

Chapter 5

An Evaluation of China's Influenza A (H1N1) Emergency Response Measures



5.1 Monitoring, Prevention, and Control

5.1.1 Epidemic Monitoring

5.1.1.1 The Expansion of the Emergency Monitoring Network

In order to stay up to date on epidemic trends and monitor possible mutations of the virus in the wake of an outbreak, China invested nearly 400 million RMB on testing large amounts of specimens and expanding the influenza monitoring network to include 411 influenza monitoring network laboratories and 556 sentinel hospitals—a network which covered all prefectural-level cities and some priority districts and counties. All of these laboratories and hospitals were in operation by September (see Fig. 5.1).

5.1.1.2 Epidemic Monitoring and Analysis

The China CDC provided technical support and services for national response efforts. Its work in this regard included the following: Upgrading the China Information System for Disease Control and Prevention; incorporating Influenza A (H1N1) into the Disease Monitoring Information Reporting Management System, the China Influenza Monitoring Information System, and the Public Health Emergency Information System; specifically establishing an Influenza A (H1N1) information management system; tracking and analyzing domestic epidemic situations through the national infectious disease network reporting system and the national influenza monitoring network system; collecting and analyzing information on the conditions, treatments, and outcomes of infected cases; providing real time analysis reports and information support needed to improve prevention and control strategies; mapping global pandemic distribution and the distribution of isolated

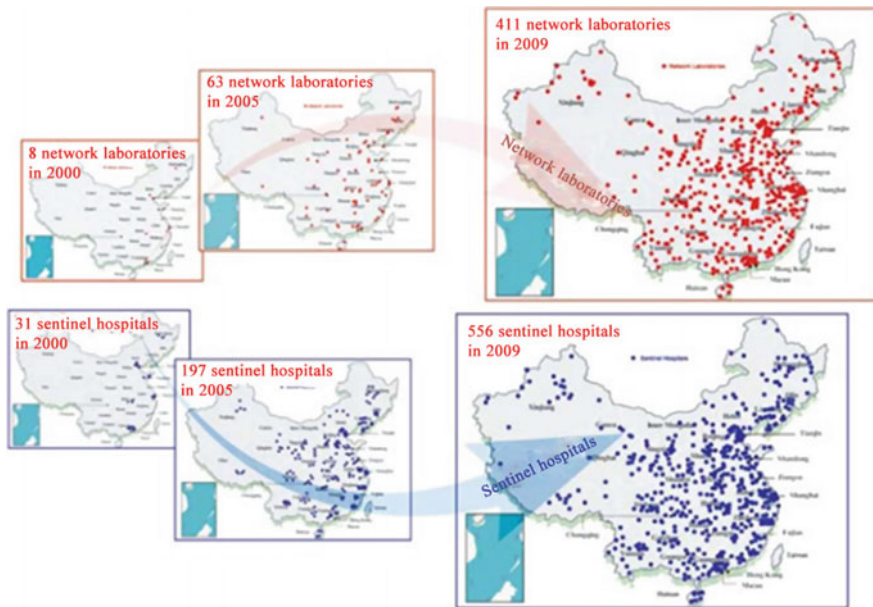


Fig. 5.1 Expansion of influenza monitoring sentinel hospitals and network laboratories in China

people by provinces; integrating individual cases and community outbreaks into the national infectious disease and public health emergency information systems for direct online reporting; enabling timely reports on severely ill cases; monitoring domestic and foreign epidemic information; optimizing information systems and platforms; ensuring the collection and analysis of information on mass vaccination, and the monitoring of side effects of vaccination.

5.1.1.3 Laboratory Testing

Upon learning of the Influenza A (H1N1) outbreak in Mexico, the CNIC immediately began developing testing kits as per instructed by the government. On April 27th, the China CDC's National Institute for Viral Disease Control and Prevention (IVDC), obtained information on the Influenza A (H1N1) virus' genetic sequences from the U.S. CDC and immediately engaged in sequence alignments, as well as the design and testing of nucleic acid detection techniques. On April 29th, after receiving from the WHO information on the recommended primer for nucleic acid detection, the IVDC promptly made comparisons with a variety of seasonal influenza viruses, synthesized the primer sequence needed for detection, and prepared the first-generation nucleic acid detection reagent for the human Influenza

A (H1N1) virus—which was distributed to 84 influenza monitoring laboratories across the country on the night of April 30th. And on May 1st, the first phase of training on influenza monitoring laboratories focusing on port-based cities began, and immigration inspection and quarantine personnel were trained later on. Also, through the WHO, the CNIC provided fourteen countries including Cuba, Mongolia, Vietnam, and Macao with the independently developed testing kit and provided training for their personnel.

The China CDC's Influenza A (H1N1) testing kits were swiftly deployed to monitoring network laboratories throughout the country, and training was promptly carried out for testing professionals. On May 10th, 2009, the Sichuan Provincial CDC tested a suspected imported case with the newly prepared reagent, with results being weakly positive. Tests conducted afterwards by the China CDC and the Academy of Military Medical Sciences proved that the case was indeed the country's first confirmed case of the virus. The testing reagent that China had independently and urgently developed proved to be a success.

In the process of coping with Influenza A (H1N1), regular etiological testing was an integral part of laboratory work. Drug resistance data obtained about the virus supported the clinical application of antiviral drugs, and knowledge acquired of the virulence of the virus and its possible mutations provided scientific support for the adjustment of prevention and control strategies and measures.

5.1.1.4 Field Epidemiology Investigations

As an important capacity that a CDC possesses to cope with public health emergencies, field epidemiology includes the detection, reporting, and response capabilities for public health emergencies, field investigation and management, emergency monitoring, survey result analysis and summation, and investigation report writing capabilities. Field epidemiology operations during this epidemic were carried out by CDCs at various levels in collaboration with related departments.

According to survey data, CDCs were able to provide real time telephone and/or online reports to their higher ups through the reporting of medical institutions, schools, nurseries, and through the active monitoring and detection of patients. This also enabled timely management of the outbreaks. CDCs at various levels had certain field investigation and management capacities, as they implemented emergency monitoring and report writing. It was also found that epidemiological survey investigators were quite able in their organization, coordination, and response, but less capable in epidemiological investigation, analysis, data interpretation, the formulation of appropriate control measures, and the assessments of prevention and control effects. Epidemiological survey investigators were able to direct or implement corresponding prevention and control measures on the spot, but they lacked sustained logistical support, personal protective equipment, and psychological counseling.

5.1.1.5 Technical Plans for Prevention and Control

On April 29th, 2009, the MOH issued the *Technical Guidance on Prevention and Control of Human-Swine Influenza (Tentative)* and the *Plan for Diagnosis and Treatment of Human-Swine Influenza (2009)*, and on April 30th, the CAAC issued the *Notice on the Work of Transporting Human-Swine Influenza Samples*. On May 7th, the MOH issued the *Work Plan for the Transport of Influenza A (H1N1) Cases* and on May 8th, it issued the *Plan for Influenza A (H1N1) Diagnosis and Treatment (Tentative, 1st Version, 2009)*. Provinces, cities, and counties organized large scale training and exercises for technical planning as per national policies, strategies, and measures.

It is worth mentioning that the 2005 *Influenza Pandemic Preparedness and Response Plan of the Ministry of Health (Tentative)* was not activated, mainly because of the following reasons: (1) this document as a departmental contingency plan only specified duties of health departments, without incorporating duties of other related departments, and (2) it was designed principally to target Influenza A virus subtype H5N1 that is highly pathogenic with high case fatality rates, and was not suitable for the Influenza A (H1N1) Pandemic.

5.1.2 Port Quarantines

After China received a disease outbreak notice from the WHO on April 25th, 2009, the AQSIQ issued the *Urgent Notice on Preventing Human-Swine Influenza from Spreading to China (No. 30, 2009)*, which made arrangements for port inspection and quarantine measures targeting people from regions with Influenza A (H1N1) outbreaks, and it also provided international travel recommendations for people traveling to such regions. Thus began the ports' battle against Influenza A (H1N1).

5.1.2.1 Port Quarantine Strategies

On April 30th, 2009, by issuing the 2009 No. 8 Proclamation, the MOH incorporated Influenza A (H1N1) into Category B infectious diseases under the *Infectious Disease Prevention and Treatment Law*, for which prevention and control measures against Category A infectious diseases were adopted, and put it under infectious disease management provided by the *Frontier Health and Quarantine Law*.

On May 2nd, 2009, the AQSIQ issued the *Notice on Restoring the Entry-Exist Health Declaration Card for People Entering China via Land and Water Ports (No. 37, 2009)*. On May 4th, 2009, the AQSIQ, the MPS, the MOR, the MOH, and the GAC jointly issued the *Notice on Strengthening Influenza A (H1N1) Prevention and Control in Passenger Trains Leaving China*. Up to this point in time, the country had strengthened prevention and control efforts for sea, land, and air transportation. In May and June of that year, the MOH and other departments

including the MFA and the AQSIQ jointly issued, as documents under Joint National Prevention and Control Mechanism, the *Notice on Further Specifying Influenza A (H1N1) Prevention and Control Measures*, and the *Notice on Adjusting Influenza A (H1N1) Prevention and Control Measures*, raising strict requirements on prevention and control measures for aircrafts and aircrews entering China. The AQSIQ issued the *Influenza A (H1N1) Port Health and Quarantine Procedure and Operational Specifications*, which included measures targeting priority areas, groups, flights, and ports, including health declarations, body temperature testing, designated docking points, strengthened medical inspection and screening, and improved management of cases and close contacts. Airport customs X-rayed all incoming luggage from epidemic areas. In the early days of Influenza A (H1N1) prevention and control, the railway authorities implemented body temperature testing of passengers aboard trains before their entry into China, and provided berths used specifically for observing passengers with fevers; tourism authorities implemented a registration system for tourists entering and leaving the country. During this phase, China implemented an “imported case containment” strategy with strict port quarantine measures.

On July 10th, 2009, by issuing the 2009 No. 9 Proclamation, the MOH incorporated the Influenza A (H1N1) virus into Category B infectious diseases under the *Infectious Disease Prevention and Treatment Law*, for which prevention and control measures against Category A infectious diseases were adopted, and put it under infectious disease management provided for by the *Frontier Health and Quarantine Law*. One month afterwards, Influenza A (H1N1) port quarantine measures across the country gradually transitioned into a routine monitoring phase.

5.1.2.2 Port Quarantine Data

Since the outbreak of Influenza A (H1N1) in China, port inspection and quarantine departments across the country accumulatively inspected 176 million passengers entering China, detected 24,800 persons with influenza symptoms, and transferred 17,700 persons to health departments for isolated observation. A total of 10,636,200 trips of aircraft, vehicles, ships, and trains entering China were inspected. See Fig. 5.2 for details.

In the phase of strict port quarantine measures which lasted from May 2nd to July 13th, a total of 1001 imported cases were discovered at ports in mainland China. The weekly curve of cases discovered at ports and that of total cases reported were highly consistent with one another ($r = 0.99$), and the ratio of cases discovered at ports each week to the total cases reported across the country each week remained stable at 30–40%.

During this period, 359 imported cases were discovered at port by body temperature screening, which accounted for 36% of all imported cases reported. 46% of the cases were discovered by hospitals when they went and sought treatment after having developed symptoms upon entry into the country; 81 cases (8.1%) were discovered when they volunteered to report to health departments after having

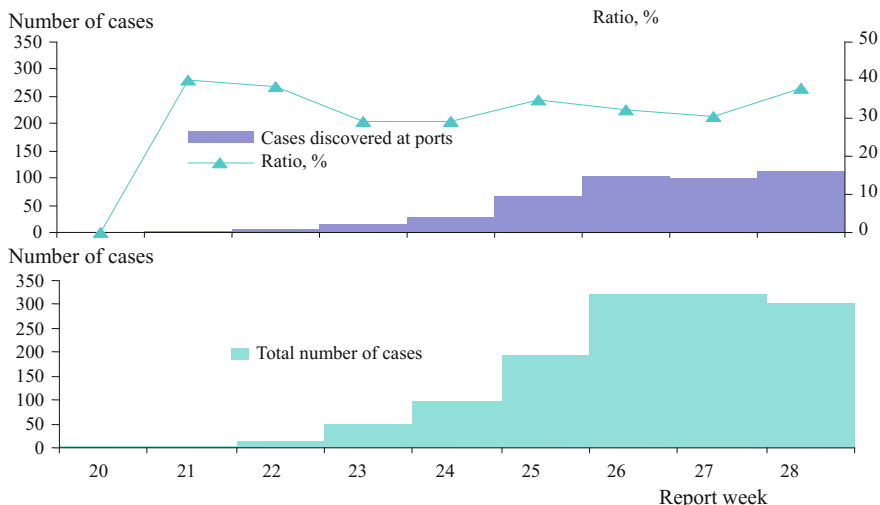


Fig. 5.2 Weekly distribution of port cases

developed symptoms on their entry; 48 cases (4.8%) were discovered when they were isolated for medical observation as close contacts; 34 cases (3.4%) declared their symptoms on port health declaration cards; and 8 cases (0.8%) were discovered in community searches upon their entry (Fig. 5.3).

5.1.2.3 Implementation of Port Prevention and Control Measures

To assess the role port quarantine measures played in the containment of imported cases, we evaluated the implementation of Influenza A (H1N1) prevention and

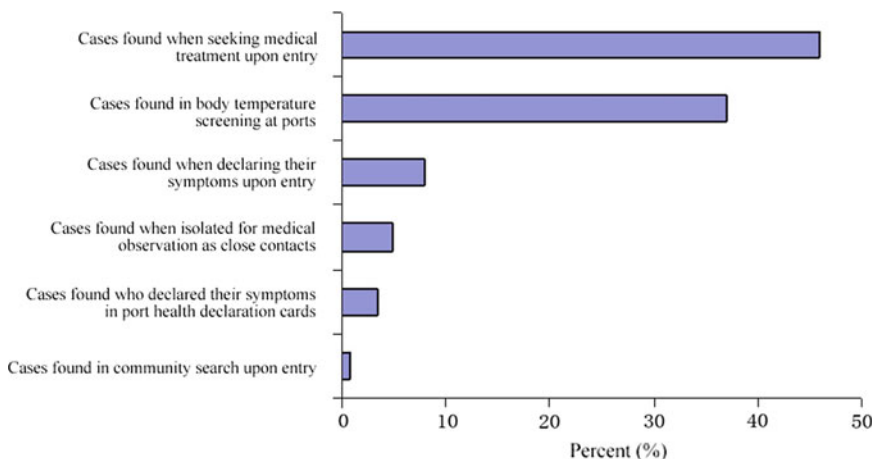


Fig. 5.3 Main detection methods for imported cases from May 2nd to July 12th, 2009

control measures by Entry-Exit Inspection and Quarantine Bureaus across the country in different phases of the epidemic, and we summarized the improvements of entry-exit inspection and quarantine strategies and mechanisms against international infectious diseases. We sampled seven Entry-Exit Inspection and Quarantine Bureaus, of Fujian, Guangdong, Sichuan, Henan and Beijing, and evaluated their emergency response efforts. These survey results served as a good representation of ports across the country.

