HURRICANE ANDREW

LESSONS FOR CALIFORNIA

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I. Introduction

The authors were in Florida from September 8 through September 15, 1992, about 3 weeks after Hurricane Andrew devastated Dade County on August 23. Our travel was supported by the Public Health Service (PHS), which not only provided the resources to make the trip, but also the ability to move relatively freely within the impacted zone and interview a full range of responders. We attended meetings and briefings, and interviewed PHS, Disaster Medical Assistance Team (DMAT), Veterans Affairs, and military management personnel. We interviewed state and local officials including emergency management, emergency medical services, hospital and clinic staff and managers. We attended the NDMS afteraction conference in Maryland in November, and one of us was able to return to Florida and discuss the hurricane at greater length with state EMS staff.

We arrived in Florida as the response transitioned from extended response to recovery. We define extended response as that period after medical problems created by the disaster have been met, but in which continued application of outside medical resources is required. Since the day-to-day system is not fully recovered, local jurisdictions have insufficient resources to meet continuing medical demand.

This report began as a straightforward description and analysis of the National Disaster Medical System (NDMS) response to Hurricane Andrew. The afteraction conference in Maryland will do a much better job at that task than we could with our comparatively narrow view of the event. We are, however, in a unique position to translate what we saw into lessons for California's health and human services response to a catastrophic earthquake.

We have described and interpreted what occurred in Florida to the best of our ability. It is important to remember that we were in Florida for only one week and during that time were not able to see all the venues of response activity nor talk to as many responders as we would have wished. Therefore, this report will contain some inaccuracies, incomplete descriptions and misinterpretations of events.

In a number of instances, we found that responders involved in the same event described what occurred in entirely different ways depending on their perspective and vested interests. We were not able to obtain contrasting or confirming perspectives on every significant event. As a result, we are reluctant to repeat accounts of many problems reported by interviewees. We have also refrained from discussing personalities. Some system problems do provide useful opportunities for learning and improvement. These we will fully describe.

The tone of this report is unapologetically favorable. We often fail to identify and investigate exemplary practices in our review of disaster responses. The review of exemplary practices, especially those we can replicate in our plans and training, offer much more opportunity for quality improvement than a catalogue of problems.

Description of Impacted Area

Southern Florida has much in common with many areas of California. Homestead and Florida City are small communities located about thirty miles from Miami. The areas surrounding these communities are rural agricultural. Travelling north toward Miami, these agricultural areas are replaced by suburban communities with single family homes, strip malls, and suburban shopping centers anchored by retailers such as Sears and J.C. Penny. Miami is linked to South Dade County by U.S. 1, a highly traveled surface street, and the Florida Turnpike, a limited access freeway.

The area struck by Hurricane Andrew also shares California's economic and cultural diversity. Of the 350,000 permanent residents, 75,000 came from families with incomes under $15,000 per year and 150,000 had incomes below $25,000. In Homestead and Florida City, more than half the families had incomes below $25,000. The area also included, however, a large number of working, middle, and upper class families.

About 25% of the population in the area is African American with a significant number of Haitians. About 50% of the population is Spanish surnamed. Many residents do not speak English. The area was home to a large number of retirees, many with special medical needs.

The remainder of this report is divided into two main sections: a description of the impact of and response to Hurricane Andrew and a discussion of the key observations and recommendations derived from our review.

II. Medical/Health Response to Hurricane Andrew

A. Warning Phase - Evacuation

Due to the forecast of a Type V hurricane and evacuation orders issued by Dade County authorities, over 1,000,000 Floridians relocated. A major impetus for the evacuation decision was the threat of a thirty foot storm surge which would have inundated coastal areas. Several hospitals evacuated patients to inland facilities. Two hospitals in the area ultimately stricken hardest by the hurricane did not evacuate. In part, this decision was based on early projections of the storm landing farther north than it actually did.

Prior to the hurricane reaching land, Dade County and the State of Florida activated their respective Emergency Operations Centers. Dade County's coordination of the pre-event evacuation effort was highly successful with few problems. There were reports, however, that the Red Cross was unable to handle the massive demand for shelter services for the evacuees. There were also problems with the many shelter residents with special medical or physical needs.

