergency of international concern within its territory and any health measure that has been implemented in response to those events. In making its recommendations, Article 9 allows the WHO to take into account reports from sources other than notifications or consultations from the affected State. Given modern communication technologies, countries now have an incentive to report disease outbreaks to the WHO, in order to ensure the accuracy of the report. Modern communication technologies (mobile telephones, email and internet) make it difficult for countries to suppress information regarding outbreaks of contagious diseases. Once the existence of an outbreak becomes known, the level of the public health risk and the effectiveness of the affected country's response influence the responses of other countries (trade and travel restrictions) and the economic consequences of those responses.

However, the 2009 swine flu outbreak demonstrates that the suppression of information is not the only issue that influences how rapidly disease outbreaks are reported. The outbreak must also be detected quickly. Mexico reported the disease

¹⁹ Fidler D. The Future of the World Health Organization: What Role for International Law? *Vanderbilt Journal of Transnational Law*. 1998 31:1079.

²⁰ von Tigerstrom B. The Revised International Health Regulations and Restraint of National Health Measures. *Health Law Journal*. 2005 13:35.

²¹ International Health Regulations (2005), WHA58.3, Fifty-Eighth World Health Assembly, http://www.who.int/gb/ebwha/pdf_files/WHA58/WHA58_3-en.pdf.

outbreak quickly, once it became aware that it was not dealing with ordinary seasonal influenza. However, it later became apparent that the A (H1N1) influenza epidemic probably had begun much earlier. At the time, health officials mistook it for seasonal influenza, since it coincided with the normal influenza season and was relatively mild.

The IHR (2005) establishes an Emergency Committee to give the Director General its views on the existence and termination of a public health emergency of international concern and on any proposed temporary recommendations. Once the Director General determines that a public health emergency of international concern exists, the Director General can issue temporary recommendations regarding measures to be taken by the affected State or other States to prevent or reduce the international spread of disease and avoid unnecessary interference with international traffic. Article 17 requires that health measures recommended by the Director General be determined on the basis of a risk assessment appropriate to the circumstances, not be more restrictive of international traffic and trade and not more intrusive to persons than reasonably available alternatives that would achieve the “appropriate” level of health protection.²²

Two related issues arise regarding the effectiveness of the WHO Director General’s authority to issue recommendations. How likely is it that the WHO Director General will issue recommendations and how likely is it that those recommendations will be followed? Before the A (H1N1) influenza outbreak, some commentators believed that even if the WHO Director General were to declare a public health emergency of international concern and issue recommendations, the affected country may have been unwilling to accept those recommendations and would seek to negotiate a compromise, as happened in Canada’s case with SARS.²³ However, some predictions based on the experience with SARS proved to be wrong when the swine flu outbreak became known to the world, underlining the unpredictable nature of epidemics.

Mexico’s Pandemic Preparations

Mexico was prepared for an influenza pandemic well in advance.²⁴ Studies of earlier pandemics convinced the Mexican government that the benefits of pandemic planning exceeded the costs. It implemented its plan almost to the letter when the new virus was confirmed on April 23.

²² The language of Article 17 echoes some of the legal criteria applied in WTO law to trade-restrictive health measures in order to determine whether they can be justified under the general exceptions of GATT Article XX (b) or permitted under the Agreement on Sanitary and Phytosanitary Measures or the Agreement on Technical Barriers to Trade. However, under GATT countries remain free to select their level of health protection and can select a zero tolerance approach. This wording seems to suggest that at the WHO level the recommendations of the DG depart from a mere “appropriate” level of protection (whatever that may be).

²³ Jonathan E. Suk, *Sound Science and the New International Health Regulations*, Global Health Governance, Volume 1, No. 2 (Fall 2007) <http://www.ghgj.org>.

²⁴ Mexico passed legislation in July 2006 that mandated the creation of a National Plan for Preparation and Response to an Influenza Pandemic (Plan Nacional de Preparación y Respuesta ante una Pandemia de Influenza) and a National Committee on Health Security (Comité Nacional para la Seguridad en Salud) and made the plan mandatory for all levels of the national healthcare system. See ACUERDO DEL CONSEJO DE SALUBRIDAD GENERAL POR EL QUE SE ESTABLECEN LAS ACTIVIDADES DE PREPARACIÓN Y RESPUESTA ANTE UNA PANDEMIA DE INFLUENZA, DOF, 19 July 2006. The National Plan was published in August 2006. See Plan Nacional de Preparación y Respuesta ante una Pandemia de Influenza, http://www.fao.org/docs/eims/upload//221482/national_plan_ai_mex_es.pdf, consulted 1 May 2009. The plan sets out general guidelines for the preparation for and response to an influenza pandemic in order to mitigate the impact of an influenza pandemic in Mexico. The Mexican government also prepared a Guide for the Preparation of Institutions for an Influenza Pandemic (GUÍA PARA LA PREPARACIÓN DE INSTITUCIONES ANTE UNA PANDEMIA DE INFLUENZA).

Mexico is the *only developing country member* of the Global Health Security Action Group, a public health communications network whose other members are Canada, Japan, the United States and several European countries.²⁵ Criticism regarding the Mexican government's response ignores the complexity of recognizing and responding to an unexpected public health emergency.²⁶ The Mexican government knew that a flu pandemic could infect 25-35% of population. A model based on past pandemics predicted the following probable impact of a worst-case-scenario pandemic in Mexico, assuming a duration of eight weeks peaking in the fifth week, 25% of population infected and 17% with a high risk of complications: 21,522-117,461 deaths; 80,727-352,513 hospitalizations; 11,798,789- 20,710,591 medical consultations; 278% use of hospital capacity in the first week and 912% in the fifth week; 58% use of ventilator capacity in the first week and 269% in the fifth; 9,084.7 million MXN (672.9 million USD at 13.5) in direct costs and 148,853.8 million MXN (11,026.2 million USD) in indirect costs (1.6% of annual GDP).²⁷ The Mexican government took this public health risk very seriously.

Mexico's pandemic preparation plan envisaged three types of measures. First, medical interventions would focus on antiviral medication, vaccines, medical attention and personal protection equipment (e.g., gloves and masks).²⁸ In this category, Mexico stockpiled antiviral medications in advance, provided medical attention regardless of the healthcare coverage of the individual and distributed surgical masks when the outbreak occurred. However, Mexico's stockpile antiviral medications in the first week of the outbreak was only 1.4 million courses of treatment, enough for only 1.3% of the population. Vaccination was not an option initially, except for seasonal flu, since it would take several months to manufacture a vaccine for A(H1N1). Moreover, when the epidemic struck, Mexico was still in the process of expanding its vaccine manufacturing capacity, which was scheduled for completion in 2011.²⁹ Second, non-medical interventions would focus on personal hygiene (e.g. hand-washing), travel restrictions, quarantine, social distancing (e.g. school closures) and communication of risks.³⁰ In this regard, the Mexican government advised people on person hygiene measures in public announcements (including in President Calderon's press conferences), progressively implemented social distancing (moving from school closures to cancellation of public events to shutting down all non-essential services and advising people to avoid crowded, enclosed places) and followed the WHO guidelines for communicating with the public during an outbreak. The government did not impose travel restrictions or quarantine, due to the determination of both the CDC and WHO that containment was not feasible and that efforts should focus on mitigation. Third, the maintenance of social and economic systems would prioritize security and legislation, water and food supplies, energy supplies, transportation, telecommunications and financial services.³¹ When the government shut down non-essential services from May 1-5, these areas were not only left operating, but had their hours expanded. These measures aim to delay the

²⁵ <http://www.ghsi.ca/english/background.asp>

²⁶ Julio Frenk, "Mexico's Fast Diagnosis", www.nytimes.com, 30 April 2009.

²⁷ P. Kuri, Mexican Ministry of Health, PREPARACIÓN PARA LA RESPUESTA ANTE UNA PANDEMIA DE INFLUENZA, Presentation to ITAM Faculty Meeting, 29 November 2007.

²⁸ Ibid.

²⁹ In 2008 the Mexican government announced the acquisition of a manufacturing plant that would have the capacity to manufacture 20 million vaccine doses annually and signed an agreement with Sanofi Aventis to produce vaccines in Mexico in conjunction with state-owned Laboratorios de Biológicos y Reactivos de México, SA de CV (Birmex). *El Universal*, 30 April 2009.

³⁰ Ibid.

³¹ Ibid.

peak in the epidemic, thereby reducing the number of cases and the burden on healthcare services that would otherwise occur (see Figure 5).³² Those who question the Mexican response understand it quickly when this point is made.

Insert Figure 5 here.

Many members of the public were puzzled and alarmed by the dramatic measures implemented by Mexico in response to the epidemic, both in Mexico and abroad. Experts in pandemic response were not. Indeed, the Director General of the WHO repeatedly praised the Mexican government for its response to the epidemic. This dramatic response had been planned for several years. Mexico's pandemic preparations and its response to H1N1 were based on cutting edge intelligence and close cooperation with the world's most advanced economies, particularly Canada and the United States.

Nevertheless, there were gaps in Mexico's pandemic preparation. Insufficient supplies of masks, gloves and gowns meant that Mexico required donations from other countries, such as China and Japan. Insufficient testing equipment forced Mexico to report suspected cases when the US was reporting confirmed cases, which gave the initial impression that the situation was far worse in Mexico than it was. Mexico's stockpile of antiviral medicine, while sufficient for this outbreak, was far below what its needs could have been in a more serious situation. This may have been a factor in Mexico's decision to respond as aggressively as it did with mitigation measures. Had the government not delayed the peak as effectively as it did, Mexico could have had far more cases. In that event, its supply of antiviral medicine probably would have been inadequate and further supplies could have been difficult to acquire. In addition, Mexico's capacity to manufacture vaccine is insufficient. While the expansion of this capacity was part of Mexico's pandemic preparation, it appears that it will arrive too late for this epidemic.

There was a lack of coordination between different levels of government, most notably the Mexico City and federal governments, both of which gave daily news conferences regarding the latest influenza statistics in their respective jurisdictions. Different political parties occupy the Mexico City government (PRD) and presidency (PAN) and this appeared to generate competition over public perceptions regarding who was doing the best job of addressing the crisis. This lack of coordination was possibly linked to the upcoming elections for Congress in July 2009 and for president in 2012. Party politics need to be set aside in an emergency and the government needs to speak with one voice. Pandemic planning should set these rules in advance. Finally, like the rest of the world, Mexico assumed that the epidemic would start in Asia. This assumption turned out to be wrong. Pandemic planning should assume that a pandemic could start anywhere.

The Swine Flu Outbreak Tests Pandemic Preparations

The swine flu outbreak provided the first test for the IHR and the WHO. The WHO's response was better than some experts had predicted. However, the outbreak still revealed cracks in national and international pandemic preparations. The influenza diary in Appendix A summarizes the manner in which this epidemic unfolded.³³

³² Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation, CDC, Feb 2007.

³³ Sources: various news media from Mexico (El Financiero, El Universal, Milenio), US (Wall Street Journal, New York Times, LA Times, Washington Post, ABC, American Press), Canada (Globe and

Several key facts emerge from the diary and provide a first indication of the effectiveness of the IHR (2005) and Mexico's response.

It is important to note that the daily reports of total confirmed cases and deaths vary depending on the source. For example, Mexico has provided two daily updates whereas the CDC has provided only one daily update. The WHO also provides only one daily update, which is usually one day behind the latest figures. For this reason, there often appear to be discrepancies in the figures. This is reflected in the differences between some of the figures for the same day in the daily diary as well as apparent discrepancies in the numbers we use in Table 4 and Figure 7.

First, Mexico complied with its obligation to report its outbreaks to the WHO. This suggests an understanding of the incentives to report outbreaks.

Second, Mexico's delays in reporting what later turned out to be cases of A(H1N1) appear to be due to insufficient technical expertise or equipment combined with the timing of the outbreak, rather than a desire to hide the outbreak. Figure 6 shows when the swine flu outbreak occurred in relation to the regular flu season in Mexico. The weekly trend did have an unusual peak in late April. But, this peak was nowhere near the peak that occurred in January 2009. Even with the peak, the level was lower than what took place in November 2008. Thus, there is no evidence that the Mexican Government delayed any reporting. On the contrary, it reported on the basis of suspected cases even before they were confirmed.

Insert Figure 6 here.

This might suggest that the obligation to report outbreaks may prove ineffective in the absence of adequate technical expertise and equipment. However, the United States also experienced delays, even though its earliest cases appear to have occurred around the same time as Mexico's earliest cases (see Appendix A). Thus, it is possible that some outbreaks may be difficult to detect or their seriousness may be difficult to confirm as quickly as we would like, regardless of the level of technical expertise and equipment. It may be that the timing of the outbreak and the nature of the virus were the primary cause of any delays.

Third, the WHO DG did declare a public health emergency of international concern, within 48 hours of laboratory confirmation that the Mexican virus was new and that it was the same as the US virus. While some might like to see a faster response, this contradicts prior speculation that the WHO DG would be unwilling to make such a declaration.

Fourth, two days after the declaration, the WHO raised the alert level to 4 and issued recommendations, before raising it to level 5 two days later. Again, while some might like to see a faster response, this contradicts prior speculation that the WHO DG would be unwilling to issue recommendations. After the declaration of alert level 5, there was speculation as to whether the WHO would raise the alert to the highest possible level of 6. That level never materialized.

Fifth, a significant number of countries—from different parts of the world and with varying levels of economic development—chose to ignore the WHO DG's recommendations in introducing trade and travel restrictions. In contrast to the reporting

Mail, Canadian Press), Britain (Financial Times, Guardian, Independent, BBC, Economist), Asia (China Post) as well as WHO and CDC web sites, Morbidity and Mortality Weekly Report (<http://www.cdc.gov/mmwr>), Emerging Infectious Diseases (<http://www.cdc.gov/eid>), FluView Weekly Influenza Surveillance Report (<http://www.cdc.gov/flu/weekly/>), Center for Infectious Disease Research and Policy (www.cidrap.umn.edu), WTO News and WHO and Mexican government news conferences.

