

Swine flu

Mexico's handling of A/H1N1 in comparative perspective

Sophal Ear

Department of National Security Affairs

U.S. Naval Postgraduate School

1411 Cunningham Road

Monterey, CA 93943

sear@nps.edu

ABSTRACT. Emerging infectious diseases (EIDs) pose international security threats because of their potential to inflict harm upon humans, crops, livestock, health infrastructure, and economies. Despite the scale of this threat, there are inherent limitations in preventing and controlling EIDs, including the scope of current disease surveillance efforts. All of this leads to the following questions in the context of Mexico's recent swine flu experience: What were the cultural, political, and economic challenges to Influenza A/H1N1 virus response in Mexico? By way of comparison, what can we learn from the U.S. experience in 1976 with A/New Jersey/76 (Hsw1N1), later referred to as H1N1? This article explores the comparative political economy of Mexico's handling of influenza virus A/H1N1 outbreak in 2009. Research provides notable observations—based on the strengths and weaknesses of each country's response—that can be used as a starting point of discussion for the design of effective EIDs surveillance programs in developing and middle-income countries. In the U.S., the speed and efficiency of the 1976 U.S. mobilization against H1N1 was laudable. Although the U.S. response to the outbreak is seldom praised, the unity of the scientific and political communities demonstrated the national ability to respond to the situation. Mexico's strongest characteristics were its transparency, as well as the cooperation the country exhibited with other nations, particularly the U.S. and Canada. While Mexico showed savvy in its effective management of public and media relations, as the article details, political, economic, and cultural problems persisted.

Key words: Swine flu, A/H1N1, Mexico, H1N1, emerging infectious diseases (EID's), political economy, disease control

Emerging infectious diseases (EIDs) pose international security threats because of their potential to inflict harm upon humans, crops, livestock, health infrastructure, and economies. Influenza virus A/H1N1's impact on the Mexican economy in 2009, for example, resulted in an estimated loss of almost 1 percent of GDP.¹ Despite the scale of this threat, there are inherent limitations in preventing and controlling EIDs, including the scope of current disease surveillance efforts. This paper examines the cultural, political, and economic challenges to the A/H1N1

response in Mexico.² By way of comparison, the analysis also considers the U.S. experience in 1976 with A/New Jersey/76 (Hsw1N1), later referred to as H1N1, and identifies the strengths and weaknesses to each country's response.

Research on the 1976 outbreak, often referred to as the "Swine Flu Affair," which actually covers March 1976–1978, is based on a seminal study commissioned by then Secretary of the Department of Health, Education, and Welfare Joseph Califano. The report was authored by Richard Neustadt, then a professor of Government at the Harvard Kennedy School, and Harvey Fineberg an assistant professor of Health

doi: 10.2990/31_1-2_52

Services at the Harvard School of Public Health (now President of the Institute of Medicine), respectively. Research on the 2009 A/H1N1 outbreak in Mexico is based on original field research and interviews conducted in June 2010 with more than fifteen individuals who were present in Mexico in 2009 during the outbreak and are deeply knowledgeable of the A/H1N1 response (see the Appendix for a descriptive list). This article compares and contrasts the strengths and weaknesses of responses to the 1976 and 2009 outbreaks, draws lessons learned, and identifies best practices that could assist policymakers in the development of strategies for EID surveillance and response.

The interviews conducted in Mexico bring to attention three major dimensions of policy that shaped responses to the outbreak: political; economic; and cultural. More specifically, the discussion includes review of government structure and infrastructure, political loyalties, transparency, uneven development, and the absence of a culture of prevention. The outbreak in Mexico turned pandemic, yielding best practices due to Mexico's response and the manner in which authorities chose a transparent approach to reporting. This is not to say that challenges were not present; to the contrary, a number of lessons were learned. Mexico is especially important considering its economic status between a fully developed and developing country. Mexico is a member of the Paris-based Organization for Economic Cooperation and Development (OECD) but frequently finds itself last in OECD rankings.³

A/H1N1 in Mexico

Since the outbreak of A/H1N1 in Mexico in May 2009,⁴ the virus has been studied across a broad biological spectrum, from its evolution to the mechanisms that aided in its spread.⁵ The origins of the virus have also been examined; as suggested by its name, it is thought that the virus originated in swine and later crossed over to humans "several months before recognition of the outbreak,"⁶ according to a report published in *Nature*. Yet, there were no data on this particular virus strain before the May outbreak and according to Smith this absence of information highlighted "the need for systematic surveillance of influenza in swine" (p. 1122).⁶ Prior to the 2009 outbreak, "closer communi-

cation between animal health authorities (e.g., practicing veterinarians, wildlife specialists, biologists and agricultural agencies) and human health authorities"⁷ was recommended in a 2001 article by Annie Fine and Marcelle Layton in the journal, *Clinical Infectious Diseases*. The relationship between animals, viruses, and humans differs greatly from case to case, but it is clear that animal and human health can be highly interconnected. Recent books by Nathan Wolfe⁸ and David Quammen,⁹ *The Viral Storm: The Dawn of a New Pandemic Age* and *Spillover: Animal Infections and the Next Human Pandemic*, respectively, highlighted this key point. In a recent analysis of factors impeding zoonotic disease surveillance, Jerolmack argues that "institutionalised thinking and practices developed to address the diseases that traditionally concerned each [animal or human health] agency constrain members from building the inter-organisational bridges required to manage the latest 'hybrid' diseases."¹⁰ This underscores Fine's and Layton's recommendation for better communication.

The outbreak and spread of influenza can be highly unpredictable. Although stochastic modeling has been used to estimate the transmissibility of the swine flu virus between humans¹¹ the emergence of a novel influenza is difficult to know in advance.¹² Akin to the uncertainty of a bioterrorist attack, uncertainty about the next virulent strain of animal influenza suggests a preventive strategy of developing effective infrastructure and engaging in thorough preparedness planning.

While the 1976 U.S. H1N1 response at Fort Dix in New Jersey left much to be desired from a communications standpoint, the 2009 Mexico response to A/H1N1 has been viewed as an overall success. Mexico's transparency and sharing of viral isolates enabled the creation of a vaccine that likely prevented more deaths from occurring. As encouraged by the World Health Organization (WHO), many countries, including Mexico, have developed plans for pandemics and/or bioterrorism preparedness.¹² Thus, the first step in responding to an outbreak need not be *ad hoc*, as happened in 1976, but rather organized and prepared.

