Not surprisingly, the large number of EOCs created coordination problems. In some cases there was a failure to share information resulting in duplicated efforts. In other cases there was an overlap of responsibility among EOCs leading to difficulty determining who was in charge of various aspects of the response. With few exceptions, the problems identified were natural outgrowths of multi-venue coordination and are to be expected in a response of this complexity.

The federal medical response employed an innovative strategy to reduce these problems. The EOC in Bethesda placed daily conference calls linking all the federal venues along with other relevant response agencies. This routine communication helped to keep the overall federal response coordinated.

The key observation concerning federal management of the medical and health response is that it is possible to manage proactively, if not control, the response to a complex multifaceted catastrophic event.

The federal response at the MSU was marked by several features:

- multi-agency cooperation;
- high autonomy;
- macro rather than micro management; and,
- commitment to problem solving.

The medical response to Southern Dade County was managed by federal responders through the Management Support Unit. The original role of the MSU was to provide management and logistic support for DMATs deployed to the impacted area. The MSU role expanded as local and state health officials designated Ellery Gray, a Captain in the U.S. Public Health Service, as Incident Commander for medical and health operations in South Dade. The MSU then became the operational control point for ESF #8. It was through the MSU that response and recovery policies were developed. Local, state, and private health organizations were involved as were high level representatives from DHHS. MSU management staff, however, seemed to have the lead role in defining the process and influencing the direction of plan and policy development.

The MSU included management staff from the Public Health Service, Department of Defense, Department of Veterans Affairs, and National Institute for Mental Health. Representatives from State EMS and Mental Health also worked in the MSU. The MSU operation was marked by the high degree of cooperation and coordination among the principle players. This cooperation was the result of:

- a clear commitment on the part of the participating agencies to meet the needs of disaster victims. This commitment was sufficiently strong to overcome differences in style and policy which could have inhibited coordinated cohesive action.

- the development of an interagency management team with compatible management styles, personalities, and objectives.

- the personalities of the chief of the MSU, his staff, and staff in key working positions. In an event with an ad hoc management system, a history of interagency conflict, and tremendous stress from the intractability of problems and long working hours, personality and style become critical factors in holding the response together. It is essential that leadership not add stress to an already stressful situation. The leader of the MSU employed a leadership style that allowed participation and expression from all key players, fostered a consensus approach to policy development without getting bogged down, and it seems, brought out the best in the people he worked with. Even with this participatory operational decisions were made quickly without hesitation. There was no question that Captain Gray was in charge.

G. Interagency Coordination

The federal response was marked by a combination of interagency cooperation and autonomy. VA, PHS, and DOD representatives at the MSU shared information and consulted on decision making, although a PHS representative was the Incident Commander. Decisions concerning deployment and demobilization of VA mobile vans were run through the MSU leader. However, in the cases I observed, the MSU leader followed the VA management recommendations.

One of the keys to success was the division of labor among the three principle represented federal agencies. PHS, through DMATs; VA, through its mobile clinics; and DOD, each took responsibility for medical care in a particular sector of southern Dade County. Although there was some overlap, this basic geographic division prevented duplication of effort and, perhaps more significantly, kept agencies from stepping on each other's toes.

Department of Veterans Affairs

The VA played two major roles in the response. It provided over $3,000,000 in medical supplies and pharmaceuticals through its Miami Hospital. This was the principal source of medical supplies until the military established its supply operation. VA also brought in the three mobile clinics described above and the staff to operate them.

Public Health Service

PHS staff filled a variety of management and administrative roles at the MSU, including MSU leader. PHS also provided medical staff to augment DMAT operations, pharmacists to assist with the development and implementation of the medical supply program, and support staff for billeting and feeding staff and for assigning and tracking personnel.

Military

The military, as reported in the press, responded with 20,000 troops. Military support was evident everywhere in the MSU, tent cities, and the medical supply system. The military liaison to the MSU chief was instrumental in developing the management system that proved so successful. He also facilitated obtaining military resources for medical operations. This relationship reinforced our belief that a high level proactive military liaison should be assigned to the medical response, and that strong military involvement in the development of response action plans and military commitment to medical response objectives is critical.

