

Handling mass death by integrating the management of disasters and pandemics:

Lessons from the Indian Ocean Tsunami, the Spanish Flu and other incidents

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When people die in an accident, disaster or catastrophe, the first problem is establishing who has died. The second is identifying the dead. After the 2004 Indian Ocean tsunami, this process went on for more than a year: even then only a small portion of the dead was identified. In New York City, it was still going three years after 9/11 (Tun *et al.* p. 457). If negligence is suspected or there is reason to assume criminal activity, there may also be a need to establish cause of death. For example, the human remains from the four attacks on London transport were kept separate to avoid forensic contamination. Finally, those who die in a disaster usually though not always die in seconds or minutes. (Some of the victims of Hurricane Katrina who died in their homes when they were trapped for days and ran out of food and water would be an exception to this as would some of the victims of the 1917 Halifax, Nova Scotia explosion who died days and weeks after the explosion when their injuries led to infection.)

The situation is different when people die in a pandemic. Pandemic victims usually die at home or in a hospital or in an emergency care centre. Their identity is normally known.* The cause of death is obvious. There is no need for the long and complex process of gathering *ante mortem* (pre death) information to match *post mortem* (post death) data from the bodies to figure out who they are. Further, in contrast to disaster death, pandemic deaths continue for weeks or months.

The differences between disaster and pandemic death – especially the need for identification -- have led to acceptance that planning should be done separately. Thus planning for disaster death is usually done by the police and planning for pandemic death by the health authorities. A closer look suggests that this separation is not justified. Disaster death and pandemic death are far more similar than might appear though documenting that is not all that easy because the research community has tended to separate studies of mass death from studies of pandemics. In fact, the mass death literature ignores pandemic death and the pandemic literature only touches on death.

This article starts by examining the problems of dealing with the dead in the December 26, 2004 Indian Ocean tsunami and other mass death disasters. Then it compares those to the ones encountered in dealing with the dead from the 1918-19 Spanish Flu and other disease outbreaks. The comparison reveals many common problems. Both types of mass death led to shortages of supplies and personnel. Both generated a demand for volunteers. Both generated unfounded concerns about whether dead bodies are a threat to the living. Both can lead to economic problems. Both often strike most severely on the disadvantaged elements in a society. Both raise cultural issues especially if it is difficult if not impossible to carry on with normal death processes: mass graves are not uncommon after catastrophes or pandemics. These many similarities suggest that the planning and experience acquired as a result of disaster mass death may be useful in planning for pandemics and *vice versa* and that the current separation in planning is based on perception rather than reality.

Mass Death Literature

Much of the early material on mass death in disaster is from the Disaster Research Center at the University of Delaware (Blanshan, 1977; Blanshan, Undated; Hershiser; Hershiser and Quarantelli, 1976; Hershiser and Quarantelli, 1979). There are also articles and book chapters on the role of the funeral director after an air crash (Pine, 1969a; Pine, 1969b; Pine, 1974; Pine, 1980) including two in Vanderlyn Pine's book *Responding to Disaster* (Catron; Beatty). There is research by: American odontologists (forensic dentists) (Brannon and Kessler; Clark *et al.*) and Canadian odontologists at the Bureau of Legal Dentistry (BOLD) at the University of British Columbia (Pretty *et al.* 2001a; Pretty *et al.*, 2001b) Japanese medical personnel after the Kobe earthquake (Nishimura, 1997a; Nishimura, 1997b; Nishimura, 1997c) and the Emergency Communications Research Unit (ECRU) at Carleton University (Scanlon, 1988; Scanlon and McCullum).

There are brief references to the handling of bodies in books or case studies of specific incidents for example the *Noronic* cruise ship fire in Toronto harbour, (Craig) the Texas City explosion (Stephens), the Vaiont dam disaster in Italy (Quarantelli), Hurricane Hazel which struck the Toronto area (Kennedy) the Gander, Newfoundland air crash (Emergency Communications Research Unit) the capsizing of the ferry *Herald of Free Enterprise* in Zeebrugge, Belgium (Kent Constabulary) the Tangshan earthquake, in China (Yong *et al.*) the Bijlmer air crash in Amsterdam (Rosenthal) and Cyclone Tracy which devastated Darwin, Australia (Scanlon, 1979). Finally, there is a growing literature on mass death resulting from the 2004 tsunami including four additional articles from ECRU at Carleton University (Bajaj; Brenner; Eberwine; Eriksen and Sprogge-Jakobsen; James; Ellen; Kieser, Laing and Herbison; Morgan *et al.*; Perera; Rognum; Sirisup and Kanluen; Sumathipala, Siribaddana and Perera; Tan, 2005; Tsokos *et al.*; Scanlon, 2006a; Scanlon, 2006b; Scanlon, 2006c; Scanlon, 2005).

In his paper on the Rapid City flood in South Dakota in 1972 Hershiser says initially many bodies were moved, sometimes by strangers:

There had been no contingency planning for such an event: thus the community was caught completely unaware of how to proceed. This perhaps accounts for the widely fluctuating estimates of the probable number of dead, as well as the initial uncoordinated manner in which the dead were recovered. Many of the 155 bodies recovered during this period were brought in by police and fire departments, as well as the local national guards, but often their actions were as much the result of individually decided courses of action as they were organizationally determined. Many of these bodies were brought in by family members or friends of the deceased as well as by people "who just happened upon" a body (Hershiser, p. 1).

A funeral director confirms this:

When we arrived...they had already brought in three or four bodies to the garage of the funeral home. Within two hours there were over sixty bodies in that garage.... They were brought in by helicopter, by army truck, by station wagon, on the back seats of cars and anything that would move (Catron, p. 127).

This pattern shows up many times. After *Empress of Ireland* sank in 1914 near Rimouski, Quebec, bodies were piled up on the dock, then in a building nearby, and then other buildings in the town were used as morgues. (Croall, p. 143) After Cyclone Tracy passed Darwin at Christmas, 1974, bodies were taken to police headquarters where they were piled up inside the door (Scanlon, 1979). After the 1995 earthquake in Kobe, Japan private citizens brought bodies to the police stations, temples, schools, gymnasias, health and community centres and private companies, where they were laid out on the floor: there were, for example, 300 corpses laid out in a sports centre in Nada ward (Nishimura, 1997b, p. 225). In Texas City, Texas where a 1947 explosion led to 552 killed, 200 missing, some bodies were taken to funeral homes or to a hastily created morgue; others were scooped from the harbour and taken by boat to nearby Galveston (Stephens, p. 69). In Tangshan, China, where a quarter of a million persons died in the 1976 earthquake, many dead were moved by individuals, then “wrapped in cotton quilts and buried in shallow pits dug by relatives and friends (Yong *et. al.*, p. 70)”.

There was a similar initial response after the 26 December 2004 Indian Ocean tsunami. In Thailand, the bodies were collected by individuals and brought to Buddhist temples where they were laid in rows on the ground. Local authorities numbered the dead and photographed them, and then posted the photos on bulletin boards and web sites. There was an effort to keep the bodies from decaying by using dry ice because no refrigeration was immediately available. In Sri Lanka, the dead were also picked up by survivors and piled up at the entrance to hospital emergency wards: there were more than 1,000 bodies in some hospital reception areas. Some physicians coated the bodies with formaldehyde in an effort to preserve them. Like the Thais they also took and posted photographs (Scanlon, 2006a). In Sri Lanka, other bodies were brought to Mosques where the public address system used to call Muslims to prayer was used to ask them to come and identify the dead.** In Sri Lanka, because of Muslim customs which require quick burial and because of inaccurate reports that bodies are a threat to the living many dead were buried very quickly. In Indonesia, where the death toll reached something like 200,000, the authorities had no choice but to bury the dead in mass graves. A few attempts to identify bodies proved abortive: since entire villages were wiped out; no one was left alive who knew the dead or could provide *ante mortem* data that might have helped identify them.