After detecting and monitoring the new outbreak, Mexico acted quickly with international cooperation and transparency, as noted in the *Archives of Medical Research*.¹³ Laboratories shared the new virus strain internationally and vaccine development began. An analysis in the *Journal of Immune Based Therapies and*

Vaccines deemed such international cooperation “on all levels” as “essential” in the response to the disease.¹⁴ In the meantime, the Mexican government launched a media effort to inform the population. The people, in turn, heeded safety precautions, such as social distancing, with a “rapid and complete community response.”¹³ Another key measure was the deployment of antivirals and antibiotics, although these were hampered by ineffective coordination.¹² An additional issue that emerged was the high price range of antivirals,¹³ which can pose a significant economic burden for middle-income countries and even more so for less-developed countries.

As the virus spread to pandemic proportions, more controversial measures were taken in population-dense Mexico City. Schools were closed in the hopes of aiding the social distancing mitigation effort. Though further research is needed on this point, one *Eurosurveillance* article concluded that school closure would aid in mitigating the spread of flu.^{15,16} The main concerns over school closure focus on social and economic impact. When a vaccine did become available, more problems emerged in obtaining enough doses and deploying them effectively. Analyses of Mexico’s response cited “unequal distribution of vaccine”¹³ and observed that “vaccine deployment plans are the critical missing link in pandemic preparedness response.”¹⁴

While the Mexican government’s response to the A/H1N1 outbreak was commendable, there are still significant unresolved issues that need to be addressed for developing an effective response plan to future pandemics. An average of three to four major pandemics will strike the world per century.¹⁷ What perspective can the U.S. experience in 1976 with H1N1 add to Mexico’s 2009 response to A/H1N1? And have other countries, such as Peru, China, and Thailand, dealt with disease outbreaks? The following section explores these comparative cases.

Comparative cases

USA 1976

As Neustadt and Fineberg point out in *The Swine Flu Affair: Decision-Making on a Slippery Disease*, the 1976 swine flu program “was once widely seen and now is overwhelmingly recalled as a ‘fiasco,’ a ‘disaster,’ or a ‘tragedy’” (p. 2).¹⁸ Much of this negative

impression can be attributed to the cases of Guillain-Barré Syndrome (GBS is a “disorder in which the body’s immune system attacks part of the peripheral nervous system”¹⁹) after a mass vaccination effort and the fact that the H1N1 virus was never identified outside Fort Dix, the New Jersey army base where it was first detected. What, then, were the reasons for taking this course of action?

In a later interview, Fineberg clarifies what appears to be the biggest problem in dealing with the 1976 outbreak—the “decision-making”—stating that “the fundamental strategic flaw was combining all aspects of response into a single ‘go or no-go’ decision.”²⁰ This rolled-in-one decision ordered enough new vaccine for the entire U.S. population (approximately 200 million at the time) to be produced and administered *en masse*.²¹ The plan to mitigate virus spread and mortality was simply to vaccinate the country; its implementation was actually quite successful, with more than 40 million people receiving shots within a span of two-and-a-half months (p. 258).¹⁸ According to Germann and colleagues, who ran a computer simulation of an influenza pandemic,²² such a plan would still be the best strategy for the United States. Indeed, GBS was not anticipated: it was a surprise, and its incidence may not have exceeded the background rate. However, the lurking question was and still remains: Why vaccinate so many with an untested vaccine when the targeted virus had not even spread beyond New Jersey?

According to Neustadt and Fineberg, the answer to this question is straightforward: to prevent a deadly H1N1 pandemic. The H1N1 response was conceived by a committee of scientists and policymakers headed by then-CDC director David Sencer. H1N1 had been identified at Fort Dix was associated with one death, and was documented to have spread from human to human. Those factors, coupled with the assumption that no one under the age of about 50 would have immunity to this virus, convinced some, such as committee scientist Walter Dowdle, that “an epidemic spreading into a pandemic had to be anticipated *as a possibility* [original emphasis]” (p. 8).¹⁸ Finally, with new theories on the cycles of pandemic virus circulation and the heavy memory of prior pandemics like those of 1918 and 1957, the question of “what if” was the elephant in Sencer’s committee chambers. Most prominent was the worry and anxiety of failure to act

in time. With the stage set for some sort of response to H1N1, the rolled-in-one decision took center stage. As elucidated by Neustadt and Fineberg, this was both the beginning and the end of the H1N1 program. Ineffective review processes did not allow proper reconsideration and flexibility, and without evidence of the virus spreading beyond Fort Dix, the H1N1 program became known as the “Swine Flu Affair.”

*Peru and beyond*²³

The South American country of Peru offers a valuable contrast. Its gross domestic product of \$177 billion in 2011 is less than one fifth of Mexico’s economic output and its per capita GDP is a little over half Mexico’s. Present day Peru has strong international relationships but struggles with overlapping functions between internal agencies; this occasionally limits cooperation, especially when program responsibilities are shared. For example, the government of Peru has three similarly functioning health institutions: the Ministry of Health (MINSA), public health care insurance (Essalud), and the armed forces’ hospitals and medical facilities. This complicates EID surveillance efforts. Peru does have a cadre of experienced health experts, but poor infrastructure and pay keep them from realizing their potential. These frustrations have manifested themselves in strikes, where health officials argue that while military wages have risen, no efforts have gone towards increasing wages for doctors, public health officials, or epidemiologists.

Consequently, Peru has lost many of its knowledgeable health experts to other countries that will pay them better salaries. The problem is not confined to Peru, but impacts other countries²⁴ like Mexico as well. In Mexico, for example, doctors are paid on average \$37,000 per year, one fourth of what their American counterparts receive.²⁵

With respect to outbreaks and how other countries have dealt with them, China’s handling of Severe Acute Respiratory Syndrome (SARS)²⁶ in 2002–2003 and Highly Pathogenic Avian Influenza (H5N1)²⁷ in the mid-2000s caused much international consternation. Similarly, the Thai government’s decision in 2003 to wait three months to announce that there was an H5N1 outbreak proved disastrous. Then-Prime Minister Thaksin Shinawatra held a cabinet meeting in which he ate chicken as proof of its safety. Likewise with an outbreak of cholera in Peru in 1991 then-President Alberto

Fujimori went out of his way to eat ceviche in public, despite warnings by the Minister of Health not to eat raw fish (Peru’s national dish is ceviche). It was later revealed that the president’s fish was caught in deep waters and miles away from the Peru’s coast to avoid any chance of contamination. These responses to outbreaks are remarkable considering Mexico’s level-headed and open handling of A/H1N1.

