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The Public Health System Response to the 2008 Sichuan Province Earthquake: A Literature Review and Interviews

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Abstract

In this paper, the authors describe and comment on the public health system response to a catastrophic earthquake measuring 8 on the Richter scale that hit the Sichuan province in China on May 12, 2008. Drawing on the literature and field research, including a series of interviews with survivors, first responders and policy makers, the post-disaster analysis presented here describes and discusses the counter methods employed during the public health response to the disaster. It also presents a conceptual framework to describe the response, emphasizing pre-existing preparedness level of the medical and public health systems, as well as social, economic and geo-political factors having an impact on mitigation efforts. The framework presented in this manuscript could be used by other researchers to describe and analyze the emergency response to other disasters.

Background

On May 12, 2008, the Sichuan Province of China was hit by an earthquake with Richter scale magnitude of 8.0. The Chinese government reported that as a consequence of this disaster 69,227 Chinese citizens were killed, 374,643 injured, and 17,923 missing (2009c). The earthquake affected a very large area, with the epicentre in the Wenchuan County in the Sichuan Province at a depth of 12 miles. Presented in this manuscript are the results of a literature review and a series of semi-structured interviews conducted with medical and public health professionals, policy makers, and survivors in China. Official documentation from the Chinese government responding agencies, the United Nations (UN), the World Health Organization (WHO), and media reports, were consulted as well and drawn upon prior to conducting the interviews and

referred to in this manuscript. Objectives of this study were: 1) To describe and analyze the public health system response to the Sichuan Province earthquake; and 2) To develop a conceptual framework that could be used by other researchers to describe and analyze the public health system response to other disasters.

Conceptual Framework and Acquisition of Information

The literature review included scientific publications, Chinese government reports, international organizations, and news reports. Fieldwork for this study was undertaken by a Master of Science in Public Health (MSPH) student (LL) during a field campaign in 2009 as part of an experiential learning project. In such occasion, key informant interviews were performed with 24 subjects. Interviewees were selected through existing contacts with academic partners to be mentors to the student and provide information on their experience in responding to the earthquake. Representing agencies are listed in detail in Table 1. The interviews focused upon the rescue efforts as well as medical and public health aspects of the response to the disaster. More specifically, the following topics were discussed: governmental organizations role during the response, coordination between local and central government, contingency plans and communications, timeline of the response and population reactions and needs. Notes were taken during the interviews and major themes were derived from the analysis of such notes to describe specific medical and public health response challenges. The themes and the results of the literature review were combined into a conceptual framework with the dual purpose of creating a structured outline of the description of the response to the Sichuan earthquake and providing suggestions to other researchers and practitioners interested in describing emergency response challenges to similar disasters. The framework includes the following four major domains: leadership, medical response, public health response, and societal response. Each domain has

sub-domains considered to be major issues in the overall emergency response to the earthquake. A graphical representation of the conceptual framework is shown in Figure 1 and details on the response to the Sichuan earthquake for each of the domains and sub-domains reported in the framework are presented in the paragraphs to follow.

Summary of Findings

Geography, Environment and Timing

The earthquake occurred in the early afternoon of a week-day, at 2:28 PM when most people were at work or at school. As a consequence of the many poorly constructed school buildings, over 5,000 children died. It occurred in mountainous and rugged terrain, 3,000 meters above the sea level, causing numerous environmental consequences, such as landslides, rock avalanches and debris flows. Due to the rough terrain and close proximity to the earthquake's epicentre, accessing inhabited rural regions of the affected area was a challenge to responders. Debris in the air made visibility difficult for helicopters to fly, forcing mobilization of response teams by foot. Aftershocks, over 33,000 being monitored up to October 21st, and landslides constituted significant barriers to relief efforts by severely inhibiting rescuers from accessing the disaster-affected areas and limiting their ability to evacuate survivors and victims. In particular, many rivers were blocked by large landslides and over thirty "quake lakes" formed behind the blockages causing a significant flood risk to the millions of people living downstream. Interviewees reported that major engineering efforts were directed to reduce pressure on the new dams and restoring water flow, and local agencies took the lead in coordinating the evacuation efforts of some entire villages because of the flooding. Furthermore, in the city of Shifang, the collapse of two chemical plants caused leakage of more than eighty tons of liquid ammonia, killing several hundred people (Hooker, 2008). During the aftermath, heavy storms occurred and

wrecked roads, hampered efforts to reach affected areas, triggered mudslides and added pressure to weakened dams.