Plans such as the one prepared by the International Police Criminal Organization (Interpol) assume that the dead will be at a single location and that that location will be controlled by emergency agencies (Interpol, 1979). The bodies will be marked and photographed in place before being moved. This may be true for an air crash or building collapse but in a disaster or catastrophe the bodies are not at one location, are not therefore controlled by emergency personnel and are not marked or photographed before being taken to collection points such as schools, hospitals or other public buildings. The plans are unrealistic given what happens in a disaster or catastrophe.

In addition to the literature on mass death, there is also a steadily expanding literature on pandemics some of which touches on pandemic death. Some of this literature dates back to the 17th Century plagues and mentions the collection of the dead and policies about disposal of bodies. Some references are in personal accounts, such as the diaries of Londoners

Samuel Pepys and John Evelyn (Wheatley; De Beer). There are a few accounts that focus mainly on the plague and its impact (Parets).

Recently, there have been a growing number of books, mostly American, on the 1918-19 Spanish flu (Barry; Crosby, 1989; Crosby, 1976; Peters; Rose). Most include accounts of bodies piled up in assembly areas, of problems collecting bodies and of issues about record keeping and funeral rites. A few articles cover death as one aspect of a pandemic (Belyk and Belyk; Grist; Persico). There are also accounts of the impact of the Spanish Flu on particular communities including Philadelphia, Pennsylvania (Starr, 1976) Newark, New Jersey and Winnipeg, Manitoba (Galishoff; Jones, 2005). Others deal with isolated aboriginal communities (Hanson). One deals with a particular physician and his role (O'Keefe and MacDonald). There are a few accounts of other pandemics such as Geoffrey Bilson's book on cholera in Canada (Bilson). Finally, a few Historians are now taking a serious look at the flu and its impact on society (Jones, 2003; Lux).

While none of these flu-related accounts deal mainly with death, all show that dealing with the dead in a pandemic leads to enormous problems. There will be a shortage of supplies, a shortage of personnel. There will be problems with paper work. There will be a desperate need for volunteers some to collect bodies, others to dig graves. There will be occasional problems with identification. There some occasional problems with identification during the Spanish flu. Crosby reports that which ships arrived with dead soldiers it was sometimes difficult to identify them: "Many soldiers were too sick and too delirious to identify themselves, and, of course, the dead were forever silent on the matter. The army had ordered that each man wear a tag around his neck with his name and number thereon, but for some reason hundreds...had no tags at all" (Crosby, 1976, p. 129). There will in short be many of the same problems that show up after a disaster or catastrophe.

Identification

As mentioned, the major difference between disaster death and pandemic death is the need to identify the dead after a disaster. This is rarely a problem in a pandemic. Blanshan says this is what distinguishes disaster body handling from normal death procedures.

It is the goal of identification which makes disasters body handling unique. Identification is not a requisite that the professional body handlers must deal with in normal death situations. The professional body handlers are ill prepared to execute the various tasks in the early stages of disaster body handling. In addition, they do not accept these tasks as part of their job *i.e.* they are death specialists and death experts who have an image of professional identity to preserve (Blanshan, Undated, p. 6).

The disaster identification process normally involved four elements. First an accurate list must be compiled of those who are missing presumed dead. Second, *ante mortem* or pre-death data must be acquired about those on that list. Third, *post mortem* information must be obtained from the remains of the victims. Fourth, the two must be compared. Until fairly recently identification was often based on visual recognition. After the 1917 Halifax

explosion, survivors collected the dead and took them to Chebucto School. Since there were no forensic techniques at that time, survivors would come to the school and walk back and forth looking at the bodies in the hope they could identify a family member.

That is also what happened in the first few days after the tsunami until the bodies deteriorated beyond recognition in the hot and humid conditions. Persons would think they recognized someone from one of the numbered photographs which they saw on a bulletin board or web site and would try to find that numbered body on the grounds of one of the temples. Officials also wandered through the bodies trying to find someone their government felt was important.**

However, with the development of sophisticated identification techniques, such as x-rays, dental records and fingerprints, the identification process has become more elaborate. After the Big Thompson flood in Colorado, bodies were brought out by helicopter, and then moved by pick-up trucks (two or three at a time in body bags) to a place where they were washed, sprayed with disinfectant and where the identification process began.

Three photographs were taken of the head (one frontal and two profile); routine physical characteristics such as hair and eye color, height, weight, sex, approximate age, etc., were noted, unusual characteristics such as scars, tattoos (stet.), false teeth, pierced ears, etc., were noted; the body was given a number and toe-tagged with it; property on the body such as rings, earrings, watches, pieces of clothing, false teeth, etc., was removed and marked with the toe number; and finally finger prints were made (Blanshan, 1977, p. 5).

Even more elaborate procedures were followed after the air crash in Gander, Newfoundland. The bodies were moved to a morgue at an unused hangar at Gander airport where identification teams from the Royal Canadian Mounted Police (RCMP) carefully examined each body for any identifying characteristic, including dog tags. This information was entered into a computer system and more than 70 per cent of the bodies were tentatively identified. Later, bodies and body parts were moved in individual carrying cases, each covered with an American flag, to the American military morgue at Dover, Delaware, where each body was photographed and filmed, x-rays taken, dental work examined, attempts made to get fingerprints and body tissue collected for forensic analysis. In Gander, soldiers, ambulance and hospital personnel assisted the RCMP. A special body-handling unit that included a professional mortician supervised the movement to Delaware. The forensic work at Dover involved US federal law enforcement, RCMP (who monitored what happened), dentists, pathologists, x-ray technicians, photographers, etc. To conform to Canadian legal requirements, an American physician was licensed to practice in Newfoundland (Emergency Communications Research Unit).

The first step in the dental identification process was opening the mouth for insertion of dental X-ray films. The mouths of the victims tended to contract due to postmortem rigidity as well of the thermal effects of the postcrash fire. On non-viewable bodies the mouth was opened either by gently prying or by incision and removal of the mandible and maxillae. Extreme care was exercised to avoid mutilation of facial features in those few bodies considered viewable. The second step required a full set

of postmortem dental X-rays. Dental charting and examination was performed following full body X-rays and required cleaning the teeth with bleach to remove as much soot and debris as possible. Photographs were used to verify and document the dental charting. The dental identification process concluded with the comparison of ante and post-mortem dental charts, X-rays and photographs (Clark, Clark and Perkins).

In Thailand after the tsunami, the initial processing of the dead was done in primitive conditions. However, after a Norwegian firm, Normeca, assembled a new morgue, the process became far more sophisticated:

The new facility consisted of 18 containers linked together so six lines could handle bodies at one time with four stations in each line. These stations dealt with general registration and clean-up of clothing, fingerprints, pathology and dental x-rays. The facility was blessed by Buddhist monks so the Thais, who believe the spirit will become restless if a body is moved, would accept it. Within a few weeks, most bodies were moved to the new facility and all the results were being checked, double-checked and triple-checked. Both ante-mortem (AM) and post-mortem (PM) information was taken to a modern data centre called the Thai Tsunami Victim Identification - Information Management Centre (TVI-IMC). There, the data was entered into two computer systems: DVI System International (for everything but fingerprints) and AFIS (for fingerprints) (Scanlon, 2006b, p. 25).

In Sri Lanka, no new facility was required since the work was done at a hospital in Colombo; but the process was similar to Thailand and the data obtained in Sri Lanka was forwarded to the TTVI-IMC in Phuket, Thailand. However, many bodies processed in Sri Lanka were those of foreigners whose bodies had been exhumed after British, German and Austrian police had located their graves. Those doing the forensic examinations had a pretty good idea of whose body they were examining and often they were able to confirm the identity and get Sri Lankan approval because the Sri Lankan coroner was usually present.