Research design

The response to the A/H1N1 outbreak in Mexico in 2009 involved a multitude of stakeholders. Semi-structured interviews of more than 15 individuals deeply engaged in the response were conducted by the author with the help of a Mexican research assistant (when on one occasion the interview was in Spanish). The interviews were conducted June 5–13, 2010, in Mexico City with several groups and individuals to gain an understanding of how the response was led, what worked, what didn’t, and why. Officials in several embassies were interviewed in Mexico City. The Embassy of the Republic of Indonesia was included because of Indonesia’s experience with H5N1 and an earlier examination of that country’s reaction to virus sharing.²⁸ These officials provided insights into how their countries interacted and learned from Mexico. They also provided valuable outside opinions on how the Mexican government and public health officials responded to the outbreak. In addition to the embassies, representatives from the U.S. Department of Agriculture and the U.S. Agency for International Development (USAID) were interviewed. USAID is important because it is active in Mexico and undertakes programs in public health.

On the Mexican side, representatives from INdRE (*Instituto de Diagnóstico y Referencia Epidemiológicos*, or Institute of Epidemiological Diagnosis and Reference), the Ministry of Health, and the Animal Health department of the Mexican Ministry of Agriculture (*Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación*, or SAGARPA) were interviewed, among others. The Ministry of Health and SAGARPA were the primary Mexican agencies in charge of responding to the outbreak, and they provide powerful insight into EID surveillance and the response to A/H1N1. Finally the United States-

Mexico Foundation for Science, funded by both countries, also provided valuable context.

Findings

Political aspects

The findings below draw out lessons learned and best political practices that had some bearing on the response to the A/H1N1 outbreak in Mexico. For instance, the decision at the Presidential level to take on A/H1N1 transparently, with a very public response; to use social distancing and close down schools to prevent the spread of the disease; to cooperate trilaterally with the United States and Canada, were major best practices. Briefly, lessons learned were that loyalty to political groups can trump bureaucracy, and that informality and patronage rule in Mexico. This is a problem in developing and middle-income countries where cooperation and transparency are not as strong, but where Mexico excelled in 2009.

Party loyalties and political patronage

Loyalty to political groups influenced Mexican politics because party interests superseded national interest. A rational and legal approach to policymaking was difficult to attain, and this stood in the way of a cohesive government response during the influenza outbreak. The post of director of epidemiology would be considered technocratic elsewhere, but in Mexico it became political because the civil service is politicized and appointments are not always made on the basis of technical competence but on party loyalty.

The problem in Mexico is that there are groups and the new group is the group of 'PANistas' [*Partido Acción Nacional*] that was not really prepared. Health is a very technical issue, where you need to have very technical people. In other countries the people with technical knowledge stay, even when the heads change. (Local Embassy Staff 4)

This issue could be less of a problem in more technocratic ministries such as the Ministry of Health, which tends to suffer lower turnover than other Ministries. As was observed in the case of the director of epidemiology, however, the Ministry of Health is not immune from patronage appointments, and there is still a need to professionalize the public service more

generally. Even though personal relationships helped during the influenza outbreak (some of the key actors happened to know each other because of interaction over the course of several years), the fact that cooperation among the United States, Canada, and Mexico hinged on personal relationships might be a problem in the future, especially considering the lack of a professional public service in Mexico:

What happens when these people leave? Well, this poses an issue that is intrinsic to Mexican politics, which is that when you have a change of government you know that you'll have almost a wholesale change even if it's the same political party that wins . . . This is a challenge that we have to face and we spend a year figuring out who is doing what. (Senior Embassy Staff 1)

Despite the issues arising from political appointments, some interviewees believed the problem was not the political parties themselves but infighting among the ministries. There was a lack of coordination between the Ministry of Health, SAGARPA, Protección Civil, and the Ministry of Defense (Junior Embassy Staff 3). Party loyalties were in some ways detrimental to the effectiveness of the A/H1N1 response in Mexico, and therefore hindered overall EID monitoring and response. But the gravity of the A/H1N1 situation encouraged a public semblance of unity both among ministries and between the *Partido Revolucionario Institucional* (PRI) or Institutional Revolutionary Party and the *Partido Acción Nacional* (PAN) or National Action Party.

There were press conferences and you could see the government on TV every day . . . It was clear that this was not only a health issue. Even the Federal District [encompassing Mexico City], which is governed by a rival party and doesn't want the other party to look good, showed a united face. (Donor Staff 11)

Relations between U.S. and Mexican institutions were important during the A/H1N1 outbreak, but personal connections such as that between Mexican Government Official 7 and Health Expert 12 proved invaluable. As Junior Embassy Staff 3 explains, "There wasn't really an institutional response. It was all personal connections, and [Mexican Government Official 7] was behind everything."

Swine flu

Personal networks helped to get the correct person to bend U.S. Customs rules and allow the carrying of viral samples across the border from Mexico to the U.S., but the drawback was a reliance on arbitrary staff (someone who spoke English or knew somebody well in the U.S. or Canada). Civil service professionalization would likely prevent future problems, but in Mexico the idea is that there is “No need to institutionalize or trust organizations as long as you know who to call” (Junior Embassy Staff 3). In fact, patronage and personal connections were the sole route by which samples got to Canada first, as Junior Embassy Staff 3 explained: “It was easier for Mexico to contact the right people in Canada to make an exception than to locate the right person in the U.S. to get a sample through.” Indeed, “Canada is less bureaucratic and the Embassy was minimally involved [in getting the samples to Canada], because the Mexican Ministry of Health has pretty good connections in Canada.” (Senior Embassy Staff 1)

If the outbreak had started in the U.S., Mexican authorities would have probably been more flexible to receive the samples than vice-versa (Junior Embassy Staff 3). But as the first cases arose in Mexico, it was not long before these informal networks yielded help in the form of supplies and equipment from the U.S. The problem was that these informal networks, however effective at communicating and sharing across borders, did not operate within the normal channels of Mexican policy and procedure.

There were problems importing supplies and equipment to Mexico even though the President had issued an emergency decree. You cannot import things to Mexico without prior approval, and people at the border didn't know what the order covered. (Donor Staff 11)

Even though there was a decree, people at the border were afraid to let critical laboratory equipment enter without the right person calling to confirm that such equipment was indeed permitted and covered under the decree. According to Donor Staff 11 “personal connections did play a role. In order to let things in, people had to get hold of somebody you knew so they could figure out who they should call. It didn't work the way it was supposed to work.” According to Mexican Government Official 7's account, the connections between INdRE and the Ministry of Health and

their Canadian and American counterparts were completely institutionalized. Personal ties developed later, and their presence helped solve problems faster.