Organization and Management

The Entry-Exit Inspection and Quarantine Bureaus and ports all established Influenza A (H1N1) prevention and control leading work groups and expert groups, with the earliest unit established on April 27th, 2009. These groups formulated response contingency plans, and implemented work responsibility and accountability systems (in which the bureau head was in command and other leaders oversaw implementation). The seven bureaus performed 186 inspections on their own Influenza A (H1N1) prevention and control work, and higher-level departments performed 78 inspections and received 476 documents; 502 prevention and control training sessions were conducted, and 686 updates were published on local media channels.

Port Prevention and Control Measures

All ports launched a health declaration card system, and set up entry passages and inspection zones specifically for passengers arriving from epidemic-stricken countries or regions; airports employed infrared thermometers and surveillance video cameras, and launched campaigns about Influenza A (H1N1) prevention and control and port quarantine requirements.

Suspected patients, once discovered, underwent epidemiological testing, and confirmed cases were strictly isolated and reported, with tracking records as complete as 95%; close contacts were strictly tracked, registered and medically observed, with records as complete as 90%. Other port countermeasures included: quarantining close contacts in designated areas; issuing clinic cards; strictly examining mail and possessions of passengers from epidemic-stricken countries and regions; disinfecting special passages and means of transport from epidemic-stricken countries and regions; environmental friendly disposition of waste generated by transport from epidemic-stricken countries and regions; crafting contingency plans and programs; and employing effective measures to protect susceptible passengers.

Personnel and Material Stockpiling for Port Prevention and Control

The seven ports surveyed deployed a total of 7533 people for Influenza A (H1N1) prevention and control work, with 6% of participants with a PhD or higher degree, 30% with a master's degree, 50% with a bachelor's degree, and 14% with a lower degree. Each month an average of 499 infrared thermometers, 91 surveillance cameras, 19 vehicles, 51 communications devices, and 19 rapid test devices were employed. The ports stockpiled 7,115,000 RMB worth of disinfectants, 5,622,200 RMB worth of protective masks, 4,327,000 RMB worth of protective clothing, and 1,574,000 RMB worth of protective eyewear. Two ports had a combined stockpile of 168,000 RMB worth of Tamiflu; six ports were equipped with 29,128,000 RMB worth of laboratory equipment; and five ports stockpiled 3,125,000 RMB worth of serological test kits.

5.1.3 Prevention and Control

In the early days of the epidemic, because of the difficulty in predicting the virus' potential damage and impact, international organizations including the WHO as well as many developed countries adopted a series of prevention and control measures. As per the WHO's response guidance, and in light of the country's epidemic trends and medical response capacity, China adopted different prevention and control strategies and measures in different phases.

As important entities for specialized disease prevention and control, CDCs played crucial roles in the nation's epidemic response. In order to evaluate the implementation and results of national prevention and control policies at a provincial, municipal, and county level for response mechanisms, we conducted research on thirty one CDCs throughout five provinces.

5.1.3.1 Close Contact Management

In the early days of the epidemic, these CDCs focused on "blocking foreign importation of the virus, containing internal transmission, and preparing counter-measures for the next wave of outbreaks." Their overall mission was to control imported cases and manage close contacts.

According to survey results, during the onset of the epidemic, 97% of the areas centrally isolated and observed close contacts, 71% tracked close contacts in their areas, 87% requested assistance from other CDCs to track close contacts, and 97% received requests from other CDCs for assistance to track close contacts.

The start of home-based isolation measures for close contacts was on May 1st, and it ended on October 8th (Fig. 5.4). On July 8th, the MOH issued the *Notice on Further Improving Influenza A (H1N1) Prevention and Control Measures (No. 122, 2009)*, which marked a turning point in policy adjustment: the Notice stipulated that

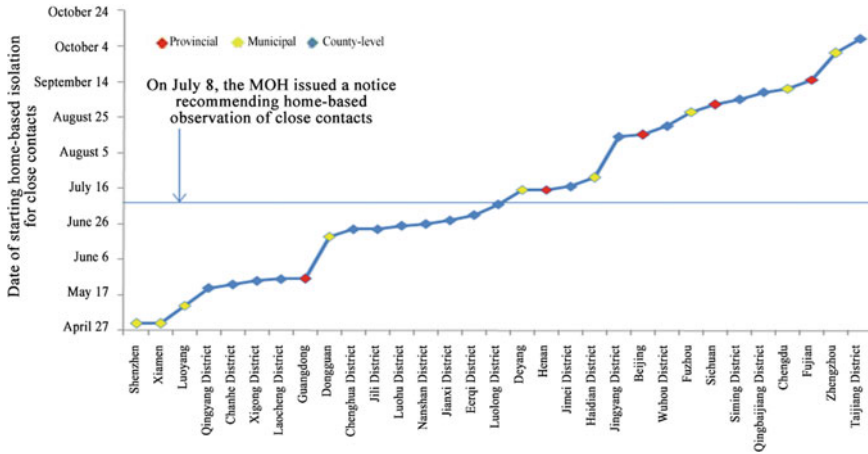


Fig. 5.4 Time distribution of close contact measures implemented in surveyed cities, regions, and counties

close contacts would no longer be centrally isolated and observed, and instead should be isolated at home with monitoring by the local health department. For people without permanent residences, medical observation was carried out either at their temporary address or at a designated area.

The earliest date among these CDCs to stop tracking close contacts was July 22nd, 2009, and the latest was January 31st. On November 6th, 2009, the MOE and the MOH issued the *Work Plan for Influenza A Prevention and Control in Schools*, and on December 10th, 2009, the MOH promulgated the *Guidance on Influenza A (H1N1) Prevention and Control by Government Organs, Enterprises and Institutions (Tentative)* and the *Guidance on Influenza A (H1N1) Prevention and Control by Towns (and Sub districts) (Tentative)*, all clearly stating that “it is in principle unnecessary to detect, track, register, and medically observe close contacts of sporadic influenza A (H1N1) cases.”

The earliest date among these CDCs to stop tracking the contacts of close contacts was May 10th, and the latest was December 31st. But the country’s prevention and control policies didn’t expressly require tracking the contacts of close contacts of Influenza A (H1N1) patients.

5.1.3.2 Case Management

The *Notice on Further Improving Influenza A (H1N1) Prevention and Control Measures (No. 122, 2009)*, which the MOH issued on July 8th, clarified categorical medical treatment; it strengthened treatment efforts for seriously ill patients, and it pushed for potential home-based treatment for mildly ill cases. According to survey findings, 94% of the CDCs had every hospitalized case separately isolated and

treated during the early stages of the epidemic; the earliest date among them to seek home-based treatment for mildly ill cases was June 24th, and the latest was November 30th. 87% of CDCs required that each case have two negative test results before being allowed a medical discharge; the earliest date among them to stop this requirement was July 13th, and the latest was November 7th. On October 12th, 2009, the MOH issued the *Plan for Influenza A (H1N1) Diagnosis and Treatment (3rd Version, 2009)*, which stopped the requirement that every case be tested negative before they could be discharged from the hospital.

In the early phases of the epidemic, the surveyed CDCs performed epidemiological testing on every single case; the earliest data among them to stop doing so was July 15th, and the latest was March 1st, 2010. All the surveyed CDCs thoroughly investigated each severely ill case or fatality.

5.1.3.3 Implementation of School Suspension

As the epidemic continued to worsen with the increase in local cases, the prevention and control strategy was adjusted to “reducing domestic cases, tightening measures against the spread among communities, strengthening treatment of seriously ill cases, and coping with changes in epidemic trends.” With clusters of cases breaking out in schools, the MOH formulated work plans for Influenza A (H1N1) prevention and control in priority areas including schools, government organizations, enterprises, and institutions, with emphasis placed on concentrated groups in schools and hospitals. According to regulations and in light of experts’ risk assessments, temporary school suspension was recommended by local health departments. Influenza A (H1N1) joint prevention and control mechanisms or emergency operations centers would review recommendations from experts and local education departments before their approval, announcement, and implementation.

Survey findings showed that 29 (94%) CDCs provided recommendations for school suspension in pursuant of national criteria while two CDCs did not, citing the reason that the “national criteria was too rigorous” and instead followed “local criteria.” 60% of the regions surveyed completely followed national school suspension criteria, 30% did so in most cases, and the other 10% did so only in a few cases. 37% of school suspension decisions were made by governments, 43% by education departments, 10% by health departments, 7% by CDCs, and 3% by schools.

5.1.3.4 Manpower and Material Security

Survey findings showed that 90% of the CDCs suffered shortages of manpower during prevention and control efforts, mainly—in descending order—field epidemiology, epidemic management, laboratory testing, and health education. To resolve these manpower shortages, 81% of the CDCs transferred personnel from sections that were engaged in prevention and control of diseases other than

Table 5.1 CDC manpower shortages

Manpower shortage	Number of CDCs	Percentage
Field epidemiology	26	93
Epidemic management	22	79
Laboratory testing	21	75
Health education	14	50
Vaccination	11	39
Logistical services	5	18
Other	2	7

Influenza A (H1N1), and 29% borrowed personnel from other agencies for their epidemic response efforts. The ratio of personnel transferred out of their entire original sections varied from 9 to 85% (Fig. 5.1 and Table 5.1).

All CDCs received subsidies specifically for Influenza A (H1N1) prevention and control from local governments, which ranged from 50,000 RMB to 8.87 million RMB; provincial CDCs received an average of 4.29 million RMB (300,000–8.87 million RMB); municipal CDCs received an average of 2.78 million RMB (100,000–7.69 million RMB); and county-level CDCs received an average of 630,000 RMB (50,000–2.6 million RMB). The ranking of the five regions in terms of CDC funding, in descending order, was as follows: Beijing, Sichuan, Guangdong, Henan, and Fujian. 45% of the CDCs stated that they experienced a shortage of funds.

Before the epidemic, all of the CDCs had strengthened preparedness in terms of emergency materials, mostly personal protective equipment, disinfection instruments, as well as laboratory reagents, equipment and consumables; some CDCs stockpiled antiviral drugs. 26% of the CDCs stated that after the epidemic occurred, they were still faced with shortages of materials, mostly test reagents, personal protective equipment, and laboratory supplies.

5.1.4 Capacity Assessment for Monitoring, Prevention and Control

The nation's Influenza A (H1N1) monitoring, prevention, and control efforts produced some remarkable results, in which the monitoring and alert network played a vital role, with some key technologies rivaling the international market; the goal of "containing imported cases, preventing domestic transmission, delaying the spread of the epidemic, suppressing the peak, mitigating the potential harmful impact with each phase, and winning time to bolster response efforts" was achieved. Notwithstanding, problems did emerge with the monitoring system as well as with manpower and materials support, which have yet to be addressed.

5.1.4.1 The Effective Mitigation of the Epidemic's Transition and the Suppression of Its Peak

In the early stages of influenza pandemic, China adopted the strict prevention and control strategy of “containing imported cases and preventing domestic transmission,” which effectively prevented the rapid development of the epidemic across the mainland. From June to August 2009, while countries in the northern hemisphere such as the United States and the United Kingdom saw the first peak of Influenza A (H1N1) cases where the virus amounted to 97% of all Influenza A viruses, Influenza A (H1N1) only accounted for 4–5% in China and no nationwide peak occurred at that time. From May 11th to August 31st, 2009, China reported roughly 3721 confirmed cases, with an average of only 33 new cases found daily. When the U.S. CDC announced on July 30th that the new Influenza A (H1N1) virus accounted for 99% of all Influenza A viruses, the ratio was only 2.3% in China. Unlike other countries in the northern hemisphere, China saw only one epidemic peak, which shows of human intervention in response efforts.

5.1.4.2 The Vital Role of the Monitoring and Alert Network

The expanded influenza monitoring network of sentinel hospitals and network laboratories made it possible to dynamically monitor, in real-time, epidemic trends and possible virus mutations (from the start of the epidemic through its spread nationwide); which enabled a comprehensive understanding of epidemic situations. This network provided a crucial foundation for scientific response measures, it provided the government with a scientific basis for decision-making, and it brought about a radical change in response by comparison with SARS in 2003 where information flow was obstructed, epidemic situations were unknown, and measures lagged in implementation. The expanded monitoring network with the advancement of information technology were iconic achievements in the investment and construction and of the public health system in recent years, and they proved their worth in this round of Influenza A (H1N1) response efforts. This network met technical requirements in epidemic management, and represented the rapid progress in capacity building for the country's public health system.

The China CDC and other specialized agencies displayed professionalism in the early phases of epidemic monitoring and alert, and the monitoring and reporting network received an upgrade in the later phases of the epidemic. The government increased the number of influenza monitoring sentinel hospitals and expanded the influenza monitoring system. Epidemic monitoring provided first-hand scientific evidence for decision-making on response efforts. In regards to Influenza A (H1N1) information monitoring and reporting, the reporting system was upgraded to the extent that it could satisfy information reporting and feedback needs in real time, which is evidence of the government's capabilities in rapid system expansion.

5.1.4.3 The Success of Rapid Testing for Influenza A (H1N1)

Within 72 h after receiving related news from the WHO, China developed a highly sensitive and specialized rapid diagnostic test kit for the Influenza A (H1N1) virus. The key probe used in the developed RT-PCR H1N1 testing kit, which was developed based on modifications made to technologies that foreign disease control and prevention centers had previously made, played a crucial role in early diagnosis of the virus. While there are no commercialized ELISA-H1N1 influenza diagnosis testing kits abroad, the SFDA has already approved seven types, which compared with their foreign counterparts, can detect the new Influenza A (H1N1) virus. Additionally, China's research and analysis of the new Influenza A (H1N1) virus' entire genome sequence garnered international recognition and played an important guiding role in the country's prevention and control efforts. At the end of 2009, after an evaluation of the CNIC, the WHO concluded that the CNIC's operations and research were on the forefront of international research, and agreed to include the CNIC as one of the five WHO Collaborating Centers for reference and research on influenza, making it the first of the kind in a developing country to earn the status.