Table 4 Confirmed (suspected) cases versus travel and trade restrictions

Date	Confirmed (suspected)	Travel Measures	Trade Measures
April 23	Mexico 18	--	--
April 24	Mexico 18(1004); US 7(NA)	Brazil, Chile, Peru, Colombia, Ecuador, Guatemala, Nicaragua, El Salvador and Panama begin sanitary controls on arrivals from Mexico.	--
April 25	Mexico 18(1400); US 20(NA)	Japan starts screening arrivals from Mexico for fever. Argentina, Costa Rica, Dominican Republic and Honduras begin sanitary controls on arrivals from Mexico.	Nicaragua restricts pork imports from Mexico.
April 26	Mexico 26(1614); US 40(NA); Canada 6(NA)	US begins "passive surveillance" on arrivals from Mexico. China, Russia set up quarantines. Hong Kong advises residents not to travel to Mexico. Malaysia, South Korea and Japan check airport passengers for signs of illness.	--
April 27	Mexico 26(1995); US 64(NA); Canada 6(NA)	CDC recommends Americans forgo "nonessential travel" to Mexico. EU health minister urges Europeans to avoid nonessential travel to the US or Mexico, but later denies she issued any travel advisory.	China, Russia ban pork imports from Mexico and affected US states. Indonesia, Lebanon ban pork imports from Canada, Mexico and US.
April 28	Mexico 26(2498); US 91(NA); Canada 13(NA)	Britain, Canada, France, Germany, Switzerland advise against nonessential travel to Mexico. Australia recommends citizens who travel to Canada consult a doctor if symptoms develop. India and Malaysia warn citizens to restrict travel to Mexico, Canada and the US. Japan requires Mexicans to obtain visas before arrival; sets up quarantine for suspected cases. Britain tells citizens in Mexico to consider leaving. Cuba and Argentina suspend flights to Mexico for 48 hours. Air Canada, Westjet and Transat suspend flights to Mexican beach resorts.	--
April 29	Mexico 97(NA); US 109(NA); Canada 19(NA)	Ecuador, Peru suspends flights with Mexico. French health minister calls for suspension of flights from EU to Mexico. Five cruise lines stop all port calls in Mexico.	China ban imports of pigs and pork from Mexico and 3 US states.
April 30	Mexico 156(NA); US 109(NA); Canada 34(NA)	EU rejects French proposal to suspend flights with Mexico. Taiwan issues a red alert for citizens not to travel to Mexico, yellow alert for Canada and US.	--
May 1	Mexico 397(NA); US 141(NA); Canada 51(NA)	Hong Kong quarantines hotel. China suspends flights from Mexico to Shanghai. Nestlé bans all non-essential travel by its executives to US and Mexico.	--
May 2	Mexico 506(NA); US 160(NA); Canada 70(NA); EU 39	Chinese health authorities find and place under quarantine 164 of the 189 passengers and crew members aboard a flight from Mexico to Shanghai.	Ukraine, Philippines and Serbia ban pork products from US. Indonesia bans pork from Mexico, US, France, Canada, Israel, Spain and New Zealand.
May 3	Mexico 590(NA); US 226(NA); Canada 101(NA); EU 91	China is still holding Mexicans in quarantine.	China stops imports of Alberta pork.
May 4	Mexico 822(NA); US 403(NA); Canada 140(NA); EU 107	Argentina says it suspended flights with Mexico because of its seasonal influenza and dengue fever outbreaks. China quarantines 25 Canadian students, 2 US citizens, increases delay for US visas to 6 days.	20 countries have banned imports of pork and other meat from countries with reported infections. Russia extends its pork import ban to Canada and Spain, but lifts the ban for some US states.
May 5	Mexico 942(NA); US 642(NA); Canada 165(NA); EU 127	Mexico sends plane to get Mexicans quarantined by China. China sends a plane to get Chinese stranded to Mexico. China has quarantined Canadians and Mexicans based on nationality. Singapore orders a seven-day quarantine for all passengers arriving from Mexico, Canada and US.	--

Notes: The numbers of confirmed cases are based on WHO reports, backdated to take into account the one-day delay in reporting North American figures in Geneva. The travel and trade restrictions are based on the sources used in Appendix A. Mexico began processing a backlog of suspected cases on April 28, at which point Mexico's confirmed cases began to increase rapidly.

obligation, the WHO DG's recommendations are not binding. This suggests that non-binding recommendations might not prove effective in minimizing the economic damage caused by disproportionate trade and travel restrictions. These trade and travel restrictions were more severe for Mexico than for other affected countries. Despite the

earliest confirmed cases surfacing in the United States and Mexico around the same time and the large number of cases in the United States, many assumed that Mexico was the origin of the virus without any scientific evidence to confirm this conclusion.

In Figure 7a, we display the number of confirmed cases in the three countries in North America: Canada, Mexico and the United States. While Mexico started with a larger number of confirmed cases, the US figures exceeded that of the Mexican cases on May 7, 2009, two weeks after the pandemic broke out. The discriminatory treatment of Mexico is apparent. If one compares the confirmed cases per million people in Canada and Mexico, Mexico leads (see Figure 7b). But the difference between the US and Canada disappears altogether.

Insert Figure 7a and 7b here

Sources: CIA Factbook (populations, est. July 2009), WHO, Public Health Canada, CDC, Secretaria de Salud (Mexico)

The perception that Mexico was the source of the problem appears to be due to three factors. First, Mexico initially reported *suspected cases* (a much larger number than confirmed cases) while the United States only reported *confirmed cases*. Second, Mexico applied serious mitigation measures earlier and more broadly than other countries. This not only helped Mexico avoid a greater number of cases in Mexico; it also represents a serious commitment to addressing a global health threat that benefited other countries as well. Third, most of the early confirmed cases outside of Mexico were linked to travel to Mexico. The earliest confirmed cases in the United States are an important exception to this pattern. Thus, trade and travel measures that discriminated against Mexico were based more on the *perception* of risk than scientific proof of risk. One need only compare the number of confirmed cases in Mexico at the time that many of these restrictions were implemented against Mexico with the number of confirmed cases elsewhere when restrictions were applied (or not) against other countries (see Table 4).

Sixth, the WTO was remarkably slow to address the disproportionate trade restrictions, despite being the international organization with jurisdiction over such matters. The WTO Director General's initial response, when prompted by a reporter's question, was merely that no WTO members had formally notified the WTO of any trade restrictions. It took eight days from the start of the epidemic for the WTO to issue a joint statement, together with the FAO, OIE and WHO, that pork products handled in accordance with hygienic practices are not a source of infection for the A/H1N1 virus. The WTO is a Member-driven organization, which may place limits on the Director General's capacity to respond quickly to the use of disproportionate or unjustifiable trade restrictions during disease outbreaks in the absence of formal notifications or complaints. This suggests that WTO rules may need to be changed to allow the Director General to take actions in the absence of formal notification, as the IHR (2005) have done in allowing the WHO to gather information on disease outbreaks from non-governmental sources.

Seventh, lack of access to accurate testing equipment severely hampered Mexico's ability to confirm quickly the cause of death and illness. This led to the perception that Mexico's epidemic was far worse than any other country's. As we noted above, while Mexico initially reported suspected cases on a daily basis, the US limited its release of information to confirmed cases, which reinforced the perception that Mexico was much more seriously affected than the US. This perception resulted in

more severe trade and travel restrictions applied to Mexico than to the US or any other country (see Table 4), as well as more severe domestic mitigation measures than elsewhere. Once Mexico had the capacity to test samples, it limited its release of information to confirmed cases, as the US had done from the beginning. These developments underline the importance of domestic testing capacity and an effective communication strategy for both domestic and international audiences. Figures 8a and 8b compare probable and confirmed cases in Mexico. Figure 8a shows that there is a gap between the two. This arises directly from the lack of capacity and equipments available in poor states of Mexico where such epidemics are likely to arise. This stands in sharp contrast with the situation in the US where a preliminary confirmation is available within 24 hours of a reported probable case.

Insert Figure 8 here.

If Mexico's willingness to report outbreaks promptly was based on the notion that this would trigger WHO recommendations that would help to reduce the risk of disproportionate trade and travel restrictions, this incident may serve to undermine the IHR (2005) reporting requirements. However, it is not at all clear that this was Mexico's motivation for prompt compliance. A more likely explanation is that Mexico's political leadership recognized the need to respond quickly with mitigation measures in order to minimize the health risks to its own population. The inadequate government response to the 1985 Mexico City earthquake is considered to have been the beginning of the end for the PRI, the party that enjoyed a monopoly on power for seven decades, ending in 2000. An inadequate response to the flu epidemic might produce similarly undesirable political consequences for the Mexican President's party (PAN) or the Mexico City Mayor's party (PRD).

Effective and timely mitigation measures would also be likely to minimize the economic damage to Mexico's economy, regardless of the WHO recommendations or other countries' responses to those recommendations.

Another factor that created incentives for Mexico to report and to respond relatively quickly was the existence of confirmed cases in the US, since this could allow Mexico to benefit from American bargaining power with other countries. However, this did not occur. Several countries imposed trade restrictions and issued travel advisories or restrictions that applied to Mexico without applying to the United States. It is not clear whether this was due to differences between the two countries with respect to communication strategies (especially with respect to releasing data on suspected cases), surveillance and testing capacity (which would allow the US to confirm or rule out cases more rapidly), international bargaining power (for example, pressuring the EU health minister to retract her statement regarding travel to the US) or some combination thereof. Nevertheless, their different communication strategies do appear to have had a major impact on media reporting, which in turn influenced the perceptions and responses of other countries. It is unclear what impact this might have on incentives to report only confirmed cases, as opposed to both suspected and confirmed cases.

WHO Guidelines for Communicating with the Public during an Outbreak

The WHO Guidelines for Communicating with the Public during an Outbreak (the "Guidelines") set out best practices for communicating with the public during an

outbreak.³⁴ They resulted from the Report of the WHO Expert Consultation on Outbreak Communications, held in Singapore, 21–23 September 2004, in which the WHO sought expert advice on two questions: (1) how can communication hasten containment of an outbreak, and (2) how can communication help mitigate the social and economic impact?

The Guidelines first identify the unique circumstances, common to disease outbreaks, that create unique challenges for public communications: (1) outbreaks are urgent emergencies in which decisions and actions must be taken rapidly, often with support from an informed public; (2) the course of outbreaks is unpredictable, creating unanticipated setbacks and surprises; (3) outbreaks usually alarm the general public, causing great anxiety and extreme behaviors that cause social disruption and economic losses out of proportion to the true severity of the risk (including wearing masks, avoiding travel, fear of hospitals, stigmatization of patients and minority groups, riots, loss of confidence in governments and significant drops in consumer consumption); (4) outbreaks have a high political profile, which can make them a high priority or impede control when information is downplayed or concealed to minimize economic consequences; (5) outbreaks generate media coverage that can help to inform the public or fuel public anxiety out of proportion to the actual threat; and (6) human behaviors usually contribute to the spread of the disease.³⁵ These factors are influenced by the nature of the disease: airborne transmission, high mortality, international spread and the absence of a vaccine or cure will heighten anxiety, factors that the IHR (2005) take into account in determining whether an outbreak constitutes a public health emergency of international concern.³⁶ Disincentives to report outbreaks include economic impact, the absence of laboratory diagnostic capacity to confirm an unusual disease and the difficulty of spotting an unusual disease in countries where there is constant high morbidity and mortality from other infectious diseases.³⁷ Most, if not all, of these factors were at play in the 2009 swine flu epidemic.

Against this backdrop, the Guidelines identify five essential practices for effective outbreak communication, based on the experiences of several countries to disease outbreaks: (1) build trust; (2) announce early; (3) be transparent; (4) respect public concerns; and (5) plan in advance.³⁸ Trust comes from public perceptions (including those of the media) of the motives, honesty and competence of authorities and needs to be developed before a disease outbreak.³⁹ Scientific uncertainty compounds distrust of government and suspicions regarding its motives during an outbreak response, undermining compliance with recommended control measures and allowing counter-productive behaviors to flourish. Distrust is created or increased by concealment, denial, understatement and bold reassurance unsubstantiated by the scientific evidence, both domestically and internationally. Conversely, when government officials report on the outbreak frankly, openly, completely and constantly and engage outside experts, trust increases and control measures are more effective. People who are alert to symptoms are more likely to seek early treatment and awareness of protective behaviors can help to prevent further cases.⁴⁰ The first communication about an outbreak will influence public perceptions of subsequent communications;

³⁴ WHO, WHO Guidelines for Communicating with the Public during an Outbreak (Geneva, 2005), http://www.who.int/csr/resources/publications/WHO_CDS_2005_32web.pdf, consulted 29 April 2009.

³⁵ Ibid, pp. 7-9.

³⁶ Ibid, p. 10. IHR (2005), Annex 2.

³⁷ Ibid, pp. 10-11.

³⁸ Ibid, p. 3.

³⁹ Ibid, p. 23.

⁴⁰ Ibid, pp. 12-18.

delaying announcements and concealing information can breed lasting distrust.⁴¹ While not all information must be revealed in real time, for example to protect patient confidentiality, limits on transparency must be carefully considered.⁴² Planning communication strategies in advance, while not essential to effective communication during an outbreak, helps to avoid mistakes.⁴³

With the exception of the lack of coordination among different levels of government, Mexico's communication strategy during the 2009 flu epidemic was largely consistent with WHO communication guidelines. Mexico was right to reveal suspected cases so promptly and frankly, even though this compared unfavorably with the US strategy to focus only on confirmed cases. Given the technical limitations Mexico faced in seeking to confirm cases quickly, a focus on confirmed cases only could have given the impression that Mexico was delaying and concealing information. Thus, in the circumstances, Mexico's international communication strategy was likely the right one.