Leadership

Prior to the disaster, China had developed an emergency contingency plan for earthquake disasters and conducted regular exercises and drills testing evacuation plans. From the moment the earthquake struck, China established an emergency response command body, with the Premier taking the post of commander-in-chief. China has had a long history of earthquakes with the first being documented in 1177 B.C. (2008c) and the deadliest on records occurring in Shaanxi in January 1556 with an estimate of more than 800,000 casualties. When the 2008 Sichuan earthquake happened, the China National Committee for Disaster Reduction (NCDR) immediately initiated a "Level II Emergency Contingency Plan" (ECP) that only eight hours later was moved up to level I. Under level I, all government agencies are activated and the Ministry of Finance is authorized to release the national emergency fund in support of relief operations (PRC, 2006a, PRC, 2006b, Li, 2008). The delay in activating the level I was due to the Chair of CNDRC and Vice-President of the People's Republic of China (PRC) Liangyu Hui, being outside of the country. Thus, the Vice-Chair initiated the level II disaster relief plan while trying to contact him. The Wenchuan earthquake was the first test on China's level I ECP since the bill was enacted on January 11, 2006.

Minutes after the earthquake, President Hu Jintao ordered all-out efforts to help the victims and communicated to the public that *"…the disaster response would be rapid"*. Premier Wen Jiabao flew to the area 90 minutes after the earthquake to direct the rescue efforts. As interviewees reported his presence on the scene certainly had a positive impact on subsequent decisions, made with direct knowledge of the situation and understanding of the magnitude of the disaster.

Premier Wen Jiabao acknowledged the need to engage the People's Liberation Army (PLA) and armed police and fire fighters, under the unified guidance of the Central Military Commission to "*… strive to get into the epicentre by whatever means, land, air or sea !* " (Liu, 2008). His presence was important to establish trust in the population, demonstrate empathy and show the face of a government in close contact with those affected by the disaster. On Figure 1, we display the timeline of major response events led by the government during the first ten days of the aftermath. Immediately after the earthquake, the Political Bureau of Central Committee of the Communist Party of China (CCCPC) activated the "Earthquake Disaster Relief Headquarters of the State Council," temporary command centers consisting of nine subordinate working groups made up of local government officials, military and disease control experts chaired by Premier Wen Jiabao (Table 2). In China, there is not a national disaster management agency and disaster management policies are made and implemented by governments at different administrative levels in a vertical manner led by the State Council. As interviewees reported that in this circumstance, such verticalization may have led to excessive intervention of supervising agencies restricting the ability of local disaster response and relief departments to carry out their duties. A few medical and public health professionals involved in local responses confirmed the duties and responsibilities of all relevant government agencies were not always clear The Chinese government quickly mobilized resources and trained manpower, including over 170,000 troops, air force armed police, paramilitary forces and rescue workers (United Nations (UN), 2008) and deployed various measures to ensure provision of medical and blood supplies, food, clothing, temporary shelter for the people in the disaster areas and their subsistence. The Medical Supply Group, under the Earthquake Disaster Relief Headquarters of the State Council, was established to coordinate the logistics of the delivery, storage and distribution of food and other supplies. As

confirmed by the interviewees, a life necessities market tracking and monitoring system was initiated and food, daily household supplies, lighting instruments and disinfecting equipment, were set as priority items and prices monitored on the market under the supervision of the Chinese National Development and Reform Commission and the Ministries of Commerce and Agriculture (UNDP-China, 2009).

Communication to the Public and Use of Mass Media

In the aftermath, the Chinese government, made unprecedented use of mass media, greatly appreciated domestically and internationally. The Chinese state and local news media provided around-the-clock live coverage and updates on death tolls, damage, search and rescue operations and the overall government's response. The Chinese Ministry of National Defense came forward for the first time in Chinese history and provided detailed information to the domestic and international audience about the rescue operations performed by the PLA (2008a, 2008d). As interviewees reported lessons learned through the 2003 Severe Acute Respiratory Syndrome (SARS) crisis and the 2005 toxic pollution of the Sanghua River, may have played a role in the decision to establish a more open relationship with the media. For the Chinese leaders, the disaster in Sichuan became an opportunity to humanize the image of "China" abroad when struggling to recover from severe criticism of its military actions in Tibet and surrounding regions. Openness to the media became a stabilizing factor both internally and with the outside world. After the earthquake, international journalists were allowed on the scene. In the immediate aftermath, international agencies reported on the response efforts with outwardly positive comments. From a review of news reports, we identified relevant comments provided by international leaders. UN praised China's President and Premier's leadership, under which, "*The national response to the earthquake was decisive and swift*" (UN, 2008). WHO's representative

