Unidentified Bodies and Mass-Fatality Management in Haiti:
A Case Study of the January 2010 Earthquake with a Cross-Cultural Comparison*

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Abstract

The following paper examines the January 2010 earthquake in Haiti as a case study to better understand what happens to unidentified bodies in mass-fatality management. The paper explores the literature on mass-fatality management, discusses the context of Haiti and the impact of the earthquake in this country, mentions the methods undertaken for this study, and then outlines the key lessons from this particular disaster. The paper compares preliminary findings in Haiti to other incidents in India, Bangladesh and Sri Lanka, and concludes with a discussion of implications for research and practice.

Key words: Haiti, mass-fatality management, unidentified bodies, earthquake

Introduction

Past disasters such as the terrorist attacks of 9/11, the Indian Ocean tsunami, Hurricane Katrina, the Sichuan earthquake, and the Japan earthquake/tsunami/nuclear radiation release underscore the need for a thorough understanding of mass-fatality management (MFM). These aforementioned disasters resulted in a significant number of deaths to such an extent that the resources of local, state, and federal governments were severely overwhelmed. For instance, the Indian Ocean tsunami of December 26, 2004 and the terrorist attacks of September 11, 2001 in the United States killed over 275,950 and 2,792 people respectively (Koontz 2005; National Institute of Justice (NIJ) 2006). In these cases, the tsunami and terrorist attacks clearly strained

the response systems of the affected nations (Tun et al. 2005). One of the most significant

potential problems after such major disasters is how to effectively deal with unidentified bodies.

The goals of this research are two-fold. First, this study aims to broaden our

understanding of the neglected function of MFM (Blanshan and Quarantelli n.d.; Tun et al. 2005)

using the January 2010 earthquake in Haiti as a case study. Second, the paper will compare

findings from Haiti to those from India, Sri Lanka, and Bangladesh, with the aim of identifying

lessons that could help improve our response to mass-fatality incidents in the future and advance

our theoretical understanding of MFM.

In an attempt to meet these goals, the paper explores the literature on MFM, discusses the

context of Haiti and the impact of the earthquake in this country, mentions the methods

undertaken for this study, and then outlines the key findings from this particular disaster. The

paper compares findings in Haiti to other disasters in India, Sri Lanka, and Bangladesh, and

concludes with a discussion of implications for research and practice.

Literature Review

According to McEntire (2007, p. 159), a mass-fatality incident is a disaster "situation

where there are more bodies than can be handled using existing local resources." Jensen (2000,

p. xi) similarly defines a mass-fatality incident as "any event that produces more fatalities than

can be handled using local resources." Teahen (2012, p. 1) asserts that "a mass fatalities incident

is an event that causes loss of life and human suffering, which cannot be met through usual

individual and community resources." According to these definitions, the number of fatalities

does not characterize a mass-fatality incident alone. If the number of fatalities is high but local

resources are adequate to handle the deceased, then the incident will not be considered a mass-

fatality incident. Conversely, if the number of dead is low and a community does not have

adequate resources to manage the bodies, the incident may be regarded as a mass-fatality incident. Nevertheless, the number of fatalities is important because with a larger number of deaths, complexity increases (Scanlon and McMahon 2011) and more resources would be needed to manage the incident. Other significant factors in defining mass-fatality incidents include the condition of the dead and the way the deaths occurred (Jensen 2000). MFM complications also increase depending on the speed of the recovery of remains, the condition of bodies, and the lack of information describing who could be deceased (like manifest of a plane) (Scanlon and McMahon 2011; Tun et. al. 2005). A school bus accident that kills 10 students may have a lasting impact on responders and may engender a prolonged recovery time for the affected community (Jensen 2000; Teahen 2012). Even this small event, according to Jensen (2000), may qualify as a mass-fatality incident.

The Need for Mass-fatality Management

It is important to study mass-fatality management for at least two significant reasons. First, there are currently insufficient technical guidelines for dealing with large numbers of fatalities following large natural disasters (Morgan et al. 2006). Teahen (2012) does provide recommendations based on his personal experiences about how to cope with stress and manage the mass-fatality disaster site, the family assistance center, the staff processing center, and the victim identification center. Teahen (2012) asserts that "*Mass Fatalities: Managing the Community Response* is not a book about the dead" (p. xix). Instead, Teahen writes to assist the individuals who handle the remains. In spite of this contribution, we simply do not know enough about the increasingly important MFM function in emergency management. For instance, Morgan et al. (2006) note that guidelines exist for MFM in the purview of transportation accidents (e.g., Davis and Scraton 1999; Meyer 2003) and terrorist attacks (e.g., NIJ 2006).

However, these recommendations are not always transferable to mass-fatality incidents engendered by natural disasters.

Second, through studies of major disasters and catastrophes, researchers can better understand MFM and provide policy advice to reduce psychological distress in the affected community or nation (Morgan et al. 2006). Understanding mass fatality management may also facilitate compensation of death benefits (Phillips et al. 2008) and provide closure for surviving family members after disasters.

Prior Work on the Subject

Much of the pioneering research on MFM came out of the Disaster Research Center (formerly at Ohio State University, now at University of Delaware) almost four decades ago. These studies focused on mass-fatality incidents caused by flooding or dam failure (e.g., Blanshan 1977; Hershiser 1974; Hershiser and Quarantelli 1976; Quarantelli 1979), terrorist attacks (Aguirre and Quarantelli 2008), and the 2004 tsunami (Rodriquez et al. 2006). Other studies outside of the DRC have also emerged (e.g., Pine 1974; Jensen 2000; Klinenberg 2002; Shaler 2005; Umer et al. 2009; Teahen 2012). Some MFM studies also came out of Canada (e.g., Brannon and Kessler 1999; Scanlon 1998; 2006; 2008; 2009; 2011; Brenner 2006; Scanlon, McMahon, and van Haastert 2007; Stoney et al. 2011). In addition, other mass-fatality management studies have emerged from international organizations like World Health Organization (WHO) (e.g., Tun et al. 2005) and the Pan-American Health Organization (PAHO) (e.g., Morgan, Tidball-Binz, Van Alphen 2009). NIJ has also contributed to the advancement of this literature by producing documents on victim identification (NIJ 2005; 2006).

Many of the previous MFM studies on natural disasters emerged after the Indian Ocean tsunami of December 26, 2004 (e.g., Perera 2005; Oyola-Yemaiel and Gupta 2005; Tun et. al.

2005; Oyola-Yemaiel and Gupta 2006; Brenner 2006; Gupta 2006; Morgan et al. 2006;

Rodriquez et al. 2006; Roy 2006; Scanlon 2006; Scanlon et al. 2007; and Scanlon 2008). For

instance, Morgan et al. (2006) examined the management of bodies following the Indian Ocean

tsunami in three countries - Thailand, Indonesia, and Sri Lanka. These authors found that the

lack of local mass-fatality plans hindered the response to this incident (Morgan et al. 2006).