The Public Health Service also tracked the growth and path of the hurricane prior to its landfall. The arrival of the hurricane happened to coincide with the convening of the National Disaster Medical System (NDMS) Conference in Oklahoma City. With all the key NDMS agencies and staff assembled at the conference, the Public Health Service, Department of Veterans Affairs, and Department of Defense established an emergency operations center at the hotel. This EOC coordinated the initial alerting, and subsequent deployment, of two NDMS DMAT's and the Management Support Unit. These actions facilitated the rapid deployment of DMATs after the hurricane, although transportation problems did delay their arrival.

B. Hurricane Impact

Hurricane Andrew shared many characteristics with our expectations for a catastrophic earthquake, except for the small number of casualties it produced. This was the result of pre-event evacuation of large numbers of people, especially those living in vulnerable housing. Several other aspects of the hurricane impact are especially germane to this report:

- Damage was widespread and continuous. About 120,000 homes (50% of the homes in hardest hit area) were damaged. An estimated 250,000 people were displaced. Almost all buildings received some damage and some entire neighborhoods (especially mobile home parks), were totally destroyed. Earthquakes often create pockets of extreme damage with neighboring areas having little or no damage.

- All commercial activity was disrupted. Very few businesses were able to continue operation. Many businesses sustained direct heavy damage. Others were shut down by the loss of electricity, water, and sewer services. The electrical system lost its distribution network when thousands of poles were knocked down by the storm.

- The entire medical system of South Dade County was impacted. The two hospitals in the area evacuated after the storm. One kept open an urgent care operation while the other was completely closed after treating the initial wave of casualties. All of the Community Health, Inc. (CHI) clinics (major provider of services to migrant workers and medically underserved populations) were damaged or suffered from loss of electricity. Additionally, physicians offices and pharmacies were closed. With many roads blocked by debris, access to medical care was practically nonexistent.

- Transportation was further limited by loss of street signs and traffic signals.

- Loss of electricity, television, and some radio hampered communications with the disaster impacted population. In some cases it took several days for information about assistance to reach residents. This delayed the distribution of food, water, and services.

- Rescuers were victims, too. Fire, police, and hospitals reported about 30% of their employees had homes damaged by the hurricane. Post storm absenteeism was high everywhere with rates in the Florida City police department approaching 90% in the immediate storm aftermath. Those not on duty at the time were unable to report until roads were opened.

The damage in South Dade County was as close to total as we had seen in any event. Although the hurricane created relatively few casualties, the destruction of the health system provided critical lessons for California.

C. Response Phase

Prehospital Response

Dade County Fire and Rescue, the EMS provider for the County, sheltered its equipment until the hurricane abated. The County Communications Center was evacuated due to the threat of its glass windows blowing out. Dispatchers operated on a manual system for 18 hours before returning to the Communications Center. At one point, 200 calls for help were on hold. After an initial call volume of 300% of normal, call volume leveled off at about 35% above normal levels.

In the immediate aftermath of the hurricane, prehospital responders faced major response obstacles. In addition to the call volume and communications problems, fallen trees and branches blocked many of the roads. In some cases, ambulance crews needed chain saws to cut a path through the debris.

One of the few weaknesses reported in the immediate local response to the hurricane was the proliferation of emergency operations centers and command posts and the concomitant lack of coordination. Dade County Fire established a command post in the Southern part of the county. There were reports of some coordination problems between that command post and the main Fire EOC. The lack of coordination between fire and police created even more problems for the response. Although both services had operations command posts near each other in the southern part of the county, they would not collocate. The lack of coordination and information sharing lead to duplicate effort, especially in search and rescue.

Hospital and Clinic Medical Care

During the height of the hurricane, Homestead and Deering Hospitals found themselves forced to evacuate patients internally away from broken windows and doors. Attempts to block openings with mattresses were futile, or at best a short term success. When Deering lost generator power, staff were forced to manually ventilate six patients overnight.

After the hurricane passed, the injured began presenting themselves at Homestead and Deering Hospitals. Both hospitals had to evacuate shortly due to generator failures. Hospital operations at Homestead were made even more difficult because nursing home patients were left at the hospital without warning.