The physical location of the MSU some twenty miles south of the DFO, coupled with the collocation of ESF #8 managers with resource allocation authority, was very important to the success of the medical and health response. It is not clear how approval for commitment of resources occurred in the immediate aftermath of the hurricane, but during the period we observed, the MSU brokered the application of medical and health resources. The delegation of decision making to the MSU allowed it to establish ongoing operation rather than having to address individual resource requests. This autonomy allowed managers to be proactive, reduced delays in the application of resources, and contributed to morale by moving decision making to the lowest appropriate level of the organization.

The problem of balancing attention to detail with maintaining an overview perspective of the response, is a difficult one for disaster managers. The MSU succeeded on both counts. First, there was sufficient staff with disaster preparedness and response experience so that managers could delegate tasks with confidence. Confident and committed people at all levels worked together to solve problems, gather and share information, and establish self-sustaining response systems.

Second, the MSU used a status monitoring system and operational planning to achieve a unity and cohesion to the medical and health response without the cost of a rigid command and control structure. The status system, refined from the fire services, was remarkable in its simplicity. The overall medical recovery effort was divided into key components: evacuation (EMS), hospital facilities, primary care, shelter (tent cities), water quality, vector control, solid waste, etc. The status board used at briefings consisted simply of red, yellow, or green color code for each component based on a set of measurable criteria. Of course, at the operational level responders tracked the detail of requests, resources, and service statistics, but at the top management level, and to other response participants as well, this simple display provided a means to focus on high need areas, develop an overall assessment of the situation, and provide a common display format for all participants.

The MSU also successfully implemented an operational (or action) planning system that established a common priority framework for the medical and health response. An interagency task force was created for each of the key components identified above. These task forces were charged with defining the criteria (objectives) for improvement, the plans and strategies required to meet those criteria, and the resources needed to implement the plans. A series of regular briefings were held. During the initial briefings, these plans were

presented; during subsequent briefings, progress and problems were discussed. These meetings were sometimes time consuming, but it was useful for each component to hear what other components were doing. The participants derived several benefits:

- focusing on problem solving rather than the missions of agencies;
- sharing innovative ideas;
- understanding the basis for competing resource demands;
- identifying opportunities for sharing resources;
- identifying the interrelatedness of problems; and,
- achieving consensus on priorities.

This last point was especially important. When information is shared, the rationale for priorities tends to become clear to all players. Priorities arise from commonly understood criteria and the information presented. When priorities are imposed without such a consensus process, unhealthy competition and foot dragging may result. These briefings were open to all MSU staff who could attend. The openness of the briefings meant that the informal, as well as formal, MSU information channels contained high quality up-to-date information.

One of the keys to this type of management effort is the ability to deliver effective briefings. The red, yellow, green system provided a common framework for all presentations. Each briefer addressed the current status and the actions required to move that status closer to green. As usual, the best briefings were short, pointed, and clear. They used charts and handouts and presented or reported progress on measurable objectives.

Staging Area

The MSU at the Dade County Government Center also served as a staging area for a variety of personnel, including medical, public and environmental health, and mental health responders. The lack of hotels and other services in South Dade coupled with the establishment of a livable environment at the Government Center allowed it to meet this need. Many responders stayed in Miami and commuted to the Government Center. Others stayed at the Government Center or in the field. The Dade Center was the site for responders to pick up military transportation or escorts, check in for assignments, communicate with state and other federal EOCs, and participate in briefings and plan development.

H. Case Study - Medical Supply System

The response to medical supply and pharmaceutical needs represents one of the exemplary practices developed for response to Hurricane Andrew that should be applied in other events. The disruption of the medical delivery system, closure of pharmacies, and creation of ad hoc

medical treatment services created a need to develop a system for acquiring and distributing medical supplies. The medical response faced the following medical supply problems:

1. Acquiring appropriate medical supplies in sufficient quantities to meet demand.

2. Distributing resources to medical care sites.

3. Managing inventory and accounting for product.

4. Managing the influx of unsolicited donated pharmaceuticals.

Initial support to DMATs and surviving community responders was provided principally by the Department of Veterans Affairs Hospital in Miami. Veterans Affairs provided over $3,000,000 in medical supplies and pharmaceuticals to medical services throughout the impacted area, including of course its own mobile clinics.

Initially medical supplies were stored in the basement of the Dade County Government Center. With the arrival of an expanded military response, however, a Medlog Battalion was brought in to manage the military medical supply operation. The Medlog established its operation in a vacant warehouse at a military airport about thirty miles north of the MSU.