Perera (2005) also studied the legal implications of mass burials of unidentified victims in Sri

Lanka after the Indian Ocean tsunami and found that many of the unidentified victims were

buried in mass graves. Therefore, he recommended that the Sri Lankan government develop a

national emergency management plan addressing the problem of victim identification for future

mass-fatality incidents (Perera 2005).

However, with the notable exception of some important studies (e.g., Hershiser 1974;

Blanshan 1977; Blanshan and Quarantelli (n.d.); Scanlon 1998; Scanlon 2006; Scanlon 2008;

Scanlon 2009; Scanlon 2011; Scanlon et al. 2007; Stoney et al. 2011), there are still too few

MFM studies on natural disasters. As a result, researchers have called for more field research on

this subject (e.g., Morgan et al. 2006). Against the backdrop of a limited number of MFM studies

on natural disasters, it becomes compelling to increase research endeavors in this area.

The Process of Dealing with Bodies

According to the literature, the response to a mass-fatality incident can be divided into

two phases. The first phase involves rescuing victims and stabilizing the incident, while the

second phase focuses on recovering bodies, identifying victims and collecting evidence (NIJ

2005). Therefore, MFM typically begins once there is no further threat to life (Jensen 2000).

However, the response to a mass-fatality incident consists of many actions that must be

performed in such a manner to ensure that the deceased are treated with dignity and in accordance to local customs and government laws (Jensen 2000; Teahen 2012).

Many researchers have studied the process of handling bodies after mass-fatality incidents (e.g., Blanshan 1977; Blanshan and Quarantelli (n.d.); Oyola-Yemaiel and Gupta 2006). For instance, Blanshan (1977) compared the body handling process during a normal death setting to that of the sudden-collective-death setting. She found that the body handling process for the former situation had six tasks while the latter events had eleven tasks (Blanshan 1977). Furthermore, in the aftermath of the Indian Ocean tsunami, Oyola-Yemaiel and Gupta (2006) examined and described the process of handling bodies in India and Sri Lanka**.** These authors studied the following stages of body handling: recovery, transportation, preservation, communication with the community, identification and the return of bodies to family members. This study will focus on the following body handling tasks, body recovery, followed by the storage of remains, identification, release of the deceased to family members and final disposition in accordance with prior research (Blanshan 1977; Blanshan and Quarantelli n.d.; Oyola-Yemaiel and Gupta 2006).

Body Recovery. This is the first step that must be completed after any disaster (Morgan et al. 2006) and it is characterized by some degree of chaos and disorganization (Morgan et al. 2009). For instance, individuals, the military, law-enforcement officers, volunteers, search and rescue teams, tourists, and firefighters (Morgan et al. 2006; Morgan et al. 2009) often undertake the body recovery process. Even tourists helped to recover bodies after the Indian Ocean tsunami. Body recovery also requires at times the use of heavy equipment– grapplers, bulldozers, and dump trucks – which may not be readily available in some nations due to the equipment's high procurement and maintenance costs.

Body recovery may last a few days to several weeks, and in some cases, months, depending on the size of the disaster or manpower and resource availability (Morgan et al. 2009). Once bodies are recovered, they are often placed in body bags (Morgan et al. 2009). If body bags are not available, locally available materials (such as a shroud, plastic bags, bed sheets, etc.) may be used (Morgan et al. 2009). It is important that the collected personal effects are not be separated from the bodies where they were found since items like watches or wallets may help in identification or may be valuable to family members of the deceased (Morgan et al. 2009).

Body Preservation. The next step after body recovery is storage. In order to preserve bodies for identification, they should be kept in cold storage (Morgan et al. 2009; Teahen 2012). The ideal location is in morgues, where temperature for storage is between 2^0C-4^0C (Morgan et al. 2009). However, due to the vast number of bodies that must be stored after some disasters, morgue spaces fill up quickly, leading to the use of less desirable alternatives. For instance, after the Indian Ocean tsunami, bodies were left in the courtyards of temples in Thailand (Scanlon 2006). Similarly, in Sri Lanka, bodies were placed in emergency wards, hospital reception areas, and mosques (Oyola-Yemaiel and Gupta 2006; Scanlon et al. 2007). In some cases, there may be no refrigeration immediately after the disaster, so local authorities will need to improvise. As an example, local authorities in Thailand used dry ice while physicians in Sri Lanka coated bodies with formaldehyde in order to preserve bodies after the tsunami (Oyola-Yemaiel and Gupta 2006; Scanlon et al. 2007). When morgues are full, refrigerated trucks or ice skating rinks can also be used to temporarily store bodies (Hooft, Noji, and Voorde 1989). In some cases, those involved in MFM will need to rely on temporary burial (Morgan et al. 2006; Teahen 2012).

Body Identification. After bodies have been recovered and stored, the next step is identification. The International Police Criminal Organization (Interpol) has developed disaster

victim identification guidelines, which state that all dead bodies must be properly identified (Scanlon 2006; Scanlon and McMahon 2011). From the medical/legal standpoint, body identification is the most important aspect of mass-fatality investigation (Perera 2005). The significance of identifying bodies has been summed up succinctly by an NIJ report that stated, "correct victim identification is essential to satisfy humanitarian considerations, meet civil and criminal investigative needs, and identify victim perpetrators" (NIJ 2005, p. v). In addition, PAHO and WHO have consistently called for victim identification so that families of victims can begin the recovery process (de Ville de Goyet 2004). Surviving families are more able to move on after the tragedy once they have confirmed that their loved ones are dead. Proper identification is crucial to surviving families' quest for closure.

Body identification is a multidisciplinary process, involving the expertise of police, forensic experts, and medical examiners (Tun et al. 2005). Personal possessions recovered from victims, such as identification cards, can help reveal the identity of victims (Hooft et al. 1989). In addition, bodies may be identified by examining faces and body markings, like tattoos and scars. Although visual identification is simple, its use may be limited - especially in hot climates - where decomposition may reach advance stages within 12-48 hours after an incident (Morgan et al. 2009). As a result, visual identification may be difficult and unreliable. Perhaps due to this challenge, Morgan et al. (2009) have recommended that visual identification should be combined with other identification techniques.

Bodies can also be identified through additional means including: fingerprint records, dental records, and deoxyribonucleic acid (DNA) profiling (Shaler 2005; Brenner 2006; Scanlon 2006; Teahen 2012). For example, Thailand carried out some identification using dental and fingerprint records after the Indian Ocean tsunami (Morgan et al. 2006). DNA may also be used

to identify bodies. This technique was instrumental in identifying the remains of the 9/11 victims and the remains of some of the terrorists that carried out the attacks (Shaler 2005). However, such methods are not always possible (McEntire 2009). This may be especially the case when there are limited DNA-profiling facilities and forensic experts to carry out the identification (Perera 2005). Unfortunately, Morgan et al. (2006) found that none of the three countries surveyed after the Indian Ocean tsunami (Thailand, Indonesia, and Sri Lanka) had sufficient forensic capability. This may be one reason why only 5,000 – 6,000 of the estimated 250,000 – 300,000 people killed after the 2004 Indian Ocean tsunami have been formally identified (Scanlon 2006).