Homestead Hospital reopened an ad hoc urgent care function within three days. It was staffed in part by volunteer paramedics and nurses from out-of-state. Deering hospital re-established an urgent care capability service within a week. These operations stabilized emergency patients for transport to surviving acute care hospitals 15-30 miles north in Miami.

During the second week following the landing of Andrew, medical needs and care had changed markedly. Hurricane created injuries had been handled. Significant medical needs remained, however. Most medical care sites reported lacerations and puncture wounds related to clean-up. Other cases included non-hurricane emergencies including a handful of gunshot wounds. The vast majority of cases were primary care including many pediatric and several obstetric. Most of the available information on patient injuries was anecdotal.

In addition to the hospitals, medical care was provided at several other sites:

Community Health Incorporated (CHI) Community Clinics

CHI is a multisite community clinic system designed to serve migrant workers and other poor in South Dade County. This clinic system is an extremely important provider in the area. When the first DMATs arrived, Dade County health officials selected the main CHI clinic as one of the sites for DMAT deployment. This clinic is a very large complex with emergency care receiving capability, albeit limited.

The DMATs, which rotated through this clinic established an interesting working partnership with clinic staff and management. The DMATs received emergency cases brought in by ambulance. Clinic staff continued to see the primary care, pediatric and obstetric cases. We did not get utilization information on the clinic or DMAT operation. The evening we visited the clinic, about six patients were seen during a one hour period. The clinic operated on generator power, which sometimes failed to function.

Perrine

The Dade County Public Health Department clinic in Perrine was destroyed by Hurricane Andrew. The County leased a vacant office building and converted it into a rudimentary clinic. This site was augmented by a DMAT. The interesting aspect of this operation was that the building was not designed for medical care. It did not have sufficient sinks, wide enough corridors, or internal communications. The county staff and the DMAT did, however, demonstrate that an ad hoc clinic could be established in almost any kind of structure if required.

Department of Veterans Affairs Mobile Clinics

The VA brought in three mobile clinics which provided care at a variety of sites. These clinics were converted buses with two examining rooms and storage for supplies. Ordinarily used for outreach to veterans located distant from fixed VA facilities, these clinics provided more than 4000 patient visits to Dade County residents during the approximately ten days they were deployed. Deployment sites included a very large, heavily damaged migrant worker camp on the edge of the Everglades, a high school, and Homestead Hospital. The high school operation was particularly interesting. The VA shared the site with a military medical operation and a food distribution center, and provided primary care and mental health services with a fairly extensive pharmacy. While the VA operated during the day, the military took over the site in the evening providing medical care to uniform personnel rather than the general public.

The mobility of the clinics proved especially valuable. As hospitals or clinics recovered, services could be moved quickly to new sites where they were needed.

Ad Hoc Clinics

Throughout South Dade County, more than 40 volunteer ad hoc clinics sprang up to fill the gap left by the closure of private physician offices, hospitals, and clinics. These clinics were usually staffed by one or two physicians, nurses, or paramedics most often from the Miami area. The small clinics we visited had utilization rates of from one to ten or fifteen patients per day. They were usually not very busy.

Other ad hoc clinics were larger more organized efforts. Some were sponsored by religious and voluntary organizations such as the Southern Baptist Conference. Others were sponsored by Humana, PCA and other health care organizations. We do not know how quickly these operations were established after the hurricane passed, but within ten days, many residents of South Dade County may have had greater access to primary health care than before the hurricane.

D. Extended Response

In past disasters we recognized the importance of designing a response to meet the needs of victims converging on a damaged medical system in the immediate aftermath of a disaster. We also learned that primary care needs may persist in a community that has lost much of its medical capacity. The medical response in South Dade also demonstrated that when receiving hospitals are closed, alternative receiving sites must be created and maintained to stabilize patients and reduce the transport times of emergency victims and rapidly return ambulances to service.

In South Dade, during most of the time Homestead Hospital was closed, its staff operated an ad hoc urgent care center which received and stabilized for transport, or treated and discharged, presenting emergency patients. Later Deering Hospital opened a similar operation. The DMATs at CHI provided receiving services throughout the response. The operation at CHI required the commitment of considerable outside resources including the DMATs, medical supplies and pharmaceuticals, and military logistic support and transport. The VA clinics, when presented with emergency patients, stabilized them to the best of their ability and then used military vehicles to transport them to CHI or Homestead Hospital after it reopened.