in China, dr. Hans Troedsson, hailed China's health emergency response for its quickness, effectiveness and organization, which can be largely attributed to the prompt activation of military forces (Alexander, 2008). *The Economist* in London noted that China reacted to the disaster *"...rapidly and with uncharacteristic openness…"* (2008b). *Time* magazine reported that the quake changed the world's perception of China (Elegant, 2008). The U.S. Secretary of State, Condoleezza Rice said she was "…*really impressed by the recovery effort*…," after her visits to the disaster zone in June 2008 (Lyle, 2008; Cornwell, 2008) and "… *of how the human spirit can overcome great devastation*" (Lyle, 2008, Cornwell, 2008). However, such wide coverage started to diminish a few months after the event when stories on rescue efforts became of little interest and difficult political issues, such as poorly designed and constructed school buildings, were becoming major points of debate.

International relationships

Despite past diplomatic controversies, interviewees confirmed that China sought disaster relief experts and rescue operation equipment from neighbouring countries. China accepted help from at least three private relief teams in Taiwan, with whom China has long had tense relation-ships. This was achieved by direct communication between Chinese President Hu Jingtao and the Taiwan's ruling Kuomintang (KMT), honorary chairman Lien Chan, aided by the significantly improved cross-strait relationship between Taiwan and China since 2008, when the KMT regained power (Zhang, 2008, Deng, 2008). The Tzu Chi Foundation from Taiwan was one of the first relief forces from outside the PRC to join rescue efforts and one of the last forces to leave (Zhou, 2008, Zhu, 2011). However, historical sensitivities limited the scope and delivery of some Japanese aid. One of the initial plans to have Japanese Air Self Defense Force transport aid into China caused great resentment among Chinese citizens because it would have been the first

arrival of Japanese military planes in the county since the end of the Japanese invasion and occupation during World War II (Jin, 2008). As interviewees reported this factor underlines the importance of taking into consideration geo-political circumstances in emergency planning which may have an impact on relief efforts. Disasters strike across political boundaries and challenge the ability of governments to overcome such boundaries on behalf of the containment of civil loss. Eventually, the Japanese supplies were shipped in by commercial aircrafts. A few days later, access was extended to teams from Russia, South Korea, Singapore and even the United States which strengthened ties amongst these countries. The WHO also provided experts and a wide range of essential medicines, health supplies and equipment, including water purifiers and portable x-ray machines. Unfortunately, local healthcare personnel, as well as military, were not always adequately trained on how to use such equipment or on how to appropriately store the medications received.

Rescue Operations

The emergency response to the Wenchuan earthquake became China's largest ever non-combat airlifting operation in history. Within fourteen minutes after the earthquake, the first military rescue teams were dispatched to the disaster area (Qi, 2008). Many villages, in the extremely difficult terrain, could only be accessed by foot or air. In many disaster affected areas there was only one way leading out and connecting with the outside. As a consequence interviewees confirmed that “isolated islands” were formed due to failures in communication and transportation. Despite the dangers of the aftershocks and landslides, PLA headed for the harder-hit areas by road, air and water, assisted in reopening lifeline systems (i.e. roads and communications), provided security and order, logistics and transportation, and led the effort to channel quake-lakes. Helicopters were used to bring in PLA soldiers, engineering corps,

explosive specialists, and other personnel and heavy earthmoving tractors to the disaster area. One unit of 600 armed police forces marched for twenty-one hours, approximately 90 km, with heavy relief supplies to enter the Wenchuan County (Liu, 2008). Ultimately, all the disaster-affected counties, including the harder-hit townships and towns, were reached by May 15 (UNDP-China, 2009).

Mass Evacuation

Chinese engineers were on alert for potential secondary disasters. In particular, expert consultation sessions were held on the risk of floods, likely consequence of the breaching of lakes formed by landslides blocking rivers or heavy rains. Over fifteen million quake survivors were evacuated, of which the majority self-evacuated during the first three days, due to the risk of flooding and potential secondary disasters caused by the heavy rains. It was documented that the Mianyang and Suining municipal governments alone evacuated over 200,000 people (UNDP-China, 2009). Interviewees reported that within four days of the event, emergency workers built hundreds of thousands of temporary houses and tents for the displaced people.