As can be seen, the process of identification is by no means an easy task. In a bid to improve victim identification in future mass-fatality incidents, the Disaster Victim Identification System of the International Police Criminal Organization (Interpol 1997) was adopted by the international community as the international standard for victim identification (Scanlon 2006). However, even with existence of such systems, body identification may continue for up to a year, as was the case after the Indian Ocean tsunami (Scanlon et al. 2007) or up to three years after the 9/11 terrorist attacks (Tun et al. 2005).

Release of Deceased to Family Members. After a body has been positively identified, authorities will return the body to family members along with a death certificate (Morgan et al. 2009; Perera 2005). Returning the bodies to relatives is vital since it gives them closure, allows them to grieve, and begin to recover from their loss. If bodies are not returned to relatives in a timely manner, it may exacerbate the sadness experienced by family members and magnify the psychological distress on the affected community. These sentiments were observed after the 9/11 terrorist attacks and the Indian Ocean tsunami (Tun et al. 2005).

According to common practices, it is crucial to release bodies along with personal effects, no matter how insignificant they may seem (Jensen 2000; Teahen 2012). Personal effects can have considerable sentimental value to surviving family members (Jensen 2000; Teahen 2012). During this phase, information on the relative that claims a body, along with the body's unique reference numbers, should be recorded (Morgan et al. 2009). All of this will be imperative if insurance or legal claims are to be justified.

Disposition. After claiming bodies from authorities, relatives may decide to bury or cremate the bodies according to local customs and religious practices, which can vary widely. For example, most of the Western part of the world use coffins while Oriental cultures use shrouds (de Ville de Goyet 2004). Burial is preferred over cremation because it can maintain evidence for future forensic investigation, if necessary (Morgan et al. 2009; Teahen 2012). Burial sites must be carefully selected bearing in mind distance to the affected community, proximity to water sources, and soil conditions, among other factors (Morgan et al. 2009; Teahen 2012). However, in spite of these recommendations, cremation is becoming a more common practice around the world.

Challenges Facing Mass-fatality Management

According to researchers and practitioners, there are many challenges associated with mass-fatality incidents. This section discusses six challenges prevalent in major disasters.

a. Lack of Resources. An often-overlooked challenge of mass-fatality incidents is the amount of resources needed to carry out such operations. Resources include personnel, equipment, and supplies (NIJ 2005). Shortage of these resources may hamper or alter the response to mass-fatality incidents. For example, inadequate storage facilities in morgues and the unavailability of refrigerated trucks resulted in mass burials in deep trenches in

Indonesia after the Indian Ocean tsunami (Morgan et al. 2006). When staff, equipment, and supplies are in short supply, the ability of a community to improvise and harness neighboring community resources is crucial in ensuring an effective response to a mass-fatality incident. For example, Blanshan (1977) found that the use of volunteers was an effective strategy in helping to process the bodies of the dead after a flash flood in the Rocky Mountains of the western United States. Similarly, during the pandemic influenza (1918-1920), streetcars and grocery carts were used to transport dead bodies in Montreal (Scanlon and McMahon 2011).

b. Decomposing Bodies and Health Risks. Researchers have consistently debunked the myth that remains will generate diseases among survivors in the hope of preventing the burial of disaster victims in mass graves (e.g., Hooft et al. 1989; de Ville de Goyet 2004; Kirkis 2006; Phillips et al. 2008; McEntire 2009; Morgan et al. 2009; Teahen 2012). Nevertheless, this MFM myth may have prompted local communities in Indonesia to embark on mass burials (Morgan et al. 2006). In fact, there were 14 mass graves close to Banda Aceh, Indonesia, the largest of which contained 60,000-70,000 victims (Morgan et al. 2006).

c. Lack of Expertise or Training to Handle Bodies. Ordinary citizens may move the bodies of their loved ones (Morgan et al. 2009; Scanlon 1998; Scanlon and McMahon 2011) or bury or cremate the bodies without obtaining death certificates. The practice of moving bodies by those who are not experts is against the principles of identification contained in Interpol's guide (Interpol 1997). Burying or cremating bodies without proper processing also makes it difficult for local authorities to ascertain an actual death toll. According to

Scanlon and McMahon (2011), bodies should not be moved until marked and photographed where they are located.

d. Lack of Pre-death Data. Without ante-mortem data, it will be difficult to identify the victims of any disaster using DNA, fingerprints, or dental records. This difficulty may be exacerbated when whole villages are wiped out by disasters as was the case in some Indonesian villages after the Indian Ocean tsunami. Another challenge inherent in mass-fatality management is racial issues pertaining to the dead. Evidence from past disasters shows that the way bodies are treated sometimes depend on their race. For example, there was tremendous effort to identify the bodies of foreigners in Sri Lanka and Thailand after the Indian Ocean tsunami (Aguirre and Quarantelli 2008). In addition, Aguirre and Quarantelli (2008) examined why the official New York City list of the dead after 9/11 did not contain Latino victims.

e. Badly Disfigured Bodies and Bone Fragments. After a mass-fatality incident, bodies may be disfigured beyond recognition, and in some cases, only body parts and bone fragments may be found (McEntire 2009). This creates a nightmare situation for those in charge of identification. For example, 19,893 separate body parts were found after the 9/11 attacks at the World Trade Center (McEntire 2009).

f. Unavailability of a List of the Deceased. A lack of a list of who may be deceased (like manifest of a plane) could pose a big challenge to those in charge of body identification (Tun et al. 2005; Scanlon and McMahon 2011). In the case of an airplane crash, it is relatively easy to use the manifest to identify those on board. However, after mass-fatality incidents induced by disasters or an influenza pandemic, there may not be a list of the dead (Scanlon and McMahon 2011). Furthermore, the dead may be scattered over a

large area and sometimes whole villages may be wiped out, making it almost impossible

to develop a list of the deceased.

Unidentified Bodies

As can be seen, forensic experts, medical examiners, and other relevant experts work

diligently after a mass-fatality incident to identify those killed. In many cases, there are many

unidentified bodies. Bodies may be unidentified for many reasons. First, body parts – such as

fingers, teeth, legs, and the head – may be missing. Second, improper storage may lead to

decomposition of the body, making identification difficult. Third, the identification technology

needed may not be available in the affected nation. For instance, some poor countries do not

have DNA technology for victim identification. Fourth, if the number is very high, it becomes

more difficult to identify all the victims (Tun et al. 2005). Fifth, a lack of mass fatality

management plans, especially regarding unidentified bodies, may prompt some communities to

bury unidentified bodies in mass graves. In fact, Perera (2005) observed that unidentified bodies

were buried along with identified bodies in Sri Lanka after the Indian Ocean tsunami. Rather

than burying unidentified bodies in mass graves, Hooft et al. (1989) suggested that these bodies

should be stored, embalmed or buried temporarily, so that their identities can be further

investigated later. What to do with unidentified bodies is still an on-going research subject in

need of further investigation.