5.1.4.4 Construction of the Monitoring and Alert System Still Needs to Be Strengthened

An imbalance still exists among provinces in terms of the development of the influenza monitoring network. Monitoring has not begun in Tibet, and some influenza network laboratories are still of poor quality. An integrated monitoring system that enables full coverage, high quality monitoring, epidemiology and laboratory monitoring has not truly been established domestically. There are still inadequacies regarding in-depth analysis and comprehensive judgments of the monitoring data, as well as a lack of related models and analysis methods appropriate to national conditions. Detection capabilities of public health emergencies are inadequate, and the existing functions of the web-based public health emergency reporting system still require expansion and improvement. Moreover, the fact that reporting for this Influenza A (H1N1) epidemic involved four information platforms - the epidemic information system, the influenza monitoring system, the emergency reporting system, and the Influenza A (H1N1) reporting system, along with the changes in the scope of information collection and reporting designs, caused trouble and confusion in local information reporting, analysis, and utilization. Multi-departmental mechanisms for information communication and integration still require further improvement.

5.1.4.5 The Inadequacy of Human, Financial and Material Resources

Influenza A (H1N1) prevention and control caused considerable pressure on human resources in local CDCs. Survey findings showed that 90% of the CDCs suffered manpower shortages, mainly in field epidemiology, epidemic management, and laboratory testing. 45% of the CDCs stated they experienced financial shortages, and 26% were faced with material shortages such as testing kits, protective equipment, and laboratory supplies after the outbreak of the epidemic.

5.1.4.6 Prevention and Control Policies and Measures Could Further Be Improved in Terms of Flexibility and Adaptability

In regards to formulating policies and countermeasures for different phases of the epidemic, many policy documents were issued providing detailed specifications of prevention and control strategies and measures, with real time policy adjustments. Our research found, however, that it was widely claimed that the national policies, strategies, and measures did not suit local epidemic situations and prevention and control capabilities, so in turn local CDCs were unable to properly adapt to them; national policies were often formulated and adjusted either ahead of or lagging behind local trends and prevention and control needs. According to survey findings, when national policies were inconsistent with local epidemic situations, nearly half of the CDCs strictly adhered to national policies, 35% formulated their own strategies and measures, and 23% didn't formulate written regulations but instead flexibly implemented measures to suit local conditions. Discrepancies existed also in the implementation of specific measures regarding to the time and process. On close contact management, for example, nearly half the local CDCs had already adopted the relatively loose measure of home-based medical observation before the national policy was promulgated, and some of them stated that they had communicated with related state departments, obtained verbal approval from them, and hence experimented with the implementation of this measure.

5.2 Medical Treatment

As a key part of Influenza A (H1N1) prevention and control efforts, the effectiveness of medical treatment has a direct impact on the livelihood of the people. Up until August 10th, 2010, of the 128,033 confirmed cases reported by the mainland's 31 provinces (municipalities directly under the central government, and autonomous regions), 31,994 cases were hospitalized—805 were fatal, with a death rate of 2.5%.

In dealing with Influenza A (H1N1), the MOH employed a comprehensive strategy, deploying limited medical resources with the integration of medical technology for the categorical treatment of patients. The MOH specified Influenza A (H1N1) diagnosis and treatment duties for medical institutions of all levels, and

established national, provincial, prefectural-level expert teams, and medical rescue teams at hospitals designated for treating seriously ill patients—all with the mission to carry out categorical medical treatment. The practice of “assembling patients, experts, and resources for concentrated treatment of seriously ill patients” at designated tertiary infectious disease hospitals and general hospitals guaranteed the efficient utilization of limited and top-quality medical resources. Domestic clinical experiences were summarized on a regular basis, and multiple meetings were held to revise plans for clinical diagnosis and treatment. Additionally, international exchanges were strengthened to improve the quality of medical treatment. Meanwhile, assistance mechanisms were established between provinces, within provinces, between large general hospitals and local medical institutions, and between different departments within hospitals, all to provide regions that had inadequate medical resources with technical and material support to enhance medical treatment quality.

Medical institutions were the main fields of battle against the influenza epidemic, and their capabilities were a direct manifestation of the country’s medical treatment capabilities. Medical treatment policies were under continuous adjustment as epidemic situations changed. The Evaluation Team assessed medical treatment policies and their implementation in different epidemic phases through interviews conducted with the heads of the General, Healthcare, and Support Groups under the Joint National Influenza A (H1N1) Prevention and Control Mechanism, as well as with 31 hospitals in the five representative provinces and cities. Survey results showed that these hospitals shared many similarities with their Influenza A (H1N1) prevention and control work and were definitely representative to a certain degree of the national medical treatment capabilities.

5.2.1 Medical Treatment Strategies and Measures

5.2.1.1 Time Distribution and Evolution of Influenza A (H1N1) Cases

From April 25th to June 10th, 2009, the first imported case in China was reported and subsequently a surge of imported cases followed suit. The first confirmed imported case was reported in the mainland on May 11th, 2009, and thereafter, imported cases were on the rise, mostly in provinces with air and land ports. The first domestic case was confirmed on May 29th, and on May 11th, the WHO declared a global influenza pandemic, stating that the influenza virus was spreading in seventy one countries and five continents; this was the same day the first local case from unknown sources of infection was reported, marking the start of the national epidemic response efforts. Up until June 10th, the mainland reported a total of 170 confirmed cases—including 14 locally infected cases, with no seriously ill cases or fatalities—and most of these were located in regions with more transportation ports such as Beijing, Guangdong, Fujian, and Shanghai.

From June 11th through early August 2009, mild cases increased gradually, most of them being local in nature. China reported the first severely ill case on August 8th, and the success in curing this case paved the way for later treatment of the large number of severely and critically ill cases. Up until August 10th, a total of 2348 conformed Influenza A (H1N1) cases were reported in the mainland, 2167 of them cured with zero fatalities. In the same time period, according to data published by the WHO, the Influenza A (H1N1) virus had spread to more than 170 countries and regions worldwide, with 177,457 internationally confirmed cases and a death toll of 1462.

Guangdong reported the mainland's first seriously ill case on August 8th, 2009, and from then on seriously and critically ill cases were on the rise, until two months later when only a few critically ill cases were being reported in some provinces. In September, with students returning to school after the summer holiday, cases began rising rapidly, mostly in concentrated outbreaks in schools. On October 4th, Tibet reported the mainland's first Influenza A (H1N1) fatality. With the remarkable increase of clustered cases, severely and critically ill cases continued to rise in October, alongside increasing fatalities, and at that time the Influenza A virus became the dominant strain of influenza in the country. Cases increased significantly into November, and infection rates remained high for three consecutive weeks before reaching the peak of more than 1200 cases reported weekly. The ratio of the patients infected with Influenza A (H1N1) virus to the total number of patients with influenza viruses recorded by monitoring sentinel hospitals across the country peaked at the end of November. Children under nine years old were the biggest proportion of severely ill cases, followed by high-risk groups like people with chronic disorders, pregnant women, and people with obesity, with main complications including pneumonia, respiratory failure, and acute respiratory distress syndrome.

New cases in the mainland fell gradually beginning in December. In early 2010, Influenza A (H1N1) virus activity was in decline, alongside a rapid drop in new cases. As of March 2010, only a few cases were being reported across the country, and activity gradually transitioned to seasonal influenza, dominantly Influenza B viruses.

5.2.1.2 General Requirements and Strategies for Medical Treatment

In regards to medical treatment strategies, the specific requirement, which was clarified for hospitals on April 27th, 2009, was "strengthening the monitoring and reporting of cases of pneumonia caused by unknown reasons" while maintaining the focus on medical treatment of seriously ill cases.

After the first local case caused by unknown reasons was reported on June 11th, the government reviewed its previous response efforts and revised its prevention and control strategy to "reducing domestic cases, tightening measures to prevent community-level transmission, strengthening medical treatment of seriously ill cases, and coping with epidemic changes," placing emphasis on measures aimed to control and reduce the occurrence of domestic cases and improve capabilities of

medical treatment for seriously ill cases. On July 8th, the government once again issued a document stressing the strengthening of medical treatment of seriously ill cases, and specifying categorical treatment of patients.

After Guangdong reported the mainland's first seriously ill case, on September 3rd, 2009, the Joint National Prevention and Control Mechanism changed the prevention and control strategy set forth on June 12th to "reducing domestic flu cases, controlling epidemic transmission in communities, strengthening treatment of severely ill patients, protecting susceptible populations, and mitigating epidemic damage," so as to minimize the occurrence and mortality rate of Influenza A (H1N1).

5.2.1.3 Main Measures

During the phase where most cases reported were imported cases, and in order to implement measures that focused on "discovering, diagnosing, reporting, isolating and treating cases as early as possible," China, in its effort to guide and regulate Influenza A (H1N1) diagnosis and treatment operations, promulgated a total of thirteen documents and technical plans concerning monitoring and treatment in hospitals. The government also standardized monitoring plans and procedures, performed two revisions on the treatment and monitoring plans, and also made provisions concerning nosocomial infection and patient transport—with particular emphasis on cases with flu-like symptoms from epidemic-stricken regions. Health departments at various levels designated hospitals to admit and treat emerging Influenza A (H1N1) cases, and designated first aid centers (stations) to transport suspected and confirmed cases.

On July 10th, the MOH revised the *Plan for Influenza A (H1N1) Diagnosis and Treatment (Tentative, 1st Version, 2009)*, and issued the *Plan for Influenza A (H1N1) Diagnosis and Treatment (Tentative, 2nd Version, 2009)*, providing further guidance to medical institutions on Influenza A (H1N1) treatment and bolstering countermeasures against the epidemic. The second version of the Plan added diagnosis criteria and treatment guidelines of high-risk cases and seriously ill cases, stating that it was unnecessary to administer neuraminidase inhibitors (NAIs) (e.g. Tamiflu) to mildly ill cases with no complications and whose condition tended to be self-limiting, and instead provide Tamiflu to high-risk cases and seriously ill cases. The revised Plan also made provisions for medical treatment of critically ill cases, instructing that these cases be transferred to ICUs for treatment if local medical conditions permit.

On October 12th, 2009, the MOH issued the *Plan for Influenza A (H1N1) Diagnosis and Treatment (3rd Version, 2009)*, which revised diagnosis criteria from the previous version and added criteria for identifying severely and critically ill cases, with particular emphasis placed on the early identification and treatment of the two types of cases. On April 30th, 2010, the MOH issued the further revised *Plan for Influenza A (H1N1) Diagnosis and Treatment (2010)*, with the addition of clinical characteristics and treatment principles for children and pregnant patients. At that time, a total of four editions for the diagnosis and treatment plan for Influenza A (H1N1) were issued.

5.2.1.4 Hospital Preparedness and Response

The Establishment of Organizational Mechanisms

On April 27th, 2009, the MOH issued the *Notice on Strengthening Preparedness for and Response to Human Swine Influenza*, requiring local health departments to designate hospitals for the concentrated arrival and treatment human swine influenza cases. Provinces across the country forwarded this document and made arrangements accordingly. 90% of hospital directors, according to the survey, made Influenza A (H1N1) prevention and control a top priority, established a leading group before May 22nd, and were able to specify and implement response measures in the early stages of prevention and control. 38% of hospitals were so responsive that they established leading groups, medical treatment groups, and Influenza A (H1N1) prevention and control plans the day they received administrative orders.

The Formulation of Response Plans

All designated hospitals crafted preparedness plans for Influenza A (H1N1) medical treatment, strengthened organizational leadership, and arranged proper response measures. 60% of hospitals formulated response plans in the early phase of the epidemic as per state requirements, 64% had made such plans before they received their first cases, and the latest date in plan formulation for all the hospitals was September 30th.

Expert Groups and Personnel Training

Firstly, expert groups were established. 76% of hospitals set up experts group alongside their leading groups. The majority of hospitals already had experience in infectious disease prevention and control, and with their clear division of labor had no issues with rapid response once the epidemic occurred.

Secondly, personnel training was implemented. 86% of hospitals before June 10th, 2009, had launched an Influenza A (H1N1) awareness training program, which included lectures and in some cases epidemic exercises. Sichuan Provincial People's Hospital, which detected the country's first imported case, was one example. This hospital received an administrative notice on April 30th, 2009, then on May 4th sent personnel to attend provincial level emergency and respiratory medical training. On May 5th the hospital carried out hospital-wide training to disseminate knowledge about Influenza A (H1N1) prevention, control, diagnosis, and treatment, and on May 7th it participated in an exercise organized by the provincial infectious disease hospital which taught how to detect, transport, and treat patients, and how to improve the vigilance of outpatient doctors. When its emergency center received a patient with a fever from an epidemic-stricken region on the afternoon of May 9th, the hospital was able to immediately transfer the patient to a fever clinic via an isolation passage, and took proper protective

measures pursuant to their response plans; the patient was determined to be China's first Influenza A (H1N1) case, confirmed by the hospital's clinical experts, epidemiological experts from CDCs, as well as by laboratory test results.

However, with the updating of the plan, personal training seemed sluggish. After the second version of the National Diagnosis and Treatment Plan was issued on July 10th, only 13% of hospitals carried out personnel training. After seriously ill cases began emerging, 39% of hospitals organized multiple training sessions; after the third version of the National Diagnosis and Treatment Plan was issued, up to 50% of hospitals carried out training with more frequency than before.

Thirdly, treatment teams for seriously ill cases were established. Multidisciplinary expert teams for the treatment of seriously ill cases were set up all over the country over a period that lasted from April 27th until December 8th, 2009, and 70% of hospitals surveyed established such teams.

Fourthly, treatment teams were supported and reinforced. 91% of hospitals tasked with treating seriously ill cases reinforced their Influenza A (H1N1) treatment forces by transferring staff members from their other sections to supplement the team, thus transferred personnel accounted for on average 30% of Influenza A (H1N1) treatment teams.

The Increase in Reserve Hospitals

According to categorical medical treatment, key hospitals and backup or reserve hospitals were designated for the treatment of seriously and critically ill patients. The MOH collected detailed information on designated reserve hospitals all over the country in order to cope with an escalating influenza epidemic, and on June 14th it issued the *Notice on Further Strengthening the Medical Treatment of Influenza A (H1N1)*, requiring all areas to designate reserve hospitals. Therefore, 406 medical institutions were subsequently designated as reserve hospitals.

Medical Equipment Funding

The central government appropriated a total of 397.56 million RMB to 17 central and western provinces as well as the Xinjiang Production and Construction Corps, to strengthen treatment capacities of medical institutions for severely ill cases, including the purchase of ICU equipment such as intensive care beds, respirators, and monitors.