Medical Response

Mass Care

The first 72 hours after an earthquake hit are often referred by rescuers in China and Taiwan as "Golden 72 hours", critical window when those trapped under rubble if rescued and treated have the best chance of survival; and as such, the ability to quickly restore lifeline systems to the heavy-hit areas, mobilize medical resources and provide necessary care became a critical task (Schultz et al., 1996). In the hardest hit Mianyang, the earthquake destroyed 88% of the local healthcare system, and caused massive deaths and injuries in a very short period of time (Lei et

al., 2008). Mianyang and the Aba Prefecture, accounted for 77% of the total number of deaths (Zhang et al., 2010). Most rescue efforts were carried out by "bystanders" who acted as first responders and helped family members, friends and strangers, saving thousands of trapped victims. In mass casualty events, "bystanders" are the first responders and rescue forces by default. This phenomenon is common and familiar in almost every disaster. In the aftermath, the Chinese medical response to the Wenchuan earthquake carried out in four stages: 1) Search and Rescue (Day 1-3); 2) Treatment of the Injured (Day 1-Week 2); 3) Resuming of Health Services (Week 3-5); and 4) Health System Recovery and Rebuilding (Week 6 and Beyond).

Search and Rescue

Minutes after the earthquake, the local headquarters for earthquake disaster relief operations were activated and local medical staff promptly began to set up first-aid stations for emergency medical treatment. Seventy-one percent (n=35,880) of the responding medical staff reached the frontline during the first three days (Dai et al., 2009). All the first responders interviewed in the Wenchuan County Hospital and Yingxiu Township Health Center reported that as a result of road and communication disruption during the first hours of operations they were cut off from the outside world. As interviewees reported, most of the infrastructure, including roads and transportation, telecommunication, water supply, electricity and gas distribution were destroyed. In addition to that, because most of the equipment and medical supplies were destroyed or buried, the shortage of medical supplies and equipment became the greatest challenge during the first 48 hours after the earthquake. Interviewees reported about the efforts they made to save equipment and pharmaceuticals, after saving and stabilizing inpatients at the time of the earthquake.

In worst-hit counties in the Mainyang area such as Wenchuan, Lixian, Maoxian, Pingwu and Chingchuan, local healthcare workers were on their own for two days in providing assistance to

28,340 wounded patients (Dai et al., 2009). Many healthcare workers reported to duty, but still many others dropped off to take care of family members. Interviewees reported that among the several challenges that clinical personnel had to face were: shortage of medical supplies (e.g. oxygen, fluids, and antibiotics) and equipment, little visibility due to dust and dirt, and numerous aftershocks. The use of the military to deliver medicines and medical equipment, while a good strategy to overcome logistical and security issues, turned out less effective as hoped because of their lack of training in handling medical supplies as reported by some of the officials being interviewed.

Treatment of the Injured

The Ministry of Health and relevant departments launched a special mechanism to mobilize 375 hospitals from twenty provinces to accept injured patients. The wounded were transferred to fourteen provincial and city-level hospitals across China (Dai et al., 2009). West China Hospital (WCH) of Sichuan University is one of the largest medical centers in China (with 4,300 beds), located about sixty miles from the epicentre. During the disaster relief efforts, the hospital served as a strategic base of operation and storage. Interviewees confirmed WCH had supplies for operating the 4,300 beds for 72 hours. This hospital became the leading agency in the relief effort especially in the initial stage. In fifteen days, WCH received 2,283 earthquake victims, with 1,572 (68.9%) admitted to the wards (Nie et al., 2010). Soft tissue injuries, legs and arms and pelvis fractures were the most common injuries. Crush syndrome was common among those who had been buried under rubble for days before being rescued. Interviewees reported that faculty and medical students at WCH formed rescue teams to respond while osteologists and emergency medicine doctors were leading the effort. After receiving first-aid and emergency

care in the temporary field hospitals and clinics, the injured were triaged and transferred to frontline and second-line hospitals for treatment according to the severity of their injuries (Dai et al., 2008a, Dai et al., 2009). In fifteen days (May 17-31), 10,015 inpatients were transferred to hospitals outside the Sichuan area (Dai et al., 2009).

Resuming Health Services

Earthquake victims' presentation at the hospital peaked within the first three days and started to decrease after ten days (Nie et al., 2010). Treating non-earthquake related illnesses and meeting the needs of chronic disease patients became the main medical focus (Dai et al., 2009). As found in the literature and confirmed by interviewees, in the Wenchuan County, forty percent of patients were over sixty years old because working age people had moved to urban areas for better job opportunities in preceding years (Chan, 2008). Vulnerable populations (i.e. elderly, women, and children) were highly represented, and need for chronic health care was great. Hospitals, including WCH, sent medical teams daily to the temporary settlement areas to provide primary care services and health education (Dai et al., 2008b). More tent stations and field hospitals were set up across the Sichuan Province to provide regular clinical services.