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Context of the Haiti Earthquake

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To further the understanding of the difficulty of responding to mass fatality incidents, this

paper examines the 2010 earthquake in Haiti. Haiti is a country situated between the Caribbean

Sea and the North Atlantic Ocean (Central Intelligence Agency 2011). Haiti shares the island of

Hispaniola with the Dominican Republic along with a history of colonization, wars of

independence, and frequent political instability. Like many developing nations, Haiti is experiencing a young - but growing - population, increased urbanization, limited education, and a weak economy. Haiti also has one of the most disparate income structures in the world (Jadotte 2006). While there are a privileged few, the majority of Haitians - 80% of the population - lives below the poverty line. This suggests that most Haitians survive on a budget of $2 per day or less, and 54% of the population fall below abject poverty (defined as less than $ 1 per day). Schuller (2008) therefore notes that Haiti is one of the poorest countries of the world, and it is also the least wealthy country in the Western hemisphere. Olson (2010) even termed Haiti as a "Fourth World" country that is desperately poor and unsustainable on its own. Due to such conditions, concerns about disasters and emergency management generally take a back seat.

Hazards and Vulnerability in Haiti

Haiti faces a variety of natural hazards including hurricanes and tropical storms. While these weather-related hazards pose constant threats in the summer and early fall, they do allow for warning and prediction. Seismic activity, which generally has no warning, occurs periodically in Haiti as the country is located at the intersection of the North American and Caribbean plates. For instance, on October 18, 1751, a major earthquake and resulting tsunami caused heavy destruction. A few weeks later, on November 21, 1751, another major earthquake destroyed Port-au-Prince, leaving one masonry building standing (Fierro and Perry 2010). On June 3, 1770, a sizeable earthquake struck Port-au-Prince again. There was another damaging earthquake on April 8, 1860, again accompanied by a tsunami (US Geological Survey (USGS) 2011).

In spite of these hurricanes, tropical storms and earthquakes in Haiti, homes and other structures are considered highly vulnerable. After the notable earthquakes in 1751 and 1770,

authorities required that buildings be constructed with wood and they forbade masonry (USGS 2011). Unfortunately, that was 240 years ago, and human collective memory has faded over time. Today, there are no building codes in Haiti, and this is no surprise since engineering curriculum does not include seismic design in this country (Fierro and Perry 2010). Even if building codes existed, it is unlikely that they would be enforced or followed. In addition, architects, engineers, and contractors do not need licenses, and many people build their own homes with limited resources and knowledge (Fierro and Perry 2010). Consequently, buildings often lack sufficient rebar and do not contain the proper mix of sand and cement. While 73% of the buildings in Haiti were one-story with 82% having sheet metal roofs, 71% of multi-story houses and apartments had roofs made of concrete. In either case, the walls – which are made of concrete/block/stone (Earthquake Engineering Research Institute (EERI) 2010a) – collapse easily under the strain of earthquakes.

The 2010 Earthquake and its Impact on Haiti

On Tuesday, January 12, 2010, at 16:53:10 hours, an earthquake of magnitude 7.0 on the Richter scale struck Haiti. The quake was located at 18.443°N, 72.571°W (about 25 km distance west/south west of the capital city of Port-au-Prince) with a depth of 13 km (Blanpied 2010). The earthquake occurred in the boundary region separating the Caribbean plate and the North America plate that is dominated by left-lateral strike slip motion and compression, with the Caribbean plate moving eastward against the North America plate. The earthquake did not produce observable surface displacement on the geomorphologically well-expressed main-strand of the Enriquillo-Plantain Garden fault system. Instead, the earthquake involved rupture of a fault or faults distinct from the previously mapped principal strand, causing significant uplift

along the Léogâne Delta (USGS 2011). Regardless of its unique nature, the earthquake lasted for 35 seconds and was extremely violent.

After the main earthquake, the USGS (2011) recorded at least 59 aftershocks of magnitude 4.5 or greater. Sixteen of these aftershocks had magnitudes of 5.0 or greater with the two largest having magnitudes of 6.0 and 5.9. The magnitude 6.0 aftershock occurred 7 minutes after the main shock on January 12 and the magnitude 5.9 event occurred on January 20. Due to the unrelenting aftershocks, people decided to live on the street or open areas for a lengthy period.

In its Action Plan for National Recovery and Development document, the Government of the Republic of Haiti (2010) states that the number of houses totally destroyed and damaged due to the earthquake is estimated to be 105,000 and 208,000 respectively. In addition, another 1,300 educational institutions and 50 hospitals and health centers collapsed and are unusable. The port was also considered inoperable after the earthquake. The earthquake even destroyed the Presidential Palace, Parliament, law courts, most ministerial buildings, and high-end tourist facilities like the Montana Hotel (Government of the Republic of Haiti 2011). Much of the damage was located in the city of Léogâne, the epicenter of the earthquake. Eighty percent of the collapsed or critically damaged buildings occurred in this jurisdiction (EERI 2010b).

The Government of the Republic of Haiti (2010) estimates the damage[1] and losses[2] resulting from the earthquake to be U.S. $7.9 billion, or about 120% of the country's GDP in 2009. Relative to the country's economy, this is consequently one of the most expensive disasters in the world. About 70% of the economic losses from damaged assets occurred in the private sector while the public sector suffered about 30% of the losses. Considering the economy as a whole, the value of all types of physical assets destroyed is about 55%. The effect on

economic flows from loss of production, turnover, and employment is 45% (Government of the Republic of Haiti 2010).

The human toll of the disaster was particularly significant. While there are discrepancies in the statistics, the Government of Haiti estimated the number of dead to be more than 316,000 (Gaestel and Brown 2011). The number of people injured in the earthquake is estimated to be 300,000, and more than 4,000 of these individuals became amputees after life-saving operations. In addition, it is estimated that the earthquake directly affected about 1.5 million people (or 15% of the country's population) (Government of the Republic of Haiti 2010). Another 1.5 million people were indirectly affected (United States Agency for International Development (USAID) 2011) and the International Organization for Migration asserts that 680,000 individuals were displaced from their homes (USAID 2011). It has also been suggested that over 600,000 left the capital city and relocated to rural areas. However, as of March 2010, about 1.3 million people were living in temporary shelters in the Port-au-Prince metropolitan area. Under such conditions, health officials became concerned about a major cholera outbreak in October 2010 (Ministère de la Santé Publique et de la Population and PAHO 2011). It is estimated that there were ½ million registered cholera cases, of which 138,946 individuals required hospitalization (USAID 2011). More than 6,700 people died due to the cholera outbreak (Guyler-Delva, 2011).