The director of the MSU created a multi-agency task force to address the pharmacy issue. Participants included representatives from PHS, VA, and DOD. This task force developed a plan with the following steps:

1. Develop a formulary of items stocked by the Medlog.

2. Distribute the list and ordering procedures to all potential customers.

3. Maintain inventories principally through the DOD procurement system with some support from VA.

4. Provide daily shipments to customers from Medlog warehouse.

5. Collect donated supplies and pharmaceuticals and use pharmacy interns to salvage usable material.

Note that the locus of this system is the Medlog Battalion, which shifted its role from supporting only the military medical response to supporting all medical needs in the impacted area.

Public Health Service pharmacists visited each potential civilian customer to explain the program, estimate demand and assess site capabilities for storing supplies. The civilian customers included all active service providers in the community including ad hoc religious and voluntary clinics, community based organizations, hospital based clinics, and sites

operated by Humana and others. VA restocked its own mobile clinics and provided some items to the Medlog not available through the DOD supply system. The VA also handled requests for controlled substances.

The Medlog was provided with a list of approved customers who could place orders by telephone. It then shipped requested items once or twice a day to all customers. While on site, Medlog staff would pick up donated medications and return them to Medlog for sorting and potency validation.

Several features of the system deserve special mention:

1. It was created on-site by a multi-agency team of experts and required interagency coordination to make it work.

2. The Medlog required a very large warehouse with loading docks to handle the operation. The Medlog operation was housed next to the Red Cross supply operation allowing for resource sharing and coordination.

3. Public Health Service pharmacists visited every customer site, assessed capabilities for storing pharmaceuticals and estimated demand. This face-to-face contact also provided useful intelligence on utilization and capabilities of services, and was effective for sharing information with community providers.

4. The program created an effective strategy for handling unsolicited donations of medical supplies. Although receiving unsorted unsolicited shipments remained extremely labor intensive, this approach allowed the system operators to at least get a handle on the problem.

5. The program was self sustaining requiring little attention from medical response managers.

6. The approach was customer oriented throughout the system.

III. Findings and Recommendations

A. Findings and Observations

1. DMATs were an important part of the medical response in Florida. Their significant contributions included:

   - emergency medical care;
   - ambulance receiving (reducing transport times and distances);
   - primary and urgent medical care; and,
   - community outreach.

2. DMATs consist of civilian volunteers who do not always respect the need for response discipline.

3. DMATs have varying degrees of self sufficiency. While all can carry enough initial medical supplies and food and water for personal use, almost all will need transportation from the community they are serving and logistic support for an extended response.

4. DMAT team members reported that they wanted:

   - recognition for their efforts from the communities they are assisting;
   - prompt attention to requests;
   - frequent communication on response environment and situations; and,
   - information on length and conditions of tour of duty.

5. Hospital generators often fail to perform in disasters and should not be considered reliable sources of power.

6. When usual sources of primary and urgent care are reduced by disasters, victims will turn to 9-1-1 and hospital emergency departments for routine care.

7. Restoration of community health services requires restoration of electrical, water, and sewer utilities.

8. Community based organizations are critical for reaching traditionally underserved populations with disaster relief.

9. Translators are needed to serve non-English speaking clients.

10. Managing the human services response to a catastrophic disaster is extremely labor intensive. Several hundred personnel were needed in Florida to support and coordinate direct service providers.

11. EOCs are inherently stressful.

12. Response managers need the capability to quickly reach all sites supported by resources under their management.

B. Recommendations

The following recommendations are based on our observations of the medical and health response in Florida, and the benefits derived from sharing resources, sharing information, jointly setting priorities, and working jointly to solve problems. In most disasters the problems involved in staging response personnel and maintaining interagency communications are minimal and quickly resolved. Transportation resources are plentiful and within-area movement is usually not a problem. The problems created by most disasters are relatively easy to compartmentalize and solve by agencies working within their traditional response scope, with only minimal interagency coordination required.

Following Hurricane Andrew and, we believe also a catastrophic earthquake, disaster victims faced complicated and long-term problems that required a very high degree of coordination among response agencies at all levels of government. Following an earthquake, this coordination will need to be created and maintained in an environment marked by scarce transportation, communications, and logistic support. Collocation of operations is the most efficient method for achieving the levels of response coherency and coordination required to meet the needs of response victims.