Mexico's domestic communication strategy, while relatively well executed, appeared unable to overcome pre-existing mistrust of government in Mexico. On April 30, a survey of 410 Mexico City adults revealed that 57% believed the government was underreporting the numbers, 10% believed the numbers exaggerated, 19% believed official figures and 14% were not sure what to think. Only 49% were somewhat or very afraid of catching the flu, 50% felt little or no fear and 1% did not know. Half believed facemasks somewhat or very effective in preventing infection and half believed they were mostly or completely ineffective. From April 26 to May 8, we collected data on daily mask usage on the Mexico City subway system, sampling 400 passengers per day for a total of 13 days. The percentage of subway passengers wearing face masks peaked on April 27 at around 60 percent. After that, it went down steadily to virtually zero when the alert level was reduced to Level 2 (yellow).

Trade Restrictions, the IHR (2005) and WTO Law

The IHR (2005) reflect the intention of its drafters to avoid conflicts with other international legal obligations, particularly WTO law. In particular, the drafters of the IHR (2005) have attempted to facilitate the compatibility between temporary or standing recommendations under the IHR (2005) and trade-related obligations by establishing criteria that are similar to those used in WTO law, especially the Agreement on Sanitary and Phytosanitary Measures.⁴⁴

In Article 57.1 of the IHR (2005), "States Parties recognize that the IHR and other relevant international agreements should be interpreted so as to be compatible". This provision reflects the presumption against conflict in international law. Since the language of Article 17 reflects WTO law, it is unlikely that a conflict would arise between the two. However, Article 57.1 goes on to state that "[t]he provisions of the IHR shall not affect the rights and obligations of any State Party deriving from other international agreements". It seems highly unlikely that this provision would prevent a WTO panel from considering the scientific evidence that supports any recommendations issued by the WHO Director General, as a question of fact. A more reasonable

⁴¹ Ibid, p. 24.

⁴² Ibid, p. 24.

⁴³ Ibid, p. 25.

⁴⁴ See Committee on Sanitary and Phytosanitary Measures, International Health Regulations Revision, Communication from the World Health Organization, WTO Doc. G/SPS/GEN/522, 21 October 2004, para. 6.

interpretation is that a WTO panel would be free to disregard any legal determinations regarding whether a particular trade measure is “more restrictive of international...trade...than reasonably available alternatives that would achieve the appropriate level of health protection”, as a question of law. This interpretation is consistent with WTO and GATT jurisprudence that has taken scientific evidence from the WHO into account in its analysis of trade-restrictive health measures under GATT Article XX(b).⁴⁵ It is also consistent with WTO jurisprudence that has found that WTO panels are not obligated to apply the rulings of non-WTO tribunals.⁴⁶

GATT Article XX(b) permits trade restrictive measures that are “necessary to protect human, animal or plant life or health”. The WTO Member that enacted the measure has the burden of proof to show that it meets the requirements of Article XX(b). First, the Member must make a *prima facie* case that the policy goal at issue falls within the range of policies designed to protect human, animal or plant life or health. Once it is established that the policy goal fits the exception, the Member must demonstrate that the measure is “necessary” to achieve the policy goal.

To demonstrate that the measure is necessary involves weighing and balancing a series of factors. First, the greater the importance of the interests or values that the challenged measure is intended to protect, the more likely it is that the measure is necessary. WTO jurisprudence has found that “few interests are more ‘vital’ and ‘important’ than protecting human beings from health risks”.⁴⁷ Second, the greater the extent to which the measure contributes to the end pursued, the more likely that the measure is necessary. While WTO law recognizes that “it may prove difficult to isolate the contribution to public health...of one specific measure from those attributable to the other measures that are part of the same comprehensive policy”, the measure in question must be “apt to produce a material contribution to the achievement of its objective”.⁴⁸ Third, the less the trade impact of the challenged measure, the more likely that the measure is necessary. Thus, a complete ban on imports is less likely to qualify as necessary than less trade-restrictive measures, such as quarantine or inspection requirements.

The fourth issue is whether a WTO-consistent alternative measure the Member concerned could reasonably be expected to employ is available, or whether a less WTO-inconsistent measure is reasonably available. The weighing and balancing process of the first three factors also informs the determination of the fourth. The party that enacted the measure may point out why alternative measures would not achieve the same objectives as the challenged measure, but it is under no obligation to do so in order to establish, in the first instance, that its measure is “necessary”. However, if the party challenging the measure raises a WTO-consistent alternative measure that should have been taken, the party defending the measure will be required to demonstrate why its challenged measure nevertheless remains “necessary” in the light of that alternative or why the proposed alternative is not, in fact, “reasonably available”, in the light of the interests or values being pursued and the party’s desired level of protection.⁴⁹

In the context of GATT Article XX(b), WTO jurisprudence has confirmed that WTO Members have the right to determine the level of protection of health that they

⁴⁵ Report of the GATT Panel. Thailand – Restrictions on importation of and internal taxes on cigarettes. 1990; Report of the Appellate Body. EC – Asbestos. 2001.

⁴⁶ Report of the Panel. Argentina – Poultry Anti-Dumping Duties. 2003.

⁴⁷ Report of the Appellate Body. EC – Asbestos. 2001; Report of the Panel. Brazil – Retreaded Tyres. 2007.

⁴⁸ Report of the Appellate Body. Brazil – Retreaded Tyres. 2007.

⁴⁹ Report of the Appellate Body. US – Gambling. 2005.

consider appropriate in a given situation and that they are not obliged to use an alternative measure that fails to achieve their desired level of health protection.⁵⁰ Article 3.3 of the Agreement on Sanitary and Phytosanitary Measures (SPS Agreement) confirms the right of a WTO Member to establish its own level of sanitary protection. Similarly, the IHR (2005) provide that States are entitled to implement health measures in response to specific public health risks or public health emergencies of international concern, which achieve the same or greater level of health protection than WHO recommendations (Article 43.1(a)). When those health measures affect international trade, they will have to comply with WTO law. However, the right of a WTO Member to establish its own level of health or sanitary protection may not make this a difficult hurdle. In the case of import bans on pork in response to the swine flu outbreak, countries might argue that their measures aim to eliminate entirely any health risk. Since the WHO indicated that there was no risk as long as pork was properly cooked, countries might argue that the risk of improperly cooked pork required an import ban in order to eliminate any health risk.

While the right of a WTO Member to determine an appropriate level of health protection is absolute, the measure it chooses to implement its policy, the manner in which it determines the appropriate level of protection and the manner in which it chooses to apply the measure can be challenged and set aside at the WTO.⁵¹ In order to justify a health measure under GATT Article XX(b), WTO Members may rely, “in good faith, on scientific sources which, at that time, may represent a divergent, but qualified and respected, opinion”.⁵² While the scientific basis need not represent the majority view within the scientific community, it must have “the necessary scientific and methodological rigour to be considered reputable science” and be “a respected and qualified source”.⁵³ Under SPS Agreement Article 3.2, there is a rebuttable presumption that SPS measures that conform to international standards, guidelines or recommendations are consistent with the SPS Agreement and GATT. In the SPS Agreement, the standard setting bodies are clearly and exhaustively identified.⁵⁴ Deviation from the relevant international standards, guidelines or recommendations must be supported by scientific justification (Article 3.3) and take into account risk assessment techniques developed by the relevant international organizations (Article

⁵⁰ Report of the Appellate Body. EC – Asbestos. 2001.

⁵¹ Marceau G, Trachtman J. The Technical Barriers to Trade Agreement, the Sanitary and Phytosanitary Measures Agreement, and the General Agreement on Tariffs and Trade. 2002. 36 *Journal of World Trade* 36:811.

⁵² Report of the Appellate Body. EC – Asbestos. 2001; Report of the Appellate Body. EC – Hormones. 1998.

⁵³ Report of the Appellate Body. Canada – Continued Suspension of Obligations in the EC – Hormones Dispute. 2008.

⁵⁴ Annex A provides the following definition of “international standards, guidelines and recommendations”:

(a) for food safety, the standards, guidelines and recommendations established by the Codex Alimentarius Commission relating to food additives, veterinary drug and pesticide residues, contaminants, methods of analysis and sampling, and codes and guidelines of hygienic practice;

(b) for animal health and zoonoses, the standards, guidelines and recommendations developed under the auspices of the International Office of Epizootics;

(c) for plant health, the international standards, guidelines and recommendations developed under the auspices of the Secretariat of the International Plant Protection Convention in cooperation with regional organizations operating within the framework of the International Plant Protection Convention; and

(d) for matters not covered by the above organizations, appropriate standards, guidelines and recommendations promulgated by other relevant international organizations open for membership to all Members, as identified by the Committee.

The WHO would qualify under paragraph (d) if so identified by the Committee.

5.1). In the SPS Agreement, the requirement of a risk assessment (Article 5.1) and “sufficient scientific evidence” (Article 2.2) prevent the use of health measures for arbitrary or unjustifiable discrimination between Members or as a disguised restriction on international trade. An SPS measure must be sufficiently supported or warranted by a risk assessment, which may be conducted by the WTO Member in question, another WTO Member or an international organization.⁵⁵ The chosen level of protection must not affect the rigour or objective nature of the risk assessment, which must evaluate possible adverse effects using scientific methods.⁵⁶ Finally, under both GATT Article XX(b) and SPS Agreement Article 2.3, health measures must not be applied in a manner that results in discrimination or a disguised restriction on international trade. While it is not clear whether the countries that imposed trade restrictions did so following a risk assessment that would meet the requirements of the SPS Agreement, the discrimination between pork imports from Mexico and other countries affected by swine flu might be justifiable on the basis that the mortality and severity of the epidemic in Mexico is greater and the evidence indicated that the virus originated in Mexico.

Continued discrimination between Mexican products and products from other countries could fail the test of the Article XX chapeau once it became apparent that the risk in other countries was comparable to the situation in Mexico. In other words, as long as the same conditions prevail in the different countries with respect to the level of risk, the discrimination would be arbitrary and unjustifiable.

In most cases, health measures will be regulated by both the GATT and the SPS Agreement. The Agreement on Technical Barriers to Trade (TBT Agreement) does not apply to SPS measures (TBT Agreement Article 1.5). However, extraterritorial health measures, which are aimed at protecting health outside the jurisdiction of the country that enacts the measure, could fall under the ambit of the TBT Agreement.⁵⁷ The Preamble of the TBT Agreement also allows each WTO Member to determine the level of protection it considers appropriate. Article 2.2 only requires a consideration of “available scientific and technical information”. Since the TBT Agreement does not explicitly regulate risk assessment or require scientific bases for regulations, the implicit requirement for some scientific basis should be less rigorous than the explicit requirements of the SPS Agreement.⁵⁸ However, TBT Agreement Article 2.5 creates a rebuttable presumption of compliance with Article 2.2 where a technical regulation aimed at health protection is in accordance with relevant international standards. Moreover, under Article 2.2, the analysis of whether a technical regulation is more trade-restrictive than necessary to fulfill a legitimate objective will be very similar to the analysis under GATT Article XX(b).

It may be difficult for WTO Members to justify trade restrictions on products where there is insufficient scientific evidence that the product poses a risk to human health⁵⁹ or when the trade measures will not address the risk.⁶⁰ However, the IHR 2005 (like the IHR 1969) does not seriously deter countries from implementing trade

⁵⁵ Report of the Appellate Body. EC – Hormones. 1998.

⁵⁶ Report of the Appellate Body. EC – Hormones. 1998.

⁵⁷ Marceau G, Trachtman J. The Technical Barriers to Trade Agreement, the Sanitary and Phytosanitary Measures Agreement, and the General Agreement on Tariffs and Trade. 2002. 36 Journal of World Trade 36:811.

⁵⁸ Marceau G, Trachtman J. The Technical Barriers to Trade Agreement, the Sanitary and Phytosanitary Measures Agreement, and the General Agreement on Tariffs and Trade. 2002. 36 Journal of World Trade 36:811.

⁵⁹ Report of the Appellate Body. EC – Hormones. 1998.

⁶⁰ Report of the GATT Panel. Thailand – Restrictions on importation of and internal taxes on cigarettes. 1990.

restrictions that do not have a solid scientific basis. While the WTO provides the real disciplines in this context, the WTO process does not work quickly enough because countries can enact harsh temporary measures, keep them in place while the crisis lasts, and remove them before any serious WTO dispute settlement remedy could be secured.

Once an outbreak of an infectious disease has been reported, the *affected* country might have an incentive to comply with WHO recommendations regarding appropriate responses, in order to minimize the risk of disproportionate responses on the part of other countries. The WHO's assessment of the public health risk and the appropriate measures to take will carry more weight than the affected country's assessment of the situation. Failure to comply with WHO recommendations, or under compliance, could have a negative impact not only on the protection of its citizens but also on the affected country's effort to persuade other countries to avoid imposing trade and travel restrictions. Given the economic and political incentives, there is probably no need to make compliance with WHO recommendations mandatory as far as they apply to the affected country. The key obligation is to report the outbreak, at which point the risk of negative economic consequences becomes real.

It would be redundant for the IHR (2005) to provide enforceable legal obligations to regulate the use of disproportionate trade restrictions in response to a reported outbreak, since those obligations are addressed in WTO law. The key role of the WHO in this regard is to provide an objective risk assessment and to make recommendations regarding appropriate responses based on scientific evidence, both of which are provided for in the IHR (2005). The WHO's determinations on these issues may be relevant to determine whether trade-restrictive health measures can be justified under the general exceptions of GATT Article XX (b) or permitted under the SPS Agreement or the TBT Agreement. Evidence from the WHO has played a role in WTO cases regarding the compatibility of trade-restrictive health measures with GATT and WTO law.⁶¹

When countries impose unjustified trade restrictions it may take a few years to resolve the matter through the dispute settlement system of the WTO, by which point the economic damage has already occurred. However, in the age of internet, email and mobile telephones, it has become difficult for countries to suppress information on outbreaks of disease. Moreover, as Fidler has noted, international law tends to "shape the debate" in international negotiations.⁶² This is as true in consultations regarding trade measures as it is in global health diplomacy. The use of disproportionate trade measures in response to outbreaks of infectious diseases undermine international health protection by discouraging reporting of such outbreaks and undermining incentives to comply with WHO recommendations under the IHR (2005). Global Health Law and World Trade Law can and should be mutually supportive. However, the formal dispute settlement system of the WTO is unlikely to be effective in addressing this issue. Rather, disproportionate trade restrictions will have to be addressed in negotiations in which countries are persuaded that it is in the best interests of all countries to comply with the existing legal framework in order to ensure that both the multilateral trade system and multilateral cooperation on world health issues function adequately.