Relations are completely institutionalized and personal. Mexico has had these collaborations for the longest time. Every time a new director of INdRE comes along, they are going to be exposed to and will interact with the director of U.S. Centers for Disease Control and Prevention. However, this is the first time in years that we have all these people collaborating in more personal ways, because it's not the same . . . if I don't know the person. Collaboration wouldn't be that easy and trust is important. (Mexican Government Official 7)

With respect to furthering formal networks and partnerships Health and Human Services Secretary Kathleen Sebelius and Mexico Secretary of Health Salomón Chertorivski announced a series of new steps in May 2012 to strengthen health security cooperation between the two countries. The two health officials “signed a declaration formally adopting a shared set of technical guidelines that both countries will follow to respond to public health events and emergencies of mutual interest when they arise.”²⁹ The guidelines, which describe how the two nations will coordinate the exchange of information, complement the International Health Regulations calling for “neighboring countries to develop accords and work together on shared epidemiologic events and public health issues.”²⁹

Trilateral cooperation and transparency

The A/H1N1 response underscored the importance of cooperation as another best practice, but there were also some lessons learned about sharing samples and vaccines. Mexico's government reacted by sharing all the information it had, even though there were issues with statistics at the outset. An April 30, 2009 graphic editorial in the popular magazine, *Milenio*, shows the Minister of Health on television saying, “Of the 159 dead, 26 are infected by the virus and seven are confirmed” while a viewer notes “Seems the virus first weakens the ability to do math.” International cooperation was not without its glitches. Canada helped with analyzing samples and responded quickly, giving doses of the vaccine when the U.S. was not able to share any of its stock with Mexico when the Mexican government requested a few thousand doses

for its healthcare workers. The timing of Mexico's request for vaccine from the U.S. happened just as bottlenecks in production were becoming apparent and the request did not take into account how the U.S. coordinated vaccine sharing through the World Health Organization.

The U.S. helped with laboratory capacity, equipment, and technicians, but Canada was the easier country to which to send samples. A Mexican military plane delivered the samples after a personal phone call to health authorities there who could make arrangements on the Canadian side. In a baffling incident the day before, a sample had been sent to the U.S. but got stuck at the border while Customs officials on the U.S. side stopped the entry of an unknown "disease agent" (as required in Customs Declaration CBP Form 6059B).

Mexico might not have been ready, but it had the elements to reach out to its neighbors in very little time. The director of INdRE has (Health Expert 16) from Canada on speed-dial. They are great friends, and this doesn't come from one meeting. These people know each other, they talk and plan together. That didn't only work for INdRE, it worked for the Ministry of Health, too. We had an entire team of people that we had already worked with before . . . International coordination went well right away, because we understood that this had to be done, so we went to our partners to see if they had more information. (Mexican Government Official 7)

Of course, this begs the question of what if the director of INdRE had not been great friends with Health Expert 16? Would the outcome have been different? From the U.S. perspective, the relationships were intensified in the aftermath of NAFTA: "Canada and the U.S. have a long history of working bilaterally in regulatory and protocol issues. A lot of these contacts with Mexico are recent. . . NAFTA created the opening and as issues arise, where people realize that cooperation is needed, that is when this particular area starts getting attention." (Senior Embassy Staff 1)

The formal networks, however, were already created through the Security and Prosperity Partnership (SPP) of North America, now the North American Leaders Summit (NALS), and the International Health Regulations of the WHO. As the North American Plan for Animal and Pandemic Influenza, released April 2, 2012, notes,

Superseding the SPP...NALS provides a renewed collaborative framework among the governments of Canada, Mexico, and the United States. During the first NALS, held in August 2009 in Guadalajara, Mexico, the three leaders highlighted North America's coordinated response to Pandemic (H1N1) 2009 as a global example of cooperation. The Leaders also reaffirmed their commitment to a continued and deepened cooperation on pandemic influenza preparedness.³⁰

Among the most dangerous aspects of not just viral but all outbreaks are their spread and the enormous challenge posed by tracking the disease and quarantining infected individuals. Knowing that a disease such as A/H1N1 does not stop at borders, cooperation among North American countries became important not only for goodwill toward Mexico, but also to ensure the successful isolation and treatment of the virus to prevent its proliferation.

Response to the A/H1N1 threat offers a pertinent example of how transparency helped mitigate the virus's destructiveness. Consequences could have been far worse had Mexico decided to remain silent about the outbreak or share viral isolates. Addressing the Young Global Leaders at the World Economic Forum on Latin America 2012, Mexican President Felipe Calderón stated that when A/H1N1 emerged Mexico in 2009, 19 million people could have died.³¹ He based this estimate on the mortality rate of H5N1. Early in the crisis, at the Presidential Palace late one night, President Calderón's advisers proposed two possible paths for Mexico to take. A then unknown virus was afflicting his people and the economy of his country. Should Mexico follow China's approach or Canada's?

China had gained notoriety for its unwillingness to be transparent in the face SARS and H5N1 outbreaks. When SARS hit both China and Canada, each country reacted very differently: Canada opened up, whereas China demurred. Canada saw local transmission of SARS as opposed to only imported cases, but was a model of transparency in reporting. In the case of Mexico, President Calderón could have gone either way, but he chose the Canadian approach. In choosing transparency, he paid a terrible price—an estimated 1 percent of Mexico's GDP (nearly \$9 billion, based on GDP of \$882 billion in 2009). The global financial crisis shaved a further 5 percent from Mexico's GDP, dropping it a total of 6 percent in 2009. President

Calderón's choice was courageous and prioritized global public health. As one of the key officials involved in the response to A/H1N1 attested:

There is a need to raise awareness that we are living in a new world. And sometimes there's more value in being transparent and being honest than there is in knowing all the facts and knowing all the truths [before being able to share them with the public or other nations]. (Mexican Government Official 7)

Arguably, the crisis also helped promote transparency within Mexico, since the highest political spheres (i.e., the president and the Minister of Health) decided to share considerable information accumulated with respect to the A/H1N1 outbreak.

Globalization in Mexico was not very popular, but globalization is not something that you choose, it's something that happens. In the political and diplomatic point of view, politicians were very willing to share information and very willing to admit that they didn't know what was going on at the beginning, but they were willing to say, "I don't know what's going on, but I'm trying to find out." (Mexican Government Official 7)

In hindsight, it is readily apparent that the efforts of local, national, and international actors to contain the A/H1N1 outbreak in Mexico were clearly communicated, and this very likely aided the international effort to contain the outbreak and mitigate its destructiveness. This good practice presented a contrast to the view of a foreign diplomat, whose country also suffered outbreaks of an emerging infectious disease and who, while praising Mexico's brave and transparent approach to reporting, said his own country would not have taken the same path.