Antiviral Drug Treatment

87% of hospitals surveyed used Tamiflu for the treatment of seriously ill cases. Studies show that the Influenza A (H1N1) is sensitive to the neuraminidase inhibitors in Tamiflu and zanamivir, and is resistant to amantadine and rimantadine.

The data also indicates the early use of effective antiviral drugs can suppress symptoms like fever and coughing within a few days. Controlling the reproduction of the virus both efficiently and rapidly means curbing systemic inflammatory response syndrome, reducing immunologic injury, and preventing the occurrence of multiple organ dysfunction syndrome (MODS) at the source. However, many cases were not treated early enough with antiviral drugs. According to statistics, only 28% of the cases were given antiviral drugs within 48 h of the onset of symptoms; the window was missed for the other cases and thus their prognoses were negatively affected.

5.2.2 Medical Treatment Evaluations

All in all, the national Influenza A (H1N1) treatment work was quite successful, with a high cure rate and a lower case fatality rate than in many other countries. Nonetheless, problems such as inadequate capabilities, regional imbalance in medical treatment, and unsound mechanisms for treatment compensation did exist.

5.2.2.1 The Remarkable Results of Medical Treatment

There was a three-month period within China from the first confirmed case to the first seriously ill case, which provided precious and ample time to better prepare medical treatment for seriously ill cases. As local governments became fully aware that their designated hospitals were insufficient in this regard, and especially since the hospitals lacked mechanical ventilators, ICUs, and related technicians, local governments began incorporating general hospitals with strong intensive care into their lists of reserve hospitals. Based on data collected regarding domestic cases as well as data from the WHO and other countries regarding Influenza A (H1N1) prevention and control, the National Diagnosis and Treatment Plan was revised three times to better suit treatment conditions, a move which effectively lowered fatalities caused by the epidemic.

Up until March 31st, 2010, 31 provinces had reported more than 127,000 confirmed cases, including 126,000 domestic cases and 1228 imported ones; 122,000 patients had been cured, including 4859 patients cured at hospitals and 46 at home, with a total of 800 fatalities.

According to the WHO, as of March 28th, 2010, 213 countries and/or regions had reported more than 500,000 laboratory-confirmed Influenza A (H1N1) cases, including at least 17,483 fatalities, with a global average case fatality rate of over 3%—nearly five times higher than that in China. On August 10th, 2010, the WHO announced that the pandemic had transitioned into the post-pandemic period, and listed Influenza A as seasonal influenza. By this point in time, there were 805 fatalities related to Influenza A (H1N1) in China, indeed a very low death toll compared with at least 18,449 deaths reported by 214 countries.

5.2.2.2 Some Clinical Research on Par with Leading International Studies

A Clinical Study on Symptoms and Therapeutics of Mildly Ill Patients of Influenza A was published in the world's authoritative *New England Journal of Medicine*.¹ This medical journal in the same issue also published an op-ed on the mentioned study, titled *The Need for Science in the Practice of Public Health*, authored by Professor Nicole Lurie, Assistant Secretary for Preparedness and Response (ASPR) at the United States Department of Health and Human Services (HHS), and a world-renowned expert on medicine and public health. She stated in the article that the Chinese study proved that the country had constructed a robust surveillance and response system in a relatively short period of time, and opined that China's early detection and mitigation capabilities had significantly improved. Moreover, achievements were also made in TCM treatment of (mildly ill) Influenza A (H1N1) patients. Forty varieties of Chinese patent medicine with fever reduction and detoxifying functions, such as "Lianhua Qingwen" and "Fufang Qinggan" were developed, assessed at cellular and animal levels, and put on the list of TCM medications recommended by the MOH issued *Plan for Influenza A (H1N1) Diagnosis and Treatment (3rd Version, 2009)*.

5.2.2.3 Inadequate Medical Treatment Capabilities for Pandemic Diseases

Firstly, pre-hospital emergency care was inadequate. Many first aid centers did not possess specialized healthcare workers, vehicles, or other equipment for patient transport, and in many parts of central and western China and even in some parts of eastern China, these centers simply were not established. Secondly, hospital treatment capabilities were insufficient. Some regions, especially less developed ones, had very limited medical resources, and local governments were unable to provide the funding needed to strengthen treatment capacity against a pandemic disease. These hospitals suffered severe shortages in related equipment and facilities, antiviral drugs, protective supplies, and particularly ICU facilities and equipment, which made it difficult to meet the needs of the patients. Thirdly, specialized local capabilities for medical treatment were relatively weak. Surveys found that after the National Diagnosis and Treatment Plan had been adjusted, more than a half of local level hospitals did not carry out training, and among those who did so, few conducted a post-training assessments.

¹Cao et al. (2009).

5.2.2.4 Compensation Mechanisms for Medical Services Against Pandemic Diseases Requires Improvement

Although the government clearly stipulated a free treatment policy for Influenza A (H1N1) patients, local governments adopted compulsory isolation and treatment measures in the early phases of the epidemic, and since designated hospitals could not forcibly charge patients for their treatment, the hospitals ended up paying for their medical and living expenses. After the national prevention and control strategy was adjusted, four ministries including the MOH and the MOF jointly issued a document on expenses for Influenza A (H1N1) treatment, requiring that expenses for cases which hospitals had received and treated be settled by local governments, and those cases yet to be received and treated would be solved through the urban employee insurance, the urban resident insurance, and the new rural cooperative medical care system. Nevertheless, many issues arose during the document's implementation, and some provinces still have not solved the issue of expenses that designated hospitals shouldered. 45% of the surveyed hospitals did not receive government subsidies, nearly 70% bore the medical costs themselves, and 84% paid medical expenses for patients. Because medical treatment of seriously ill cases were quite expensive and in some cases could cost up to tens of thousands of RMB for a single patient, those who were not medically insured could not afford it and became indebted to that hospital. Surveys found that 26 hospitals combined paid 14,235,500 RMB in medical expenses, averaging 550,000 RMB per hospital.

While bearing the loss of expenses paid in treating Influenza A (H1N1) patients, hospitals faced economic losses from the decrease in outpatients revenue. This in turn put great pressure on their survival and development, an issue particularly prominent in less developed regions of central and western China. Moreover, treatment of severely ill cases was costly, involving the use of protective equipment that was not covered by medical insurance, which resulted in many patients becoming unwilling or unable to pay for their treatment. As some Influenza A (H1N1) patients were of the floating population, problems in medical insurance settlement between different regions kept springing up. There was no definitive policy as to the financial channel, responsibility, procedure, and time limits of compensation to the designated hospitals for expenses they paid in transportation, treatment, and living costs when treating Influenza A (H1N1) patients.

5.2.2.5 Inadequate Local Level Stockpiles of Antiviral Drugs

Though Tamiflu proved to be an effective treatment in the early phases of the Influenza A (H1N1) epidemic, only provincial-level health departments stockpiled small amounts of the drug, which was allocated on a unified basis after the epidemic broke out. On June 19th, 2009, Shanghai Pharmaceuticals Holding Co., Ltd produced the year's first batch of Tamiflu, but its supply still fell short of the demand. According to statistics, seriously ill patients did not receive antiviral drugs in time; only 28% of the cases were given antiviral drugs within 48 h of the onset of virus,

and for the rest they missed their window, thus negatively impacting their prognoses. The country has not yet established an antiviral drug stockpiling mechanism or regional drug warehouses intended for local medical institutions.

5.2.2.6 Policy Feasibility Needs Improvement

The Chinese government issued related guidance documents in real time, but those documents could have been further improved in terms of guidance, feasibility, sustainability, and comprehensiveness by providing more tailored recommendations for local prevention and control efforts, diagnoses, and treatment. One example would be strengthening the scope and intensity of training through these documents for local communities, and paying more consideration to opinions and suggestions from local agencies in the process of policy making.

5.3 Vaccine Development and Supply

Vaccine plays a big role in the human struggle against epidemic diseases, and it is one of the best ways to prevent Influenza A (H1N1). An Influenza A (H1N1) vaccine can stimulate the generation of antibodies against the virus and thus provide the body with immunity. Vaccine development and supply remained one of the top priorities of the prevention and control work since the Joint National Prevention and Control Mechanism was launched.

5.3.1 Strategies and Measures for Vaccine Development and Supply

China implemented practical prevention and control strategies suitable for the different phases of the epidemic. Work on vaccine development and supply began when the epidemic first started, and afterwards adjustments were based on local epidemic situations.

5.3.1.1 The Rapid Launch of Vaccine Development and Supply

Before China's first imported case was discovered, a support group, headed by the NDRC, had been set up under the Joint National Prevention and Control Mechanism, as envisaged by the 59th Executive Meeting and its work conference on Influenza A (H1N1) prevention. With participation of the MIIT, MOF, MOT, MOR, MOC, MOH, AQSIQ, CAAC, and CFDA, the support group established a

liaison mechanism and began preparing for vaccine development and supply. According to the *Work Plan for the Joint Prevention and Control Mechanism against Influenza A (H1N1)*, the support group was charged with managing affairs regarding vaccine supply and demand, production, stockpiling, transport, and the coordination and allocation of special funds. The Science and Technology Group was tasked with coordinating and addressing scientific and technological issues in vaccine development and application, and the Healthcare Group was in charge of formulating and revising technical plans for disease prevention and control, including national vaccination planning. In addition, the Expert Committee was to oversee major scientific issues related to vaccination. Such an emergency vaccine support mechanism achieved linear emergency response coordination for the development, production, stockpiling, and application of a normal vaccine supply system (Fig. 5.5).

5.3.1.2 Preparations for Influenza A (H1N1) Vaccine Development, Production, and Stockpiling

From May 11th to late August, 2009, related departments engaged in preparations for Influenza A (H1N1) vaccine development, production, and stockpiling as per the general prevention and control strategy of “giving equal importance to virus

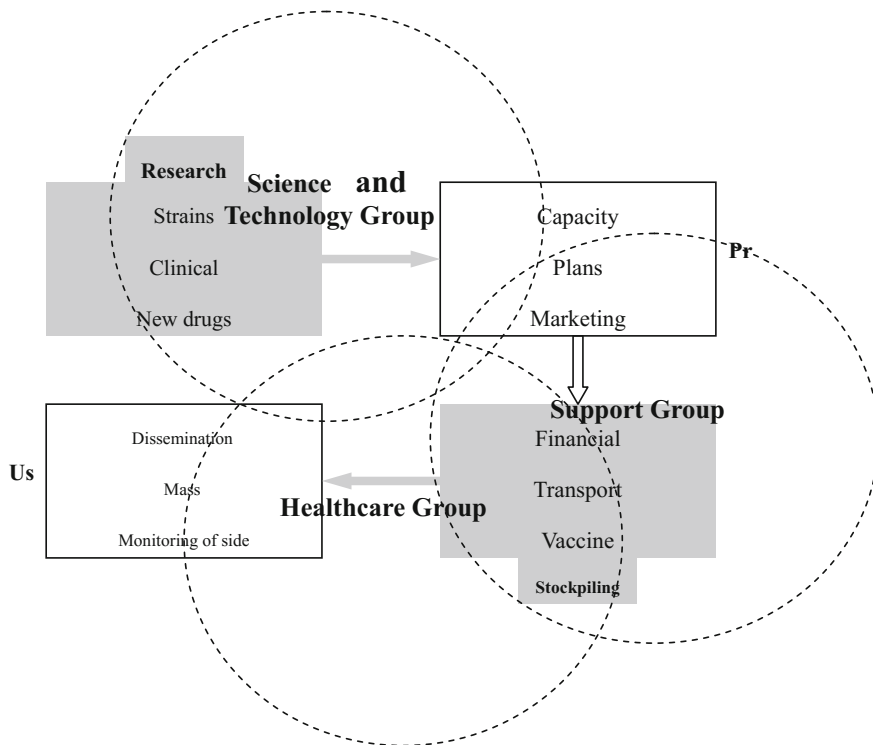


Fig. 5.5 Influenza A (H1N1) vaccine development and support system

containment and prevention with the goal of reducing peak periods.” On June 2nd, the *Notice of the CFDA on Strengthening Preparations for Influenza A (H1N1) Vaccine Production* was issued. On June 25th, the MIIT began preparations for national production and stockpiling of Influenza A (H1N1) vaccine. On the same day, the MOH and the CFDA established the Influenza A (H1N1) Clinical Trials Work Committee, which consisted of experts from the China CDC, the CFDA’s Center for Drug Evaluation, the Center for Drug Certification, the NICPBP, and CDCs in Beijing, Jiangsu, and Guangxi - the first CDCs chosen to conduct clinical trials, alongside related working mechanisms. Vaccine manufacturers immediately carried out toxicological experiments and clinical trials after receiving WHO-approved vaccine strains from the U.S. CDC and the British National Institute for Biological Standards and Control (NIBSC). On July 22nd, more than 13,000 volunteers in seven provinces were inoculated against Influenza A (H1N1) in the world’s largest clinical vaccination trial. On August 2nd, ten Chinese vaccine manufacturers completed first-injection inoculation and serum specimen collection in seven clinics, with 12,868 people inoculated or given placebos. Observations of first-injection inoculations found no occurrences of serious side effects or incidents, and preliminary analysis showed that the Influenza A (H1N1) vaccine produced by China was safe and reliable. On August 21st, China made a global announcement that within two weeks of the vaccination, over 80% of antibodies tested positive, which demonstrated that one single injection could be enough—compared to two injections recommended by the WHO—which meant a considerable reduction in vaccine production. Trial results also demonstrated for the first time that the vaccine, after administered, manifested itself as an antigenic determinant (this was later proved by American and European scientists), indicating that case fatality rates for Influenza A (H1N1) would not be too high.

The MOH and the MOST co-launched “Emergency Research Projects for Joint Prevention and Control of Influenza A (H1N1),” which apart from the development of rapid testing kits, included the following: evaluation and development of biological protective equipment and disinfectant products, the evaluation and development of medications, the investigation into the virus’ genetic background, the evaluation of cross-protection effects of Chinese natural immunity and the seasonal influenza vaccination, the development of key technologies used to increase capacity of influenza vaccine manufacturers, the evaluation of clinical treatment methods, and the research on case resource integration. These projects were launched to technically prepare the nation for a possible epidemic.