Health System Recovery and Rebuilding

In stage four, medical professionals started to re-organize the healthcare system in the disaster area while running regular clinics. Because of the change of focus, starting from June 20, the local "Medical Rescue Headquarters" in Mianyang City and Aba Prefecture were regrouped and renamed the "Public Health and Disease Control Headquarters" and local rehabilitation centers were re-opened to receive inpatients (Huang et al., 2008b, Lei et al., 2008).

Mental Health

Hospitals in the affected areas sent out first teams of experts to the resettlement sites to provide medical care and psychological assistance (Lei et al., 2008, Mao and He, 2008). China's Ministry of Health mobilized 247 experts in psychological intervention and 2,000 volunteers to offer mental health and social services (Dai et al., 2009). The prevalence of post-traumatic stress disorder (PTSD) was over 40% in the heavily damaged counties. (Zhao et al., 2008, Kun et al., 2009a) Risk factors included: female gender, living in a temporary shelter, low socioeconomic status, severity of injury, and belonging to an ethnic minority group (Kun et al., 2009a, Wang et al., 2009a, Kun et al., 2010, Wang et al., 2010a, Xu and Song, 2010, Kun et al., 2009b, Guo et al., 2008, Wang et al., 2009b). Studies showed that the mental health status of survivors, patients, first responders (i.e. soldiers and medical staff), and vulnerable populations was significantly affected (Jia et al., 2010, Huang et al., 2008a, Liu et al., 2009, Liu et al., 2011, Li et al., 2009, Ning et al., 2008, Wang et al., 2010b). An important factor affecting society and having a profound negative effect on mental health was the impact of having lost a child, in particular for those families that were subjected to the "One Child Policy". The policy, established by Chinese leader Deng Xiaoping in 1979 is restricted to the ethnic Han Chinese living in urban areas, and limits couples to one child. Interviewees reported that for these couples, the already dramatic experience of losing a child meant losing their family and their future.

International Medical Assistance

Relief fund and material aid worth nearly five billion Chinese Yuan (783.95 million U.S. dollars) poured in from over 170 countries and regions and from over 20 international organizations. (UNDP-China, 2009) Over 270 overseas specialized workers from Russia, Japan, Korea and Singapore arrived in Sichuan on May 16 to participate in rescue efforts, followed by more than ten other international delegations. At least eleven medical teams, consisting of 304 members

from Hong Kong, Macao, Taiwan, and eight other foreign countries, stayed till June 18 to set up temporary hospitals and provide treatment to the victims.(Jiang and Dai, 2009) Interviewees reported that at first, it was a challenge for local medical workers to collaborate with these groups because of differences in background, styles of practice, and familiarity with equipment. Ultimately, temporary field hospitals, pharmacies, intensive care units, laboratories, and operating rooms were set up and at least 24,587 patients were treated, 594 operations performed, and 3,164 clinical shifts executed as well as several seminars and academic meetings attended by over 2,800 first responders (Jiang and Dai, 2009).

Public Health Response

Public health professionals strived to achieve the goal of *"no major epidemic post-major disaster",* set out by the Ministry of Health on May 15, 2008. (2008c) According to China's Ministry of Civil Affairs (MCA), the earthquake destroyed 6.5 million homes, affected 46.25 million people and a total area of about 500,000 km^2. As a result, fifteen million people were evacuated from their homes. Five million people became homeless and were hosted in temporary shelters. Despite heavy casualties to the personnel, a severely damaged healthcare system, and destroyed networks, interviewees reported that Chinese CDCs located in the Sichuan Province activated their emergency response contingency plans for major natural disasters within two hours after the earthquake, prepared and revised the technical guidelines for post-earthquake disease control and prevention, and deployed response teams. The Chinese public health response effort was organized in three response areas: 1) Needs Assessment and Surveillance (starting week 1); 2) Disease Prevention and Control (week 2-4); and 3) Public Health Services Restoration (month 2-4). The China's State Council announced the goal of restoring the basic

public health services in the affected areas by the end of September 2008 and that target was met on time.

Needs Assessment and Surveillance

Approximately 75% of the infectious diseases reporting network system in Sichuan, consisting of 422 surveillance sites, was destroyed by the earthquake. During the first two months after the earthquake, 53% of the total cases of infectious diseases such as Encephalitis B, Chickenpox, and Parotitis were reported by mobile phones. (Wu et al., 2008, Ma et al., 2009, Yang et al., 2009, Xie & Wu, 2008). Subsequently, public health professionals directed their attention and resources to the control of other infectious diseases, such as HIV/AIDS and Tuberculosis. By the end of May 2008, the majority of people living with HIV and AIDS were under treatment (2008e).