In all cases, nevertheless, the procedures involved a great deal of paper work. There was paper work required as the information was collected from the body and there was substantial paper work involved in collecting the pre-death information. (Interpol provides lengthy yellow and pink forms for recording pre and post death information.) Even as recently as the Bali night club bombings, matching pre and post death information involved shuffling two coloured piles of paper, searching for matches. There was usually some attempt to break the piles by sex, age and other characteristics. Now, the actual searching for matches can be done using computerized systems but there is still a lot of paper work involved in collecting the data that goes into those computer programs. For example, as a body is being examined, a scribe follows it along making notes on everything that is observed.

Use of Volunteers

The demands created by disaster death often lead to *ad hoc* responses and the use of volunteers. Even the initial response organization is often unplanned. For example, within hours of the 1917 explosion in Halifax, Nova Scotia (1,963 dead, 9,000 injured) a committee of local politicians and leading citizens had formed the Halifax Relief Committee. The committee took on tasks of feeding, clothing and sheltering the victims and dealing with the dead. It arranged a line of credit from the Bank of Nova Scotia and it arranged for a morgue to be established in the basement of the Chebucto School. (Halifax was unusual in its ability to deal with mass death. Five years earlier it had used the Mayflower Curling Club for bodies recovered from *Titanic*.) A similar unplanned response was hastily organized after the cruise ship *Noronic* caught fire in Toronto harbour in 1949:

When the firemen began the work of removing the bodies and the extent of the disaster was realized, the Chief Coroner took charge. A Disaster Committee was quickly organized. The Attorney General on behalf of the Provincial Government, and the Mayor on the part of the city, agreed to look after any necessary expense. Mr. W. J. Stewart was appointed Chairman of the Committee and quickly enlisted the aid of the Red Cross, the St. John Ambulance Brigade, The Salvation Army, The Morticians and Funeral Directors. The Horticultural Building at the Exhibition was engaged as a temporary morgue, and using all available ambulances and service cars of funeral directors, the bodies were rapidly transported there. Each body had been tagged with a number and, if it was possible, the number of the cabin it was in. The Chief Coroner set up an office there to direct proceedings. The Police Department assisted by photographing all the bodies and collecting all valuables, jewellery and on the bodies which was then listed and put into safe keeping. Mr. Paul Keenan, Secretary of the Morticians' Association organized staff to look after the bodies. In another wing of the building, the Salvation Army and the St. John Ambulance Brigade set up a temporary hospital and reception parlour for inquiring relatives. Several telephones were installed, a taxi service arranged to bring relatives out and a panel of workers to interview the visitors. The St. John Ambulance Brigade also set up a canteen service to feed visitors and workers.... (Grant, Prendergast and White, p. 4).

Even tasks normally reserved to death professionals are turned over to volunteers. Stephens reports students were brought in to assist after the Texas City explosions:

Approximately 150 embalmers, many of whom were students at mortuary training schools in Fort Worth and Houston, worked with whatever equipment was at hand. Sand and tar paper were spread on the floor so embalmers would not slip in the blood and the embalming solution. With few preparation tables available, cots, stretchers, counters, and even a grease rack served as substitutes (Stephens, p. 70).

When Hurricane Hazel struck Toronto the police broadcast an appeal for persons to assist at the Etobicoke Police Station. Among those who responded were J. R. McFadden and Elliot Baker. When the police learned that Baker was a medical student at the University of Toronto and had experience with cadavers, he and McFadden were asked to set up a morgue in an old fire building. Assisted by a young woman, the men cleaned the bodies and wrote

notes about anything that might help identify them then handed these to Salvation Army personnel who were dealing with those looking for the missing (Kennedy, pp: 125-6). These volunteers were not supervised by any emergency agency or by persons who normally deal with bodies.

Shortages

After a mass death incident, there is likely to be a shortage of facilities and supplies. After the loss of *Empress of Ireland*, *Lady Gray* brought in 188 coffined corpses to Quebec. In spite of that sufficient coffins could not be secured at Rimouski, and a score or more victims had to be placed in hastily constructed wooden boxes” (Marshall, p. 24). After the Canadian Pacific steamer *Princess Sophia* ran aground near Skagway, Alaska in 1918, the bodies of the 343 dead were brought to Juneau, Alaska. Supplies to make coffins and embalming fluids had to be shipped in because supplies ran out overnight (Coates, p. 115). After the 1985 air crash in Gander, Newfoundland, the hospital morgue had space for just two bodies and a nearby garage -- designated as a back-up facility -- was far too small. At Gander, the responders ran out of body bags, shroud sheets and places to lay out the bodies. The bodies had to be left on plastic ground sheets on the hangar floor. This was far better than what happened at the temporary morgue after two ships exploded in Texas City:

The garage morgue had a cement floor, and in embalming the bodies there was no way for us to drain unto containers; consequently we had to drain the blood on the floor embalming Fluid was spilled and it drained from the mutilated parts of the bodies. After several bodies were embalmed the floor was an inch or two deep in slush (Stephens, p. 69).

There were similar scenes in Thailand after the tsunami:

...the scene at a temple as hectic with hundreds of makeshift coffins piled five or six high, people searching vainly for relatives, uncertain policemen attempting to assert a confused authority, TV crews, and some Buddhist monks.... The party was taken to the place where the bodies were being kept. They were met with rows and rows of bodies, some enclosed in plastic, some half covered, some completely exposed, many in a condition that made them no longer identifiable (Bajaj, pp: 504-5).

In Thailand and Sri Lanka, one reason so many bodies deteriorated is that the few morgues available were in hospitals and had room only for a few bodies. This is less of a problem in Northern countries during the winter.

Even when the dead are not in the hundreds or hundreds of thousands, there have been supply problems. Glen Beatty describes the situation after 91 men died in a fatal fire in a mine in Idaho:

The supply of embalming chemicals was not adequate for the condition of the remains. One must recognize the severe limitation in preparation faced by this firm in this small community where no one wanted to admit or consider that these lives had been lost. It

takes a lot of manpower and equipment to care for eighty-four remains in a week's time (Beatty, pp; 120-122).

Sometimes there are unexpected needs. After the crash of Swissair 111 it was assumed there would be a need for body bags:

A large supply of body bags from a Georgia supplier was placed on a flight for Halifax within hours of the crash, but they were not needed because the bodies of the 229 victims had been horribly shattered and only one whole body was found. Instead of the bags, thousands of disposable forceps and glass test tubes for use in DNA analysis had to be ordered to deal with the 15,000 body parts that were recovered.... Preparations for handling the body parts meant that it was soon impossible to buy Ziploc plastic bags in some Halifax stores. Members of the local Emergency Measures Organization office were sent to grocery and department stores to purchase plastic tubs and Ziploc bags in bulk. "They cleaned the stores shelves out (Grant, 1999, p. 743).

In addition to finding a suitable location for a morgue, moving the dead to that morgue may require makeshift resources. Craig describes what happened after the *Noronic* fire:

As they [charred remains] accumulated on the dock, police patrol wagons and even ordinary trucks were pressed into service to supplement the fleet of hearses and ambulances being used to carry them away (Craig, pp: 92-93).

Inevitably some of response activities raise cultural problems. A proposal to cremate the dead after the 1917 Halifax explosion was withdrawn as a result of protests. New facilities for processing the tsunami dead in Thailand could not be used until they were blessed by Buddhist monks. One Thai state refused to allow bodies to be transferred to the morgue because it would disturb the spirits, which Buddhists believe are still in the bodies.

Disasters also have economic consequences: Thailand's tourist industry virtually disappeared after the 2004 tsunami. New Orleans was virtually wiped out after Hurricane Katrina. Disasters also tend to impact more severely on those already disadvantaged. The 1917 Halifax explosion impacted mainly the poor, Roman Catholic North End of the city. Hurricane Katrina hit hardest on those who did not have the ability to leave the city. The tsunami did take the lives of many tourists in places like Thailand but the bulk of the dead were poorer persons who lived in coastal villages.