5.3.1.3 Vaccine Production and Application

Beginning in September 2009, related departments stepped up supply support for vaccinations in light of the general prevention and control strategy of “strengthening prevention measures, controlling transmission in communities, strengthening treatment of severely ill patients, and mitigating epidemic damage,” which

originated from the 80th Executive Meeting of the State Council. On September 2nd, the CFDA approved through a special procedure, an Influenza A (H1N1) vaccine developed by the Beijing-based Sinovac Biotech Ltd., which was the world's first of its kind to be approved and applied. On September 10th, the MIIT and the MOF officially launched allocation and distribution of the Influenza A (H1N1) vaccines from the national drug stockpile, with the hopes of strengthening development, production, and management to ensure vaccine quality and safety. On September 14th, the CFDA issued the *Notice on Strengthening Supervision over Safety of Influenza A (H1N1) Vaccine*. On September 15th, the MOH issued the *Guidelines on Vaccination against Influenza A (H1N1) for the Autumn and Winter of 2009*, ensuring the scientific, standardized, and effective distribution of the nation's vaccinations and also to ensure prevention and control efforts stayed current during the autumn and winter seasons. Up until November 24th, 2009, plans had been announced for producing 114.28 million doses of the vaccine. As of December 2nd, the SFDA had approved the allocation of 57.18 million doses in 320 batches, 50.70 million doses were received, and 29.11 million people were vaccinated against Influenza A (H1N1). On December 9th, the MOH, joined by the CCPPD, NRDC, MOE, MIIT, MOF, and MOA, issued the *Notice on Stepping up Vaccination against Influenza A (H1N1)*. On January 7th, 2010, the MOH issued the *Notice about the Guidelines on Vaccination against Influenza A (H1N1) for Children Aged between 6 Months to 35 Months (No. 3, 2010)*.

5.3.1.4 Emergency Vaccinations

Starting in 2010, China's general prevention and control strategy shifted to focusing on the treatment of severely ill patients, etiological surveillance, and interim evaluations of response efforts. On January 15th, the MOH held a national vaccination work symposium, conveying gratitude from the ministry's leaders to health workers across the country engaged in Influenza A (H1N1) prevention and control and vaccination. The MOH also analyzed global and domestic epidemic trends, briefed the attendees on progress in vaccinations and their side effects from the previous phase, and discussed the further improvement of the vaccination program. On February 5th, the MOH issued the *Action Plan for Mass Vaccination against Influenza A (H1N1) in Rural Areas in the Spring of 2010* so as to increase immunity coverage for priority groups in the country's rural areas. At the same time, the Healthcare Group under the Joint National Prevention and Control Mechanism stepped up communication efforts in order to accelerate vaccination for priority groups such as pregnant women, infants, children aged six months and older, patients with chronic disorders, and migrant workers employed by labor-intensive enterprises. The Healthcare Group also sped up the allocation of the country's fourth batch of the vaccine. The Support Group coordinated export affairs of the vaccine, and decided that after the seasonal influenza vaccine came into rotation, there would be no need to separate the Influenza A (H1N1) vaccination in terms of production, storage, or purchasing. As of the end of June 2010, 102.09 million people had been vaccinated.

5.3.2 Evaluations of Vaccination Supply

The work on influenza A (H1N1) vaccine supply was quite fruitful on the whole. All in all, the supply work for the Influenza A (H1N1) produced positive results. On the one hand, it played a big role in containing the spread of the virus and on the other the adequate amount of stored vaccines bolstered public confidence and stabilized social expectations. However, on the issue of vaccine safety, there was a certain amount of public concern, which challenged the nation's risk communication.

5.3.2.1 China First to Succeed in Developing Influenza A (H1N1) Vaccine

Influenza A (H1N1) strains a week later than other countries, Jiangsu Provincial CDC among other CDCs, as commissioned by ten Chinese vaccine manufacturers, conducted timely vaccine clinical trials, and performed scientific, rational, and effective evaluations on their safety and efficacy, which lead to legitimate and credible research results. These clinical trials were among the first of their kind in the world. Research results showed that the domestically developed vaccines against Influenza A (H1N1) were highly safe and immunogenic to different groups of people, and that the optimal immunity dose for the adjuvant-free Influenza Vaccine (Split Virion), inactivated, was 15 µg. A single injection would be enough to combat the virus through—as was indicated—a memory immune response—which some experts believed was caused by a certain overlap in antigenicity in the seasonal H1N1 influenza virus and the new Influenza A (H1N1) virus. This provided a crucial foundation for the national Influenza A (H1N1) immunization strategy, and invaluable experience for global vaccine development and promotion.

5.3.2.2 Incredibly Shortened Time to Market for Vaccine

From the time the first Chinese vaccine manufacturer obtained strains from the WHO that could be directly applied in vaccine development on June 8th, 2009, to the time the vaccine was officially approved for production on September 2nd, after the research and development, pilot production, clinical trials, field investigation, registration inspection, evaluation and review were completed, only took 87 days. This amount of time is far shorter than average process of two to three years for a new drug to pass through technical evaluation and administrative approval, which won precious time for China's prevention and control efforts. Meanwhile, the CFDA launched a special drug review and approval procedure, which formulated detailed approval plans and required technical points. The CFDA achieved synchronization in three areas while adhering to the principle of "protecting all

procedures and standards”: the Center for Drug Evaluation synchronized its technical evaluation with interim applications filed by enterprises, the Center for Drug Certification synchronized its field production inspection with production processes, and the NICPBP synchronized its batch inspections of clinical samples with enterprises’ self-inspection procedures. Related provincial-level food and drug supervision departments tightened supervision and completed required tasks with limited time through early intervention, comprehensive coordination, proactive response, and field inspections.²

At the same time, the NRDC and the MOF worked closely to provide specialized vaccination research and development funds early on to domestic vaccine manufacturers’, ensuring adequate preliminary preparations for the rapid development of Influenza A (H1N1) vaccine. The Support Group under the Joint National Prevention and Control Mechanism accomplished the following tasks: coordinated the rapid handling by the GAC and the AQSIQ of customs clearance formalities for vaccine strains, closely followed domestic influenza vaccine manufacturers’ progress in research and development, actively coordinated the material supply (chicken embryos, etc.) for vaccine production, and organized the development of vaccine batch approval procedures for rapid verification. The Expert Committee under the Joint National Prevention and Control Mechanism, worked with related MOH departments, the China CDC, MOST, CAS and other departments and institutions, and provided integral support and assistance for drug evaluation and approval tasks. The NICPBP launched organized research into quantitative measurement of vaccine antigens, which provided technical support for vaccine development and saved the one month it would’ve taken in waiting for WHO standards. The China CDC organized clinical trials for the developed Influenza A (H1N1) vaccines, including the recruitment, vaccination, observation, and blood sampling for over ten thousand participants, which produced considerable data in support of vaccine evaluation and approval.

5.3.2.3 Overall Vaccine Is Safe and Effective

Results from the clinical trials showed that the domestically developed Influenza A (H1N1) vaccines were both safe and effective. The injection of a 15 µg dose of Influenza Vaccine (Split Virion), inactivated, could reach or exceed a certain serum

²Specifically, the CFDA formulated support guidance on emergency prevention and control, such as the *Emergency Work Plan for Special Review and Approval Procedure of Vaccine against Pandemic Influenza*, the *Work Plan for Review and Approval of Vaccine against Influenza A (H1N1)*, and the *Technological Considerations for Influenza A (H1N1) Vaccine Research and Development*, as per Special Procedure for Drug Evaluation and Approval of the China Food and Drug Administration. While ensuring safety and effectiveness, the CFDA launched the special drug review and approval procedure, which provided an effective means of epidemic prevention and control and accumulated invaluable experience in terms of evaluation and approval of emergency drugs.

antibody titer (1:40), with a serum protection rate of over 85% among the subjects and of over 80% among those aged 60 and older; the trials proved that the vaccines were safe, and side effects were mostly mild reactions such as local inflammation, pain and fever. Results of clinical trials carried out in other countries also supported China's research findings. At the same time, according to monitoring results of suspected uncommon side effects from mass vaccination, up until November 30th, 2009, the country had reported 2867 cases of suspected uncommon side effects from vaccination, including common side effects (76.6%), uncommon side effects (11.48%), coincidental symptoms (6.63%), and psychogenic side effects (3.14%). Of the uncommon side effects, 29 cases suffered serious uncommon effects, including one case of Guillain–Barré syndrome, 16 cases of anaphylactic shock, and 12 cases of laryngeal edema, with an incidence rate of about one per one million people.

Influenza A (H1N1) vaccines developed and produced by China proved to be safe and effective, and the incidence rates of suspected uncommon side effects and serious side effects were on the whole consistent with conclusions published by the WHO about global safety evaluations of Influenza A (H1N1) vaccination. Data showed that the domestic incidence rate of serious side effects from mass vaccination was quite low, with no occurrences of mass drug-related safety incidents. According to results of the clinical trials, China's Influenza A (H1N1) vaccine and seasonal influenza vaccine were consistent in safety standards with other vaccine prototypes from North American countries, the EU, and Japan. Moreover, quality standards were higher for China's Influenza A (H1N1) vaccine than for seasonal influenza vaccines, with significantly higher control standards for constituents liable to cause allergic reactions such as egg albumen; the production review and approval process also involved animal experiments, which ensured the safety and effectiveness of vaccines. A vaccine with poor quality, if widely distributed, could cause considerable negative results. With more than 100 million people vaccinated in the country, the incidence rate of suspected uncommon side effects reported up until December 31st, 2009, was roughly 12.4 in 100,000 people, and most of those effects were mild in nature; the incidence rate of serious uncommon side effects was roughly 0.1 in 100,000 people, which evinces the safety of said vaccine. That being said, some serious cases did emerge. The occurrence of coincidental incidents and serious unusual side effects from mass vaccination is unavoidable; such cases were mostly incidental, followed by anaphylactic shock which caused death due as treatment was unavailable in time. During the same period, fatalities from the vaccination were reported in several countries, including five deaths in both the United States and Sweden, one in Hungary, two in Norway, and one in Israel.

5.3.2.4 Adequate Supply of the Vaccination

As stipulated by the 80th Executive Meeting of the State Council, the Support Group set the target of stockpiling 100 million doses of the Influenza A (H1N1) vaccine in the first quarter of 2010. The MIIT tapped into the potential of domestic

vaccine manufacturers' capabilities, increasing the monthly vaccine production capacity from 20 million doses in September 2009 to 45 million doses in January 2010. Sinovac Biotech Ltd. increased its annual vaccine production from 20 million doses to roughly 30 million doses; Hualan Biological Engineering Inc., the country's largest manufacturer of influenza vaccines, increased its annual production to 90 million doses; Zhejiang Tianyuan Biological Pharmaceuticals Co., Ltd., which had had an annual vaccine production capacity of five million, increased to 15 million doses, and possessed a monthly production capacity of five million doses.

Following the success in vaccine development, from September 2nd, 2009, to April 1st, 2010, the MIIT, joined by the MOF, the MOH and other departments, announced the *Vaccine Production Plans* to ten vaccine manufacturers, which called for the production of 151,546,000 doses in 795 batches (26 million doses for the national stockpile), covering over 10% of the Chinese population. Vaccination stemmed, to a certain degree, virus transmission in regions where people were inoculated. In November 2009, 360 clustered outbreaks were reported across the country, which was down by 39.5% from 595 outbreaks in October, suggesting that vaccination to certain groups had worked as successful deterrent against the pandemic influenza virus. Moreover, vaccination priority was also given to National Day parade troops and security guards (100,000 doses), to National Day celebration participants, and 11th National Games of China service workers (400,000 doses), which was a solid political move that engendered positive social feedback.

5.3.2.5 Industry Development for Vaccine and Diagnostic Reagents

Technological research into vaccine production capacity expansion led to considerable breakthroughs in key technologies, and the developed Influenza Vaccine (Split Virion), Inactivated, was approved as a new drug certificate. In addition, through the technical vaccine innovation alliance platform, the vaccine manufacturers involved experienced a huge boost in production capacity as breakthroughs in key technologies occurred. Up until April 13th, 2010, 151,546,000 doses in 795 batches produced by ten manufacturers were approved by the SFDA for distribution, with a proportion exported to foreign countries such as Mexico and Pakistan; multiple varieties of influenza diagnosis reagents were also authorized by the SFDA to go to market.

5.3.2.6 Vaccination Risk Communication Requires Improvement

On November 13th, 2009, the MOH declared two fatalities from the vaccination. Some websites published articles attributing the mid-November Influenza A (H1N1) outbreak in Beijing to the vaccination of primary and secondary school students; foreign media also reported the growing distrust the public expressed in the vaccines. According to results of a nationwide questionnaire, the ratio of respondents willing to be vaccinated to those unwilling to do so was at 4:1 in

August 2009, which then plummeted to 1:1 in November; meanwhile the rate of respondents unwilling to be vaccinated for safety reasons rose from 15 to 50%. In early December 2009, it was reported that nine children diagnosed with Influenza A (H1N1) in Shenzhen were found to have brain damage, which sparked a public debate as to “when to fight the virus and when to get vaccinated.” There were multiple factors to this problem. Firstly, government leaders in some regions expressed suspicion of vaccine safety, and at the same time they worried that too much advertising could cause a vaccine shortage, which would make their vaccination arrangements appear inadequate. Secondly, some provinces didn’t specify targets in their vaccination plans and instead simply distributed vaccines equally, making it difficult for local departments to select targets for the vaccination and hence compounding organization of the program. Thirdly, failure to clarify compensation for local workers engaged in the vaccination program was demotivating and the objective was not conducive to effective promotion of the vaccine. Moreover, media coverage of individual deaths from vaccination, coupled with unfavorable comments from well-known experts on the safety of the vaccines, and some home and foreign manufacturers’ acts of recalling problematic vaccines, produced certain psychological effects on the general public. Risk communication in the early phases of the epidemic mobilized the public and projected confidence in “preventing, controlling, and curing” the virus, which in turn made the vaccination look unnecessary. Risk communication that followed was so inadequate that the public lost all confidence in the program and some even expressed an “anything that is free can’t be good” mentality. Therefore, issues such as how to strengthen public affairs and risk communication, how to stress the pertinence and flexibility of vaccination programs, and how to avoid the awkward situations such as “people with access to vaccination don’t want to be vaccinated, and people who want to be vaccinated have no access vaccination,” are all worth further reflection.