Economic aspects

Economic inefficiency was another factor in dealing with the A/H1N1 outbreak in Mexico in 2009. At the time of the outbreak there were insufficient laboratories in Mexico for analysis, and those that were present were ill-equipped, limiting the quality and diversity of information they could gather. Planning was also a weak area. Public health and government officials were unprepared to make rapid decisions in response to the growing viral outbreak. In addition to a lack of

planning and procedure, the sparsely populated and poor areas of the country that experienced the disease were hard to identify and treat in a timely manner.

The lack of economic resources undermined the effectiveness of an A/H1N1 response in Mexico and should be taken into consideration in planning for future outbreaks. In a middle-income country, one would expect to find sufficient laboratory equipment to gather, study, and disseminate information pertaining to viral outbreaks. In reality, at the time of the A/H1N1 outbreak in 2009, Mexican authorities had access to only one advanced laboratory capable of performing sufficient research towards preventing the spread of the virus. As Junior Embassy Staff 3 noted, "Mexico is a middle-income country, but development is really uneven. Investment in science is lagging behind." In contrast, Senior Embassy Staff 1 disagreed, "It is not a matter of lack of resources. Mexico is a wealthy country and when it wants to focus resources on something, it certainly can." Indeed, both might be right.

Government Official 7 affirmed that, "Health is a priority of the Mexican Government, but almost all resources go to medical care, and very few resources are used for surveillance or early warning systems." Government laboratories (often lacking proper funding and equipment, according to Scientific Expert 13) exemplify this resource deficit. This lack of funding leads to a lack of preparedness—but the A/H1N1 threat represented both a public health opportunity and a public health challenge.

Mexico was not prepared for a threat like influenza, but it is unfair to judge that, because no country expects something like that to happen, especially because influenza is not a common disease in Mexico. Some countries are more prone to the flu than others. SARS in Canada, for example, was the genesis to create the Public Health Agency of Canada. (Senior Embassy Staff 1)

There were laboratories in Mexico that could have analyzed the samples, but the procedure at the influenza reference laboratory was to use immunofluorescence first to detect the type of virus, and Polymerase Chain Reaction (PCR) later, since the latter was more expensive. To clarify, the PCR technique uses a device to amplify copies of genes so researchers can easily compare a sample taken from a sick person to the genetic material of a known virus, whereas immuno-

fluorescence is a technique allowing the visualization of a specific protein or antigen in cells or tissue sections.

The Mexican government has 31 laboratories, many of which are capable of PCR. But only one advanced laboratory used immunofluorescence, according to Mexican Government Staff 10. “Some PCR tests were done, some journals and World Health Organization reports said that we didn’t really have the test, but that is absolutely not true. The machine was set up in INdRE. However, it was not the first technique of choice, because it is very expensive.” (Mexican Government Official 7)

Prior to the outbreak, INdRE received approximately 2,000 influenza samples to test every year. During the outbreak, they received 1,000 samples a day.

What we didn’t have was the capacity to test a thousand samples a day...Our preparedness plan had been published in 2006 and then it was revised, but it had not really come into place and we were thrown into phase 5 of the pandemic just right away and we had to adjust during that time...It was useful to have the preparedness plan and it was also useful to already have the contacts and to be able to call people. Of course, there were things in the coordination that didn’t go so well because people had changed and roles had changed. (Mexican Government Official 7)

Mexico’s frustrations in dealing with the A/H1N1 outbreak appear to be due to a lack of adequate coordination of resources. With an already sizable budget directed at public health, it seems that more money would have only had a marginal impact. Better planning and coordination would have made the biggest difference on Mexican laboratory capabilities.

Lack of confidence in capacity: Real or imagined?

The Mexican Academy of Science argued that the government did not trust them enough to ask for their help during the outbreak. On the other hand, during a crisis, decisions with huge political and social ramifications must be made very quickly. From the position of a foreign embassy staffer, decision makers did not have the luxury of time to consider all options domestically, so they went for the easiest and most trusted option, sending samples for analysis to the U.S. and Canada. This mentality manifests itself in what Senior Embassy Staff 1 refers to as an “inferiority

complex,” explaining the lack of trust between the government and academia:

There is a sense that if you want the best you go to the U.S. or Europe. We don’t have it here. It is a reflex a lot of people have ... Now that the crisis has settled down, [the government has] the opportunity to look around, take a breath, and do a bit of analysis and make an effort to reach out domestically. (Senior Embassy Staff 1)

Mexico was not really prepared for the outbreak [and] Mexico did not trust the scientists with what was going on. Mexico relied on international commitments and connections to get the U.S. and Canadian cooperation. How can you act without having the scientific support of the national academia? ... The Mexican Academy of Science complained about the lack of confidence in our science, because there are scientists who could do the job yet the government just sent the samples abroad. (Local Embassy Staff 4)

INdRE didn’t expect any participation from the universities. Maybe they should have. The coordination was there from the laboratory part, but it was really competitive, and in a crisis like that you become hesitant to be as open and inclusive. The question is how to include them, but that has to change in the future. Academic institutions need to be included. (Mexican Government Official 7)

The first days of the outbreak were a mass of confusion and even organizing incoming information presented a challenge (Mexican Government Officials 7 and 8). According to Donor Staff 11, “There was information coming in from doctors about cases, but there wasn’t a very good system for the data to go up to the decision makers. There was also a lack of capacity to analyze the information.” Mexican Government Official 7 believed that the confusion during the initial phase of the crisis was compounded by the number of political advisors who came to the Ministry of Health claiming to be top influenza experts. The experts were not very helpful, health staffers reported, but had to be heard because they were close to the president. While it would have been desirable to utilize local scientific networks to address the crisis, the confidence in the Mexican scientific community was not present. As a result, dealing with a potential pandemic forced Mexican policymakers to seek scientific advice from trusted sources.

Surveillance and resources: Human vs. animal

During the A/H1N1 outbreak, Mexico possessed defective or nonexistent surveillance for monitoring infectious diseases. Despite having an action plan to fight against external health threats, the government was caught off guard. As Local Embassy Staff 4 described it, “In order to build an early warning system to detect disease outbreaks, there’s not only a need for money. It is also a matter of commitment and international collaboration.”

Before the outbreak, implementing the established guidelines or enforcing the action plan was not a priority, as no real risk of such an incident was perceived.

The surveillance for influenza was never given much importance until SARS. Surveillance began after the outbreaks of Avian Influenza. Then, Mexico started to do what all the other countries around us were doing, especially the U.S. Right now there is not an agency fully dedicated to emergency preparedness. We are working towards building that, and we are thinking that eventually it will happen, but at this point there is no emergency preparedness agency. (Mexican Government Official 7)

Moreover, the assumption had been that any outbreak would not likely originate from North America, much less Mexico, as Asia had been the epicenter of SARS and H5N1. The imagined scenario was that pandemic preparedness would involve controlling the spread of a disease originating from Asia or elsewhere, for which a diagnosis would already have been made weeks or days in advance by laboratories in places other than Mexico (likely North America or Europe). This knowledge would then be shared with Mexico. Mexico, in other words, would not be the place where patient zero would originate. This thinking was turned on its head with A/H1N1.