Funeral Professionals

In a normal death situation, the family is involved in the selection of those who will deal with the body and the procedures to be followed (whether there is to be religious service, whether the casket is to be open, whether there is to be interment or cremation). In the case of mass death, family and relatives are often excluded from the initial stages of body handling -- both search and rescue and identification. Pine says this leaves the families powerless. Describing his experience at an air crash in New Hampshire (Pine is a Sociologist *and* a funeral director), he reports:

...there was not absolutely no elective process, *nor* was there any selective process. This reduced the sufferers to a position of nearly complete dependence, and gave the experts total control. Everything was out of the hands of grief sufferers, except the final funeral arrangements (Pine, 1969a, p. 5)

In addition, individuals are forced to provide normally private information to assist with identification and to provide it to agencies that will not necessarily respect that privacy. (Pine says funeral directors are used to handling and keeping in confidence sensitive information such as whether the deceased wore a wig, had false teeth, had other prosthetic appliances.) Certainly in the case of the tsunami there were extensive efforts to gather *ante mortem* data from family, dentists, physicians, hospitals records and any other source that could be located. In one case, a child was identified by fingerprints obtained from a pre-school finger painting.

When regular funeral professionals do get involved, their involvement may be different than after normal death. In Rapid City, for example, the three local funeral homes agreed that:

...normal competition among homes would be eliminated. Provisions were made to provide a moderately priced funeral for all affected. The same type of casket was provided with the same kind of cement vault and minimal cosmetics were applied. Viewing time was reduced usually to a single viewing by close relatives and often only when specifically requested. This, although there was a reduction of choice with regard to funeral arrangements, it was generally felt that such a reduction was necessitated by the larger number of dead. Two of the three funeral directors, however, did evidence some misgivings about these procedures feeling that the relatives might, in retrospect, feel that they had not properly handled the burial since few choices were afforded to them (Hershiser, p. 3).

Even when all the deaths occur in one location, there may be a change in the way funerals are handled. Catron reports that after the Rapid City flood it was, "regrettably necessary" to tell the families that normal religious services would not be possible. Most bodies were buried after a graveside committal service. A memorial service for the entire community was held some week's later (Catron, p. 129). In Italy after the rockslide there were also individual religious services, again at the graveside (Quarantelli, p. 208). Sometimes as after the 1917 Halifax explosion and as after a fatal fire at the Knights of Columbus hostel in St. John's Newfoundland where 99 persons died in 1942, there have had to be mass funerals (Fitzgerald, p. 26). In 1974 in sub-tropical Darwin, Australia, after Cyclone Tracy the dead were buried in 24 to 48 hours: there was no power and no storage facilities (Scanlon, 1979). No religious services of any kind were held. The situation was the same in some areas after the Indian Ocean tsunami:

After the tsunami, the deceased were sent to the nearest hospital morgues during the initial stages, and within hours all available space was occupied." "The deceased were sent to mass burial sites, bypassing the hospitals. As a result, thousands of deceased were neither imaged nor documented in appropriate registries before being

sent to mass burial grounds.” “The rapid disposal of the deceased into mass burial sites without any sort of documentation had serious effects on issuing death certificates subsequently. Many mass burial sites were not planned and not well documented. The police figures about the deceased in many burial sites were contradictory. In some instances, the identified and unidentified deceased were buried together. In none of the sites were the buried bodies given any permanent identification marks or tags (Perera, e165).

If the dead are to be identified using forensic techniques as was done in Thailand after the tsunami the release of bodies for burial is a slow process. Some are released almost immediately when relatives certify their identity before the bodies have deteriorated beyond recognition. (This often leads to error: the first two bodies shipped back to England after the tsunami had both been wrongly identified by relatives; the errors were caught when the bodies were re-examined by staff of the West London coroner.) After that there is a slow but steady flow of bodies and body parts as individuals are identified. In the case of the tsunami the identification had to be approved by local authorities – in Thailand that was the police – then cleared for release by the appropriate embassy. The body could then be buried or cremated in Thailand or shipped overseas for handling as desired by next-of-kin. Until then, the relatives had to wait.

Pandemic Death

How does all this compare to pandemic death? As mentioned, most pandemic victims die at home or in health care centres where they are known. There are some variations from this pattern. While most who died from the 1918-19 Spanish flu died in their own communities the flu also took the lives of Allied soldiers some in Europe, some while returning home by ship. Identification is not usually an issue. There is no need for autopsies or extensive forensic examination to determine why pandemic victims died. There is also no need to compile a list of those who may have died and to have police and other agencies spend time trying to collect *ante mortem* data so it can be matched to information collected from the bodies. However, despite those major differences, a review of what is known about pandemic death suggests there are, in fact, many parallels between pandemic death and disaster death.

First, although disaster victims die at one time or over a very short period, as mentioned above they do not enter what might be called the death system all at one time. There are two reasons for this. Sometimes body recovery takes time as was the case, for example, after the bombing of the Murrah Building in Oklahoma City or after the attack on the World Trade Center towers in New York City on 11 September 2001. The bodies and body parts were recovered over an extended period. Second, the need to identify the dead means that even if the dead are collected very quickly, identifying them make take months, even years as was true for the tsunami and 9/11. That means the release of bodies to next of kin for death rituals – funerals, cremation, internment – takes place over an extended period. That is very similar to the steady flow of dead during a pandemic.

Second, both in disasters and pandemics, it is common for storage facilities and personnel to be in short supply. Belyk and Belyk report that – just as in Thailand, Sri Lanka and India after the tsunami -- this was a problem in Cranbrook, British Columbia during the 1918-19 Flu pandemic:

When the local undertaker fell ill there was no one to prepare for burial the flood of Flu victims. Fourteen year old Frank Roberts' father assumed the role of mortuary caretaker during the absence of the undertaker. One night the boy accompanied his father to the funeral parlor to check the furnace. After entering the building through the back door, his father pulled the cord on a bare overhead bulb. The flood of light suddenly revealed a ghastly sight. The room was full of bodies, so many that they were stacked like firewood (Belyk and Belyk, p. 48).

There were similar problems elsewhere:

The corpses had backed up at undertakers', filling every area of these establishments and pressing up into living quarters; in hospital morgues overflowing into corridors; in the city [Philadelphia] morgue overflowing into the street. And they had backed up in homes. They lay on porches, in closets, in corners of the floor, on beds. Children would sneak away from adults to stare at them, to touch them; a wife would lie next to a dead husband, unwilling to move him or leave him (Barry, p. 326).

During pandemics as during disasters, there is also a need for volunteers.

[In Alberta] salaries were offered to attract volunteers: first to any unmarried trained nurses not currently employed, then to unmarried V.A.D.'s (members of the Voluntary Aid Detachment), then to married nurses or V.A.D.'s with no dependent children, then to those with children who could make other arrangements for their care, then to anyone who might not know anything about nursing but could at least warm soup, get a drink of water, or empty a bed pan. Desperate notices asking for more volunteers appeared every day in the newspapers and, by the end of the year, even part-time help was sought (McGinnis, p. 6).

[In Newark, New Jersey]...corpses were arriving at the cemetery more rapidly than they could be interred, with the result that: 'often the dead remained for days and even weeks because of the lack of men to inter them. City employees were sometimes used for grave digging and a hundred firemen volunteered for the task on one occasion. Teams of horses were used in several cemeteries to plough trenches, in which influenza victims were buried in long rows. When 140 unburied bodies crowded Holy Sepulcher Cemetery at once, the city hired laborers-at high wages- to perform the corporal work of mercy (Galishoff, p. 250).

[In Philadelphia] the usual complement of grave diggers was far too small to dig the number of graves required. Various city departments, including the House of Detention, sent men to cemeteries and they, plus volunteers, did the job. The Bureau of Highways offered a steam shovel to dig trenches in Potter's Field for the burial of

the poor and friendless. Such was the confusion and the speed with which the dead were thrust into the ground that it was apparent that there would be some, perhaps many, cases in which relatives would want to move their dead to family plots or even to other cemeteries, so the bodies were tagged for identification if they should later be disinterred (Crosby, 1989, p. 83).