South Florida also faced a variety of public, environmental, and mental health problems. Many residents elected to remain in the area, rather than leave their homes vulnerable to looting. With electricity, water, and sewer services disrupted, they faced the threat of water borne diseases. Additionally, crowding in the tent cities, low immunization rates for children and poor health status of adults put many at risk for communicable diseases. Fortunately, there were no major outbreaks of communicable diseases.

Vectors were also identified as a potential problem. Public health officials were concerned that the large piles of debris would encourage rodent breeding and standing pools of water would lead to increased mosquito activity. Other concerns included hazardous materials used in agricultural and commercial enterprises.

The most significant environmental health issue involved burning of debris. With high water tables, South Florida did not have adequate solid waste disposal capacity to deal with the trees, other plants, and building material waste created by the hurricane. Burning the material became the solution of choice. Two problems arose, however. The burn sites were located sufficiently close to populated areas so that when the wind shifted, remaining disaster victims were exposed to the smoke. There were also reports of chemicals and ash leeching from the burn site into ground water supplies.

Multi-service Centers

The overwhelming devastation of Hurricane Andrew created multiple service needs among disaster victims and a harsh response environment. These factors converged to create multi-service centers; ad hoc operations where residents could receive food, water, counselling and medical care. These centers provided "one stop shopping" for victims with limited transportation capabilities and efficient use of logistic support for responders. The centers also had sufficient critical mass to manage large amounts of resources and serve as a base for community outreach activities.

In Florida, one of the centers we visited was managed by the Army, with health and mental health services provided by DVA. The other center was operated by the Southern Baptists Convention.

Tent Cities

With about half of the homes in the Hurricane's path severely damaged, shelter became a major problem. Many residents relocated to relatively undamaged areas of Dade and Broward Counties to the north. Others camped out at their homesite to prevent looting. Many, however, required temporary shelter. Local and federal responders created tent cities to shelter and serve disaster victims with no other options.

Although we did not gather census data on the tent cities, we estimated the resident population at greater than 1000 people per tent city. They were managed by the military, but not for security reasons. The military was the only organization with the logistic capability to provide food, water, shelter and medical care for an ad hoc community of this size. Medical services were augmented by volunteers and mental health support provided by the state.

There is no doubt that a massive immediate shelter program was required. The tent cities, as implemented in Florida, raise a number of questions we need to address in California.

1. A larger number of smaller tent cities dispersed throughout the community would have reduced problems created by overcrowding but at a higher cost for logistic support.

2. There was uncertainty about who was responsible for enforcing the variety of rules under which tent city residents lived. For example, public health officials determined that food in sleeping tents could attract rats, but the military, understandably, did not want to assume a police mission for enforcing those rules.

3. Tent cities attracted people from outside the disaster area. Unemployed and underemployed construction workers from all over the Southeast United States converged on Dade County looking for work. The lack of hotel space coupled with the availability of free shelter and food made the tent cities attractive. Eventually the out-of-area construction workers were expelled.

4. As federal responders prepared to turn the response over to state and local government, Florida officials were reluctant to accept control for the tent cities without federal financial assistance.

Florida's experience with tent cities revealed many problems associated with sheltering large numbers of disaster victims. In addition to the problems related above, local officials have to face the issue of how to phase people out of the tent cities. Some of the residents were homeless prior to the disaster; many others still have no housing alternative because many damaged buildings have not yet been repaired. (As of February 24, 1993, at least one tent city remains in operation in Dade County).

E. Recovery

One of the major recovery issues for the area was the retention of medical personnel so that normal services could be restored. The hospitals did not lose significant personnel during the general evacuation prior to the hurricane. Deering encouraged employees to bring family members into the facilities to weather the storm. Following the hurricane, however, retaining staff became more problematic. Estimates as high as a third of the employees at Deering experienced damage to their homes. Homestead Hospital was closed for more than a week; Deering was likely to be closed for 90 to 120 days. During those time periods, even in the face of reduced revenues, the hospitals took steps to encourage employees not to desert them to work at other Miami area hospitals. These steps included extended paid time off, transfer to sister facilities, and assignment to other tasks.