1. Management Concepts

a. Medical/Health response venues should operate under the Incident Command System (ICS) or Multi-Agency Command System (MACS).

b. The medical response should transition as rapidly as possible from ad hoc responses to crises to a proactive managed response based on shared priorities and written action plans.

c. Action plans should establish measurable response objectives.

d. Response actions should be based on disaster needs and problems rather than driven by agency missions.

e. Response managers should promote creation of ongoing relatively autonomous processes to address longer term community needs.

f. The response should be high touch as well as high tech. Response managers should travel to sites where people are being served for face-to-face meetings with staff and consumers.

g. Response managers should establish feedback mechanisms to track progress towards completing objectives and customer satisfaction.

h. A combination ombudsperson/circuit rider should be employed to routinely and informally survey customer service sites. His/her reports should augment routine information sharing and provide an expedited information channel for critical data.

2. Management Structure

a. California's human services response (public and environmental health, medical, shelter, mental health, hospital inspection, social services) should operate jointly at the State Operations Center, the Joint EOC at the Department of Health Services in Sacramento, and the Unified Medical Operations Center (UMOC) on the periphery of the disaster area. Unifying the EOCs of the various human services in the disaster area would generate the following benefits:

1) In the worst case situation with major damage to the impacted area's infrastructure, minimizing the number of separate EOC sites reduces the power, water, food, communications, and transportation support requirement for response management.

2) Unifying the EOCs, in any event, would improve:

- information sharing;
- interagency planning and priority setting;
- interagency operations;
- building and supporting multi-function client service centers;
- liaison with local government; and,
- interagency cooperation and team building.

b. The human services response should adopt a task force structure built around population problems rather than agency missions. These task forces should be multi-agency and multi-jurisdictional with local, state, federal, and private representation. Each task force should be chaired by a representative from one of the agencies with primary responsibility for and expertise in that problem area. The task forces would be charged with:

- establishing measurable response objectives to address problems;
- developing plans to meet objectives;
- defining resource requirements to implement plans;
- measuring progress toward meeting objectives; and,
- modifying plans as needed.

c. Federal human services response representatives, including MSU staff and military medical personnel, should be collocated with their state counterparts at the State Operations Center and UMOC.

d. National Guard and federal military medical, health, and logistic support units should play an active role in developing task force plans and supporting plan implementation.

3. Management Support

a. Planning, implementing, and monitoring the human services response will require the long term (4-12 weeks) commitment of hundreds of local, state, federal and private sector staff working in management and support capacities in and around the disaster area.

b. If we are to achieve a truly unified response effort, a site near the disaster area must be found to house large numbers of people. This site must be provided with potable water, chemical toilets, food, cots and blankets, showers and access to laundry. Electricity may need to be provided by generator. At this site, a separate personnel support unit should be established to handle billeting, feeding, and sanitation for staff. A centralized transportation function should also be established to facilitate movement to service sites, EOCs, etc. The Dade County Government Center proved to be a valuable response asset.

The Center, actually a complex of buildings, was newly constructed but unoccupied. Its various rooms were designed for the full range of government functions and provided response managers with room for small meetings, large conferences, sleeping and storage. Furthermore the building design created a pleasant well-lit working environment. Disaster responders cannot expect "deluxe" quarters for housing their activities. However, contrasting the quality of the environment at the Dade County Government Center with the work environment of the DFO underscores the value of good working conditions.

c. All EOCs should have mental health staff dedicated to monitoring and reducing the stress levels of responders.

4. Recommendation - Multi Service Centers

The human services response should use multi-service centers to provide comprehensive services to disaster victims.

a. These centers should provide the following services:

- medical care;
- immunizations;
- health information;
- pharmacy;
- mental health;
- food, water, and ice;
- services information;
- utility restoration information; and,
- disaster assistance applications (Disaster Assistance Center).

b. The centers should include a management and administrative support function.

c. Human services response agencies should find opportunities to share resources such as: space, personnel staging operations, transportation, bilingual staff, and administrative and logistic support.