At the height of the epidemic, Philadelphia's undertakers couldn't keep up.... They ran out of coffins, spaces to put coffins with bodies in them, and places to bury the victims. Embalmers were in such short supply that many bodies started to rot. Horse carts trolled the city streets, their drivers calling for the dead to be brought out. Steam shovels dug trenches in which to bury the poor while volunteers and prisoners from the House of Detention dug individual graves for those who could afford them (Peters, p. 31).

The first problem in the wake of a disaster is collecting the bodies which, as after the tsunami, may be scattered over a wide area. Collection of the dead is also an issue in a pandemic and is a problem that has been around for centuries. Miquel Parets describes scenes in Barcelona during the plague in 1651:

It was terrifying to see the carts...move through the streets filled with the dead, some fully dressed and others naked, some wrapped in sheets and others with only their shifts on... (Parets, p. 55).

This is very similar to the situation in 1918-19:

Six wagons and a motor truck toured the city and collected 221 corpses which had gone without burial for one to four days since death (Crosby, 1989, p. 83).

As already mentioned, disaster plans assume that the dead will be collected by trained emergency personnel but, in fact, they are usually collected by survivors. In a pandemic the problem of collection also requires the use of volunteers:

...forcing open doors in cheap tenements and run down rooming houses [in Philadelphia], the priest and his helpers gathered up some 200 bodies in twenty four hours. They deposited their grim harvest in a morgue built to accommodate 36 dead, where conditions soon became so offensive that veteran embalmers recoiled and refused to enter (Persico, p. 80).

Religious Rituals

In Sri Lanka, after the tsunami, residents in smaller communities decided to bury the dead in mass graves because they felt the bodies might be a threat to the living. That same fear led to swift action in Baltimore during the 1918-19 Flu:

...in Baltimore the mayor, fearful of contagion from unburied influenza victims, urged undertakers to speed up their work, but the morticians complained that they were

hampered by the insistence of families on expensive coffins, which were sold out (Persico, p. 80).

And, just as religious rituals are adjusted during a disaster, similarly, in Quebec during the 1918-19 Flu bodies were sewn into tarpaulins and dropped into the water at least 20 miles from major settlements. Burial took place within six to 12 hours of death (Bilson, p. 98). In some communities however the bodies piled up in overcrowded morgues:

The city's only morgue...was a scene of grisly confusion. Its capacity was 36 bodies: it now had several hundred. They were piled three and four deep in the corridors and in almost every room, covered only with dirty and often bloodstained sheets. Most were embalmed without ice. Some were mortifying and emitting a nauseating stench (Crosby, 1976, p. 77).

In fact, neither the disaster dead nor the pandemic dead constitute a threat but in both are often perceived as being one.

In pandemics funerals are also abandoned for other reasons: it does not seem like a good idea for people to gather together. In many communities during the 1918-19 Flu all public church services including funerals were stopped. In Calgary in 1918 for example:

On Oct. 19th, police and store managements were given orders to enforce a new "no loitering" rule. In addition, the following types of concerns were closed or forbidden: dance halls, pool rooms, dancing academies, cabarets, joy parlors, theatres, picture shows, roller skating rinks, second hand clothing and furniture stores, meetings of women's clubs and organizations and all public meetings and parades. Schools closed the next week.... Eventually, all auctions, wedding parties and public funerals were banned. Even churches and Sunday Schools were closed.... Ironically, the churches were the first to lead a rebellion against these restrictions; they wanted to hold a thanksgiving service to celebrate the end of the war but it took pressure from the business community to get rid of the restraints (McGinnis, p. 9).

Geoffrey Bilson reports similar changes in Quebec during a cholera epidemic:

There were other regulations which disrupted the customary courtesies of the dead. Those who died on the river were to be sewn into tarpaulins and dropped into the water at least twenty miles from major settlements. Those who died in town were to be buried within six hours if they died during the day or twelve hours if they died at night. There was no time allowed for mourning or holding wakes and resentment was very high (Bilson, p. 35).

There were also shortcuts in Saskatchewan during the Spanish Flu as well as problems with paper work:

Dead bodies were literally stacked up awaiting burial. Urban bylaws requiring either embalming or burial within twenty-four hours were unrealistic. In Saskatoon, there

was no morgue to store the bodies and the local registrar of Vital Statistics, J. M. Lloyd was overwhelmed by the demand for death certificates. Saskatoon's cemetery caretaker was charged in early November with allowing burials without a permit in violation of Section forty-eight of the Vital Statistics Act. The situation had become impossible by early November, and a number of burials took place at the Catholic cemetery without permits. Local police in Moose Jaw rounded up loafers and unemployed men and pressed them into service as grave diggers. At least one man refused and was fined twenty dollars plus court costs. Local police in Moose Jaw rounded up loafers and unemployed men and pressed them into service as grave diggers. At least one man refused and was fined twenty dollars plus court costs (Lux, p. 10; Belyk and Belyk, p. 48). The miserable situation was compounded by a provincial Order-in-Council forbidding the transportation of bodies either within, or outside the province. Bodies were to be buried in the nearest cemetery as quickly as possible. Many grieving families lost track of their loved ones forever (Lux, p. 10).

This was similar to what happened in London centuries earlier:

...until the end of August most of the victims were interred in consecrated ground, although several bodies were placed in each grave. Then when no more corpses could be packed into the existing churchyards the victims were buried in unauthorized ground which was either consecrated at the time or afterwards. Only when the social disorganization for the reverent disposal of the dead was disrupted by the great increase in mortality in September were the plague-dead tumbled indiscriminately into hastily dug pits outside the city precincts (Shrewsbury, p. 462).

In both disasters and pandemics there can be cultural issues over the disposal of the dead. Some religious groups, for example, object to cremation and oppose it no matter what the cause of death. As mentioned, this led to controversy after the 1918 Halifax explosion and it is leading to controversy when it is proposed as a solution to mass death during a pandemic.

Impact of Incidents

Most disasters impact more heavily on the dispossessed. The 1917-18 Halifax explosion hit mainly the poorer North End of the City. The 2004 Indian Ocean tsunami did impact on tourists in Thailand but the most severe loss of life took place among the poorer coastal populations of Sri Lanka and Indonesia. Reports on the 1918-19 Spanish flu suggest it had devastating impact on First Nations' communities:

Among the Crees...half the population was dead by mid December. At the Beaver Lake reserve...seven people dead in the home of the chief, who was himself ill but alive. Around Big Bay...twenty unburied bodies which were moved into a shed until people could recover enough to dig graves.... The problem...was made worse by the Indians gathering together in fear and for sympathy.... ..as many as thirty people in one cabin including people who were sick, dying and dead (Keer, p. 336).

...in one badly stricken community, the only survivor was an eight year old girl. As her family lay still around her, she had watched starving husky dogs eat their bodies. In another settlement, the stricken residents, with no soil deep enough to hold the bodies of the dead, weighed them down with rocks and dropped them into the sea from an overhanging bluff. It was all they could manage in their weakened state (O'Keefe and MacDonald, p. 144).

The 1918-19 Spanish Flu was unusual in that it was carried by soldiers who had been forced to live in crowded and – once it hit the troops overseas – in very unsatisfactory conditions. Therefore the death toll was high among young adult males. Normally however pandemics hit the most vulnerable portions of society – including the poor and the aged. In London, for example, during the mid-seventeenth century, the affluent inner city was much less affected by the plague than the poorer suburbs.

After 1563 the rich parishes in the city were increasingly fortunate. By 1665, the plague was half as severe there as in some of the suburbs.... The most drastic deterioration in the environment and hence in health took place in the outer fringes of the city.... (Beier and Finlay, p. 63).