Transparency needs to be encouraged (and discriminatory and excessive trade and travel restrictions discouraged) in the interests of public health. For example, information regarding the behavior of (H1N1) in the Southern Hemisphere winter is

⁶¹ Baker M, Fidler D. Global Public Health Surveillance under New International Health Regulations. EID. 2006 12:7 1058-1065.

⁶² Fidler D. Influenza Virus Samples, International Law and Global Health Diplomacy. EID. 2008 14:1 88-94.

important to determining whether a vaccine is necessary, according to the WHO. In an effort to determine how this virus might behave in the next Northern Hemisphere winter, the CDC negotiated with the Pan American Health Organization and health ministries in Latin America and other Southern Hemisphere countries to monitor the virus during their winter flu season. If countries perceive that they will suffer from more severe trade and travel restrictions the more transparent they are, this will discourage the sharing of vital information.

Patents and Access to Antiviral Medications

The threat of compulsory licenses has been used in the context of a perceived national health emergency to reduce the cost of obtaining stockpiles of medicine in the United States and Canada. In 2001, these countries used such a threat to reduce the price of ciprofloxacin in their negotiations with Bayer in order to address real and imagined threats of anthrax, respectively. At the 2001 WTO Ministerial Conference in Doha, the severity of the HIV/AIDS crisis and other public health issues in many parts of the developing world prompted several developing countries to adopt a common position calling for clarifications to the rights of governments to issue compulsory licenses to protect public health and, in particular, to promote access to medicines for all. The resulting Declaration on the TRIPS Agreement and Public Health also identified a gap in the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), under which only countries with adequate pharmaceutical manufacturing capacity could in practice exercise the right to issue compulsory licenses on pharmaceutical products. Two years of multilateral negotiations on this issue ultimately led to a decision to amend the TRIPS Agreement (known as the Paragraph 6 Decision), but it took two more years to adopt the amendment formally and it has yet to be adopted by the two-thirds of the WTO Members required for it to enter into force.

In spite of these developments at the WTO, the pharmaceutical industry has continued to use its political influence to discourage the compulsory licensing of patents. When Thailand exercised its rights under WTO law to issue compulsory licenses on some pharmaceutical products (including antiretroviral drugs for its HIV/AIDS treatment program), the US Trade Representative placed Thailand on its priority watch list of countries and characterized the Thai government's decision as "further indications of a weakening of respect for patents". This kind of political pressure from the governments of the major pharmaceutical companies discourages the use of compulsory licensing to increase affordable access to medicine in developing countries, undermines the international rule of law and may pose a threat to global public health by making it more difficult for developing countries to stockpile adequate supplies of medicines in preparation for pandemics. As we noted above, Mexico's stockpile of antiviral medicine to treat influenza is sufficient to serve the needs of about 1.3 percent of its population, whereas developed countries have stockpiled enough to treat 25-50% of the population that could need such medicines in an influenza pandemic.

Strong patent rights for pharmaceutical products in developing countries are not necessary to provide research incentives to invent new medicines. Parallel imports of cheaper drugs from developing countries are unlikely to undermine research incentives in developed country markets. Patent rights in fact have the effect of stifling innovation by providing an incentive to patent holders to invest in legal action to extend the life of their patents and to prevent others from developing new innovations. In economic terms, this is an inefficient way of allocating economic resources. Striking the right

balance between incentives to invent new medicines and affordable access to those medicines is a key issue in addressing global diseases.

Governments grant patents to inventors on the national level, which means that they only have legal effect in the jurisdictions where the application for a patent has been granted. One of the conditions for granting a patent is that the inventor disclose the data used in the producing the invention. TRIPS established minimum standards for the protection of intellectual property rights in the national laws of WTO Members. TRIPS requires that patents be granted for a minimum of twenty years and that they provide patent owners with the exclusive right to prevent third parties from making, using, selling or importing a patented product without the owner's consent. However, TRIPS allows exceptions to these patent rights, including the right of governments to issue compulsory licenses under certain conditions.

A compulsory license authorizes a third party to produce and sell the invention without the patent owner's consent. This exception plays a key role in balancing the rights of patent owners against the needs of consumers of patented products. The right to issue a compulsory license on a patented drug provides countries with bargaining power to extract price concessions for patented drugs or to issue compulsory licenses if price negotiations fail. However, this bargaining power applies only to countries that have the manufacturing capacity to produce generic drugs, since the generic drugs must be used to predominately supply the national market of the country that issues the compulsory license. Countries that lack domestic manufacturing capacity would need to be able to import generics manufactured under compulsory licenses in other countries in order to enjoy a comparable level of bargaining power. The Paragraph 6 Decision established rules to allow this to happen.

The Paragraph 6 Decision waives an exporter's obligation to supply predominantly its domestic market, enabling any country with manufacturing capacity to issue a compulsory license to produce generic drugs for export to countries that have insufficient or no manufacturing capacity, subject to several conditions. No formal restriction on the countries that are eligible to import exists under the Paragraph 6 system. All WTO members, other than least-developed countries, are required to notify the WTO of their intention to use the Paragraph 6 system. Some countries have made a commitment not to use the Paragraph 6 system as importers, while several others have committed to using the system as importers only in situations of national emergency or extreme urgency. Mexico is in the latter category, which means that Mexico has agreed, in effect, not to use the system simply to lower the general cost of purchasing medicine for public health care systems. No restrictions exist regarding the countries that are eligible to export. A key issue for countries that lack sufficient manufacturing capacity to effectively exercise their right to issue compulsory licenses is whether the Paragraph 6 system can be used to stockpile medicines before the emergency occurs. The Paragraph 6 system works too slowly and faces too many political obstacles to serve countries in an actual emergency. This means that Mexico, for example, needs to ensure that it has adequate manufacturing capacity to issue a compulsory license in order to acquire sufficient stockpiles of medicine in advance of a pandemic, or to use the threat of a compulsory license to lower the price in negotiations with the patent holders, also in advance of a pandemic.

The Paragraph 6 system does not apply to countries that have sufficient manufacturing capacity to issue compulsory licenses to meet the needs of their own populations. The question in a given case is whether the importing country has manufacturing capacity for the pharmaceutical product in question. For example, countries like China, India and Brazil, if they lack capacity for a particular medicine,

could use the Paragraph 6 system to import drugs from generic manufacturers in other countries. However, where developing countries do have manufacturing capacity, they will have to determine whether and how to use compulsory licensing to reduce the cost of providing treatment by issuing licenses to their own generic manufacturers. When a country issues a compulsory license to its own generic drug manufacturers to serve its own market, the Paragraph 6 Decision will not apply.

In the case of a fast-moving global disease, such as SARS or influenza, or the use of biological agents in war or terrorism, such as anthrax, governments may wish to stockpile medical treatment before the disease occurs. In these circumstances, WTO members can exercise their right to issue compulsory licenses under TRIPS Article 31 or the Paragraph 6 System or use the threat of a compulsory license to expand production or to lower the cost of the drugs that they need to stockpile.

Conclusion

Accelerating globalization has changed the context in which the WHO works, and has also hastened the spread of infectious diseases. Moreover, the multiplicity of players involved in tackling global health issues has increased the need for global leadership to convene and coordinate activities related to international health. In the wake of the SARS epidemic, the IHR (2005) provided for binding obligations (reporting outbreaks) and non-binding recommendations from the WHO. In addition, the WHO studied best practices regarding communication strategies during an outbreak. Many countries used past experiences with pandemics to prepare pandemic plans, including Mexico and the US. All of these developments were put to the test in the 2009 swine flu epidemic. As a result, the experience with this epidemic is a source of valuable information on how to continue improving national and global responses to public health threats of international concern.

Understanding past outbreaks of diseases can lead to new public health measures and other interventions to more effectively address existing diseases and to better prepare the world for future pandemics. While medicine and science have a crucial role to play in addressing pandemics, whether slow moving (like HIV/AIDS) or fast moving (like influenza), the social, legal, political, financial and economic ramifications of pandemics can not be ignored. Well-considered social, legal, political and financial strategies are essential in order to address any pandemic effectively, but they are particularly important when it comes to addressing fast-moving pandemics.

International health law is far less developed than international trade law, due to the perception that the latter is of greater economic importance than the former. However, global pandemics are also of great importance to economic growth. The key difference between international trade and pandemics is that the former is a positive force for economic growth, while the latter has a negative impact. International trade raises standards of living, whereas pandemics lower standards of living and the length and quality of life. If economic importance is the key reason for having effective global policies, laws and institutions, then the further development an effective global framework to address the negative consequences of pandemics should be given much greater priority.

The lack of financial assistance to help many developing countries build their required core surveillance and response capabilities under the IHR (2005) is an important gap in pandemic preparedness. The A/H1N1 outbreak highlighted the difficulties that can arise in rapidly detecting public health threats, even in a middle income country like Mexico or a wealthy country like the US, both of which had

engaged in intense international cooperation and preparation for such an event. In addition, this outbreak revealed an asymmetrical application of travel and trade restrictions between Mexico and the US.

In our view, Mexico was singled out for more numerous and more severe treatment for all the wrong reasons. Mexico reported the outbreaks and determined the seriousness of the threat as quickly as the US. Mexico applied mitigation measures more quickly and more broadly than any other country. Mexico communicated its actions and all of the latest developments honestly and transparently. Mexico's exemplary treatment of this outbreak limited the spread of the virus both within Mexico and internationally. The disproportionate response of several countries to Mexico's response may well discourage other countries from acting so quickly, effectively and transparently in future disease outbreaks, to the detriment of all countries.

The lack of any effective recourse under either the IHR (2005) or the WTO compounds the problem of disproportionate and asymmetrical travel and trade restrictions and creates disincentives to report outbreaks and deal with them in a transparent and decisive manner. This is of particular concern in view of the importance of rapid and transparent responses to disease outbreaks and suggests a need for increased attention to the issue of such travel and trade restrictions on the part of both the WHO and the WTO. Finding ways to avoid such inappropriate responses should also form part of the pandemic preparation process at the national level.

Appendix A: Diary of a Global Influenza Outbreak⁶³

As we noted above, it is important to note that the daily reports of total confirmed cases and deaths vary depending on the source. For example, Mexico has provided two daily updates whereas the CDC has provided only one daily update. In addition, the federal government of Mexico communicates national statistics, while the Mexico City government communicates statistics for the Federal District only. The WHO also provides only one daily update, which is usually one day behind the latest figures. For this reason, there often appear to be discrepancies in the figures.

1988	CDC reports that H1N1 swine flu virus is found in US in a previously healthy 32-year-old pregnant woman who died 8 days after she was hospitalized for pneumonia. Four days before she got sick she had visited a swine exhibit at a county fair where a flu-like illness was widespread among the pigs. Follow-up studies showed that 76% of swine exhibitors had antibodies to the swine flu virus, though no illnesses were reported. However, researchers found that one to three healthcare workers who had contact with the woman experienced mild flu symptoms with antibody evidence of swine flu exposure.
August 2005	An outbreak of swine flu takes place in the Sichuan Province of China. 24 people die.
Dec 2007	Researchers report that a new swine flu subtype found in Missouri pigs (H2N3) combined genes from avian and swine flu viruses and was transmissible in pigs and ferrets.
Sept 14, 2008	CDC researchers and public health officials from Wisconsin publish a case report in Emerging Infectious Diseases on a healthy 17-year-old boy who had mild respiratory symptoms in December 2005, 3 days after helping his brother-in-law butcher pigs. CDC investigators identify the virus, as a swine influenza A (H1N1) triple reassortant virus, A/Wisconsin/87/2005 H1N1.
Nov 24, 2008	CDC reports on a person in Texas infected with a swine influenza A/H1N1 virus in mid-October following several exposures to pigs, including a sick one.
March 9, 2009	An outbreak of respiratory disease begins in La Gloria, Veracruz.
March 10, 2009	10-year-old boy in San Diego County falls ill. The CDC later determines the cause to be the same strain of A/H1N1 influenza as in Mexico. The boy had no contact with pigs.
March 28, 2009	9-year-old girl in Imperial County is treated for a cough and a 104-degree fever. The CDC later determines the cause to be the same strain of A/H1N1 influenza as in Mexico. The girl had no contact with pigs.
April 2, 2009	Boy falls ill in La Gloria, Veracruz. His sample tests positive for A(H1N1) on April 23.

⁶³ Sources: various news media from Mexico (El Financiero, El Universal, Milenio), US (Wall Street Journal, New York Times, LA Times, Washington Post, ABC, American Press), Canada (Globe and Mail, Canadian Press), Britain (Financial Times, Guardian, Independent, BBC, Economist), Asia (China Post) as well as WHO and CDC web sites, Morbidity and Mortality Weekly Report (<http://www.cdc.gov/mmwr>), Emerging Infectious Diseases (<http://www.cdc.gov/eid>), FluView Weekly Influenza Surveillance Report (<http://www.cdc.gov/flu/weekly/>), Center for Infectious Disease Research and Policy (www.cidrap.umn.edu), WTO News and WHO and Mexican government news conferences.