In order to have a baseline for comparing the response to the Haiti earthquake, it is imperative to discuss the normal death rituals in Haiti. The normal death rituals in Haiti follow the usual steps - body recovery, embalming, storage, positive identification, death certificate issuance, return of body to family members, and presentation (Blanshan 1977). However, during final burials, Haiti is unique. The Haitian culture – based on a combination of Roman Catholicism and Voodoo beliefs – believes in giving a befitting burial to the dead. This is why

burials in Haiti are often accompanied by huge fanfare and celebrations. The resources to carry out routine identification and disposition activities (e.g., morgue directors, forensic pathologists, funeral home directors, etc.) are available in normal circumstances. However, these resources quickly become overstretched in mass-fatality incidents, such as the Haiti earthquake.

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Research Methods

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In order to improve the understanding of mass-fatality management, the authors of this study have undertaken a qualitative research design. Because the nature of this study as well as the situation in Haiti and other countries do not allow for quantitative or experimental methods, the focus has been on quick response research that is common in many disaster studies. Quick response research has been defined by Michaels (2003, p. 41) as the information collection phase occurring during or immediately after a damaging event. In accordance with this research practice, the authors therefore traveled to the field to collect perishable data, conduct interviews, and participate in direct observation.

Timeline and Funding

Two of the authors traveled to Haiti under a University of Colorado Natural Hazards Center (NHC) Quick Response Research Grant funded by the US National Science Foundation (NSF) (CMMI 0734304). They left on February 23, 2010 (as soon as commercial flights resumed) and remained in the country for 6 days. All three authors made the journey to Haiti on May 31, 2010 under this current NSF Rapid Response Research (RAPID) Grant (Award # 1034799) to follow up on prior research efforts and remained there until June 3.

In addition to the research in Haiti, one of the authors participated in an NSF Small Grant for Exploratory Research (#0522362) dealing with MFM after the Indian Ocean tsunami. He visited several locations from May to August 2005 in Kerala and Tamil Nadu states and the

Union Territory of Pondicherry in India as well as Ampara, Batticoloa, Colombo, Galle, Hambantota, and Matara in Sri Lanka. He sought to understand how the governments dealt with the death of 223,492 people, which includes 40,320 who are missing and presumed dead (Oyola-Yemaiel and Gupta 2006, p. 413). This author also traveled to India and Bangladesh in the summer of 2009 under a NHC Quick Response Research Grant (CMMI 0734304) to understand MFM after Cyclone Aila (which killed 330 people on May 25, 2009). Finally, this same author visited India again under the current grant (Award # 1034799) to follow up research on Cyclone Aila and gather data regarding the Stephen Court building fire (which killed 41 people on March 23, 2010) and the Gyaneswari Express derailment (which killed 147 people on May 28, 2010).

Data Collection

The primary method of data collection in this qualitative field study is interviews. While in the aforementioned countries, the authors conducted over 176 interviews about MFM, including 28 in Haiti. Interviewees were not selected randomly, but using a non-probability technique called snowball sampling (Ireland, Berg, and Mutchnick 2010). The snowball sampling method involved interviewing a few respondents identified by our contacts in Haiti and approved by the research team. After interviewing this first group of respondents, we asked the informants to name others that we could also interview and these individuals were sought out. Many of the interviews were face-to-face, while other knowledgeable individuals (who were not available or located in the affected countries) were contacted by phone. Most of the interviews were conducted in English, although some were conducted in other languages (e.g., in Haiti, we conducted some interviews in Haitian Creole). In these cases, interpreters were used to help collect the research data.

Those interviewed include government officials, U.N. representatives, morgue and funeral home directors, the Disaster Mortuary Operational Response Team (DMORT) leader, religious leaders, national and international non-profit employees, forensic pathologists, doctors, military and police officers, and fire fighters. Surviving family members, local residents, spontaneous volunteers, researchers, university administrators, and hospital superintendents also participated in this research. Respondents were asked a series of questions including the impact of the disasters in addition to the number and nature of fatalities. The authors also examined how bodies were recovered, transported, preserved, and identified (if that was possible). The participants also provided information about religious practices for the deceased as well as thoughts about burials in mass graves. Furthermore, we tried to find if there were differentiations in handling the cadavers based on the apparent socio-economic status or nationality.

In addition to the interviews, the research team used secondary sources of information including media reports, government documents from the affected countries, or situation updates from the United Nations or non-governmental organizations. These were obtained through Internet searches or were provided from the contacts established during or after the interviews. The purpose of these additional sources was to corroborate initial findings or expand knowledge obtained from initial informants. Once the data from these interviews were collected and analyzed, the authors wrote up a case study of MFM in Haiti according to established research protocols (Yin 2009). MFM in Haiti was then contrasted with similar activities in the aforementioned disasters in India, Bangladesh, and Sri Lanka per the comparative method (Lijphart 1972).

Mass-fatality Management in Haiti

Mass-fatality management in Haiti reveals patterns similar to and different than other poor nations. Haiti was completely overwhelmed with the number of fatalities resulting from the earthquake and building collapses, and it was unable to identify the vast majority of bodies and avert their burial in mass graves. Because of the slow and ineffective response on the part of the government, some citizens dealt with the deceased in ways that may seem inappropriate to people in developed nations today. However, it is worth noting that in some past disasters, developed nations have engaged in questionable MFM practices too. For example, after the Chicago Heat Wave of July 1995, 68 unclaimed bodies were buried in mass graves outside of Chicago (Klinenberg 2002).

As previously mentioned, the fatalities in Haiti occurred in many structures, including government office buildings, schools, businesses, and homes. Depending on the type of the collapse and the conditions of safety or access, immediate family members, relatives, co-workers, neighbors, or people who happened to be at the location of death attempted body removal. While the retrieval of bodies was immediately possible in some circumstances, it was unmanageable in many cases due to unstable rubble, limited entry and exit points, or the lack of proper tools and equipment. Thousands of bodies were removed within hours and days, while others were extracted weeks and months after the earthquake. It is believed that even more than one year after the incident, there were still locations where bodies have not been removed from collapsed structures. For instance, one man described his heart-wrenching experience of searching for his wife as follows:

> I was in my house . . . and was going to pick up my kids from school. At
> 4:55 pm, the earthquake came, and my wife was inside the school [and]
> my son was in the same [building]. . . My son said he and his mother were
> on the first floor before the earthquake. His mother wanted to talk to the
> principal, whose office is on the second floor. My son went to the
> bathroom and the earthquake happened . . . He went outside . . . and [saw]

the school was totally collapsed. . . . After fifteen to twenty minutes, I saw my son coming alone without his mother. . . I took the car and went to the school. . . I saw people carrying bodies on the street. I saw people still trapped in the buildings crying. They were trying to move outside but could not. Everybody was screaming, crying, and there was complete disorder. . . I formed a team of five people and began to help move bodies. . . I never found the body of my wife. For two months nobody did anything. Every second and third day, I passed by the school to see if there was any change. . . But nobody helped. I went many times but I never saw my wife's body. My wife died inside the school. . . I asked the school what they plan to do with the bodies inside the school. . . They said they cannot do anything.