Disease Prevention and Control

The main risk factors for increased communicable disease burden were: interruption of access to safe water and sanitation, population displacement and overcrowding, increased exposure to disease vectors (e.g. Japanese encephalitis virus-carrying mosquito) and poor access to healthcare services. At ten days after the earthquake, 116,700 public health professionals were mobilized and the Ministry of Health and the Sichuan provincial government published a series of vaccine administration guidelines within two weeks after the earthquake, giving specific instructions on mass vaccination campaigns and vaccine stockpiles. For example, in June, 2008, an immunization campaign against Hepatitis A and Encephalitis B alone vaccine approximately 677,000 people in the Sichuan Province including children, medical staff, military personnel and first-line workers. (Shen et al., 2009) As a result, more than 95% of the children in the affected area were immunized against Encephalitis B and Hepatitis A. (Zeng, 2008) By August 2008,

most of the regular vaccination clinics were re-opened (2008f) and "*the patriotic health campaign*" was reintroduced to the affected area promoting health-related behaviours and improving sanitation. As a result, according to the local officials interviewed, there is a 15% decrease in the number of infections reported in the Wenchuan County. Interviewees also confirmed that no disease outbreak was reported in any of the affected areas and that after the first weeks, the public health response shifted from disease control and prevention to the restoration of local medical and public health systems, establishment of local infectious control working teams, and relationship-building with partner provinces.

Societal Response

Chinese saying: "*When disaster struck, help came from all sides*" was repeatedly emphasized by the Chinese leaders and embodied throughout the entire response and recovery operations. On May 22, the Ministry of Civil Affairs announced a "One-to-One Assistance and Support System", in the acute phase of relief efforts. This system was later approved, with some modification, by the State Council on June 11 to guide the three-year period of reconstruction. The system consisted of "twinning" the several affected counties with other Chinese provinces and municipalities to provide assistance to the affected areas with resources, personnel, and moral support for recovery. For example, Wenchuan County was paired with the wealthy Guangdong province for long-term reconstruction and assistance, including the provision of medical personnel to replace staff who died during the disaster and the training of Wenchuan-based staff in teaching hospitals in Guangdong. (Hoyer, June 2009) Charges for medical services in the disaster areas were waived until the end of the year 2008. Furthermore, the Chinese leaders took immediate and necessary measures to ensure the safety and well-being of the children orphaned in the devastating earthquake. MCA made an announcement, right after the disaster, that the

Child Welfare Institutes would provide shelter to the thousands of children orphaned by the earthquake. When media attention to the plight of children prompted more than 20,000 families to express interest in adoption, MCA and local government made absolutely clear that no adoption would take place until order was restored, family members traced, and children confirmed to be orphans. Eventually, 634 children were confirmed orphaned in the earthquake and the majority of them (78%) were placed with extended family members under guardianship/kinship arrangements (UNICEF-China, 2010). MCA enhanced the quality of care provided by these untrained adoptive or foster families by working with the United Nations Children's Fund (UNICEF) to develop training manuals, guidelines and standards, and workshops for the new caregivers. MCA and UNICEF together, developed a tracking system to monitor the wellbeing of orphaned children, analyze their situation, improve family- and community-based safety and protection services, conduct research, and provide recommendations to the government in the aftermath of the emergency. The Wenchuan earthquake prompted an unexpected mass mobilization outside official channels. Shortly after the earthquake, millions of people from all over the country offered help with rescue and relief efforts. With the assistance of the unusually vigorous and dramatic coverage of the disaster in the state-run news media, and an active and ever-growing online Chinese community, the public response grew exponentially in matter of days. The year 2008 was considered "*The first year of the era of Chinese volunteers*" (UNDP-China, 2009). As literature reported, this earthquake changed those, particularly China's younger urban generation, who had shown little interest in the plight of people living in the countryside (Yardley and Barboza, 2008). Volunteers played an unprecedentedly important role in the medical response. China CDC partnered with local hospitals, such as West China Hospital and People's Hospital of Deyang City, to set up a

management system for thousands of volunteers, who arrived at the hospital scene hours after the quake. As interviewees reported, volunteers assisted in post-earthquake evacuation of patients, emergency reception, ward care, on-call service, epidemic prevention and control, psychological intervention, telecommunications, facilitating tracking and reunion of family members, and other major tasks. The Wenchuan earthquake inspired a huge outpouring of individual donations to charity, which had never been seen in China before. According to China's MCA, as of May 13, 2009, China had received cash and in-kind donations of 76.71 billion Chinese Yuan (12.01 billion U.S. dollars) from within the country and abroad (2009a, 2009b). This disaster also led to a change in attitude toward charitable giving in China's corporations. New attention was drawn to corporate philanthropy, which was a whole new concept to China's corporations and public leaders (Makinen, 2009). As interviewees confirmed, the vigorous Chinese online community blacklisted those who gave too little, which led to public apologies and gifts of hundreds of millions of Chinese Yuan from some chairmen to ease the public anger.