April 5, 2009	Teenage girl falls ill in San Diego County, California.
April 6, 2009	Same teenage girl's father falls ill in San Diego County. Neither has been to Mexico within 7 days of falling ill. Both later test positive for the same strain of A/H1N1 influenza as in Mexico. Neither had any contact with pigs, raising concerns regarding human-to-human transmission.
April 9, 2009	Oaxaca patient admitted to hospital with severe respiratory symptoms.
April 10, 2009	First teenage boy falls ill in Guadalupe County, Texas and found to be positive the same strain of influenza A as in Mexico, on April 15.
April 12, 2009	Mexico's Directorate General of Epidemiology (DGE) reports Veracruz outbreak of influenza-like illness to Pan American Health Organization (PAHO, the regional WHO office) in accordance with International Health Regulations. Woman in Imperial County, California falls ill and later tests positive for influenza A that cannot be further sub-typed. She has not been to Mexico within 7 days of falling ill.
April 13, 2009	Oaxaca patient dies. Lab test finds an unusual virus. Hospital notifies state and federal health authorities.
April 14, 2009	The director of Mexico's National Institute for Respiratory Diseases reports to the DGE an unusual number of severe pneumonia cases in Mexico City, most appeared in otherwise healthy adults. A second teenage boy falls ill in Guadalupe County, Texas and is found to be positive for the same strain of influenza A as in Mexico, on April 15. Neither boy has been to Mexico within 7 days of falling ill or had contact with pigs, raising concerns regarding human-to-human transmission.
April 16, 2009	Mexico informs PAHO/WHO of Oaxaca case. CDC detects two suspicious cases in Southern California.
April 17, 2009	Oaxaca case prompts enhanced surveillance throughout Mexico. Mexico's DGE issues a national epidemiologic alert to all influenza-monitoring units and hospitals, asking them to report all patients with severe respiratory illness and recommending collection of diagnostic respiratory specimens. Mexico contacts Canadian and CDC labs about analyzing samples. CDC notifies DGE of two suspicious cases in Southern California.
April 18, 2009	Mexico's DGE staff visit 21 hospitals throughout the country to confirm the apparent increase in illness incidence. In Mexico City, surveillance begins picking up cases of influenza-like-illnesses. Mexico sends first samples to labs and first report to WHO. CDC notifies WHO of two suspicious cases in Southern California.
April 21, 2009	CDC confirms two cases in Southern California and notifies WHO and Mexico.
April 22, 2009	Mexico sends 51 samples, including one from Oaxaca patient and one from young boy in La Gloria, Veracruz, to the National Microbiology Laboratory in Winnipeg, Canada. Mexican authorities are still referring to it as late-season flu.
April 23, 2009	The results from Winnipeg are positive for a new flu strain in 17 cases, from Mexico City and 3 states. Epidemiologists in Oaxaca isolate Oaxaca patient's family, disinfect her home and begin over

	<p>500 interviews with neighbors, co-workers and hospital workers. Any with flu-like symptoms are tested, but none have the same virus. Mexico's DGE defines: (1) "suspected case" as severe respiratory illness with fever, cough, and difficulty breathing; (2) "probable case" as a suspected case in which a collected specimen tests positive for influenza A; and (3) "confirmed case" as a probable case that tests positive for S-OIV by real-time reverse-transcription polymerase chain reaction (RT-PCR). Health-care officials are contacted and asked to provide data for such cases from March 1. At 11pm, Mexican Health Secretary announces all schools in Mexico City closed until further notice.</p>
April 24, 2009	<p>Mexico has 60 suspicious deaths out of 1004 suspected cases of swine flu. Only 7 deaths are confirmed to be from swine flu. CDC reports 8 confirmed cases in US. The labs confirm that the US and Mexican flu are the same (a combination of porcine, avian and human). The new flu strain has killed young people and is transmitted between humans. WHO announces that it is convening an expert committee to decide whether to raise its Pandemic alert level from 3. People start wearing masks in Mexico City. Brazil, Chile, Peru, Colombia, Ecuador, Guatemala, Nicaragua, El Salvador and Panama initiate sanitary controls on passengers from Mexico.</p>
April 25, 2009	<p>There are 1400 suspected cases in Mexico. Mexico City cancels public events and closes museums. Mexico passes national decree allowing house-isolation of any person with a suspected case. Japan starts screening arrivals from Mexico for fever. WHO declares a public health emergency of international concern. CDC says it is too late to contain the spread of the virus. Argentina, Costa Rica, Dominican Republic and Honduras initiate sanitary controls on passengers from Mexico. World Animal Health body says trade bans on pork products are unjustified because swine flu cannot be transmitted by eating meat. Nicaragua restricts pork imports from Mexico.</p>
April 26, 2009	<p>Mexico reports 103 dead out of 1614 suspected cases in 16 Mexican states. President of Mexico advises citizens to use masks on public transport and to avoid crowded places. Mexican army distributes 6 million masks. By now, the Government of Mexico has reported three separate events of influenza-like-illness to the WHO, in Mexico City, San Luis Potosi and Mexicali. The majority of these cases have occurred in otherwise healthy young adults. Soccer matches are closed to spectators. CDC team helps Mexico establish national laboratory to diagnose H1N1 infection. Twenty cases confirmed in five US states: California (7), Texas (2), Kansas (2), New York (8) and Ohio (1). US declares a health emergency. US Press Secretary announces that President Obama did not contract flu on his recent visit to Mexico. Canada confirms 6 cases. Cases suspected in France (4), Israel (1), New Zealand (10), Spain (3), Hong Kong. US initiates "passive surveillance" in screening travelers from Mexico, isolating only the ill. China, Russia and others set up quarantines for anyone possibly infected. Hong Kong advises residents not to travel to Mexico and orders immediate</p>

	<p>detention at a hospital of anyone who arrives with a fever and symptoms of a respiratory illness after traveling in the previous seven days through a city with a confirmed outbreak. Malaysia, South Korea and Japan check airport passengers for signs of illness. Britain rules out new screening at airports as ineffective. WHO announces it will decide whether to raise the pandemic alert level on April 28. CDC chief of the epidemiology and prevention says high mortality in Mexico likely due to inadequate surveillance.</p>
April 27, 2009	<p>Mexico has 149 dead out of 1,995 suspected cases, of which 1,070 have recovered. Mexico orders school closures throughout the country. Stock markets open lower in US (-1%) and Mexico (3.5%). A 6.0 magnitude earthquake centered south of the capital shakes Mexico City, interrupting cabinet officials' press conference on the epidemic. The Mexican President instructs people to wash their hands regularly, wear surgical masks, cover their mouths when they cough and avoid sharing food. The Mexican army prepares naval hospitals for flu victims. Mexican officials trace the outbreak to La Gloria, Veracruz, the site of several major pig farms. Spain confirms 1 case and suspects 17 others. Scotland confirm 2 cases. One case suspected in Italy. WHO moves its emergency committee meeting up one day and raises alert to level 4, based primarily on epidemiological data demonstrating human-to-human transmission and the ability of the virus to cause community-level outbreaks. WHO advises no risk of infection from consumption of well-cooked pork and pork products. WHO DG recommends not to close borders and not to restrict international travel, since containment is not a feasible option. WHO DG stresses that all measures should conform to the purpose and scope of the International Health Regulations. CDC recommends that Americans forgo all "nonessential travel" to Mexico. EU health commissioner urges Europeans to avoid nonessential travel to the United States or Mexico. Acting CDC director calls EU advisory against traveling to the United States unwarranted. EU health minister's office later denies she had issued any travel advisory and says she was only offering her personal opinion. China and Russia ban pork imports from Mexico and affected US states. Indonesia and Lebanon ban pork imports from Canada, Mexico and US.</p>
April 28, 2009	<p>The Mexican Secretary of Health clarifies that, according to data from the federal healthcare system Mexico has had 159 suspicious deaths, of which 7 have been confirmed as swine flu. Of 2498 reported cases, 1311 have been hospitalized and 26 have been confirmed as swine flu. Data from IMSS show the number of suspicious deaths has remained constant, but the number of hospitalizations has been declining. IMSS provides healthcare for 44% of the Mexican population. All cases are being tested and further data is being collected from the state healthcare systems. Mexico is still the only country where the flu has killed people. US confirms 64 cases, 45 of them in New York. Pharmacies in New York report runs on Tamiflu. Canada confirms 13 cases. Israel and Spain confirm 2 each and New Zealand confirm 11 cases. Suspected</p>

	<p>cases appear in Australia, Austria, Brazil, Chile, Colombia, Israel, Russia and South Korea. WHO Deputy DG concedes that “the committee is very aware that changes have quite significant political and economic effects on countries.” The Mexico City Chamber of Commerce reports a daily loss of MXN 777 million, a 36% drop in economic activity in services, tourism and commerce. Mexico City orders all restaurants, bars, cantinas, party salons, gyms, cinemas and art galleries to close. Canada recommends its citizens avoid nonessential travel to Mexico. Australia recommends its citizens who travel to Canada consult a doctor if they develop flu-like symptoms. Canada believes Australia has overreacted in its advice about traveling to Canada. India and Malaysia warn their citizens to restrict travel to Mexico, Canada and the US. Switzerland advises against travel to Mexico. Britain, France and Germany advise against any nonessential travel to Mexico. Japan will no longer allow Mexican travelers to obtain visas upon arrival travelers suspected of having the flue will be quarantined and examined further at medical facilities. Britain tells citizens in Mexico to consider leaving. Cuba and Argentina suspend flights to Mexico for 48 hours. Canadian airlines Air Canada, Westjet and Transat suspend flights to Mexican beach resorts, but not to Mexico City.</p>
<p>April 29, 2009</p>	<p>President Calderon addresses the nation. Mexico confirms 99 cases, of which 8 dead, mostly due to late treatment. 84 of the 159 suspicious deaths are probably from swine flu. Health Secretary notes it took 4 ½ days from start of mitigation measures to get testing set up in Mexico. From now on, he will announce confirmed cases, not suspected cases. Mexico City requires drivers in public transportation system to wear masks and gloves. Pope Benedict XVI expresses his solidarity with the Mexican people. Mexico releases influenza alert audio in 15 indigenous languages, including Chichimeco, Chinanteco, Maya, Mazahua, Mazateco, Mixteco, Náhuatl, Tarasco and Zapotec. After 6 days in hospital with swine flu, former Mexico City mayor Manuel Camacho Solís is released. Mexico has 1.4 million courses of Tamiflu treatment (enough for 1.3% of its population). This contrasts with stockpiles for 25-30% of population in countries like Canada and France. Virtually all economic activity to be suspended in Mexico May 1-5 to minimize human contact during long weekend, including public administration; exceptions are hotels, pharmacies, hospitals, media, telecom, financial services, transportation, gas stations, supermarkets and other food markets and stores. US confirms 91 cases and 1 death but does not reveal number of suspected cases. In New York, the city’s health commissioner says “many hundreds” of schoolchildren are ill at a school where some students had confirmed cases. President Obama recommends that schools with suspected or confirmed cases close. California Gov. Arnold Schwarzenegger declares a state of emergency. Austria confirms 1 and Germany confirms 3 cases. Britain confirms 5 in total. New Zealand confirms 14 total. Spain suspects 59 cases. WHO lists 105 confirmed cases in 7 countries. More than half are in US. WHO</p>

	<p>raises alert to level 5. WHO DG praises Mexico's cooperation and transparent reporting, Canada and US help and re-emphasizes recommendations against border closures and trade and travel restrictions. She also emphasizes that flu epidemics tend to have much higher death tolls in poor countries than in rich ones. She advises all countries to implement their pandemic preparation plans. Ecuador suspends all flights to and from Mexico for 30 days. Peru suspends flights with Mexico. French health minister calls for suspension of all flights from EU to Mexico. Five cruise lines stop all port calls in Mexico. At least 10 countries have established import bans on pork, including China, Ecuador, Indonesia, Lebanon, Nicaragua, Russia and Ukraine. Egypt decides to kill all pigs. China ban imports of live pigs and pork products from Mexico and three US states. US warns against trade barriers and insists pork is safe. EU says it will not restrict trade with Mexico. Stock markets rise in US and Mexico. Veratect, a US data-mining company seeking to sell its services to the CDC and WHO, confirms that it reported on March 30 to the WHO and CDC the admission to hospital on March 22 in Canada of a lawyer with a respiratory illness after returning from Mexico and that the Pan-American Health Organization accessed its online warning of an outbreak in Mexico on April 10.</p>
<p>April 30, 2009</p>	<p>Mexico confirms 260 cases and 12 dead (8 women and 4 men), as it continues to process its backlog of samples. It will install 6 new labs. Cases in Mexico are leveling off, prompting the Health Secretary to express optimism that the epidemic may have reached its peak in Mexico. Dr. Miguel Angel Lezana, director of the National Epidemiology Center, says he notified the Pan American Health Organization (PAHO) and WHO on April 16 about the outbreak in Mexico, but neither acted until eight days later, when the WHO announced the epidemic. A survey of 410 Mexico City adults reveals that 57% believe the government is underreporting the numbers, 10% think the numbers exaggerated, 19% believe official figures and 14% are not sure what to think. 51% believe that the authorities were slow to react to the epidemic, 41% think they reacted on time and 8% did not know. 66% think the Mexico City government is taking adequate measures to address the epidemic, 30% think they are not and 4% do not know. 49% are somewhat or very afraid of catching the flu, 50% feel little or no fear and 1% do not know. Half think facemasks somewhat or very effective in preventing infection and half think they are mostly or completely ineffective. US confirms 109 cases in 11 states. Federal government distributes millions of doses of anti-flu drugs to states. Fort Worth is first major US city to close its 147 schools, bringing total to 298 schools in US. A US data-mining company says it told the CDC about signs of a flu outbreak in Mexico in early April. A US security aide involved in Barack Obama's visit to Mexico is reported as a probable swine flu case. US rejects calls to close border with Mexico as expensive and ineffective. Vice-president, Joe Biden, retracts television comments against flying or using the subway. CDC issues guidelines for airline crew and notes that social</p>