If the bodies were extracted initially, they were most often laid (and sometimes piled) on sidewalks and streets in front of damaged buildings. One respondent described twenty-five bodies lying on the road in a space of just five meters. In other cases, bodies of the deceased were taken to functioning hospitals (including University General Hospital in Port-au-Prince) or the MINISHTA United Nations compound, where they quickly outstretched the capacities of people in those locations. Bodies were therefore moved to proper storage facilities. However, the sheer number of deaths prevented efforts to retain bodies for any extended period of time, and in locations and at temperatures that would prevent tissue decomposition.

In addition, it was reported that Haiti had very few mortuaries prior to the earthquake, and Port-au-Prince was not left with many functioning mortuary facilities after the earthquake. For this reason, people began to notice after a few days that the corpses were bloating and beginning to decompose. The warm, humid weather along with the delayed ability of the government, hospitals, and morgues to deal effectively with the large numbers of deceased, were causing bodies to deteriorate quickly.

In some cases, bodies were identified by surviving family members or friends, who then sought proper storage and disposition by those providing funeral services. However, and as can be imagined, there was a significant shortfall in coffins and personnel to handle the deceased.

Some of the survivors who were interviewed told us that this delayed disposition resulted in extreme frustration and contributed to further emotional trauma after the earthquake. Nevertheless, the vast majority of bodies were not identified due to a variety of factors. For instance, some bodies did not possess any form of identification whatsoever, and this may have been common among a sizable group of impoverished Haitians. It was also reported that a few of those retrieving bodies accessed the wallets of victims and removed their contents (but did not return personal belongings to the original pockets). One interviewee described such a situation at the University of Port-au-Prince:

> There was a group of people from the streets looking for money, and while they were identifying the dead people, they just . . . put their hand in the pocket of the dead. . . [If] they find the money, they take the money and throw the [ID] card. . . Then somebody else takes it [the ID card] and brings it to us. In this way, we could identify some of the dead.

Looting of bodies in Haiti can be described, according to Quarantelli's (1994) classification, as minor. It was covertly done by individuals under opportunistic conditions, but socially disapproved by Haitians.

The loss of entire families or an inability to properly bury the dead in individually marked graves likewise made identification difficult or futile anyway. Furthermore, one United Nations official noted that there was no effective government command and control system in place for the first five days after the earthquake. He said there was a lack of professionals to follow the basic norms, as to "when you take a body, how you identify it, whether you take a photo or not, where you should keep immediate belongings, should they be kept in a vault or not?" The difficulty of accessing bodies also made identification problematic. One respondent replied that "it was definitely too late, you could not even see the faces of the body." Therefore, identification was only pursued in select situations where relatives sought a traditional funeral

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service. For most of the deceased, identification was either not attempted or was simply regarded to be an overwhelming task to accomplish.

The dispersed location of the fatalities was also a problem in the disaster. When the earthquake occurred, people were involved in daily activities (such as work, school or shopping) that required them to be in locations far from their homes and relatives. Therefore, the deceased were located in many areas throughout the capital city and countryside. This fact, along with the lack of adequate proper identification or the loss of entire families in the disaster, made the return of bodies to relatives extremely difficult. A Deputy Commander of the Indian Central Industrial Security Force, working as part of U.N. police, also noted that very few family members came to retrieve bodies. In other cases, loved ones did attempt to retrace the steps of parents, siblings, and children in the hopes of finding them alive or receiving medical treatment elsewhere. They also searched local hospitals to retrieve bodies if they could be found. Unfortunately, this was painstakingly difficult because bodies were extracted from many locations and moved elsewhere. In addition, there was little effort on the part of hospitals to track down surviving family members because the number of deaths made this prohibitive.

Where and when possible, bodies of the deceased were given last rites and either buried or cremated (according to the family's wishes). In Haiti, this commonly occurred according to traditional Roman Catholic religious practices. However, there were also rituals performed by Voodoo priests. These rituals were important to certain individuals since "in the Voodoo belief . . . the souls of people buried without the correct rituals remain close at hand and put a hex on the area" (Ghosh 2010). One such Voodoo priest noted that 4,000 to 5,000 bodies were taken to a cemetery in Dajao. He said:

> The ceremony of last rites was performed in the streets and not in the
> church. . .The Voodoo ceremony tries to free the spirits from the dead

bodies. . .The ceremony was performed by myself with other people. . .We started on January 15 . . . and continued. More bodies were found, they were brought and prayers continued. The last day of the ceremony was January 30th. All the witch doctors came to gather [and] prayed for the people who had passed away.

When asked about the particulars of the ceremony, he mentioned that he meets the family at the cemetery, calls for the spirit to protect the body, and burns incense so that the body could smell the incense and other people could not take away the spirit.

Although there were efforts to be sensitive to last rites, as required of specific religions, the reality of the situation made this improbable. One United Nations official commented on the difficulty of this goal:

> Every nationality has its own . . . customs and traditions to be followed to keep a dead body. The U.N. lost its own personnel, which included Muslims, Christians and Hindus. So there were issues about keeping the bodies together, keeping the bodies in separate places, keeping the bodies in refrigerators, or in other conditions. But at the end of the day, when it is a crisis, I don't think . . . these things matter . . . We all say to ourselves, "we have a task at hand. We have to get these bodies preserved before they get destroyed." Therefore, we cannot really pay heed to all the customs and traditions.

The disposition of bodies through normal death practices was also rare in Haiti. Because piled bodies were decomposing rapidly, and since the efforts to retrieve, store, identify, and dispose of bodies was seemingly slow or non-existent, some Haitians doused bodies with gasoline and lit them on fire. Haitians described a pungent odor that had to be ridded of and felt this was the only way to resolve the situation. Nevertheless, for the vast majority of the bodies, on-site cremation did not occur.

Reeling from the event itself, the government gradually began to mobilize its resources to deal with the mass-fatalities. On January 13, 2010, the government appointed the Central National Equipment (CNE), the government public works department, as the agency to lead

mass-fatality efforts. The CNE and many other international governmental or non-government agencies collected bodies with human labor and dump trucks, but then had the difficult decision of determining what to do with the remains. The Haiti government decided that mass burials would be required and many of the bodies were taken to vacant fields just outside of Titanyen (about an hour North East of Port-au-Prince). A number of long trenches were dug with a backhoe and bulldozer, and thousands of bodies were laid to rest in mass graves.