Discussion

Disasters and their aftermath have significant potential to affect the political environment and society of a nation. The 2008 earthquake in Sichuan was no exception. Images of Premier Wen Jiabao on the disaster scene within two hours of the event, in close contact with the population and open to communicate with national and international media marked a significant change in the political history of China; a leadership choice with a positive impact on disaster management operations and international affairs. The Chinese news authorities impressed both the domestic and overseas audience by showing openness and responsiveness to information flow in mass media, including the online community. For the first time, the internet was recognized by the Chinese authorities as mainstream media, a laurel previously granted only to state news agencies.

Chinese leaders recognized that in the aftermath of a disaster, despite the difficulty to manage "rumor control", open information can be a stabilizing factor for internal and external relationships. The response of the Chinese government to this and previous disasters has been characterized by a heavily centralized command structure and military engagement, certainly needed to overcome logistical challenges. However, the absence of a national disaster management agency may have contributed to the lack of coordination across governmental agencies from the state council down to the cities and townships, as well as lack of multi-sector relationships. Furthermore, surprisingly was the fact that despite the fact that China's history has been characterized by centuries of disasters, government officials at the local level, healthcare professionals, and the general population acknowledged lack of education in emergency preparedness. This may be the side effect of an over centralized emergency response system and of an excessive focus on national rather than local response, and reconstruction efforts rather than community resilience. Nevertheless, in the aftermath of the disaster response, Chinese experts concluded that current emergency plans were inadequate and relevant governmental departments unclear about their own functions and responsibilities, and that even though relevant departments acquired large amount of information from the frontline, the information acquisition and analysis was not as timely as needed. Another lesson learned was the need for a designated management agency to supervise, examine and distribute donations. Donated drugs and equipment did not always meet the local needs or were inappropriately used or handled because of lack of training. Interviewees reported that a large proportion of the donated products were not properly labelled with manufacturing information (e.g. manufacturing place and date) and some were even expired or spoiled. The public health officials interviewed commented medication with foreign labels always required translation before it could reach those in need and thus not

only was there a delay in delivery but it also required additional manpower at a critical time. As such, the officials advised that donation of cash to proper agency is usually more effective in helping the victims rather than of goods. The Sichuan earthquake also had a tremendous impact on society and Chinese people as individuals. In Chinese modern history, it was the first time that individuals decided to volunteer of their own will. From an emergency management perspective, issues related to the difficulty of managing crowds of untrained volunteers were experienced. As in many other disasters, lack of coordination of non- governmental organizations in such matter turned out to be problematic. After the 1949 revolution, all charitable volunteer work was organized by the government and had to be under the leadership and control of the state party. What made this case very different from the past is the fact that Chinese people decided to go to the disaster area, donate and operate with their own hands because of their personal choice and often resisting the orders of political leaders.

Conclusions

One of the lessons learned from the response to the Sichuan earthquake was how having the premier on the disaster scene, few minutes after the earthquake, had a positive impact on building population trust in the government and a deployment of resources proportional to the magnitude of the event. Furthermore, how government's openness to the media helped in building and reinforcing new and existing relationships with foreign governments and international organizations that contributed to the response efforts. Also, as stated, establishing a management agency to supervise, examine and distribute donated drugs is an important part of the response and recovery process as well. A centralized and military response was necessary to overcome logistical barriers. However, centralization in the response may have led to uncertainty

in the role of local administrations, difficulties in the flow of information and overall lack of community resilience.

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Table 1. Governmental and Academic Institutions Interviewed

Names of the Organizations Interviewed	Type of Agency	No. of Interviewees
Wenchuan Health Bureau	Local Government	2
Wenchuan County Mayor Office	Local Government	2
Wenchuan Hospital	Local Hospital	2
Yingxiu Hospital	Local Hospital	1
Wenchuan CDC	Local Government	2
Chengdu CDC	Local Government	1
West China School of Public Health at Sichuan University	Academic	2
West China Hospital, Sichuan University	Local Hospital	2
Chinese Disease Control and Prevention Center (China CDC)*	Central Government	4
Beijing Emergency Response Center	Local Government	1
Tsinghua University*	Academic	3
Beijing Normal University*	Academic	2
Total Number		**24**
*Some are also members of the Emergency Management Experts Committee under the State Council		

Figure 1: Wenchuan Earthquake Response Timeline (based on UN report and interviews).