Over the last six decades, several disease outbreaks have negatively impacted the Mexican economy. Some of the most important outbreaks have been:

- Foot and Mouth Disease (FMD) between 1948 and 1954, when over one million head of cattle were quarantined and killed;
- Highly Pathogenic Avian Influenza (H5N2) in Puebla and Queretaro, where over 18 million birds were culled in 1994 and 1995 respectively;³²

- Screw-worm outbreaks in Chiapas in 2001, 2003.

These and other outbreaks have led the government to invest in laboratory capacity and in other measures to monitor animal diseases. SAGARPA, under the Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food, has over 16 laboratories country-wide and two more Biosafety Level 3 laboratories are under construction. Compared to other ministries, including Health and the Environment, SAGARPA has had more experience in the prevention and surveillance of diseases—driven in large part by Mexico’s export of livestock to the United States—and has established cooperation agreements with universities all over the country. Veterinary Experts 14 and 15, who do not work for SAGARPA, agreed that animal health in some ways is actually better than human health because of exports.

Despite the leadership shown by SAGARPA in EID research and prevention, funding has not always been adequate. While public health has been a priority for the government, this has taken the form of investing in hospitals and health care with little funding allocated for EID. When A/H1N1 appeared, Mexico was not prepared to deal with human diseases. Emergency plans presupposed that the disease would originate from outside, giving country at least two weeks to organize and implement a plan. Mexican Government Official 7 said as much: “Once the pandemic hits we will have two weeks to get everything working. What Mexico was not prepared to do was to jump from phase 1 to phase 5.”

As part of its early surveillance system, SAGARPA imposes regulations on biosafety that are very strict. A total of 187 private laboratories that can detect diseases are part of or associated with different farms. Public laboratories also supervise the farms in EID detection. SAGARPA works with different universities to train biologists, zoologists, and veterinarians on how to react during an outbreak. Other strategies of SAGARPA include:

- Verification routes through different regions of the country.
- Risk evaluation campaigns.
- Timely detection of diseases.
- Research collaboration with different institutes.
- Biosafety assessment programs in farms.

At an industrial level, policies of SAGARPA have worked, and big farms in Mexico comply with the norms. Backyard farms, on the other hand, do not, and they are common in rural and poor areas. These farms are a big risk and can be the source of many diseases, but poverty and inequality are a fact in Mexico. As stated by Senior Mexican Official 6: “In some farms, pigs live better than people.”

Cultural aspects

Mexico has an array of cultural characteristics that had a direct bearing on the outcome of the 2009 A/H1N1 outbreak. Because of a culture of self-medication, there were problems tracking and treating those infected early on. This tendency of Mexican citizens to treat themselves without pursuing professional medical assistance is common and helps explain high mortality rates. Senior Embassy Staff 1 underscored this problem, expressing concern about people infected with A/H1N1 coming into emergency rooms too late for care. Seeking assistance early on greatly increases the effectiveness of treatment. “The first cases of flu were not taken seriously enough, because of the self-medication culture. People only went to the hospital when the disease was in a late stage and was already deadly. That’s also probably one of the reasons why poor people died the most.” (Junior Embassy Staff 3)

Additionally, technical collaboration among Mexican, U.S., and Canadian authorities is sometimes difficult due to language barriers. “INdRE received a guidance document from the CDC, but it wasn’t useful because it was in English. Also the manuals are in English. . . It was an advantage that Mexican Government Official 7 spoke English.” (Local Embassy Staff 4) Embassy Staff 5, who happened to be a former microbiologist, had to translate technical manuals and help the Mexican technicians understand what they were supposed to do with PCR equipment sent from the U.S. But cultural factors for disease prevention run deeper in Mexico than just a lack of English or unwillingness to seek medical assistance. A culture of informality in the workplace, a lack of professionalism, and an absence of prevention as a practice all had direct roles in the 2009 A/H1N1 outbreak.

Planning and understanding

Influenza had never been a priority for the Ministry of Health because there were more prevalent diseases in Mexico affecting the population. At the time of the outbreak, INdRE was dealing with two other non-influenza outbreaks and did not think the influenza outbreak was an issue that deserved more attention. As Junior Embassy Staff 3 noted, the Mexican authorities “plan for things that are common like earthquakes, hurricanes. . . but they don’t have a lot of pre-planning” when it comes to infectious disease control. “They never expected having to do all the research themselves.” Preparations and response structures were guided by U.S. strategy, but surveillance of the outbreak was weak and the response was for the most part reactive.

Our surveillance system is not a real-time system. At the beginning of February and more towards March 2009, we started getting more reports on outbreaks of respiratory diseases. That was a little bit puzzling to us. What we did in the first place was to open that situation for comments and none of the southern countries answered. The U.S. mentioned some outbreaks, but they were not worried about it. (Mexican Government Official 7)

The surveillance system started to show that there were pneumonia-like cases in hospitals, but few notifications were sent through formal channels. Instead, information spread through informal networks of doctors and other healthcare professionals. Mexican government Official 9 received no formal notification of the rise in pneumonia cases but instead heard from friends who worked in different hospitals. At that time, other cases in the Imperial Valley of California, and the Mexican cities of Calexico and Mexicali, were confirmed. After the case of a deceased social worker in Oaxaca, the authorities started to suspect that they were dealing with SARS.

A social worker developed pneumonia very rapidly and then died. And when that happened the state health department said it was a case of SARS. They tested for the virus, but didn’t find SARS. Then when we looked into the evidence we tested again and had the same thing, but we still didn’t understand why she died so fast . . . At that point our political leaders were telling people that we were seeing an intensification in

Swine flu

respiratory diseases, but until now, all that we've ever found is influenza. (Mexican Government Official 7)

Workplace culture

The workplace culture present in Mexico also had a direct effect on those trying to learn about and combat the outbreak of A/H1N1. The workplace is hierarchical and involves strict vertical lines of authority where employees are expected to follow the instructions of their supervisors without question. When CDC staffers were sent to Mexico to help, they were surprised that it was not customary for underlings to ask questions of their supervisors.