And pandemics, like disasters, can lead to economic problems. Though no cases of Sudden Adult Respiratory Syndrome (SARS) occurred in Prince Edward Island, PEI's markets were hit by reduced consumption of shell fish in Toronto and tourism dropped substantially especially from Japanese normally attracted by *Anne of Green Gables*. During SARS flights between the USA and Hong Kong fell by 69 per cent. Osterholm says this would “pale in comparison” with the impact of pandemic influenza (Osterholm). There can be no doubt the 1918-19 Flu had severe economic impact:

At the end of October and again at in the second week of November, Dunn's Review of New York announced that Canadian business was suffering general temporary slowdown due to the Flu. In Calgary, advertising managers worked overtime to think up ways to lure customers into their stores. The Hudson's Bay Co. announced it was, “taking unusual precautions for the safety of its patrons” and ordered its sales personnel to wear masks three days before the order became general. It also prided itself on being “the best ventilated store in the west”. For those still not convinced it offered a stepped-up telephone order service, as did Jenkins Grocery.... Calgary sports promoters lost big money; theatres and moving picture houses were closed for over five weeks; and more than one acting troupe was stranded in the city, unable to give performances there or anywhere else in the West (McGinnis, p. 9).

Although it is clear that disasters can cause damage and destruction as well as injury and death, it is not clear whether the economic impacts of disaster are short or long-term. Scanlon for example has argued that disasters strike unevenly on communities and that there are winners and losers but the overall economic impact is minimal (Scanlon, 1988). However, it seems clear that the 2004 Indian Ocean tsunami had a major impact at least over the short term on the tourist-based economy of Thailand.

Differences

Of course, even when there are similarities between disaster and pandemic death, the reasons for those similarities may be different. In both mass death disasters and pandemics, there may be a need for rapid disposal of the dead, partly because of the belief that bodies constitute a threat to the living. But after a disaster, if bodies are properly stored, they can be released to next-of-kin for customary death procedures. In contrast, during a pandemic normal death procedures such as wakes and funerals can not be held not because the dead are a threat to the living but because the living pose a threat to each other.

Another difference is that after an incident such as an air crash, emergency personnel are not normally among the victims. Thus police, firefighters and medical personnel can assist the living and the dead. This is not so true in a pandemic because unlike most disasters which are site specific, pandemics affect everyone. Crosby reports that in November, 1918, every single member of the San Francisco fire department was ill with the Flu (Crosby, 1976, p. 98). McGinnis describes what happened when the Spanish Flu arrived in Calgary:

Many doctors had gone overseas with the troops. So had many nurses. Added to the shortage was the fact that, due to their constant contact with the sick, health personnel yielded to the infection in great numbers. As many as 16 city doctors were sick at one time.... Nurses also suffered a high rate of sickness and death (McGinnis, p. 6).

The lack of personnel led to many bodies being piled up as recovery procedures weren't up to the task (Starr, p. 517).

However, there can be personnel problems in a widespread disaster. When an ice storm struck most of Eastern Ontario and neighbouring Quebec in 1998, it forced scores of communities to declare a state of emergency at the same time. As a result mutual aid was extremely difficult: there were so many problems in each community that it was impossible for communities to assist each other (Scanlon, 1998). Emergency personnel such as hydro workers were so involved in trying to repair the damage in their own communities they could not assist their neighbours. This is very similar to what happened in Western Canada during the 1918-19 Flu pandemic.

Summary and Conclusions

There are some significant differences between disaster death and pandemic death. There is above all the need for identification in disasters, a requirement that occurs but only rarely during pandemics. There is the fact that the area impacted by a disaster can usually be fairly clearly defined. The tsunami for example impacted a number of countries but its major impact was on Indonesia, India, Sri Lanka and Thailand. This is much less true in a pandemic because the effects are often country wide even world wide. There are so many places of impact it is difficult to possible for personnel to be moved around to take care of shortages. There is also the fact that disasters usually occur and stop whereas

pandemics move along from place to place. In 1918-19 for example the exact time the flu arrived in Western Canadian cities is known because it was brought by returning soldiers travelling by train who were known to be ill. Now with air travel pandemics can move around the world in weeks and may not show symptoms on arrival. There is the fact that disasters rarely impact emergency personnel (though that can happen in a catastrophe) unlike a pandemic which may cripple some emergency agencies such as hospitals.

Nevertheless, both disasters and pandemics lead to a steady flow of bodies into the death processing system. Both lead to a shortage of supplies including coffins and body bags. Both lead to a fear that bodies create a threat to the living. Both generate economic problems. In both, there is a requirement to collect and process bodies and consideration given to abandoning normal death rituals. This will inevitably lead to the involvement of volunteers who have not been trained for these tasks, many of whom may be wary of such jobs because of the widespread misbelief that the dead are a threat to the living. In addition, both types of mass dead can create cultural problems and disturb religious sensitivities when it comes to handling the dead.

Disaster death is seen as the responsibility of professionals experienced in the handling of the dead such as police. Pandemics are also seen as incidents that must also be dealt with by professionals but, in this case, health professionals. Given the many similarities, this separation does not make sense. Perhaps it is time that planning for all types of mass death situations recognizes the fact that there will be a need for volunteers and a need to educate them and that just as plans are made to use volunteers in some tasks – such as search and rescue – plans ought to be made to use them in others – such as in the handling of the dead.

Perhaps it is also time those planning for both types of mass death situations should recognize that preparation should include not just plans to educate people during and after a problem but before it. Decisions should be made in advance about what needs to be said and who should say it and many of those statements will be much the same given mass death no matter what the cause. It would make sense for example to mention whenever the opportunity arises the dead rarely if ever constitute a threat to the living. It does not matter whether people have died in a disaster or a pandemic: their bodies normally do not pose a health risk. It would also make sense to explain that under certain conditions it may be necessary to bypass normal mourning and religious rituals and it would be wise to have the religious authorities involved in discussing how this might be done. It would also be wise to consider what groups might be able to assist with tasks such as transporting the dead or digging graves. Since this article was written, others have echoed many of the sentiments expressed. For example, Eric Holdeman and Michael Loer of King County from the State of Washington writing in the November, 2005, issue of the *Natural Hazards Observer* emphasized the need to plan for a pandemic using the all hazards perspective and emphasized the need for public information:

...a coordinated public education campaign prior to a pandemic and a coordination public information response during a pandemic are top priorities.... Rumor control will be of the utmost importance (Holdeman and Loer).

It would also be wise to consider that stockpiles of supplies may be necessary in both mass death disasters and pandemics. In Canada, there are now arrangements in place to stockpile equipment for emergency health care centres. It would make equal sense to have stockpiles of certain types of supplies, non-perishable supplies that could be used to deal with large numbers of dead. In short, it would seem that with so many similarities and with some common myths it would make sense to start emergency planning for pandemics by looking at the similarities and seeing that disaster plans are also suitable for pandemics instead of taking – as now seems common – an entirely separate approach.

It is true that pandemics create major problems for the health community but it is also true they create major problems for the entire society. Most emergency planners now take an all hazards approach to disaster planning. Perhaps it is time they changed that *all hazards* approach to planning to an *all emergency* approach to planning. In fact, once it is recognized that these two types of events may be far more similar – in terms of dealing with the dead – that current plans recognize other similarities may become apparent. The Public Health Agency of Canada has for example prepared a *Canadian Influenza Pandemic Plan* and that plan has Annex I, “Guidelines for the Management of Mass Fatalities” (Public Health Agency of Canada, Annex I). That plan, among other things, questions whether certain facilities will be appropriate for handling bodies:

Municipalities should avoid using trucks with markings of a supermarket chain or other companies, as the use of such trucks for storage of corpses may result in negative implications for business.

Exactly the same issue arose in Thailand in the wake of the tsunami. One solution was to remove markings from vehicles (Public Health Agency of Canada, Annex I, Section 1.5). As this article suggests there are many other similarities between the two types of mass death situations. Despite the differences – including the major one, a need for identification – it would seem that planning for both types of mass death situations could be and should be more closely intertwined.