South Dade also faced the loss of physicians. With their hospitals closed, homes and offices damaged and patients unable to reach their services, many physicians faced critical income reductions. Hospitals gave high priority to repairing the offices of staff physicians while building temporary alternative quarters until their offices could be restored. State and local officials gave the problem of physician retention high priority in recovery plans, including proposing temporary income subsidies.

The communities faced an interesting recovery dilemma. It was believed by private sector providers of medical services that the ad hoc and VA clinics and DMAT operations inhibited the restoration of permanent medical services. They asked, "Why would patients pay for care they could receive for free?" We could not confirm the accuracy of this assumption, but it does raise a critical issue that must be considered in transitioning from a helping response to a restoration of pre-disaster services.

The restoration of services in South Dade will be especially difficult. First, the destruction was so widespread and intense, almost every enterprise will face major obstacles to business recovery. The rebuilding effort may help the economy, but other factors will inhibit revitalization. People who worked in most damaged businesses will have lost wages. The buying they are able to do, will by necessity, take place out of the area. Commercial and residential real estate values will fall and commercial vacancy rates rise. Many families with options will choose to leave South Dade County.

The closure of Homestead Air Force Base creates additional problems for the area's economy (and relatedly, its medical care system). It will cost thousands of civilian jobs and many of the spouses of the transferred military personnel were employed in area businesses. In fact, many of the skilled employees at Homestead Hospital have already left as the base evacuated. Others will be lost when the base closes.

With rare exceptions, disasters strike children, elderly, the poor and disadvantaged harder than middle and upper class residents. All segments of society are vulnerable, but the more advantaged have more options and resources to speed recovery. In some cases, the human services response to disasters actually creates resource levels greater than those available to the community prior to the event. Federal assistance under the Stafford Act is designed to restore communities only to the level that existed prior to the disaster.

Political and moral difficulties arise from withdrawing services that are obviously needed. The transition from response to recovery may actually make the community worse off. Closing shelters, whose last inhabitants were people homeless prior to the disaster, and withdrawing disaster medical services are cases in point. As noted above, the medical issue is complicated by the provision of free services inhibiting the recovery of the private sector (including non-profits) which will ultimately be left with the task of providing medical care to their community.

Florida Health and Rehabilitative Services, the U.S. Public Health Service, and the Federal Emergency Management Agency took an interesting approach to addressing these health

system recovery issues. FEMA is providing the state with a $10,000,000 grant to ease the transition from response to recovery. Preliminary plans indicate the funds will be used to support the recovery of private physicians by subsidizing their income, assist the recovery of community based health care providers, and provide some funding to hospitals.

F. Management Issues

As we expect in the response to a catastrophic earthquake in California, the response to Hurricane Andrew involved the full range of federal, state, local, and private sector agencies and organizations. These entities operated from a variety of emergency operations centers. The federal medical response operated from the following sites:

NDMS EOC (Bethesda, Maryland) - responsible for obtaining support from federal agencies in Washington, maintaining information on the overall medical response, and supporting DMAT team movement into and out of South Florida;

Disaster Field Office (DFO) in Miami - responsible for overall management of the federal response and for processing claims for federal assistance. The Medical/Health Branch (ESF #8) was responsible for operational coordination with non-medical federal responders and providing resources to DMATs and the Management Support Unit;

PHS Region IV (Atlanta, Georgia) - responsible for providing logistic support for ESF #8 staff working in the disaster field office; and,

Management Support Unit in the South Dade County Government Center - responsible initially for supporting and coordinating responding DMATs. The personnel staffing the MSU eventually assumed overall management of medical response operations. (It is important to note that the evolution of this role is the result of a unique series of event not likely to be duplicated in California. Throughout the remainder of this report this overall management function is refereed to as the "MSU". This is a misnomer of convenience: technically the only function of the MSU is to support DMATs).

State and local responders also worked from a variety of venues. Florida established its emergency management EOC in Tallahassee. Along with sending a representative there, Florida HRS established its own EOC in the state's emergency medical services office. A state EOC was also collocated at the Disaster Field Office, and state EMS and Mental Health representatives were stationed full-time at the MSU.

Local response management was centered at the Dade County Office of Emergency Services EOC. Police and fire services also maintained separate emergency operations centers and had satellite operations in the southern part of the County.