When asked about what was taking place, a heavy equipment operator replied that "it had to be done" (as cited by Ghosh 2010). However, not all victims were treated similarly. According to one reporter, "some dump trucks seem to have simply unloaded their cargo of corpses and rubble into the open [elsewhere]. Some halfhearted attempts at burial have been left incomplete. The result is a scene from a bad horror film: mounds of red earth, with body parts sticking out at grotesque angles. Some bodies are totally exposed, putrefying into a shade of yellow" (Ghosh 2010). Some survivors consequently felt "numb" because they did not know where their loved ones were buried and they believed the treatment of bodies was insensitive.

Although the management of mass-fatalities after the earthquake may be deemed inappropriate in many nations, several of the respondents noted that Haiti did the best it could with the situation it was facing. The country operates under difficult circumstances normally, and the disaster killed many civil servants and destroyed many government buildings including the Presidential Palace (the President had to seek shelter in a police station according to one interviewee). For the most part, those interviewed were sympathetic to what Haiti was dealing with before and after the earthquake.

A Notable Exception

As noted above, mass-fatality management in Haiti was, for the most part, improvised and conducted according to norms of necessity versus principles of preference. However, foreigners who died in Haiti were treated differently. For instance, governments around the world sent individuals and teams to Haiti to obtain the corpses of their citizens and return them to family members in their respective countries. The U.N. also provided body bags and wooden caskets for those who died in their office buildings. The U.N. compound had refrigerated containers, but these were inundated as people and police brought bodies by vehicles, vans, and trucks.

The U.N. also contracted with Kenyon International Emergency Services, a company that specializes in MFM. Kenyon arrived in Haiti on January 14, 2010 and helped the U.N. and other clients recover, identify, and return the personal effects and bodies of the deceased. Kenyon International was instrumental in the successful recovery of deceased U.N. workers killed in Hotel Montana. Kenyon International continued its MFM responsibilities until July 2010.

The United States government also became involved in the retrieval of Americans who perished in the earthquake. Two days after the earthquake, a team of representatives from the Department of Health and Human Services (operating under ESF 8) arrived in Haiti. A sizable portion of the crew immediately went to work (as best they could under the circumstances) to help with rescue operations and treat Haitians in portable hospitals, clinics and functioning hospitals. Four individuals affiliated with DMORT started to assess mass-fatality concerns, but they arrived with no formal mission or official U.S. role for this responsibility.

During the initial period of operations, many individuals and organizations asked the assessment team what should be done with deceased Americans. The team began communicating these inquiries to the U.S. embassy in order to convey needs and resolve legal and financial

concerns about Department of Health and Human Services DMORTS working in a foreign country. For days, there were no definitive answers and the situation was extremely dynamic. About this time, a Congressional Representative arrived in Haiti and started to pressure the U.S. government to act. He traveled at the request of American families who lost students while on a study abroad from Lynn University. The attention he brought to the issue was enough for decision makers to activate DMORT nearly one full month after the Haiti earthquake.

The goal of the team was to facilitate body collection and repatriation to America. In many cases, notes and calls from Haitian citizens and hospitals relayed information about dead Americans and where remains could be picked up. However, Americans also remained trapped under rubble, as was the situation at the Hotel Montana. Soldiers from the 113th Mortuary Affairs out of Fort Lee, VA conducted search and recovery operations at this location. They had the proper training and equipment to extract corpses from collapsed buildings. Regardless of where the bodies were initially found, they were taken to DMORT, which was set up at the Port-au-Prince airport.

The portable morgue unit at the airport had refrigerated trucks and containers, powered by fuel from the U.S. military, which were used to store bodies. The forensic professionals were divided into teams and worked on a 24 hour schedule (with 12 hour shifts) to process the remains. The DMORT process included an X-ray of the remains in the body bag, an admitting and numbering of the corpse, a catalog of personal effects, the taking of photos and finger printing, pathology and anthropological exams, dental observation, and collection of DNA specimens.

While this information was being acquired, an ante-mortem team in Florida collected similar information from family members who claimed to have lost relatives in Haiti. This

included data about body height and weight, hair color, tattoos, jewelry, DNA, and medical or dental records. When a positive match could be made (and there was absolute certainty that the remains were those of an American citizen), the remains and a tracking manifest were flown by the Air Force to a base in Dover, Delaware (the designated location to receive and process all of the remains of soldiers and diplomats who die abroad). At this point, the bodies were returned to families or sent to local funeral homes for proper ceremonies and burials.

By the time they finished operations in Haiti at the end of March, DMORT had processed over 200 American bodies. When asked about lessons learned from the experience, a DMORT official commented that the U.S. government needs to determine operating procedures in foreign nations when there is no coroner or legal jurisdiction. He also acknowledged the difficulty of language barriers and recommended adequate "fly away kits" including cell phones, lap tops, printers, and other working tools.

Cross-Cultural Comparison

Haiti's experience with mass-fatalities was both similar to and different than other major emergencies and disasters in India, Bangladesh and Sri Lanka. First, a number of individuals and organizations retrieved bodies after the Indian Ocean tsunami in India and Sri Lanka, after cyclone Aila in Bangladesh and India, and after the Stephen Court building fire and the Gyaneswari train derailment in India. In addition, local citizens, police and fire departments, the military, and the Indian National Disaster Response Force (NDRF) attempted to retrieve bodies drowned or buried in a mudslide after Cyclone Aila. A Deputy General Commandant of NDRF commented that "the recovery of bodies was a team effort [among] government and local people. Local people informed [the police] about the bodies . . . Police collected the bodies and brought [them] to the hospital morgue for postmortem." These findings about body retrieval are

consistent with the experience in Haiti and prior studies about human behavior in disaster

situations, although postmortem activities were almost non-existent after the Haiti earthquake.

Second, after the aforementioned emergencies and disasters, divergent patterns emerged

regarding body storage. For instance, many of the corpses after the tsunami in India were

preserved for up to two weeks while this was less common in Sri Lanka. In Bangladesh, after

Cyclone Aila, remains were stored for a short period (generally 4-5 days). When the fire and

train derailment occurred in India, the remains of the deceased were taken to hospitals and

morgues, and were kept for at least fifteen days and even for months while identification and the

notification process occurred. This finding lies in stark contrast to what happened in Haiti. After

the earthquake, bodies were taken to hospitals or morgues, or were simply piled in the streets.

However, the government of this Caribbean nation made little or no effort to store bodies for

extended periods of time (which was understandable since the number of deaths was of a far

greater magnitude than the much smaller incidents in India).