* There some occasional problems with identification during the Spanish flu. Alfred Crosby reports that which ships arrived with dead soldiers it was sometimes difficult to identify them: “Many soldiers were too sick and too delirious to identify themselves, and, of course, the dead were forever silent on the matter. The army had ordered that each man wear a tag around his neck with his name and number thereon, but for some reason hundreds...had no tags at all” (Crosby, 1976, p. 129).

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** * Most of the information about the handling of the tsunami dead was acquired through personal interviews with those involved. All of those interviewed were promised anonymity: therefore no sources are identified.

Bajaj, A. (2005). "Disaster victim identification: Tsunami." *British Dental Journal* Vol. 198 No. 8, pp. 504-5;

Barry, John M. (2004) *The Great Influenza: The Epic Story of the Deadliest Plague in History* New York: Viking

Beatty, Glenn W. (1974) "A State Funeral Directors Association Participates in the Aftermath of a Mine Fire" Vanderlyn R. Pine, ed. *Responding to Disaster* Milwaukee: Bulfin pp. 117-121

Beier, A. L. and Roger Finlay (1986) Harlow: Longman Group Incorporated p. 63

Belyk, Robert C. & Diane Belyk (1988) "Spanish Influenza 1918-19: No Armistice with Death" *Beaver: Canada's History Magazine* Volume 68 no. 5 (October/ November) pp: 43 – 49

Bilson, Geoffrey A (1980) *Darkened House: Cholera in Nineteenth Century Canada* Toronto: University of Toronto Press, 1980

Blanshan, Sue A. (Undated) "Disaster Body Handling" Newark: Disaster Research Center Preliminary Paper # 44

Blanshan, Sue (1977) "Disaster Body Handling" *Mass Emergencies* Vol. 2 pp. 249-258;
Blanshan, Sue A. (Undated) "Disaster Body Handling" Newark: Disaster Research Center Preliminary Paper # 44;

Brannon, R. B. and H. P. Kessler (1999) "Problems in mass disaster dental identification: a retrospective review" *Journal of Forensic Science* Vol. 44 pp: 123 – 127

Brenner, Charles H. (2005) "Some mathematical problems in the DNA identification of victims in the 2004 Tsunami and similar mass fatalities" *Forensic Science International* Vol. 157 pp 172-180

Catron, Dennis (1974) "The Cooperative Efforts of Funeral Directors in a Major Flash Flood" Vanderlyn Pine, ed. *Responding to Disaster* Milwaukee: Bulfin pp. 125-131;

Clark, M. A., S. R. Clark and D. G. Perkins (1989) Mass Fatality Aircraft Disaster Processing" *Aviation, Space and Environmental Medicine* Vol. 60 No. 7 pp: 64 – 73

Coates, Kenneth. (1990) *The Sinking of Princess Sophia* Toronto: Oxford University Press p. 115

Craig, John (1977) *The Noronic is Burning* Markham: PaperJacks

Croall, James A. (1978) *Fourteen Minutes* London: Michael Joseph Limited p. 143

Crosby, Alfred W. (1989) *America's Forgotten Pandemic: The Influenza Pandemic of 1918-1919* New York: Cambridge University Press

Crosby, Alfred W. (1976) *Epidemic and Peace, 1918* Westport, Connecticut: Greenwood Press, 1976

De Beer, E. S. Ed. (1955) *John Evelyn The Diary of John Evelyn* Oxford: The Clarendon Press Vol. III

Eberwine, Donna (2005) "Disaster Myths That Just Won't Die" *Perspectives in Health* Vol. 10 No. 1

Ellen, Rebecca (2005) "The Victorian Response to the Tsunami Disaster in Thailand 2004/2005: A Personal Account" *Victorian Institute of Forensic Medicine* Vol. 3 no. 2 pp: 15-19

Emergency Communications Research Unit (1985) *The Gander Air Crash* Ottawa: Carleton University

Eriksen, A. and S. Sprogge-Jakobsen (2005) "The identification of tsunami victims -- a Swedish experience" *Scandinavian Journal of Forensic Science* Vol. 11 pp: 51-53

Fitzgerald, Jack (1984) *Newfoundland Disasters* St. John's: Jespersen Press p. 26

Galishoff, Stuart (1969) "Newark and the Great Influenza Pandemic of 1918" *Bulletin of the History of Medicine* Vol. 43 No. 3 (May/June) pp: 246 – 58

Grant, Dorothy (1999) "Swissair Disaster Taught Medical Examiners a Lesson in Logistical Challenges" *Canadian Medical Association Journal* (September 21) 161:6. p. 743

Grant, Edmund A, W. K. Prendergast and E. A. White (1952) "Dental Identification in the Noronic Disaster" *The Journal of the Canadian Dental Association* Vol. 18 No. 1 p. 4

Grist, N.R. (1979) "Pandemic Influenza 1918" *British Medical Journal* 2 no. 6205 (December 22-29) pp: 1632 – 33

Hanson, Ann Keektjuk (2001-2002) "Tragedy at Crooks Inlet" *Beaver: Canada's History Magazine*. Vol. 81 No. 6 pp: 39 - 45

Hershiser, Marvin R. (1974) "Some Observations on the Handling of the Dead in the Rapid City, South Dakota, Flood Disaster" Newark: Disaster Research Center Preliminary paper # 12

Hershiser, Marvin R. and E. L. Quarantelli (1976) "The Handling of the dead in a Disaster" Newark: Disaster Research Center Preliminary paper # 26

Hershiser, Marvin R. and E. L. Quarantelli (1979) "The Handling of Dead in a Disaster" Richard A. Kalish, ed. *Death and Dying: Views from Many Cultures* Farmingdale: Baywood Publishing Company, Inc. pp. 132-144

Holdeman, Eric and Michael Loer (2006) "Preparing for a Flu Pandemic A Northwest Perspective" *Natural Hazards Observer* Vol. XXX! No. 2 (November) pp: 1-3

Interpol (1997) *Disaster Victim Identification Guide* (Pages are not numbered.)

James H., Ed. (2005) "Thai Tsunami Victim Identification - Overview to Date" *Forensic Odonto-Stomatology* Vol. 23 No. 1 pp: 1-18

Jones, Eyllt W. (2005) "Co-operation in All Human Endeavour: Quarantine and Immigration Disease Vectors in the 1918-19 Influenza Pandemic in Winnipeg" *Canadian Bulletin of Medical History* Vol. 22 No. 1 pp: 57 - 82

Jones, Eyllt W. (2003) "Searching for the Springs of Health: Women and Working Families in Winnipeg's 1928-2929 Influenza Epidemic" Thesis (Ph. D): University of Manitoba

Keer, Stephani (1994) "In six hideous months the flu kills almost as many as the war" Ted Byfield, Ed., *Alberta and the Twentieth Century Vol. 4 The Great War and its Consequences 1914-1920* Edmonton: United Western Communications pp: 326 - 44

Kennedy, Betty (1979) *Hurricane Hazel* Toronto: Macmillan of Canada

Kent County Constabulary (1987) *The ZEEBRUGGE Ferry Disaster* Maidstone: Kent County Constabulary

Kieser, Jules A., Wayne Laing and Peter Herbison (2006) "Lessons Learned from Large-scale Comparative Dental Analysis Following the South Asian Tsunami of 2004" *Journal of Forensic Science* Vol. 51 No. 1 (January) pp: 109-112

Lux, Maureen (1997) "The Bitter Flats": The 1918 Influenza Epidemic in Saskatchewan *Saskatchewan History* Vol. 49 No. 1 p. 10

Marshall, Logan (1972) *The Tragic Story of the Empress of Ireland; An Authentic Account of the Most Horrible Disaster in Canadian History* W. H. Tantum Ed. Connecticut: 7 C's Press, Inc. p. 74

McGinnis, J. P. Dickin (1976) "A City Faces an Epidemic" *Alberta History* Vol. 24 No. 4 (Autumn) p. 6