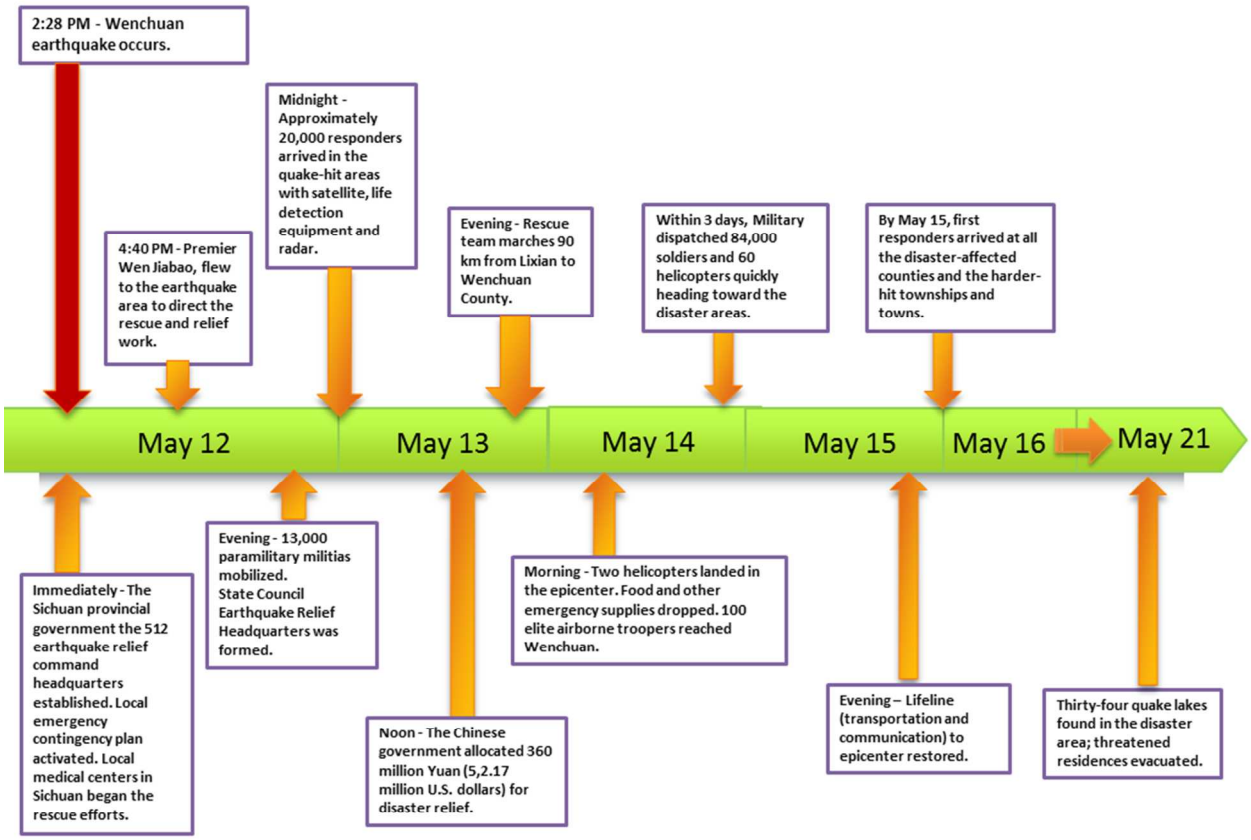

Table 2: State Council Earthquake Relief Headquarters

STATE COUNCIL EARTHQUAKE RELIEF HEADQUARTERS	
Chief Commander: Premier Wen Jiabao, **Vice Chief Commanders: Vice Premiers Li Keqiang and Hui Liangyu)**	
SUBORDINATE WORKING GROUPS	**LEADING AGENCY**
Rescue and Relief Group	Headquarters of the General Staff of the Chinese People's Liberation Army
Public Livelihood Support Group	Ministry of Civil Affairs
Earthquake monitor Group	China Earthquake Administration
Epidemic control Group	Ministry of Health
Publicity Group	Publicity Department of the CPC Central Committee
Production Restoration Group	Ministry of Industry and Information Technology
Infrastructure Assurance and Post-disaster Reconstruction Group	National Development & Reform Commission
Water Administration Group **Social Security Group**	Ministry of Water Resources Ministry of Public Security

Figure 2: Conceptual Framework