	<p>distancing will play the primary role in preventing exposure of persons to the virus in the event of a widespread outbreak or pandemic. Canada confirms 34 cases and human-to-human transmission. Spain confirms 13. Britain confirms 8. New Zealand is down to 3 confirmed cases. Israel has 2 confirmed cases. The Netherlands, Peru and Switzerland confirm 1 case each. South Africa is the only African country to have filed a national contingency plan with the WHO and the first African country to suspect cases. Most Latin American and European countries without confirmed cases suspect cases, as do Australia, India and South Korea. China, Japan, Central and Southeast Asia and the Middle East (minus Israel) are notable for reporting neither confirmed nor suspected cases. Leaders begin to refer to the virus as H1N1, to avoid implying transmission from eating pork. The WHO home page simply states, "From today, WHO will refer to the new influenza virus as influenza A(H1N1)." WTO DG Lamy reelected to a second term. In response to a reporter's question about flu-related trade restrictions, he says no Members have formally reported pork import bans to the WTO. EU rejects French proposal to suspend flights with Mexico. US also will maintain air links with Mexico. Taiwan issues a red alert advising its citizens not to travel to Mexico and a yellow alert for Canada and US. Flu vaccine manufacturers report limited capacity. There is still insufficient evidence to switch from manufacturing seasonal influenza vaccine to swine-flu vaccine.</p>
<p>May 1, 2009</p>	<p>Mexico confirms 397 cases out of 908 tested cases, 285 of them in Mexico City and 45 in the neighboring state of Mexico. Of 159 suspicious deaths, 58 are not flu-related, 16 are and 85 are yet to be analyzed. The majority of the 16 confirmed deaths occurred in 21-40-year-olds. The Secretary of Health rejects the idea of declaring a national quarantine. The Secretary of Health and CDC report that virus transmission appears widespread and the illness less severe than first thought. Many suspected deaths have proved to be from other causes. The virus has not mutated, its pattern resembles seasonal influenza and many mild cases probably are never detected. The new strain is as infectious as seasonal flu, with a rate of infection in a population of 25-30%. A WHO official notes that the 1918 Spanish flu started mildly. WHO says the seasonal influenza vaccine appears ineffective against the A(H1N1) strain. US confirms 141 cases. Some describe US school closures as overreaction where no confirmed cases yet found. The FDA and FTC warn the public of fraudulent 2009 H1N1 influenza product for sale on the Internet. Canada confirms 51 cases. New cases are reported in Denmark, France, Russia, Hong Kong and South Korea. Hong Kong confirms its first case, a Mexican hotel guest who arrived via Shanghai. Guests and staff at the hotel are placed under quarantine for seven days. China suspends flights from Mexico to Shanghai. Cuba and Argentina resume flights with Mexico. Nestlé bans all non-essential travel by its global executives to US and Mexico, one of the first European companies to extend to the US</p>

	<p>travel precautions that many companies have applied to Mexico. Japan and China donate supplies to Mexico, such as gloves, mask and antiseptic gel. The Mexico City government asks residents to stop littering the streets with used masks and to dispose of them hygienically. The captain of the Chivas soccer team, Héctor Reynoso, apologizes for spitting at another player and threatening to give him the H1N1 flu during a game on April 29. A blue stuffed toy in the form of a small virus particle—called “Achufy!”—goes on sale in Mexico, promoted as a souvenir of the epidemic. Cost: 345 pesos, plus delivery. There are no May 1 protest marches in Mexico City. It is still not clear where the virus originated. Growing evidence in California suggests that early flu cases had no apparent origin in Mexico. One possible scenario is that swine flu had been spreading around the U.S.-Mexico border. WHO spokesman Gregory Hartl notes that the term “pandemic” refers to where an illness spreads, not its severity.</p>
<p>May 2, 2009</p>	<p>Mexico confirms 473 cases out of 1,303 tests, including 19 dead, of which 14 are women. Authorities cut their suspected death toll to 101 from 176 as more test samples came back negative. Mexico City reports no deaths from H1N1 for the second day in a row. Mexican health authorities express cautious optimism that the situation is stabilizing. President Calderon reaches agreement with state governors to coordinate communications and to present unified reports on the epidemic. In a telephone conversation with President Calderon, President Obama reiterates his willingness to support Mexico as far as possible during this health emergency. President Calderon thanks President Obama for keeping the border open to the movement of people and goods. PAN and PRD each give up some media air time so that the Secretary of Health can use it to keep the public informed. The Mexico City government begins using five temperature detecting cameras in the subway to detect people with fevers. It also announces plans to hand out 500,000 doses of antimicrobial gel daily to passengers for 15 days and 5 million face masks, to install 350 special garbage cans for face masks, to require street vendors to wear masks and gloves and to apply extra cleaning to the subway system. Mexico’s Secretary of Foreign Affairs recommends that Mexicans avoid travel to China, in retaliation for China’s discriminatory travel restrictions. Concerns are raised regarding possible mistreatment of Mexicans in the United States and elsewhere as a result of the epidemic. There were also reports of discrimination against Mexico City residents in the rest of Mexico. The first shipment of 1 million euros worth of aid arrives from Spain: 63,000 masks and 6,000 protective goggles. Spain’s Ambassador to Mexico laments the blame and stigmatization against Mexico that has resulted from the epidemic. US confirms 160 cases, but still only one death. Canada confirms 82 cases. Canada’s chief public health officer reports that an Alberta farmhand who fell ill upon his return from Mexico April 12 apparently infected pigs with A(H1N1) influenza, raising concerns that other humans could be infected by the pigs. Spain confirms 15.</p>

	<p>Costa Rica, Italy, and Ireland confirm cases. Chinese health authorities find and place under quarantine 164 of the 189 passengers and crew members aboard a flight from Mexico to Shanghai that carried a man now ill with the A/H1N1 flu virus in Hong Kong. A farmhand in Canada, who traveled to Mexico and fell ill upon his return, infected the pigs with the H1N1 influenza virus. WHO says there is no evidence of sustained spread in communities outside North America. WHO reports total of 658 cases in 16 countries: Mexico 397, US 160, Canada 51, Britain 15; Spain 13; Germany 6; New Zealand 4; Israel 3; France 2; Austria, China, Costa Rica, Denmark, Netherlands, South Korea and Switzerland 1 each. The Food and Agriculture Organization of the United Nations (FAO), the World Organization for Animal Health (OIE), the World Health Organization (WHO) and the World Trade Organization (WTO) issue a joint statement that pork products handled in accordance with hygienic practices are not a source of infection for the A/H1N1 virus. Canada, Mexico and US appeal to other countries not to limit trade. Russia and China have banned pork products from some US states. Ukraine, Philippines and Serbia have banned pork products from the entire United States. Indonesia has banned pork products from Mexico, the US, France, Canada, Israel, Spain and New Zealand. Jeffery Taubenberger, the National Institutes of Health researcher who reconstructed the 1918 influenza virus, says, "We're very early on in figuring out what makes this virus tick. I am loath to make predictions about what an influenza virus that mutates so rapidly will do." Michael T. Osterholm, an epidemiologist at the University of Minnesota, says, "Everyone in one week wants an answer as to what it will do. Anyone who gives you an answer right now, do not listen to them about anything else because you cannot trust them."</p>
<p>May 3, 2009</p>	<p>Mexico confirms 590 cases out of 1500 tests. There are 22 confirmed deaths, 15 of them women and the most recent on April 29. The Secretary of Health says the evolution of the epidemic is now in its phase of descent, citing decreasing numbers of new cases and fewer hospital visits for influenza symptoms since the peak April 23-28. Pablo Kuri, a Mexican epidemiologist, provides details of 16 deaths: 3 children (a 9-year-old girl, a 12-year-old girl and a 13-year-old boy); 4 older than 60; and 9 between 21 and 39. He also says that tests have confirmed a swine flu death in Mexico City on April 11, two days earlier than what had been believed to be the first death. There have been no deaths among health care workers treating swine flu patients in Mexico, an indication that the virus may not be as contagious or virulent as initially feared. Mexico will provide kits to schools that have no running water or drainage so that the children can wash their hands. Campaigning for the July 5 congressional elections officially start, but all public campaigning remains banned to prevent gatherings where the virus could spread. Cardinal Norberto Rivera asks the virgin of Guadalupe for protection to overcome the epidemic. The US has sent Mexico 100,000 protection kits, which include respiratory masks, protective</p>

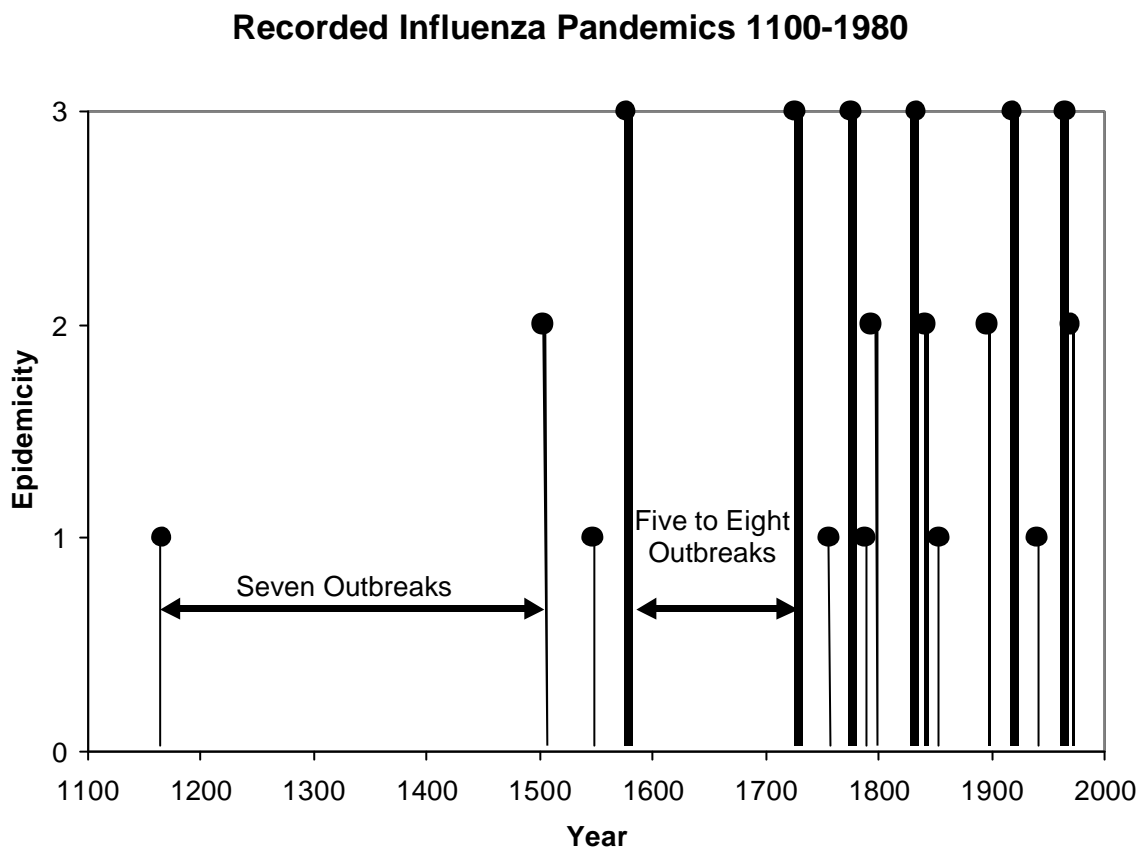
	<p>goggles and overalls, part of \$16 million in aid to Mexico since the emergency began. US confirms 226 cases in 30 states. The CDC continues to hold daily press conferences on the epidemic. The US Secretary of Health, National Security Advisor and Acting Director of the CDC appear on the political programs of ABC, CBS, CNN, FOX and NBC to discuss the US response. In other countries, total confirmed cases from various sources are: 101 in Canada; 40 in Spain; 18 in Britain; 8 in Germany; 4 in New Zealand; 2 each in Italy, France, Israel, and South Korea; 1 each in Colombia, Costa Rica, Ireland, Switzerland, Austria, Hong Kong, Denmark and the Netherlands. Colombia is South America's first confirmed case. WHO reports that 18 countries have officially reported 898 cases. WHO advises that masks could reduce the transmission of influenza in health-care settings, the benefits of wearing masks in the community has not been established, especially in open areas. WHO asks Mexico and US to watch out for pigs infected with A(H1N1) influenza, in light of Canada's infected pigs. Mexican Secretary of Foreign Affairs reports that the government asked WTO and UN Secretary General to take actions to counteract discriminatory treatment. The government described the trade and travel restrictions and the treatment of Mexicans abroad as discriminatory, xenophobic, unjustified and unilateral. She referred to the suspension of flights by Argentina, China, Peru, Ecuador and Cuba, exhaustive passenger inspections, unfair treatment of Mexicans and trade restrictions on Mexican products as unjustifiable unilateral decisions based on a lack of information and a lack of respect for human rights. China is still holding 44 Mexicans in quarantine. China stops imports of Alberta pork. Argentina denies discrimination in its suspension of flights with Mexico without explaining why its policy is different for Canada, the US and other affected countries. In Egypt, pig owners clash with police who are helping to seize their animals for slaughter. In Baghdad, Iraqi officials kill three wild boars at Baghdad's zoo because of swine flu fears. National governments and WHO continue to try to balance the danger of a serious outbreak with the risk of overreacting, while trying to determine how lethal the virus might be. As optimism grows, WHO warns countries against complacency regarding the seriousness of the public health threat.</p>
<p>May 4, 2009</p>	<p>Mexico confirms 727 cases, including 26 deaths, of which 16 are females. Mexico City experiences no deaths for the fourth day in a row and lowers its alert from red to orange. The Secretary of Health says influenza A(H1N1) appears only slightly more contagious than the seasonal flu, with each sufferer infecting 1.4 to 1.8 people on average. The number of new cases is declining in Mexico and no deaths have been reported since April 29. The Secretary of Education announces that classes will resume on May 7 in high schools and universities and on May 11 in primary schools. Mexico insists that the European press stop referring to Influenza A (H1N1) as "Mexican flu". President Calderon says Mexico has defended all of humanity from the outbreak and urges countries to stop applying</p>