Third, the process of identification witnessed a broad range of options after the various

mass-fatality incidents. After the Indian Ocean tsunami, some of the individuals were identified

in India but this was less common in Sri Lanka. In Cyclone Aila, all of the deceased could be

identified and most of the deceased could be clearly recognized after the fire and derailment in

India too. For instance, some of the bodies were identified through photo debit cards,

photographs taken of the deceased at the incident location with their publication at police stations

or through the media, recognition of the deceased by surviving neighbors and relatives, or a

measurement of skulls as compared to existing pictures. A professor of forensics who was

involved in MFM after the Stephen Court building fire commented that in "thirty-six cases . . .

remains [were clearly identified] from their belongings, from their clothing, from their

anatomical structure, from their facial configuration. . . . In seven of the forty-one cases, the

identification process was done through DNA [collection]." When identification occurred in

India after these smaller incidents, the bodies were released through official processes to

relatives. In contrast, there were fewer methods used to accurately determine identification in

Haiti, although sophisticated technical procedures were used for deceased foreigners. Again, this

difference was most likely a function of the extent of the disaster in Haiti.

Fourth, the release and disposition of the deceased was divergent in the countries

examined for this study. After the Indian Ocean tsunami, the identified dead were released to

family members in India but unidentified cadavers were buried in mass graves near the coast

(and this was the case in Sri Lanka as well). In Bangladesh, government officials had less

oversight of MFM, and family members or neighbors maintained bodies and often buried them

in individual graves in their yards or at mosques or public cemeteries. In the case of the fire and

train accident, officials in India were hesitant to dispose of remains in a hasty manner. Although

a Deputy Secretary of a Disaster Management Department in India stated, "there was no policy

for dealing with unidentified bodies," in most cases bodies were stored for two weeks to a month

to allow for positive identification. In addition, a legal approval process appeared to be required

for the disposal of unidentified bodies in various jurisdictions:

- "So the procedure of disposal is as per government order."
- "Until and unless my superior . . . gives it in writing to dispose of [the body] . . . it will be where it is."
- "If the identity [is not determined] . . . the unidentified bodies are cremated in consultation with the health department."
- "If the body is not identified or if the claimant does not come in 15 days, then the body is disposed of by the hospital under the orders of the executive magistrate. The hospital [performs] . . . the cremation."

The situation in Haiti was substantially different. Mass burial for unidentified remains was

approved on a national, as opposed to individual scale.

Fifth, if bodies were identified, last rites were at the discretion of surviving friends and family members. This was common in India and Sri Lanka after the Indian Ocean tsunami as well as in Bangladesh after Cyclone Aila. There was also no effort on the part of the government to perform last rites for the deceased in India after the fire and train accident occurred. While respondents were aware of and attempted to respect different religious traditions, they felt that the ". . . government should never bother" with these matters. Instead, those interviewed said "we are [concerned] . . . about the . . . public interest, public health, sanitation, etc. . . We are technical people . . . so we do not encourage rituals. Our government is a secular government." Religious ceremonies for the deceased were therefore left to the preference of the family members. Where possible, this was also the case in Haiti (e.g, Roman Catholic or Voodoo ceremonies). However, because of the large numbers of bodies buried in mass graves, most of the deceased – to our knowledge – had no form of rituals whatsoever.

Finally, MFM was a sensitive subject in each of the countries examined for this study. In India and Sri Lanka, MFM was a delicate topic due to the overwhelming number of deaths that occurred after the Indian Ocean tsunami. While Bangladesh did not suffer to the same extent after Cyclone Aila, family members were devastated by the loss of their loved ones. Such feelings were apparent in India after the Stephen Court building fire because it was believed that the response by the fire department was slow and insufficient. In addition, some of the bodies were not identified for several weeks after the Stephen Court building fire so one respondent noted "the administration acted in a very careless way. Human dignity was played with. Individual's rights were not safeguarded. The value of personal life was discounted." This viewpoint was shared by surviving friends and relatives in Haiti. Also, government officials in

Haiti refused to be interviewed or declined to answer questions about how they dealt with mass-fatalities after the January 2010 earthquake.

Discussion, Implications and Conclusion

This exploration into the literature on mass-fatalities, as well as the actual management of this function in Haiti and in other countries, has several implications for research and practice. On the academic side, there is clearly a need for further studies of mass-fatality disasters. The findings in this paper reveal that it is imperative that we more fully understand how to deal with thousands of bodies in general and unidentified remains in particular. For instance, are there effective and simple ways to track corpses from recovery and storage to disposition? Also, research methods for obtaining data on how governments respond to mass-fatality incidents should be explored, especially since there is great reluctance on the part of informants to share their perspective on this sensitive subject. A final recommendation for scholarship is to advance research into MFM in developing nations and with a comparative perspective. Such measures would advance theoretical understanding as well as aid in the education and training of professionals.

In terms of practice, this research on the experience of MFM in Haiti and India highlights several questions and recommendations that could be addressed in future disasters. First, are there ways to help developing nations quickly and safely extract human remains from collapsed buildings after the needs of survivors have been met? Would a request for international donations for this purpose help provide resources to accomplish this task in a shortened time frame? Second, how can hundreds or thousands of bodies be stored when corpses quickly outstrip resources of hospitals, morgues, and funeral homes? Can international advisory or support teams be sent to developing nations when major mass-fatality disasters occur? Third, what methods

could be employed to identify bodies when disposition is urgently needed? Could the use of digital cameras serve as a simple way to provide photographic evidence for those seeking information about the deceased in mass-fatality incidents? Fourth, how can record keeping be improved for unidentified bodies? Are there tracking methods or computer programs that could be utilized for this function of emergency management? Finally, what barriers have to be overcome so foreign governments can quickly extract and return remains to their countries of origin? What international agreements and domestic policies need to be put in place so organizations like DMORT can operate more efficiently after disasters abroad?

As has been illustrated, the Haiti earthquake was a worst case scenario for the Haiti government and the international community. The complexity of this mass-fatality incident can be described using Tun et al.'s (2005) characterization – overwhelming number of dead, the absence of a list of the dead, many badly disfigured bodies, and quick recovery of thousands of bodies within a short time. These factors created an insurmountable challenge for those in charge of body handling so that the Haiti government had to issue directives for mass burials. An important issue worth noting is that of determining priorities among the living and the dead. Survivors were in need of urgent medical care, food, water, and shelter. The Haitian government and the international community focused their attention first on those alive using limited available resources. This was the right thing to do according to many experts (e.g., Hershiser 1974; Jensen 2000; NIJ 2005; Tun et al. 2005).

To conclude, recent disaster trends suggest that MFM is becoming a more important emergency management function compared to the past. Events like the Haiti earthquake and other incidents elsewhere reveal that more research is urgently needed on mass-fatality disasters. In addition, there is a significant need to improve MFM and the response efforts of developing

nations and the international community concerning unidentified bodies. We hope this paper will provide some direction as scholars and practitioners attempt to increase our knowledge base and improve our ability to deal with mass-fatality disasters.

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[1] Damages are estimated at the replacement value of physical assets completely or partially destroyed, built using the same standards that prevailed before the disaster.

[2] Losses are estimates from the economic flow resulting from the temporary absence of the damaged assets.