5.3.2.7 Industry and Local Initiatives Need Further Strengthening

It is the government’s duty to foster good market conditions and guide business practices of vaccine manufacturers. The particularities of the vaccine industry mean it can neither be monopolized by the government nor be left to liberal market competition; a government monopoly could lead to low efficiency, and liberal market competition is not in the interest of the country’s security and social justice strategies. Presently, both national policies that encourage influenza vaccine research and development, and policies on financial compensation to vaccine manufacturers, are flawed in some way or another. Research capacity, development, and vaccine production against new subtypes or new strains are still not up to par, which poses a barrier to the early supply of vaccines against new influenza viruses. Vaccine application strategies and strategies regarding targeted priority groups also need refinement. At the same time, vaccine manufacturers should be encouraged to pursue influenza vaccine development and capacity building as part of their social responsibilities. Departments all over the country need be more active in their

vaccine supply efforts. It is important to note the duty of the government at various levels to fund vaccine storage and inoculation which in turn will greatly help less developed regions establish dynamic influenza vaccine storage systems, and help craft reasonable plans for the allocation of influenza vaccines. Surveys found that as of the summer of 2010, that local governments still had roughly 50 million doses of Influenza A (H1N1) vaccines in stock, and some regions and departments saw those unused vaccines as “a loss,” a sentiment that was shared across the board by many others.

5.4 Emergency Funding and Material Support

Dealing with a public health emergency requires adequate storage facilities and sound mechanisms for emergency materials storage, and involves the allocation of funds and materials needed for staff training, communication and education, epidemic monitoring, medical treatment of patients, inspection and quarantine, emergency management, and so on. In influenza A (H1N1) prevention and control, the availability of adequate funds and materials was crucial for the victory over the influenza pandemic.

5.4.1 Funding Support

5.4.1.1 The Central Government's Specialized Funds for Influenza A (H1N1) Prevention and Control

In response to the spread of the pandemic, the central government allocated five billion RMB in funds for support of Influenza A (H1N1) prevention and control efforts, and required local governments to appropriate funds for tailored prevention and control purposes. These funds were used to deploy materials such as disinfectants, purchase protective and medical equipment and sterilizing equipment, and develop and produce vaccines.

In 2009, the central government provided an appropriation of 4.328 billion RMB for the stockpiling of drugs and materials, and for prevention and control support efforts. To minimize the number of imported cases of Influenza A (H1N1), in implementing its “virus transmission containment” strategy, the central government appropriated 580 million RMB in special-purpose funds, allocated for inspection and quarantine, civil aviation, public security and other frontline departments to purchase body temperature measurement instruments, equipment sterilization and disinfectants, protective supplies and testing kits, inspection and quarantine devices, and eco-friendly treatment equipment. The strengthened immigration inspection and quarantine measures created a “firewall” against Influenza A (H1N1) and effectively accomplished the following: mitigated the pace and intensity of the

domestic transmission of the virus, won precious time to bolster response measures, it protected public health interests and safety, and greatly lowered adverse social and economic effects. The aforementioned funding included 1.085 billion RMB in national pharmaceutical stockpile funds used to purchase antiviral drugs, clinical treatment equipment, etc.; 896 million RMB in vaccination subsidies to western and central regions; and 1.26 billion RMB in national vaccine stockpile funds.

With the WHO raising the alert level to its highest measurement and with domestic cases on the rise, the central government appropriated funds in active support of epidemic surveillance, including the following: 301 million RMB in two installments to local health departments, allocated for expanding influenza monitoring sentinel hospitals and laboratories; 31 million RMB to the MOA, used for animal epidemic surveillance, stockpiling emergency materials, and vaccine evaluation; 63 million RMB to the MOH, used by the China CDC to improve its surveillance and testing capabilities, including purchasing equipment needed for Influenza A (H1N1) testing, as well as supplies and reagents necessary for large-scale rapid testing of nucleic acids, virus separation and cultivation, virus mutation analysis, and drug resistance monitoring; 37 million RMB and 43 million RMB to the MPS and the CAAC respectively; used in related prevention and control efforts; and 32 million RMB for other prevention and control purposes. In 2010, the central government appropriated 533 million RMB in subsidies for vaccine and syringe purchases.

At the same time, the MOF and the MOH, joined by other departments, issued the *Notice on the Issue of Expenses for Medical Treatment of Influenza A (H1N1)*, stipulated that medical expenses incurred by treatment in designated hospitals for Influenza A (H1N1) patients (including suspected and confirmed cases) and those with fever or acute respiratory symptoms, who were enrolled in the basic medical insurance system for urban workers, the medical insurance system for urban residents, or the new cooperative healthcare system, would be reimbursed pursuant to regulations through the mentioned systems. For patients who had not enrolled in any of those three insurance systems, and for poor patients who were still unable to afford their portion of medical expenses after reimbursement, could seek help from urban and rural medical aid programs. The MOF also issued the *Urgent Notice on Ensuring Funds for Influenza A (H1N1) Prevention and Control*, stipulating the following: make funding support for Influenza A (H1N1) prevention and control a top priority, utilize funds for vaccination and inoculations in real time, strengthen support of capacity building for medical treatment, ensure funding for paid transfer and storage of drugs, address funding for epidemic monitoring, and strengthen funds management and supervision.

5.4.1.2 Local Funding Support

Local finance departments also introduced policies and adjusted budget in time to increase funding for Influenza A (H1N1) prevention and control. For example, Beijing's finance departments appropriated over 800 million RMB for response

efforts, the Provincial Finance Department of Hebei appropriated more than 40 million RMB, and the Provincial Finance Department of Guangdong appropriated 43.95 million RMB.

In addition, some enterprises also stepped up investment in support of national disease prevention and control policies. Beijing-based Sinovac Biotech Co., Ltd., for example, invested 100 million RMB (including 20 million RMB in subsidies) in building production lines for new vaccines.

5.4.2 Material Support

On April 29th, 2009, the NDRC established a major emergency material support and coordination mechanism jointly with the MIIT as well as with MOF, MOC, MOH, and SDA; on that same day, the MOH made a request to the MIIT Department of Consumer Goods Industry for the increase of national health emergency stockpiles of clinical treatment materials and anti-epidemic materials needed for response measures. The support group headed by the NDRC was established under the Joint National Prevention and Control Mechanism on April 30th.

5.4.2.1 The Stockpiling of Antiviral Drugs

After the epidemic broke out, two Tamiflu manufacturers, whom were already a part of the national strategic stockpiling organization dedicated all of their production capacities to increasing the national stockpile. China also made timely re-arrangements in the export of raw materials needed for Tamiflu manufacturing to guarantee adequate supply for domestic production. In regards to insufficient production capacity, urgent expansion measures were adopted, and 10.2 million RMB was appropriated from the central finance budget to support the two manufacturers transforming and increasing their immediate and intermediate production capacities. As of July 15th, 2009, China had stockpiled 20 million doses of Tamiflu and formed a monthly production capacity of 60 million doses. 13 million doses of Tamiflu had been stockpiled by October 1st, and the stockpiling of 26 million doses as arranged by the State Council was completed by December 22nd, 2009. Moreover, 200,000 doses of the antiviral drug Zanamivir were also imported and stored. As of April 2010, more than 4.22 million doses of Tamiflu from the national stockpile had been deployed to provinces and related departments all over the country. Overall, the stocked amount of antiviral drugs did meet emergency response needs.

5.4.2.2 Material Support for Prevention and Control

Diagnostic testing kits, reagents, disinfection instruments, disinfectants, and protective equipment were stockpiled by various departments, and preparations were made for the provision of medical equipment needed to treat seriously ill patients. In April 2009, the MIIT appropriated 27 million RMB for the launch of a quality inspection system, including the purchase of 19,069 units of equipment and 3,502,500 units of protective equipment for port quarantine measures. Ports stockpiled emergency materials such as necessary disinfectants and diagnostic testing kits. On May 2nd, the MIIT issued the *Urgent Notice on Production Supervision over Medical Equipment for Influenza A (H1N1) Prevention and Control*, initiating daily production supervision in nine medical equipment manufacturers. On May 12th, the MIIT issued the *Urgent Notice on Production and Inspection of Peroxyacetic Acid, Bleaching Powders and Rapid Hand Disinfectants*, conducting real-time supervision over the production, orders, distribution and inventories in nineteen enterprises. On May 15th, the MIIT issued the *Urgent Notice on Production and Inspection of Masks and Protective Clothing*, carrying out dynamic monitoring of thirteen enterprises to ensure effective protection of the production and marketing of key prevention and control materials.

5.4.2.3 Traditional Chinese Medicine

Traditional Chinese medicine (TCM) is an important part of China's medical and public health industry, and together with Western medicine, it serves to protect public health and it plays a big role in public health emergencies. The MOH and SATCM issued the *Notice on Strengthening the Role of Traditional Chinese Medicine in Public Health Emergency Management*, clearly stating that, "There should be necessary support given to TCM with the arrangement of emergency health funding and material storages." Chinese patent medicines were stockpiled in relatively large amounts because of the options available for clinical treatment. For example, Beijing replaced 1 million doses of Tamiflu in its original stockpile plan with 2 million doses of TCM and Chinese patent medicines, which amounted to a four million-dose stockpile of Western and Chinese medicines.

5.4.3 Funding and Material Support Evaluations

During Influenza A (H1N1) prevention and control efforts, efficient and appropriate arrangements in terms of funding and material stockpiling bolstered public confidence in national response capabilities and laid a firm foundation for orderly, effective, and powerful future prevention and control work. Funding and material support also helped beat this epidemic. Nevertheless, there is still room for improvement in emergency stockpile standards, contents and methods, and corresponding funding measures.

5.4.3.1 Central Funding and Material Support Were Adequate and Efficient

The central government's appropriation in the initial stage of five billion RMB in specialized funds provided a fundamental guarantee for the success of national prevention and control efforts.

During the process of Influenza A (H1N1) prevention and control, central funding was relatively adequate by ensuring smooth operations for response efforts. These funds contributed to the following: the completion of antiviral drugs production and stockpiling which met prevention needs; the rapid coordination and fulfillment of prevention and control materials; the application of port quarantine prevention and control equipment and materials; and the protection of market supply for daily necessities and sanitary goods. However, the procedure for emergency appropriation of central funds requires refinement so that future funds can be rapidly allocated and fully leveraged for response efforts.

5.4.3.2 Local Funding and Materials Support Capacities Remain Inadequate, with Funding Mechanisms Yet to Be Improved

Because of the healthcare disparities between regions, some local governments have yet to pay in full for purchased vaccines, and there is a lack of proper financial support mechanisms for local governments' funds. The situation is even more severe when it comes to financial and material support for schools, as the general financial budget provides no consideration to health spending on the education system.

5.4.3.3 Medical Stockpiling Mechanisms for Pandemic Diseases Require Improvement

Executive Meeting of the State Council presided by Premier Wen Jiabao on April 28th, 2009, announced the decision to increase stockpiles for protective and epidemic prevention supplies, antiviral drugs, clinical treatment equipment. Nevertheless, the process of Influenza A (H1N1) prevention and control revealed problems that exist with the implementation of drug stockpiling for pandemic diseases (i.e. pandemic influenza).

Firstly, the *Administrative Measures for National Drug Stockpiling*, which was enacted in 1999, needs revision based on public health emergency situations as well as on adjustments in departmental functions. According to the *Administrative Measures for National Drug Stockpiling* and related contingency plans, national drug stockpiling takes place at both central and local levels. For national-level stockpiling, the MOH provides recommendations on the content and amount for stockpiling based on actual demand, and the NDRC (it is now the MIIT that oversees drug stockpiling) then consults the MOF to make funds available.

Similarly, for provincial-level stockpiling, health departments propose the content and amount to be stockpiled, and economic and trade departments then request funding from finance departments and to carry out the measures.

Secondly, national drug stockpiling was not comprehensively implemented at central and local levels. National funding fell short of meeting the needs of stockpiling health emergency material. When some provincial development and reform commissions made requests to finance departments for stockpiling funds, the finance departments deducted these funds from the provincial health budget, which discouraged local stockpiling efforts. When health emergency needs arose, these health departments directly requested the MOH to draw on the national strategic stockpile, even though their emergencies didn't reach the level that necessitated the use of the national stockpile. This caused unnecessary work for health emergency management. During the state of emergency, related ministries and commissions were unable to acquire comprehensive information on national and local stockpiles.

5.4.3.4 Medical Stockpiling Standardization, Measures, and Categories Need Further Refinement

A perplexing problem which was frequently came up in related departments and local governments surveyed was the lack of standards on drug and material stockpiling. Some local governments and departments stated that the population proportion needed for vaccination stockpiling was mostly based on officials' speeches, but whether these standards were adequate, scientific, and authoritative merits further discussion. At the same time, guidelines on drug and material stockpiling should be adjusted based upon epidemic trends. In regards to the stockpiling of drugs, provinces stockpiled general items on the drug list for the national stockpile, but procedures and regulations for government procurement in a state of emergency were lacking. The five regions surveyed suggested two-stage decision-making for emergency drug stockpiling: firstly, expert evaluations are performed; secondly, health departments could then determine the size of stockpiles, and in consultation with related departments, propose appropriate stockpiles according to capabilities of provinces and cities.

On the same token stockpiling materials used in public health emergencies should have robust reporting and management mechanisms regarding the amounts and types of materials, and specific principles for the allocation of funds. During the process of Influenza A (H1N1) prevention and control, problems emerged for local stockpiles of materials such as antiviral drugs, with few varieties and inadequate amounts. Though the use of Tamiflu in the early stages of Influenza A (H1N1) proved effective, in the early days of prevention and control only provincial-level health departments stockpiled small amounts of the drug, which was then allocated on a unified basis after epidemic break out. There were only 500,000 doses of Tamiflu and a very limited amount of N95 masks in the national stockpile before the Influenza A (H1N1) outbreak. Only 37,900 doses of Tamiflu were locally

stored, according to the *National Questionnaire on Material and Manpower Preparedness for Influenza A (H1N1)*, which the MOH Health Emergency Office conducted in early May of 2009 among health departments. Considering the shortage of materials in the national stockpile at that time, the MOH and the MIIT tightened the use of Tamiflu from the national stockpile. Moreover, the relationship between capacity building and material stockpiling needs strengthening, the drug bidding system needs improvement so that it matches the drug stockpiling system and guarantees that drugs and equipment to be stockpiled are safe. As for financial compensation for drugs, a regular claim system linked with stockpiling funds should be established. There should be a supporting system governing drug rotation, and both the central and local governments should move on to create a stronger stockpile system through collaboration between the government, market and the society, which would shed more light on capacity building and cyclical stockpiling.

5.5 Publicity and Risk Communication

Taking communication seriously with the public and mass media is one of the crucial components of emergency management both in theory and in practice. For a public emergency in particular, given its widespread impact, large population involvement, and risk to life and property, the people are anxious to know their situations and need to obtain facts from related departments or organizations to build confidence. In coping with Influenza A (H1N1), the Chinese government and related departments, drew upon experiences and lessons learned in the 2003 SARS crisis, and were then able to implement effective risk communication and health education campaigns. As a whole, the government launched comprehensive publicity and opinion guidance efforts in accordance with the needs of the entire prevention and control in the process.