	<p>trade and travel restriction against Mexico. Mexico was prepared for the outbreak and took the correct actions. Mexico's frontline battle against the outbreak has helped not just Mexico, but the entire world. China sends a second shipment of supplies out of a total 5 million USD in aid to Mexico. US confirms 286 cases in 36 states and more than 700 additional cases considered probable in 44 states. Canada confirms 140 cases. Spain confirms 54 cases, 4 of whom never traveled to Mexico. Britain confirms 27. Italy and France confirm 4 each. El Salvador confirms 2, one of whom recently returned from Mexico. WHO confirms 1,085 cases in 21 countries. Twenty countries worldwide have banned imports of pork and other meat, including live pigs, pork, cattle, poultry, livestock, feed and animal semen from countries with reported infections. Mexico, the United States and Canada are the countries most affected by the bans. The countries banning imports include Thailand, Jordan, the Philippines, Ukraine, Lebanon, Azerbaijan, Bahrain, Kazakhstan, Macedonia, Montenegro, Suriname, the United Arab Emirates and Belarus. Canada threatens WTO action against China for banning pork imports. Russia extends its pork import ban to Canada and Spain, but lifts the ban for some US states. Argentina's Ambassador to Mexico explains that Argentina suspended flights because Argentina is not prepared for a new health crisis, as it is already dealing with seasonal influenza and an outbreak of dengue fever in more than 60,000 people. Argentina says it will pay the expenses of Mexicans stranded in Argentina and apologizes for its health minister's description of Mexico as a "sick brother". China quarantines a group of 25 Canadian exchange students. China quarantines 2 US citizens and increases processing time for US citizens to get Chinese visas from 1 to 6 days.</p>
<p>May 5, 2009</p>	<p>Mexico confirms 866 cases and 26 deaths, of which half are women. Of possible deaths from flu, 37 tests remain to be done. In 77 deaths that were suspected to be from a (H1N1), no samples were obtained and tests are no longer possible. The last confirmed case occurred on April 29. Mexico City has had no deaths for a fifth day in a row. Mexico implements economic stimulus measures worth 17.4 billion pesos (about 1.3 billion USD) to mitigate the economic impact of the outbreak. Mexico's estimated economic loss is 30 billion pesos (about 2.2 billion USD). The Ambassador for South Korea agrees that Mexico has defended all of humanity from the outbreak. South Korea donates 500,000 USD worth of medical supplies to Mexico. The US confirms 403 cases in 38 states and its second death. The US is still the only country other than Mexico with any deaths. Canada confirms 165 cases, putting it in second place in cases per million people (4.9) after Mexico (7.8). Spain confirms 73, putting it in third place in cases per million people (1.8), ahead of the US (1.3). Guatemala confirms its first case. The European Center for Disease Prevention and Control confirms 107 infections throughout Europe. WHO says not all cases are linked to Mexico. At least one is linked to travel to US. WHO confirms 1124 cases in 21 countries: Mexico (590), US (286), Canada (140), Spain (54), United</p>

	<p>Kingdom (18), Germany (8), New Zealand (6), France (4), Israel (4), El Salvador (2), Italy (2), Austria (1), Hong Kong (1), Costa Rica (1), Colombia (1), Denmark (1), Ireland (1), Netherlands (1), Portugal (1), Republic of Korea (1) and Switzerland (1). Mexico sends a plane to pick up Mexicans in Shanghai, Beijing, Guangzhou, Hong Kong that were quarantined by China. China sends a plane to Mexico to pick up Chinese that were stranded when China banned flights with Mexico. China is reported to have quarantined Canadians and Mexicans based on nationality, rather than health status. Mexico complains to Germany about signs at Frankfurt airport referring to “Mexican flu”. At the WTO, Mexico calls on its trading partners to repeal all pork import bans imposed as a result of H1N1 flu virus fears, because they have no scientific grounds and violate international trade rules. Mexico is one of the top exporters of pork meat, along with the United States, European Union, Canada, and Brazil. China says its pork bans are in line with WTO rules. The EU complains to Russia about its import ban on certain EU pork products. Russia is not a WTO Member. UN Secretary General Ban Ki-moon asks countries to repeal trade and travel restrictions not based on science.</p>
<p>May 6, 2009</p>	<p>Mexico confirms 1112 cases and 42 deaths. Most deaths are in people between 20 and 29 years of age and occurred in the Federal District (68%), State of Mexico (7%), San Luis Potosí (7%), Tlaxcala, Oaxaca and Chiapas (3% each state). The 5-day virtual shutdown of Mexico City is over. The Health Secretary says Mexico applied mitigation measures reserved for WHO level 6 (pandemic). Of those hospitalized recently for observation, 85% have mild to moderate cases. The death rate was higher initially because people waited a week to seek medical attention, after having self-medicated. Business is down about 50% for Mexico City’s prostitutes, some of whom ask their customers to wash their hands. University professors and high school teachers attend sessions to prepare them for the return of their students on May 7. Students will be screened for symptoms as they enter schools and sent to doctors if they have any symptoms, among other measures. Elementary schools will return on May 11. The US confirms 642 cases in 41 states. Canada confirms 201 cases. WHO confirms 1893 cases in 23 countries: Mexico (942), US (642), Canada (165), Spain (73), United Kingdom (28), Germany (9), New Zealand (5), Italy (5), France (5), Israel (4), El Salvador (2), Republic of Korea (2), Austria (1), Hong Kong (1), Costa Rica (1), Colombia (1), Denmark (1), Guatemala (1), Ireland (1), Netherlands (1), Portugal (1), Sweden (1) and Switzerland (1). WHO begins distributing 2.4 million doses of Tamiflu to various countries, including Mexico. Singapore orders a seven-day quarantine for all passengers arriving from Mexico, Canada and US; failure to comply is subject to fines of 7,000 USD or 6-12 months. Quarantine lifted for Canadian students in China. Afghanistan’s only known pig is quarantined in a room, away from visitors to Kabul zoo. The pig was a gift to the zoo from China. Mexico City lowers the alert to “Yellow”. Movie</p>

	theaters, nightclub and other entertainment center restrictions eased. The US reports first American born victim – a Hispanic woman from Texas.
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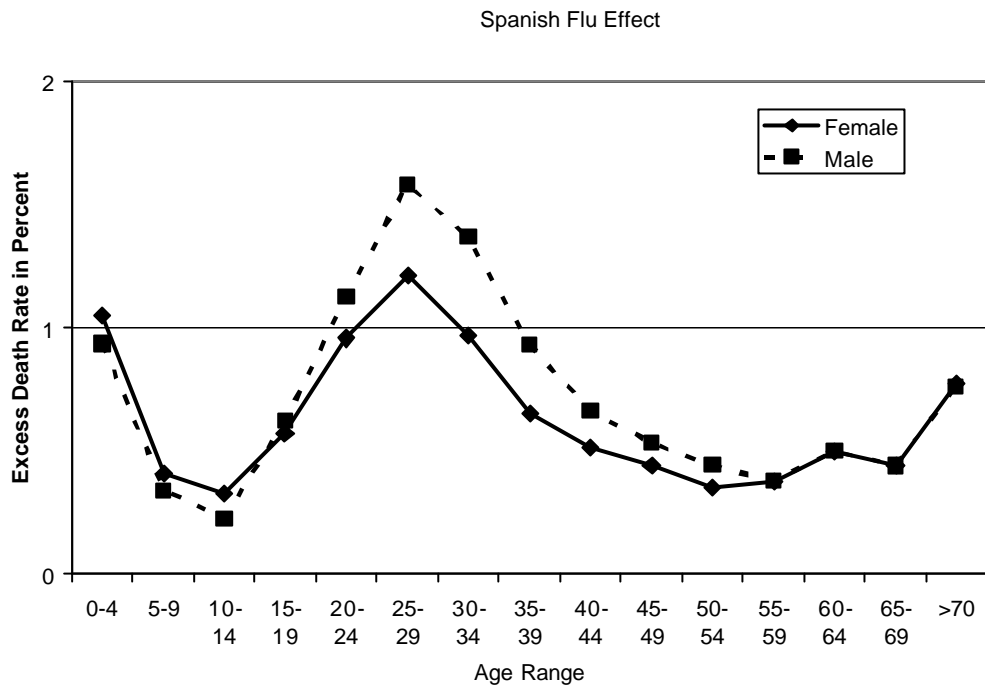
Figure 1: Pandemics are getting more frequent and more virulent over the past 900 years



Notes: 1: epidemic, 2: probable pandemic, 3: pandemic.

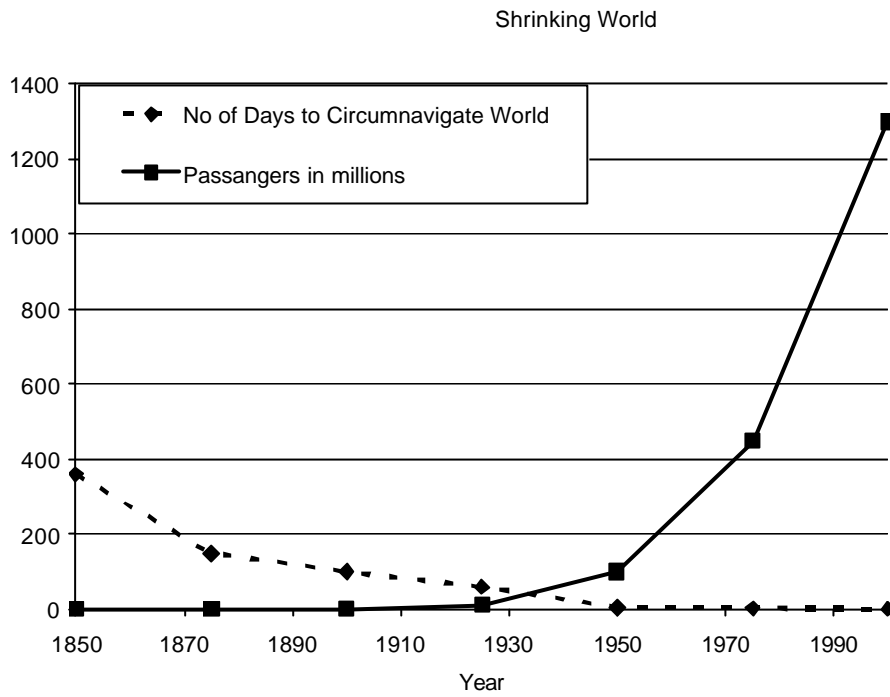
Source: Potter, C.W: Textbook of Influenza, Nicholson, Webster, Hay, Blackwell Science 1998

Figure 2: Excess death rate in percent during 1918-1919 Spanish Flu pandemic compared with the previous decades with data from 13 countries



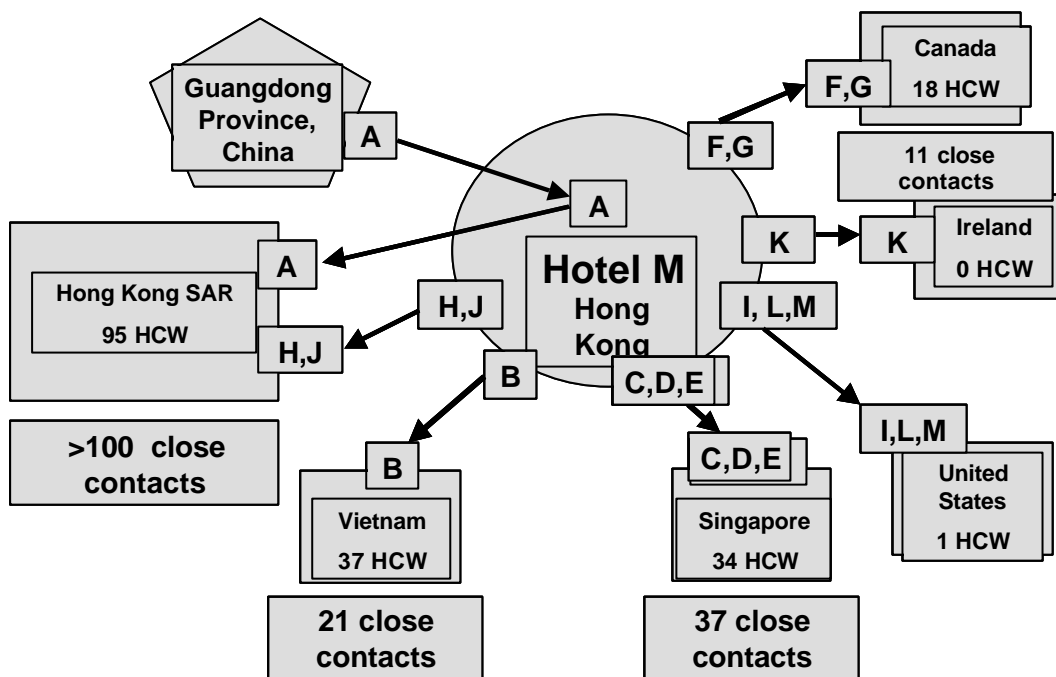
Source: Murray et al Lancet, 2006

Figure 3 : As the number of international passengers rise, the days to circumnavigate the world declines



Sources: F A Murphy and N Nathanson, Seminars in Virology, Academic Press, Volume 5, page 88, 1994 (for number of days to circumnavigate the world) and other historical documents