5. Recommendation - DMAT Operations

a. DMATs should be alerted immediately and mobilized early to a staging area following a major disaster.

b. Requesting jurisdictions should, in conjunction with federal and state staff:

- provide a liaison to each team;
- determine mission and work locations for DMATs; and,
- plan to provide transportation for DMATs from airfield to work site.

c. Responding teams should receive the following information before deployment or immediately upon arrival at the disaster area:

- overall situation
- work site description
  - environment
  - patient load

- response procedures for:
  - communications and reporting
  - resupply
  - return to home
- length of tour

d. Preference should be given to stationing DMATs in structures rather than tents, even if water and power are not available. Preference should also be given to using DMATs at or near hospitals or clinics where people are likely to seek medical care.

e. DMAT managers should be involved in meetings, briefings, and planning sessions that affect their operations.

f. EOC based response managers should visit sites where teams are operating and talk to team managers and staff, and clients.

g. Local and state responders may need to support DMATs with food, water, shelter, transportation, sanitation, and communications at some point during their tour of duty.

h. Specialized teams, or team components, should be developed in specialties such as pediatrics and community medicine.

i. NDMS and CDC should consider jointly creating teams specializing in environmental and preventive health services.

IV. Final Note

In the aftermath of DMAT deployment to Florida and Hawaii, questions have arisen about the ultimate value of DMATs. Some observers have pointed to the cost of moving and supporting medical teams far from their base. They note that the teams do not always observe military discipline and that they are not standardized in capability, training, and equipment. Some have suggested that the mission fulfilled by DMATs would be better accomplished by military teams or by volunteers in or near the disaster impacted community.

While recognizing these limitations and urging their remedy, California gives full support to the DMAT program. Our review of the hurricane responses in Florida and Hawaii reinforce our belief that disasters which severely damage the medical infrastructure of a community are likely to require sustained response from out-of-area resources. Although there are many advantages to employing responders from nearby communities, they are usually not sufficiently organized and trained for response in a disaster environment. This is especially true if hospitals and clinics, i.e. normal sites of practice, are no longer functioning. Most physicians are not prepared for field medicine without additional training. In general, trained and organized is better than untrained and unorganized.

Military medical teams certainly meet the trained and organized criteria. Furthermore, they have standardized personnel and equipment, are fully supported by military logistic elements, and readily fit into a command and control structure. Active duty teams are available who are trained for practically instant response.

Our experience with Loma Prieta and other earthquakes in California, as well as the hurricanes, indicates disaster created trauma must be (and is likely to be) handled by local responders. In metropolitan areas of the United States, there is sufficient medical capacity to redirect resources from their day-to-day use to begin to address, in the short term, the immediate disaster medical needs of victims. Under worst case scenarios, these resources will be limited by communication and transportation failures, and the lack of availability of surgical interventions over short time frames. Outside support will make a significant contribution to treating disaster induced trauma only if resources can be delivered within a matter of hours. The only medical teams capable of this fast a response to a disaster with no warning, are teams located in areas adjacent to the disaster or relatively close by.

It is important to keep in mind that the above discussion refers only to disaster induced trauma, and it is now apparent that other medical problems and injuries are likely to create major demands for medical care over a longer period of time. It is with these continuing medical needs that outside teams can make their greatest contribution; especially if the disaster has damaged the local medical infrastructure, disaster related hazards remain, and/or the impacted population is medically underserved prior to the event.

When comparing the likely effectiveness of DMATs and military teams in meeting these post-disaster medical challenges, we believe DMATs are potentially a superior resource. Our assessment is based on the following factors:

- DMAT members are currently licensed or certified practitioners in civilian community settings and are more likely to have experience with a civilian population demographic mix than military response units. Civilian disaster victims include a large number of children and elderly, populations underrepresented in military medicine.

- DMATs are also more likely to have experience with the non-disaster medical problems of the local population. Emergency physicians and nurses, paramedics, and other EMTs routinely see non-trauma patients with chronic diseases, pediatric and geriatric conditions, substance abuse problems, and other conditions more typical of civilian sick and injured rather than combat injuries.

- Civilian teams are also likely to better integrate with both prehospital and hospital components of local medical systems.

This support for DMATs is not meant to denigrate the commitment or capability of military medical personnel. Indeed, most military medical practitioners hold civilian positions and are quite capable of treating civilian populations. However, active duty military medical personnel are likely to be stronger in military medicine rather than civilian.