5.5.1 Systematic Risk Communication

SARS crisis in 2003 shed light on risk communication and its importance in handling public health emergencies. For the first time, China actively employed and developed its risk communication ideas and methods to cope with Influenza A (H1N1).

5.5.1.1 The Foundation and Preparation of Risk Communication

In 2007, the MOH collaborated with the U.S. CDC on textbook compilation and nationwide training revolving around risk communication, and one year later compiled the *Guidance on Public Health Emergency Response and Risk*

Communication. This Guidance Document, intended for response practices for public health emergencies, provided a detailed and rich introduction to risk communication theories in the sphere of public health emergencies. A series of contingency plans, most notably the *Influenza Pandemic Preparedness and Response Plan (Tentative)*, as well as other related plans, enriched knowledge and information about epidemic prevention and control. Meanwhile, the MOH launched a nationwide risk communication training program for public health emergencies, which created a considerable reserve of professionals ready to handle such situations.

In regards to the construction of a risk communication system, the MOH established a press release and spokesperson system as well as communication mechanisms and relations with major news media and journalists, which played an important role in the building of risk communication channels and mechanisms. The *Notice of the General Office of the Ministry of Health on the Work of Health Publicity for 2009*, which was issued at March, 2009, by the MOH's General Office, was the first MOH document to enshrine the words "risk communication" in a public document. It stressed the importance of "strengthening risk and crisis communication" and required "the full recognition of the importance of risk communication in routine work and of the dissemination of information in emergency management." In March 2009, the MOH refined the *Guidance on Public Health Emergency Response and Risk Communication*. These systems and documents provided a policy basis for the application of risk communication in public health emergencies.

5.5.1.2 Early Warning Risk Communication

In late April 2009, when Influenza A (H1N1) started across North America but had yet to reach China, China's related health departments began taking action, including conducting epidemic analysis, making preparations, and guiding public opinion towards a proper understanding of the virus. Upon receiving an epidemic alert from the WHO, the Chinese government placed it as a top priority and began coping with new epidemic challenges in an orderly and organized manner. This included the following actions: providing the public with information on Influenza A (H1N1) situations abroad through press releases, media coverage, and interviews with experts; describing the virus' features and transmission mediums as well as potential preventive measures; and projecting a knowledgeable and authoritative voice to the public in the early phases of the epidemic. In this stage, related departments' publicity and communication efforts made through various channels and forms, enabled people in having a basic understanding of Influenza A (H1N1) and spurred the public to take preventative actions against it. This timely initiative in risk communication was conducive to raising public awareness of the virus and acted as a warning for the public.

5.5.1.3 The Reduction of Social Panic

Effective risk communication after the first imported case was reported helped the public come to terms with Influenza A (H1N1) and removed any unnecessary panic. After the first imported case was found on May 11th, and the first domestic case on May 29th, 2009, people began to feel uneasy about this new infectious disease of foreign origin. In response, related departments took swift action: On May 11th, i.e. a day after the first case was reported, related departments held a press conference briefing the media about the possible route of transmission of the first case, its diagnosis and treatment, epidemiological survey outcomes, etc. While stressing the importance of self-protection and a reasonable attitude towards the virus, the public was also told that more cases could emerge; meanwhile, experts and related professionals were requested to provide scientific, authoritative, and comprehensive knowledge about disease prevention and control, in an effort to reduce public fear and guide the people to employing rational treatments. Of course, sensationalized reporting from some news sources after early cases began to emerge may also have intensified the public's uneasiness. This suggests that proper guidance of the media and public opinion is crucial for risk communication.

5.5.1.4 Confidence Building Through Scientific Risk Communication

In the early days of the Influenza A (H1N1) epidemic, related departments made it a point to use authoritative media to disseminate scientific and dependable epidemic information to the public, with the hopes of bolstering public confidence in the departments' response capabilities, and to project the firm belief that the people could beat the virus. At the onset of the epidemic, the MOH in collaboration with the China CDC, organized a risk communication team of experts on epidemiology, emergency disease control, vaccine research and development, and international relations, to ensure the timeliness, authoritativeness, and effectiveness of risk communication. After the epidemic continued for some time, fearing that people had become complacent in their own self-protection, the public was urged now and again to stay alert and employ scientific response actions. On August 31st, 2009, for example, the MOH, joined by related departments, launched an Influenza A (H1N1) Prevention and Control Initiative, which was widely promoted through multiple channels. Its purpose was to boost public awareness, ideas, and actions against the virus, and to ensure continued response efforts from all of society.

5.5.2 Strengthened Public Health Education

Coping with a public health emergency like the Influenza A (H1N1) epidemic requires not only the maintenance of the status quo but also the employment of emergency risk communication and related measures; not only does it require

comprehensive collaboration between departments and institutions, but also public participation and cooperation. One crucial way to achieve this is implementing widespread health education campaigns.³

Health education was placed at the forefront in the process of coping with the Influenza A (H1N1) Epidemic. On April 27th, 2009, the MOH issued the *Notice on Strengthening Preparedness for and Response to Human Swine Influenza*, requiring health departments at all levels to launch extensive public health campaigns—including disseminating prevention knowledge to the public via T.V., radio, and pamphlets. With concerted efforts and collaboration from various departments throughout the country, a countrywide health education campaign rapidly unfolded. News reports, advertisements, bulletin boards, posters throughout the country—in schools, hospitals, stations, airports, government buildings, and other crowded places—informed people that Influenza A (H1N1) was “preventable, controllable and curable.” These public health campaigns were designed to provide the people with a comprehensive and accurate overview of prevention and control methods.

5.5.2.1 The Organization of Experts in Promoting Health Education

Influenza A (H1N1) Epidemic, related departments and agencies of the MOH established an expert advisory mechanism which included experts in epidemiology, public health, disease control and prevention, and emergency management, to meet the huge public demand for knowledge about the epidemic; media interviews were arranged across the nation with these experts in order to disseminate pertinent public health information. On May 8th, 2009, related departments held a health education and risk communication symposium, at which experts in health education and influenza prevention and control provided an overview of the virus to journalists, and this information including routes of transmission, symptoms, preventive measures, and hygienic habits was then given to the public to aid in their prevention and control efforts.

5.5.2.2 The Timely Dissemination of Health Education to the Public

With the continuous development of the epidemic as it morphed into different phases, it was crucial that the public possess comprehensive knowledge about Influenza A (H1N1) symptoms, body temperature measurements, prevention, isolation, treatment, vaccinations, and the use of TCM medicines. In response, related

³Health education focuses “knowledge, faith and behavior” about health, i.e. disseminating knowledge, changing people’s attitudes towards some health issues and letting them develop good behavioral habits.

departments worked together tirelessly to collect and summarize related epidemic prevention and control information in order to provide timely updates to the public via effective communication channels.

5.5.2.3 The Use of Media to Broaden Health Education Channels

A prominent feature in the process of Influenza A (H1N1) prevention and control was the application of multifaceted dissemination channels by related departments. For health information regarding the epidemic, traditional mainstream T.V. channels and newspapers performed well given their advantages of wide coverage and their capabilities to present a wide range of content. In addition, a wide variety of alternative methods were applied as a complement to traditional news dissemination, including workshops, posters, cartoons, slogans, billboards, leaflets, bulletin boards, web pages, short messages, and electronic displays.

5.5.3 The Methodical Implementation Publicity and Public Opinion Guidance

Publicity and opinion guidance are of particular importance when mitigating public health emergencies. The 2003 SARS crisis taught everyone a harsh lesson in regards to this. After 2003, central and local government agencies began pushing for the establishment of a sound press release and spokesperson system, with the MOH taking the lead by creating such a scientific and effective system to cope with public health emergencies. All provincial-level health departments across the country appointed spokespersons who then published health information either regularly or irregularly. Preparations were already in place for publicity and opinion guidance in dealing with Influenza A (H1N1). These preparations were fully integrated with a high degree of coordination, including the planned release of epidemic information, and comprehensive opinion surveillance, and these concerted efforts yielded positive results for response efforts.

5.5.3.1 The Planned Release of Epidemic Related Information

Before Influenza A (H1N1) cases emerged in China, the MOH Information Office had formulated the *PRC Contingency Plan for Information Release on the First Confirmed Case of Influenza A (H1N1)* in accordance with the *Infectious Disease Prevention and Treatment Law*, the *Government Information Disclosure Regulations*, the *Plan of the Ministry of Health for Information Release on Notifiable Diseases and Public Health Emergencies*, and the *Contingency Plan of the Ministry of Health for Information Communication over Emergencies*. When a

suspected case was reported, according to the *PRC Contingency Plan for Information Release on the First Confirmed Case of Influenza A (H1N1)*, the MOH Information Office would publish that news, and once the case was confirmed, hold a press conference at 10:00 a.m. or 15:00 p.m. on the day of the confirmation. The division of labor was as follows: the press release script was drawn up by the General Group under the Joint National Prevention and Control Mechanism; answers to questions were prepared by the Healthcare, General, Port, and Dissemination and Communication Groups; and it was the duty of the General Group (MOH Information Office) to arrange media interviews, press conferences, and the collection of information on public opinion about the press conference.

With the Influenza A (H1N1) epidemic raging in North America, as per instructions from the CPC Central Committee and the State Council, the General Group under the Joint National Prevention and Control Mechanism, in light of epidemic characteristics and the procedures and requirements for dealing with such a public health emergency, carried out planned news publications and press releases in order to form a unified communications front for epidemic response. On May 2nd, the MOH Information Office issued the *Notice on Strengthening Publicity and Opinion Guidance with Respect to the Influenza A (H1N1) Epidemic*, which provided instructions on epidemic information disclosure, requiring health departments of all levels across the country to strengthen publicity, health education, and risk communication and respond to questions raised by the public. The Notice pushed for public opinion correction and maintenance social harmony and stability, and it required health departments to appoint—and submit the names of—press spokespersons and information office heads for Influenza A (H1N1) prevention and control efforts. Provincial health departments were required to communicate with the MOH before publishing epidemic information, and some provinces ensured horizontal risk communication for news releases between its health department and ministerial departments.

According to division of labor and work requirements, the MOH Information Office released epidemic information on a national scale, with provinces, regions and cities publishing information separately; it also coordinated press and publicity efforts among press departments, such as the CPC Publicity Department, as well as mainstream news outlets surrounding hot topics and related departments' decisions on prevention and control measures. Since April 2009, the MOH has held eight press conferences and eleven briefings, ensuring the timely announcement of important information and policy measures. The MOH also established a six-person team—whose members came from several departments—tasked with communicating with the media, analyzing media focal points, monitoring media activity, formulating communication strategies, passing timely and accurate information to media sources, and providing guidance to provincial health departments on information disclosure.

In regards to public communication, direct communication channels were provided by the 12320 Health Hotline, and MOH website, the website of the Chinese

Center of Health Education, and other public health services. Online interviews were also conducted through Xinhuanet and China.org.cn to stimulate public communication.

5.5.3.2 The Leveraging of Mainstream Media for Publicity and Communication

As per arrangements and requirements of the Joint National Prevention and Control Mechanism, member agencies of the Dissemination and Communication Group launched an epidemic press coordination mechanism for communication and publicity. With concerted efforts made on all sides, a news reporting network was swiftly created which consisted of central and local mainstream and emergency media channels—including newspapers, radio, T.V., and the web—for the accurate, timely, and appropriate reporting of epidemic information and government prevention and control measures. With the emergence of imported cases and the influx of epidemic trends, all media channels reported—as per the principles of “timeliness, and accuracy, openness, and transparency”—on measures from related departments and local governments as well as on outcomes of such efforts in various fields. All in all, a positive, orderly, and stable social atmosphere was created during response efforts from the close collaboration and painstaking arrangements on the part of the Dissemination and Communication Group, related agencies and departments. These efforts provided strong public opinion support that lasted the duration of the epidemic.

5.5.3.3 Comprehensive Public Opinion Monitoring and Guidance

A comprehensive public opinion monitoring system was created through internal publications including the State Council General Office's *Internet Information Digest*, the CPC Publicity Department's *Press Work Bulletin*, *Online Public Opinion Monitor* overseen by the Public Opinion Bureau of the State Council's Information Office, *CAS Bulletin*, the MOH Information Office's *Analysis and Reporting of Public Opinion about Influenza A (H1N1)*, Xinhua News Agency's *Press Proofs of Domestic Events: Public Opinion*, the Ministry of State Security's (MSS') *Express News*, and *China-related Public Opinion Bulletin* of the International Communication Office of the CPC Central Committee.

During Influenza A (H1N1) prevention and control efforts, related departments carried out opinion guidance work that was based upon scientific decision making and thorough coordination, targeting hot discussion topics about domestic and foreign events—especially online opinions expressed in online messages, blogs and posts—including: (1) Clarifying falsehoods and guiding public opinion regarding foreign media allegations that Influenza A (H1N1) had originated in China; (2) Helping the public understand national response measures like isolation and medical observation, and dispelling doubts over “excessive prevention and control”

and “too harsh measures;” (3) Working with internet users who called for China to suspend relations with the United States and Mexico, and encouraging users to face the epidemic and migration rationally; (4) Encouraging the public to rationally deal with the large number of students abroad who might return for summer holidays; (5) Dispelling fear from the increase in imported cases and when the WHO raised its pandemic alert to the highest level on June 11th, 2009; and (6) Requesting the public, especially targeted priority groups, to try and understand the importance and need for vaccinations.

5.5.4 Overall Evaluation of Publicity and Risk Communication

Overall, during the epidemic, related departments put a lot of effort in publicity and risk communication; results for risk communication in particular were quite successful, and played a crucial role for over a year in epidemic management. Nevertheless, it should be noted that problems did arise in publicity and risk communication, which are worth attention.

5.5.4.1 Successful Risk Communication Ideas and Methods Employed in the Newly Built System

When the influenza pandemic was raging abroad and closing in on China, related departments meticulously and scientifically brought risk communication ideas to life, ensuring smooth and orderly operations during the entire epidemic response effort. Risk communication provided the public a solid understanding of the epidemic, removed unnecessary worries and fears, and ultimately bolstered public confidence and resolve in defeating the epidemic. The incredible outcomes of these efforts are as follows:

Firstly, successful publicity, risk communication, and health education provided the public with scientific information and necessary guidance, which helped people overcome their fears and instead build confidence and resolve, which was an important assurance of beating the epidemic.