McGinnis, J. P. Dickin (1976) "A City Faces an Epidemic" *Alberta History* Vol. 24 No. 4 (Autumn) pp: 1 - 11

Morgan, O. W., P. Sribanditmongkol, C. Perera, Y. Sulasmi, D. Alphen and E. Sondorp (2006) Mass Fatality Management following the South Asian Tsunami Disaster: Case Studies in Thailand, Indonesia and Sri Lanka" *PLoS Med* (June) Vol. 3 No. 6 e195;

Nishimura, Akiyoshi (1997a) "Medical examination report on the Great Hanshai Earthquake" *Advances in Legal Medicine* 3 July pp. 234 – 238

Nishimura, Akiyoshi (1997b) "Statistical Investigation on Human Casualty in Kobe City on the Great Hanshai Earthquake" *Advances in Legal Medicine* 3 July pp. 346 – 349;

Nishimura, Akiyoshi (1997c) "Typical Traumatic cases of the Great Hanshai Earthquake" *Advances in Legal Medicine* 3 July pp: 350 - 353

O'Keefe, Betty & Ian MacDonald (2004) *Dr. Fred and the Spanish Lady: Fighting the Killer Flu* Surrey, B.C.: Heritage House

Osterholm, Michael T. (2005) "Preparing for the Next Pandemic" *Foreign Affairs* July/August Vol. 84 Issue 4 pp: 24 – 37

Parets, Miquel (1991) *A Journal of the Plague Year* [Edited and translated by James S. Amelang] New York: Oxford University

Perera C. (2005) "After the Tsunami: Legal Implications of Mass Burials of Unidentified Victims in Sri Lanka," *PLoS Med* 2(6): e185

Persico, Joseph E. (1976) "The Great Swine Flu Epidemic of 1918" *American Heritage* Vol. 27 No. 4 (June) pp: 28 - 31, 80 - 86

Peters, Stephanie True (2005) *1918 Influenza Pandemic* New York: Benchmark Books;

Pine, Vanderlyn (1974) "Grief Work and Dirty Work: The Aftermath of an Air Crash" *OMEGA* Vol. 5 No. 4 pp. 281-286;

Pine, Vanderlyn R. (1980) "Grief and Dirty Work: The Aftermath of an Aircrash" "Richard A. Kalish, ed. *Death and Dying: Views from Many Cultures* Farmingdale: Baywood Publishing Company, Inc. pp. 126-131

Pine, Vanderlyn R. (1969a) "Social Organization in Disaster" *The Director* Vol. XXXIX Number 7 July pp. 3-5;

Pine, Vanderlyn R. (1969b) "The Role of the Funeral Director in Disaster" *The Director* Vol. XXXIX Number 8 August pp. 11-13

Pretty I A, Webb D A, Sweet D. (2001a) "The design and assessment of mock mass disasters for dental personnel". *Journal of Forensic Science* Vol. 46 pp: 74 – 79

Pretty, I. A., D. A. Webb and David Sweet (2001b) "A look at forensic dentistry – Part 1 – The role of forensic dentistry in the determination of human identity" *Forensic Dentistry* Vol. 190 No. 7

Public Health Agency of Canada *Canadian Influenza Pandemic Plan* "Guidelines for the Management of Mass Fatalities" Annex I

Quarantelli, E. L. (1979) "The Vaiont Dam Overflow: A Case Study of Extra-Community Responses in Massive Disasters" *Disasters* Vol. 3 No. 2 pp. 199-212

Rognum, T. O. (2005) "The Norwegian DVI Work in Thailand -- a preliminary overview" *Scandinavian Journal of Forensic Science* Vol. 11 pp: 40-41

Rose, H. Wickliffe (1937) *Brittany Patrol: The Story of the Suicide Fleet* New York: W.W. Norton & Company

Rosenthal, Uriel (1994) *Complexity in Urban Crisis Management Amsterdam's Response to the Bijlmer Air disaster* London: James and James (Science Publishers) Ltd.

Scanlon, Joseph (1979) "Day One in Darwin: Once Again the Vital role of Communications" Joan Innes Reid, ed. *Planning for People in Natural Disaster* Townsville: James Cook University of North Queensland pp. 134-155

Scanlon, Joseph (2006c) "Dealing with Foreign Dead: An Evolution of Mass Casualty Identification" *Natural Hazards Observer* Vol. XXX No. 5 (May) pp: 10-11

Scanlon, Joseph (1988) "Dealing with mass death after a community catastrophe: handling bodies after the 1917 Halifax explosion" *Disaster Prevention and Management* Vol. 7 No. 4 pp: 288 – 304

Scanlon, Joseph (2006a) "Dealing with the Tsunami dead: unprecedented international co-operation" *The Australian Journal of Emergency Management* Vol. 21 No. 2 (May) pp: 57-61

Scanlon, Joseph (1998) *ICE STORM 1998: Sharing the Lessons Learned* Ottawa: Regional Municipality of Ottawa Carleton

Scanlon, Joseph (2006b) "Inside an international crisis How first responders combined forces in Thailand and Sri Lanka" *Royal Canadian Mounted Police Gazette* Vol. 68 No. 2 pp: 24-25

Scanlon, Joseph (2005) "Scandinavia's Key Role in the Handling of the Tsunami Dead" *Scandinavian Journal of Forensic Science* Vol. 11 no. 2 pp: 40-41

Scanlon, Joseph (1988) "Winners and Losers: Some thoughts on the Political Economy of Disaster" *International Journal of Mass Emergencies and Disasters* Vol. 6 No. 1 March pp. 47-63

Scanlon, Joseph and Conrad McCullum (1999) "Media coverage of mass death: not always unwelcome" *The Australian Journal of Emergency Management* Vol. 14 No. 3 Spring, 1999 pp: 55 – 59

Shrewsbury, J. F. D. (1970) *A History of Bubonic Plague in the British Isles* Cambridge: Cambridge University Press p. 472

Sirisup, Nantana and Sawait Kanluen (2005) "Role of Forensic Doctors in Thailand's Tsunami: Experiences from Chulalongkorn Medical School" *Journal of the medical Association of Thailand* Vol. 88 no. 4 pp: S335-38

Starr, Isaac (1976) "Influenza in 1918: Recollections of the Epidemic in Philadelphia" *Annals of Internal Medicine* Vol. 85 pp: 516 - 18

Stephens, Hugh W. (1997) *The Texas City Disaster, 1947* Austin: University of Texas Press

Sumathipala, A., S. Siribaddana and C. Perera (2006) "Management of dead bodies as a component of psychosocial interventions after the tsunami: A view from Sri Lanka" *International Review of Psychiatry* Vol. 18 No. 3 pp. 249-257

Tan, Peng-Hui (2005) "The Killing Field of Khao Lak: Odontology in Thailand Tsunami Victim Identification" *Singapore Dental Journal* Vol. 27 No. 1 pp: 41-50

Tsokos, M. *et. al.* (2006) "Experiences in tsunami victim identification" *International Journal of Legal Medicine* Vol. 120, no. 3. (pp. 185-187)

Tun, Khan, Barbara Butcher, Pongruk Sribanditmongkol, Tom Brondolo, Therese Caragine, Clifford Perera and Karl Kent (2005) "Forensic Aspects of Disaster Fatality Management" *Pre-Hospital and Disaster Medicine* Vol. 20 No. 6 November – December p. 457

Wheatley, Henry B., ed. (1897) Samuel Pepys *The Diary of Samuel Pepys* London: George Bell & Sons Vol. IV; De Beer, E. S. Ed. (1955) John Evelyn *The Diary of John Evelyn* Oxford: The Clarendon Press Vol. III

Yong, Chen, Kam-ling Tsio, Chen Feibi, Gao Zhenhuan, Zou Oijia and Chen Zhangli (1988) *The Great Tangshan Earthquake of 1976 An Anatomy of a Disaster* Oxford: Pergammon Press