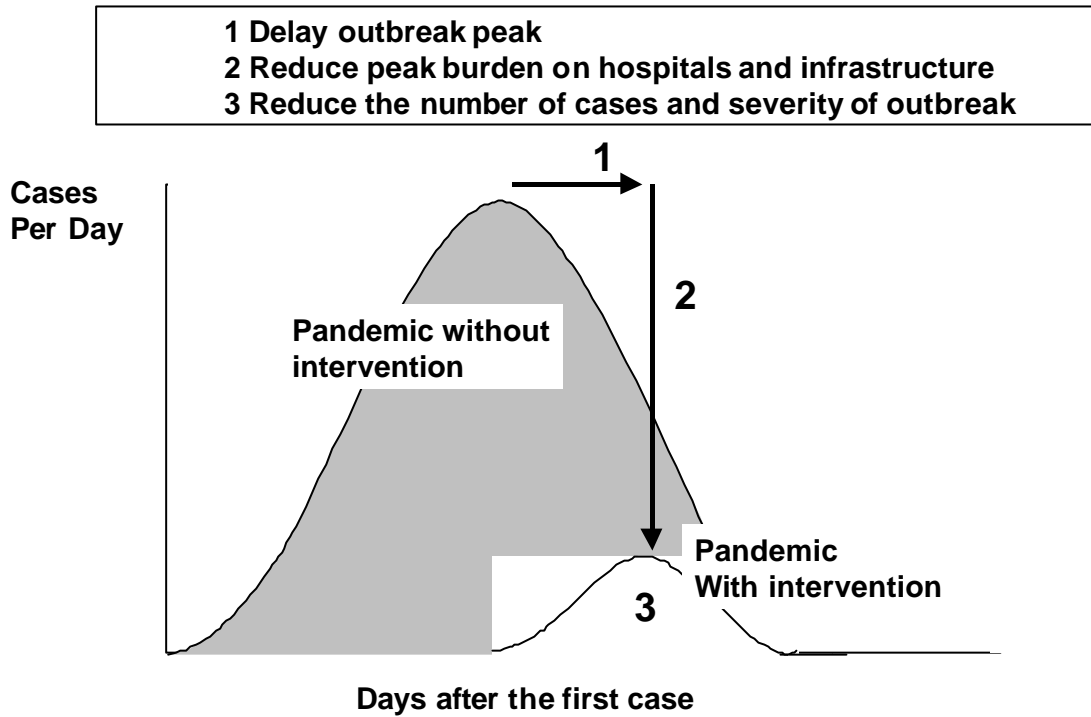
Figure 4: Anatomy of the spread of SARS that starts with patient A in Guangdong, China



Source: WHO/CDC, HCW stands for healthcare workers

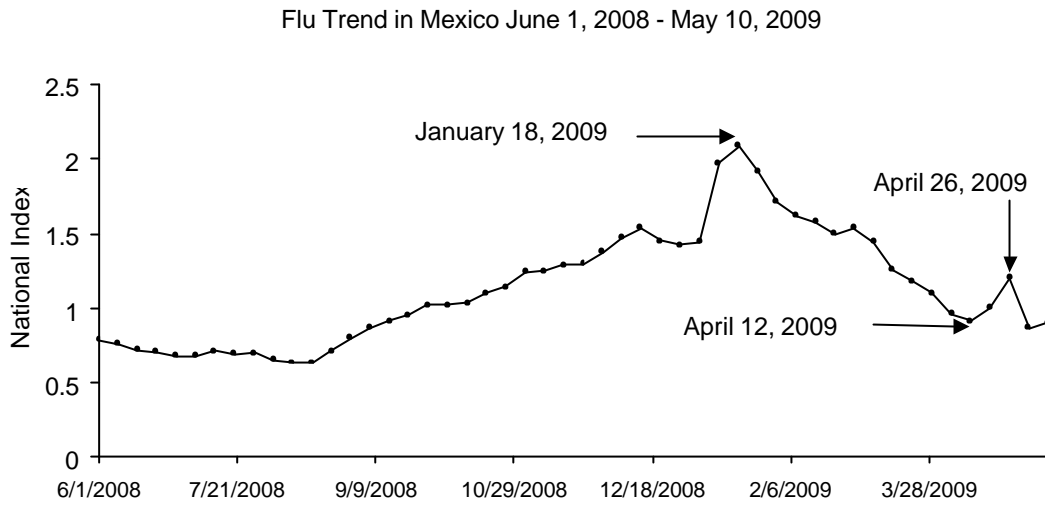
Figure 5: The objective of an intervention is to postpone the onset and reduce the peak of a pandemic

Objective of Intervention



Source: <http://www.pandemicflu.gov/plan/community/commitigation.html>

Figure 6: An unusual uptick of influenza late in the season according to Google search in Mexico



Source: http://www.google.org/flutrends/intl/en_mx/index.html

Figure 7a: Total Confirmed Cases in North America (April 23, 2009 – May 14, 2009)

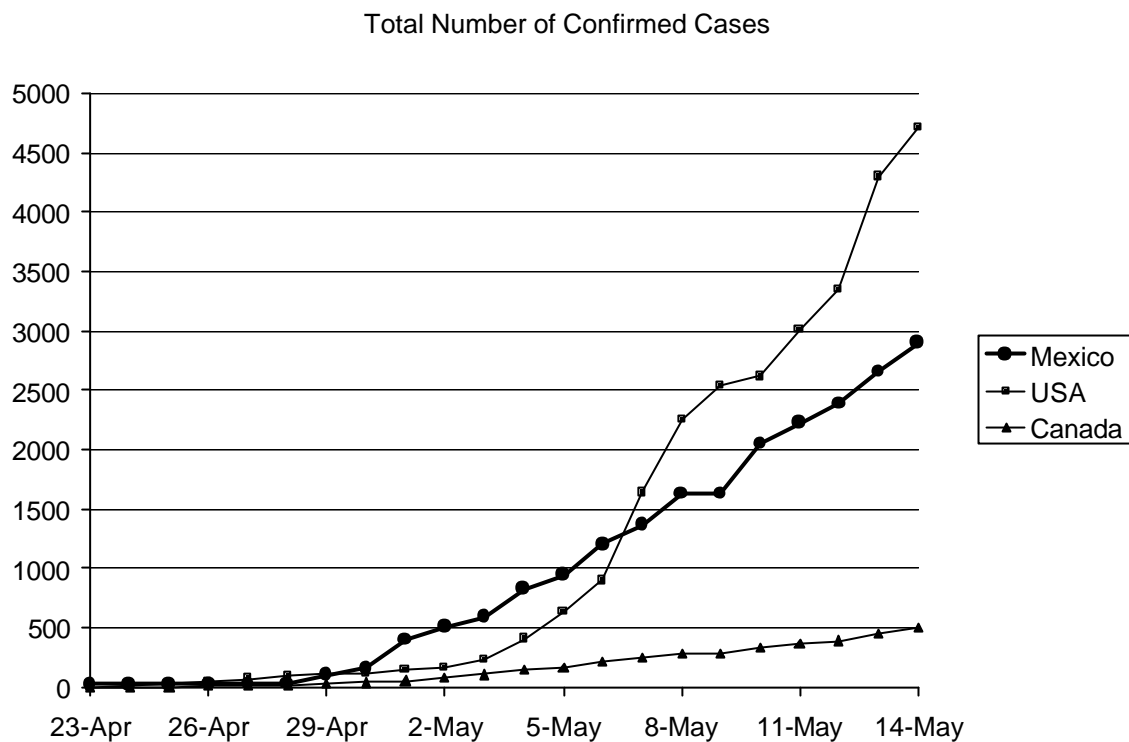


Figure 7b: Per Capita Confirmed Cases in North America (April 23, 2009 – May 14, 2009)

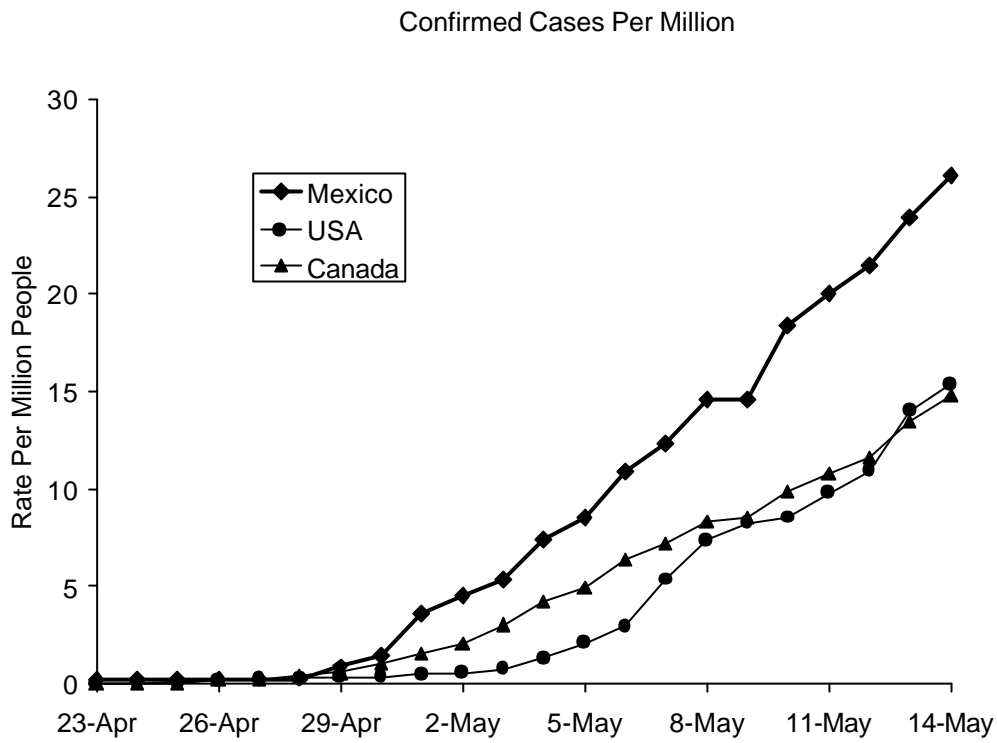


Figure 8a: Probable and confirmed cases of A(H1N1) in Mexico between 15 March 2009 and 26 April 2009

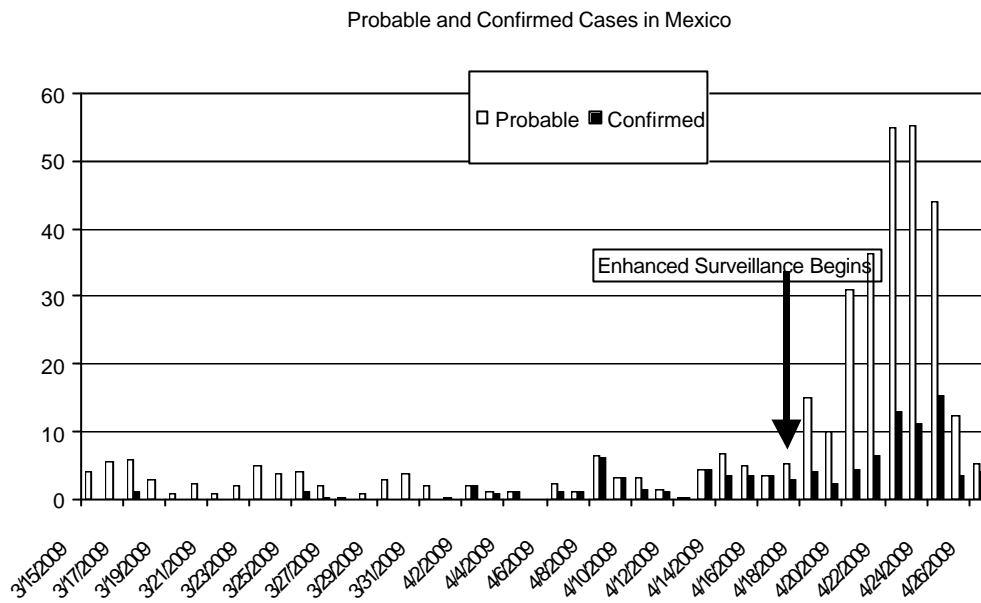
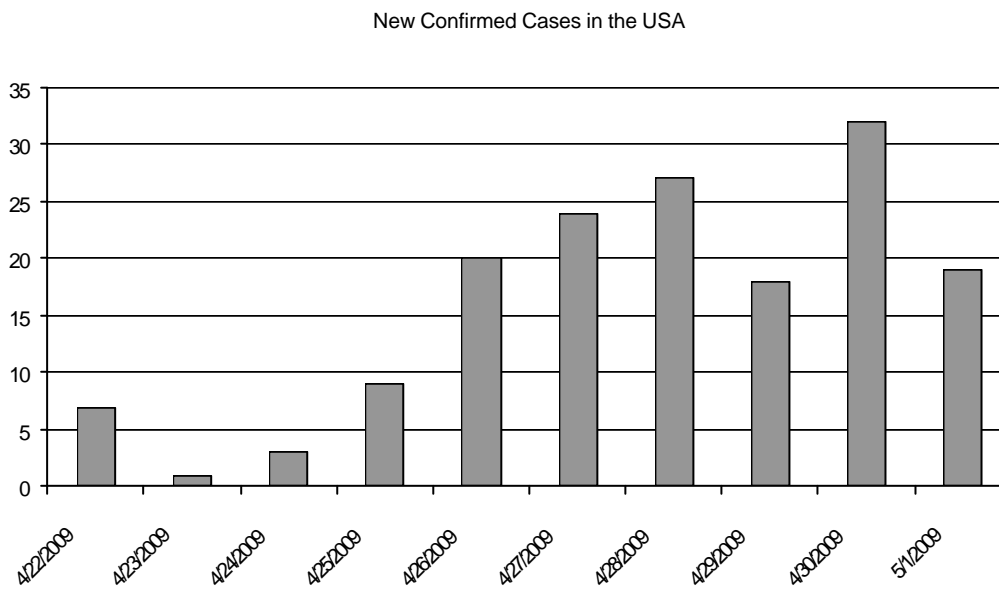


Figure 8b: Confirmed cases of A(H1N1) in the USA between 22 April 2009 and 1 May 2009



Source: <http://www.cdc.gov/mmwr/>

Biographical Sketches

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Bradly Condon and Tapen Sinha have written a book entitled "Global Lessons from the AIDS Pandemic" published by Springer Verlag in 2008.