Secondly, risk communication to a certain degree changed public perception and attitudes towards public health risks. It encouraged people to look at the epidemic scientifically and objectively, and thus ensured the continuation of the status quo.

Thirdly, by providing the media with authoritative, timely, and comprehensive information, interactions between the public and media were strengthened, which created a positive atmosphere to defeat Influenza A (H1N1).

Fulfilled the requirement of “strengthening public opinion monitoring and actively guiding the public towards participation in epidemic prevention and control” according to the principles of “timeliness, accuracy, openness, transparency, positive guidance, and moderateness in amount.”

Fifthly, the epidemic represented a precious opportunity for risk communication teams, which helped them gain experience, increase knowledge, and strengthen capabilities in public health emergency mitigation.

Finally, it helped us to improve publicity and risk communication in terms of systems, mechanisms, and specific support measures.

5.5.4.2 Publicity Channels and Methods Require Further Development, and It Is Necessary to Actively Develop Information Resources and Make Full Use of New Media Channels

How, in press release and publicity, to meet new challenges that arise from the emergence of different media platforms, and innovate channels and methods for publicity and dissemination, are some of the key issues that merit further attention for present and future public emergency management. New dissemination methods and communication platforms also pose unique challenges for publicity and dissemination.

Influential news media should take the brunt of the responsibility in coping with public health emergencies. Survey results show that related health and disease control departments expected the news media to take on as much information dissemination tasks as possible while performing their normal duties in the case of a public health emergency. There was also the expectation for related departments to come forward and coordinate with the media during public health emergencies by providing potential scenarios or phases of the epidemic, to enable the rapid and widespread dissemination of relevant prevention and control information

Mainstream media represented by central media such as People's Daily, Xinhua News Agency, China Central Television (CCTV), and China National Radio (CNR) leveraged their traditional and irreplaceable advantages in dealing with the Influenza A (H1N1) Epidemic. It must be noted, however, with the recent emergence of the internet as a representative of commercial portals and other new sources, reporting and public opinion on related events—especially public health emergencies—have diversified and enriched the channels and methods by which people receive information. That being said, this diversification also presents unprecedented challenges in the work of publicity and opinion guidance. Targeting this divergence and imbalance in public opinion, related departments should, in addition to bolstering public opinion monitoring, spend more energy expanding new sources, mobilizing and utilizing new media participation, find innovative ways to integrate and lead this new trend, and provide scientific, effective, and reliable public opinion guidance. This will in turn create an atmosphere which is positive, objective, and progressive. Today, it is imperative that we explore leveraging new media spaces and channels like blogs, microblogs, social websites, and mobile media for more effective publicity, risk communication, and health education.

5.5.4.3 Risk Communication Mechanisms Require Further Improvement

In the process of risk communication in the Influenza A (H1N1) Epidemic, no solid, multi-interactive platform was established between the health departments, experts, and the public; instead information flowed predominantly in a single direction. Without a multidisciplinary and well-defined risk communication expert team and a scientific, authoritative, and systematic risk communication system, it was essential to enhance public participation and interactions with experts. Discrepancies in risk communication capabilities between central and local governments still exist, and in some cases, the differences are staggering. There was also inadequate communication content, forms, and channels (multi-dimensional) that were tailored (focused) and familiar to different groups of people. In addition, the “social mobilization” risk communication model produced some negative results. The exaggerations at the start of the epidemic about the situation abroad caused unnecessary panic. Some medical workers surveyed felt that there may have been an over-projection of confidence by prematurely declaring Influenza A (H1N1) “preventable, controllable and curable” in early May 2009, when not much was known of the virus, nor was there any rigorous scientific proof supporting that claim. These findings merit discussion. Thus, in dealing with public health emergencies, utilizing the news for effective, scientific, and appropriate risk communication, so as to avoid either unnecessary panic due to sensational reporting or the possible disinterest in the epidemic due to lack of reporting, is an issue that needs improvement for future public health emergencies.

5.5.4.4 Risk Communication Regarding Controversial Issues Still Has Room to Improve

For risk communication regarding such subjects as case fatality rate, pregnant women cases, and vaccination safety, there are still several areas which need further analysis and improvement, as there is a lack of comprehensive and planned risk communication strategies and measures. Moreover, facing uncertain epidemic trends and the overflow of complex information, people need access to scientific and authoritative knowledge and information about epidemics. In retrospect, during the Influenza A (H1N1) epidemic, the rumor circulation about prevention and control in some ways confused the public and undermined the effectiveness of health education campaigns. For example, rumors such as: “Ordinary Chinese medicine can cure Influenza A (H1N1),” “Prickly pears also can kill Influenza A (H1N1),” and “A hot pot to treat Influenza A (H1N1)” circulated constantly throughout the epidemic.

5.5.4.5 There Is an Urgent Need for Health Education to Be Regular, Standardized, and Systematic

Health education is an important part of public health emergency mitigation. However, it should be noted that when handling a public health emergency, we could achieve twice the results with half the effort if people had regular access to related knowledge and developed good health awareness and habits. It is therefore crucial to carry out regular, society-wide health education campaigns targeting related public health issues. Health education in terms of regularization and systematization needs strengthening, and vigorous improvement is required in making health education more individualized, original, and participatory. Moreover, health education expert groups should be better reinforced.

5.6 International Collaboration

The Influenza A (H1N1) Epidemic originally broke out in Mexico and the United States, places where China had close contacts. In light of this, the Joint National Prevention and Control Mechanism specifically established the Foreign Collaboration Group at the onset of the epidemic, which was tasked with international (including Hong Kong, Macao and Taiwan) affairs related to epidemic prevention and control, collecting related information, and actively participating in global efforts to fight Influenza A (H1N1). This group took the perspective of maintaining the country's national interests and international prestige, in an effort to strengthen international collaboration. Overall, China's active participation in international collaboration on the Influenza A (H1N1) epidemic garnered positive worldwide feedback and recognition.

5.6.1 *Collaboration with the WHO*

In April 2009, when the Influenza A (H1N1) epidemic broke out in North America and began spreading to other countries, China's related departments stayed in close contact with the WHO, reporting domestic epidemic situations and enhancing collaboration on information reporting and technology.

Moreover, China participated in WHO events and global activities in the sphere of public health. At a critical moment in Influenza A (H1N1) epidemic response efforts, on August 21st, 2009 the MOH and the WHO held an international symposium on "influenza response and preparedness," which explored public health policies and implementation strategies, where related parties shared experience and lessons learned in global efforts towards Influenza A (H1N1) prevention and control. The symposium also encouraged international communication and collaboration between specialists in related fields.

5.6.2 Collaboration with Other Countries and International Organizations

5.6.2.1 The Strengthening Scientific and Technological Exchanges and the Sharing of Epidemic Information

In dealing with Influenza A (H1N1), in addition to collaboration with international organization such as the WHO, related departments also worked with other countries and regions in multiple respects. The Chinese government followed epidemic situations and response measures abroad, and worked actively on domestic epidemic prevention and control. At the beginning of the epidemic, China stayed in contact with Mexico, the United States, Canada and other countries to strengthen collaboration on information and technology. On May 7–8th, 2009, Health Minister Chen Zhu led a delegation to the ASEAN Plus Three Health Ministers' Special Meeting held in Thailand, during which the health minister coordinated specific response measures, adopted a joint statement, signed an action plan for China, Japan, and South Korea against the influenza pandemic, and launched an epidemic reporting mechanism, all of which were part of the country's effort to strengthen collaboration with neighboring countries on epidemic response. To better understand epidemic developments and trends in Mexico—which could be of some value to China's epidemic prevention and control efforts, Chinese and Mexican health officials held a teleconference on May 27th, 2009, to share latest technological information and experiences.

Moreover, the China CDC and the U.S. CDC collaborated on virus specimens, disease resistance research, information exchange, etc., and exchanged personnel to strengthen such collaboration. China also cooperated with Canadian health authorities, and through their Global Public Health Intelligence Network (GPHIN) became acquainted with global epidemic trends and latest response efforts, which provided necessary references and a basis for the country's response strategy. The government carried out diplomatic activities in seeking support from related countries and international organizations in terms of vaccine development and storage, which was valuable in the development of the world's first Influenza A (H1N1) vaccine.

5.6.2.2 The Provision of Humanitarian Assistance to Countries Based on China's Domestic Capabilities

China was vigorous in its provision of humanitarian aid to other countries based on epidemic trends and on China's own domestic capabilities. On May 1st, 2009, days after the Influenza A (H1N1) Epidemic broke out in Mexico, the Chinese government donated five million USD worth of materials in humanitarian aid to Mexico, which was transported in a chartered airplane and was the first aid Mexico had received since the outbreak. On May 4th, China's second donation to Mexico

included 70 tons in weight of masks, eyewear, gloves, disinfectants, and thermometers. In June 2009, China provided training in Influenza A (H1N1) laboratory technologies to 16 specialists from eight ASEAN countries. On September 23rd, 2009, President Hu Jintao, spoke at the 64th Session of the United Nations General Assembly, making the promise to the international community that “China is willing to offer help in its power to developing countries in dealing with Influenza A (H1N1).” At the end of 2009, when vaccine production was still inefficient in meeting the needs of 1.3 billion people, the Chinese government allocated a portion of the vaccines to help African countries plagued by the virus, highlighting China as a responsible major country. In early 2010, related government departments permitted Beijing-based Sinovac Biotech Ltd. to export Influenza A (H1N1) vaccines to Mexico.

In addition, through collaboration with the WHO, the CNIC provided fourteen countries including Cuba, Mongolia, and Vietnam, as well as Macao, with China's independently developed test kit and training for their professionals.

5.6.3 Foreign Affairs Management

Not much was known by the people regarding epidemic trends and characteristics in Northern American countries, where the epidemic was in full swing. To prevent the epidemic from spreading to China, related government departments tightened entry measures according to regulations, including: suspending flights from Mexico, placing passengers entering China under quarantine, and tightening visa policies towards epidemic-stricken countries. These measures bought precious time for the country to judge epidemic situations and prepare for it. However, misunderstandings and dissatisfaction among some foreign governments and people about China's related measures did emerge. In response to this, foreign affairs departments took a series of powerful, organized, and effective actions to communicate with these groups, and managed to resolve conflicts and yield positive results.

5.6.3.1 The Suspension of Mexican Flights

On May 2nd, 2009, the Chinese government decided to temporarily suspend Aeroméxico flights flying from Mexico to Shanghai, and reached agreement with the Mexican government that both countries would send chartered planes to return nationals. Though Chinese authorities communicated frequently with their Mexican counterparts, misunderstanding still arose in Mexico and elsewhere. In response, related Chinese ministries and embassies made concerted efforts—including multi-party communication and cooperation- to clarify the situation and strengthen cooperation. On July 2nd, 2009, Health Minister Chen Zhu, with his delegation, participated in a high-level meeting on global Influenza A (H1N1) prevention and control held in Cancún, Mexico, at which meeting he profiled China's epidemic

situation and response measures, and garnered support from the participants. Through painstaking efforts, the unfavorable effects caused by suspending Mexican flights were successfully mitigated.

5.6.3.2 Placing Passengers Entering China under Quarantine

Because Influenza A (H1N1) originated abroad, isolation and medical observation measures for passengers from epidemic regions, especially ones who once had close contact with suspect or confirmed cases, became a major countermeasure with which the government dealt with Influenza A (H1N1) in the early stages of the epidemic. Therefore, the government and related departments, from the beginning, ensured careful and considerate arrangements were made. Living conditions for foreigners quarantined in China was a top priority, and standards and procedures were formulated to ensure their stay was as comfortable as possible. All related departments properly handled isolation and observation measures in accordance with the law, and provided foreigners with scientific diagnoses, living necessities, and ensured the patients were properly cared for. Meanwhile, strengthening information reporting mechanisms and channels between local foreign affairs departments and related central departments was high on the list of priorities, and related countries were informed at the earliest possible time of their nationals quarantined in China. This was to ensure smooth operations and to minimize possible adverse effects.

On May 1st, 2009, upon learning that the first confirmed case in Hong Kong had traveled via Shanghai, related departments immediately took action and tracked down all passengers who had been on the same flight (AM098). Isolation and medical observation measures were then adopted in accordance with the law. On June 8th, Ray Nagin, Mayor of New Orleans, was placed under quarantine in Shanghai after a suspected case was found on his flight. An official statement from the U.S. noted that Nagin and others quarantined were treated well in China.

Moreover, in order to effectively control the spread of the virus and lower the risk of transmission from imported cases, the Chinese government also tightened visa policies towards epidemic-stricken countries and cultivated proper support measures. Because of these measures and arrangements were well executed, the matter didn't attract any undue attention abroad.

5.6.3.3 Policy Adjustments on Visiting Delegations and Groups

With China's frequent cultural and trade exchanges, along with targeting necessary delegations to China, related governments departments ensure tailored and flexible treatment of different groups on a case by case basis. Through active collaboration, arrangements, and strict planning by related departments, local, and central governments, response measures and prevention preparedness plans were implemented, along with active communication and information disclosure. These efforts helped

garner understanding and cooperation from the foreign visitors. In June–July 2009, the 2009 Chinese Bridge for American Headmasters and Summer Camp activities were carried out smoothly, safely and efficiently, which greatly promoted cultural exchange and cooperation between China and the United States, and earned praise from both sides. Moreover, with meticulous preparations, prevention and control was successful for foreign participants of the Canton Fair 2009 and the China Cross-Straits Technology and Projects Fair 2009.

5.6.3.4 Communication Over Foreign Prevention and Control Measures

Related prevention and control measures needed to be strengthened as China is the world's largest pig producer, and it was emphasized that China's related measures were all in accordance with relevant regulations and principles of the World Trade Organization (WTO) and the World Organization for Animal Health (OIE). These were temporary measures targeted to protect the health of Chinese citizens and the security of the country's livestock industry. These temporary measures were crucial since the "swine flu" was still largely ambiguous. The United States and Canada finally expressed their understanding and recognition of China's measures.

5.6.4 Evaluations of International Collaboration

Overall, through concerted efforts and close collaboration for Influenza A (H1N1) prevention and control, while related foreign departments maintained social and economic stability, they also strengthened multi-faceted international collaboration, obtained necessary international resources and support for response efforts, and resolved misunderstandings that related countries and people had about certain domestic prevention and control measures. This was the first time China had received worldwide recognition and praise for mitigating a public health emergency.

Nevertheless, in regards to specific communication and collaboration, especially the treatment of foreigners kept in quarantine, further coordination between provincial-level foreign affairs departments and national level agencies like the MFA needs to be strengthened.

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