They were here to provide technical expertise on how to use the results to know which cases were flu and which were not flu at all... What I found was that the trainees were talking among themselves, but were not asking the people who knew. My sense is that gender and culture have something to do with it. It was not only the language... We need to promote a culture where people can question the manager and ask questions instead of just having to follow instructions... They [the lab technicians] are very qualified, dedicated professionals, but they are stuck in a system that doesn't respond to them. (Embassy Staff 5)

As Embassy Staff 5 noted, laboratory chiefs "were more political people than technical people," yet they did not lobby for the interests of the laboratories in the political sphere. As a result, there are trained and prepared technicians in somewhat poorly equipped laboratories. High-level politicians are not receiving information or input from lower level officials or are not listening to them. On the other hand, people with technical knowledge cannot deal with political issues above their pay grade, making it difficult to get the resources needed to improve laboratory equipment.

Fostering a new working culture where not knowing the answer before posing a question should be acceptable, in the view of Mexican Government Official 7. Reporting only those cases where there is absolute certainty "leaves out the opportunity to detect that something new or different is going on. Epidemiological intelligence needs to come from all sources. Epidemiologists in Mexico are not trained to think that way, they follow and survey certain diseases and think that's early warning." (Mexican Government Official

7) In the case of the A/H1N1 outbreak, lab technicians could have reported that the immunofluorescence procedure was not working on the virus, and after seeing that this was happening in many labs, they might have concluded earlier that they were dealing with a new virus.

Conclusion

As noted, Mexico's handling of A/H1N1 in 2009 provides notable strengths and weaknesses that can be used as a starting point for discussion when considering other developing and middle-income countries as they work toward effective surveillance of emerging infectious diseases.

Strengths

Mexico's greatest achievement during the outbreak was the country's effective cooperation with other nations, particularly the U.S. and Canada, and a practice of transparency. Transparency was an organic product of the professional relationships between the scientific communities in Mexico and other countries. Informal networks also played an important role. Formal arrangements, already present through the Security and Prosperity Partnership of North America, and now the North American Leaders Summit and the International Health Regulation, have further deepened with the signing of bilateral health security cooperation agreements with the United States.

An additional success for Mexico—something the U.S. faltered on in 1976—was effective management of public and media relations. By maintaining transparency, and a united political front, Mexico was able to mobilize the public and effectively disseminate public health information. Uneven economic development was a barrier that prevented full dissemination to the more rural areas of the nation, but in general, public safety and public relations were handled relatively well.

Weaknesses

Mexico, despite its overall success in handling A/H1N1, had myriad political weaknesses that hampered efforts against the disease. Loyalty to political groups, for instance, sometimes eclipsed competence. Individuals qualified for their positions are moved or must leave when there is a change in government—even if

the same political party remains in power (never mind a different party)—causing the loss of valuable institutional knowledge and relationships. The transition process to a new administration also invariably takes up significant time.

Addressing workplace issues will also prove vital in improving national laboratory capacity. The workplace culture in Mexico did not provide for a sufficiently flexible system for noting abnormalities in patients and prevented the identification of A/H1N1 as a problem early on. Additionally, inefficiencies can be eliminated if laboratory employees are given the freedom to question situations and are provided with the latest technologies and tools for executing their duties.

In the final analysis, one can only hope that other countries—observing Mexico’s experience—decide to follow in its footsteps of relative transparency should the next pandemic begin within their borders. The reality, however, is that while Mexico received kudos internationally, it suffered economically. No international rescue package or fund could have compensated Mexico for its nearly \$9 billion drop in GDP and the political party in charge at the time, the PAN, has since lost to the PRI in presidential elections.

Note

Funding for an earlier version of the research (Report Number PA 11-012) contained in this article was provided by the U.S. Defense Threat Reduction Agency. Thanks to two anonymous referees and Erik Bucy for excellent comments. I am grateful to Roberto Kukutschka (based in Mexico), Jim Chhor, Tristan Allen, Lauren Crees, and Asiroh Cham for outstanding research assistance. Most of all sixteen interviewees in Mexico, who cannot be named here for confidentiality reasons, are gratefully acknowledged. The views expressed in this article are those of the author and do not represent the views of the U.S. Navy or U.S. government.

Dr. Sophal Ear is Assistant Professor of National Security Affairs at the U.S. Naval Postgraduate School and the author of *Aid Dependence in Cambodia: How Foreign Assistance Undermines Democracy* (Columbia University Press). He also serves as Vice Chair of Diagnostic Microbiology Development Program, a nonprofit that builds capacity for reliable infectious diseases diagnosis in the developing world. A graduate of UC Berkeley and Princeton University, he moved to the United States from France as a Cambodian refugee at the age of 10.

References

1. Richard P. Wenzel, “What we learned from H1N1’s first year,” *New York Times*, April 13, 2010.
2. Meg L. Flanagan, Colin R. Parrish, Sarah Cobey, Gregory E. Glass, Robin M. Bush, and Terrance J. Leighton, *Anticipating the Species Jump: Surveillance for Emerging Viral Threats*, December 2010, U.S. Defense Threat Reduction Agency, Advanced Systems and Concept Office, Ft. Belvoir, VA, <http://www.hsdl.org/?view&did=716028>
3. James Arnold, “What is the OECD for?” BBC, April 30, 2003, <http://news.bbc.co.uk/2/hi/business/2987887.stm>
4. Hector M. Zepeda, Lizbeth Perea-Araujo, P. B. Zarate-Segura, J. A. Vázquez-Pérez, A. Miliar-García, C. Garibay-Orijel, A. Domínguez-López, J. A. Badillo-Corona, E. López-Orduña, O. P. García-González, I. Villaseñor-Ruiz, A. Ahued-Ortega, L. Aguilar-Faisal, J. Bravo, E. Lara-Padilla, and R. J. García-Cavazos, “Identification of influenza A pandemic (H1N1) 2009 variants during the first 2009 influenza outbreak in Mexico City,” *Journal of Clinical Virology*, 2010, 48(1): 36–39.
5. Ge-Fe Wang and Kang-Sheng Li, “Origins and views of the 2009 A/H1N1 Influenza Pandemic,” *Progress in Biochemistry and Biophysics*, 2009, 36(8): 945–949.
6. Gavin J. D. Smith, Dhanasekaran Vijaykrishna, Justin Bahl, Samantha J. Lycett, Michael Worobey, Oliver G. Pybus, Siu Kit Ma, Chung Lam Cheung, Jayna Raghvani, Samir Bhatt, J. S. Malik Peiris, Yi Guan, and Andrew Rambaut, “Origins and evolutionary genomics of the 2009 swine-origin H1N1 influenza A epidemic,” Letter, *Nature*, 25 June 2009; 459: 1122–1125.
7. Annie Fine and Marcel Layton, “Lessons from the West Nile viral encephalitis outbreak in New York City, 1999: Implications for bioterrorism preparedness,” *Clinical Infectious Diseases*, 2001, 32(2): 277–282.
8. Nathan Wolfe, *The Viral Storm: The Dawn of a New Pandemic Age* (New York: Henry Holt and Company, 2011).
9. Daniel Quammen, *Spillover: Animal Infections and the Next Human Pandemic* (New York: W. W. Norton & Company, 2012).
10. Colin Jerolmack, “Who’s worried about turkeys? How ‘organisational silos’ impede zoonotic disease surveillance,” *Sociology of Health & Illness* [forthcoming], doi: 10.1111/j.1467-9566.2012.01501.x.
11. Justin Lessler, Derek A.T Cummings, Steven Fishman, Amit Vora, and Donald S Burke, “Transmissibility of swine flu at Fort Dix, 1976,” *Journal of the Royal Society Interface*, 2007, 4(15): 755–762.
12. J. Santos-Preciado, C. Franco-Paredes, I. Hernandez-Flores, I. Tellez, C. Del Rio, R. Tapia-Conyer, “What have we learned from the novel influenza A (H1N1) pandemic in 2009

Swine flu

for strengthening pandemic influenza preparedness?" *Archives of Medical Research*, 2009, 40: 673–676.

13. Carlos Del Rio and Mauricio Hernandez-Avila, "Lessons from previous influenza pandemics and from the Mexican response to the current influenza pandemic," *Archives of Medical Research*, 2009, 40: 677–680.

14. Carlos Franco-Paredes, Peter Carrasco, and Jose I. S. Preciado, "The first influenza pandemic in the new millennium: Lessons learned hitherto for current control efforts and overall pandemic preparedness," *Journal of Immune Based Therapies and Vaccines*, 2009, 7(2), doi: 10.1186/1476-8518-7-2.

15. S. Echevaría-Zuno, J. M. Mejía-Aranguré, A. J. Mar-Obeso, C. Grajales-Muñiz, E. Robles-Pérez, M. González-León, M. C. Ortega-Alvarez, C. Gonzalez-Bonilla, R. A. Rascón-Pacheco, and V. H. Borja-Aburto, "Infection and death from influenza A H1N1 virus in Mexico: A retrospective analysis," *Lancet*, 2009, 374(9707): 2072–2079.

16. David M. Bell, Isaac B. Weisfuse, Mauricio Hernandez-Avila, Carlos del Rio, Xinia Bustamante, and Guenael Rodier, "Pandemic Influenza as 21st century urban public health crisis," *Emerging Infectious Diseases*, 2009, 15(12), doi: 10.3201/eid1512.091232.

17. J. S. Spika and D. Butler-Jones, "Pandemic influenza (H1N1): Our Canadian response," *Canadian Journal of Public Health*, 2009, 100(5): 337–339.

18. Richard E. Neustadt and Harvey V. Fineberg, *The Epidemic that Never Was: Policy-Making and the Swine Flu Scare* (New York: Vintage Books, 1983).

19. National Institute of Neurological Disorders and Stroke, *Guillain-Barré Syndrome Information Page*, August 19, 2011, <http://www.ninds.nih.gov/disorders/gbs/gbs.htm>

20. Harvey V. Fineberg, "Swine flu of 1976: Lessons from the past," *Bulletin of the World Health Organization*, 2009, 87(6): 414–415.

21. John M. Wood, "Developing vaccines against pandemic influenza," *Philosophical Transactions: Biological Sciences*, 2011, 356(1416): 1953–1960.

22. Timothy C. Germann, Kai Kadau, Ira M. Longini, Jr., and Catherine A. Macken, "Mitigation strategies for

pandemic influenza in the United States," *Proceedings of the National Academy of Sciences*, 2006, 103(15): 5935–5940.

23. Sophal Ear, "Towards effective emerging infectious diseases surveillance: Evidence from Kenya, Peru, Thailand, and the U.S.-Mexico border," *PASCC Report Number 2012 014*, Project on Advanced Systems and Concepts for Countering WMD, Center on Contemporary Conflict, Naval Postgraduate School, September 2012.

24. Matt McAllester, "America is stealing the world's doctors," *New York Times*, March 7, 2012, <http://www.nytimes.com/2012/03/11/magazine/america-is-stealing-foreign-doctors.html?hp=&pagewanted=all>

25. Erik Vance, "Mexico chalks up success in health-care reforms: Near-universal coverage results from science-informed changes," *Nature*, August 17, 2012, <http://www.nature.com/news/mexico-chalks-up-success-in-health-care-reforms-1.11222>

26. Shanthi Kalathil, "Battling SARS: China's silence costs lives," *International Herald Tribune*, April 3, 2003.

27. Editorial, "Chinese hesitancy on avian flu," *Nature*, January 26, 2006, 439: 369.

28. Sophal Ear, "Emerging infectious disease surveillance in Southeast Asia: Cambodia, Indonesia, and Naval Area Medical Research Unit 2," *Asian Security*, 8(2): 164–187.

29. U.S. Department of Health and Human Services, "United States and Mexico make efforts to strengthen US-Mexican binational health," News Release, May 22, 2012, <http://www.hhs.gov/news/press/2012pres/05/20120522a.html>

30. U.S. Department of Health and Human Services, Public Health Emergency, *North American Plan for Animal and Pandemic Influenza*, April 2, 2012, <http://www.phe.gov/Preparedness/international/Documents/napapi.pdf>

31. Sophal Ear, "The president and the pandemic," *Forum: Blog*, April 24, 2012, <http://forumblog.org/2012/04/the-president-and-the-pandemic/>

32. C. Villareal, "Avian influenza in Mexico," *Revue Scientifique et Technique (International Office of Epizootics)*, 2009, 28(1): 261–265, <http://www.oie.int/doc/ged/D6192.PDF>

Appendix

List of stakeholders interviewed

The below stakeholder titles have been generalized to protect the identity of interviewees. For example, several interviewees are associated with Embassies, which if identified would make their identities obvious. Officials of the Mexican government do not have their ministries listed for the same reason. Each stakeholder has been randomly assigned a number preceded by a generic occupational role, status, or expertise.

- Senior Embassy Staff 1
- Senior Embassy Staff 2
- Junior Embassy Staff 3
- Local Embassy Staff 4
- Embassy Staff 5
- Senior Mexican Official 6
- Mexican Government Official 7
- Mexican Government Official 8
- Mexican Government Official 9
- Mexican Government Staff 10
- Donor Staff 11
- Health Expert 12
- Scientific Expert 13
- Veterinary Expert 14
- Veterinary Expert 15
- Health Expert 16