Closing the seams*

Developing an integrated approach to
health system disaster preparedness

PRICEWATERHOUSECOOPERS

Table of contents

Executive Summary

When a disaster hits, Americans rely on a fragmented healthcare system to miraculously mount a timely, cohesive, and effective recovery effort. Yet, the carefully orchestrated and sequenced medical responses to disasters lean on a disjointed health system.

During the 9/11 disaster, the number of fatalities outnumbered immediate casualties in need of medical assistance. If the situation had been reversed, would the health and medical community have been able to handle it? This is a difficult question, but one that must be answered as we prepare plans and budgets and evaluate such questions as: "Are we there yet?", "How much money is sufficient?", and "How effective are our plans?"

PricewaterhouseCoopers' Health Research Institute (HRI) examined the disaster preparedness of our health and medical system. We found that facility and staff resources are limited, public health and private medical sector plans are inadequately coordinated, communications and tracking systems are incompatible, and funding is not sufficient to support development of a sustainable infrastructure for an effective response. Since 2002, Congress has appropriated nearly USD $8 billion for disaster preparedness, yet there is little accountability to gauge our level of preparedness or progress.
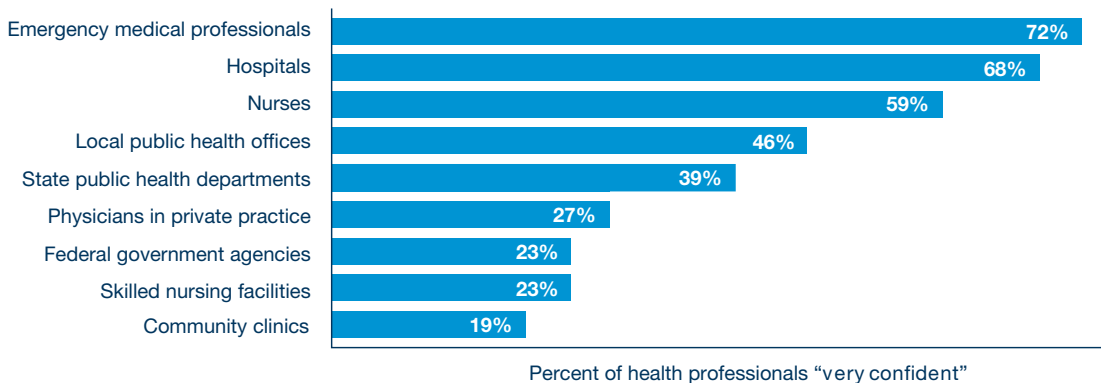
Closing the seams examines the preparedness of our healthcare system, identifies gaps, and highlights emerging solutions and innovative best practices that can be leveraged to help providers and communities deliver healthcare in the face of the unknown. We also provide a framework to help organizations, communities, and society work together to provide assistance when a disaster occurs.

Key Findings:

- A disaster occurs every week in the United States, and the frequency has been increasing. Yet disaster planning remains sporadic and disconnected. For example, hospitals and public health workers are the focal points of disaster response but rarely work together, and other frontline caregivers, such as primary care physicians, are often not included in planning efforts (Exhibit 1).

- Primary care physicians are the least likely to receive disaster preparedness training and the least likely to be prepared, according to HRI survey findings. Less than 20% of primary care physicians said they were "well prepared" about what to do in a disaster.

- Unity of command is hampered by a lack of consensus at the local and regional levels, communication breakdowns, and gaps around risk mitigation in the national framework for emergency preparedness.

- Funding approaches do not support systematic community planning. An annual funding cycle discourages long-term planning or development of a sustainable response infrastructure, and many hospital executives believe that the administrative costs of applying for funding are overly burdensome for the level of funding received.

- After a spike following 9/11, federal funding for hospital preparedness has declined steadily. The federal government spends less than $5 per person annually to pay for health systems and agencies to be prepared for a disaster. More money is now spent to stockpile drugs and supplies than to hire and train health providers to treat disaster victims.

- Benchmarks are needed to determine the level of preparedness at the federal, state, and local levels. There is no common definition of preparedness, and requirements have shifted.

- There is no federal or state requirement for communities to maintain a certain level of hospital capacity for disasters, and most health system resources are owned and operated by private organizations that are pressured to improve their operational efficiency and financial bottom line.

- Disasters will strain the current shortages of medical personnel, who have little spare time to train for them. Contributing to this problem is the lack of consensus on the most appropriate skill set for responders, leading to a patchwork of training and licensing programs. While many volunteer programs exist, they are often poorly coordinated, leading to confusion about the actual number and skills of people registered.

- State and local planners often lack the necessary systems, staffing, and training for distributing stockpiled drugs and supplies. Peak demand usually occurs within the first 24 hours of a disaster, and national stockpiles were designed to supplement local capabilities rather than as a first-response tool.

- Technologies to support disaster response and recovery abound, but standards and interoperability are lacking.

Exhibit 1. Casualty Coordination Among Health Professionals

During a disaster, how confident are you in being able to coordinate casualties with each of the following?

Category	Percent
Emergency medical professionals	72%
Hospitals	68%
Nurses	59%
Local public health offices	46%
State public health departments	39%
Physicians in private practice	27%
Federal government agencies	23%
Skilled nursing facilities	23%
Community clinics	19%

Percent of health professionals "very confident"

Source: PricewaterhouseCoopers' Health Research Institute survey

Recommendations:

Health and medical systems should adopt a systems-oriented approach and infrastructure for disaster response.

Organizational Strategies:

- **Plan for Altered Standards of Care.** During a disaster, medical priorities must shift from focusing on individual patient-based outcomes to population-based outcomes. Hospitals need to decide how they will free up capacity, plan for delivering care in unconventional locations, recycle supplies to extend limited quantities, and ration resources to care for those most likely to survive. In addition, the scope of practice standards for physicians, nurses, and paraprofessionals may need to be changed so that they can provide care outside of their clinical specialty areas.

- **Identify Alternate Care Sites.** Since many hospitals function at near full capacity under ordinary circumstances, they may not have sufficient resources to meet patient demands during a major disaster. Alternate care sites should be considered to alleviate the patient demand at hospitals and increase healthcare surge capacity within a community. Potential sites may include: shuttered hospitals, mobile medical facilities, ambulatory care centers, dormitories, and large public buildings.

- **Prioritize Pharmaceuticals and Other Supplies.** Federal funding has provided much of the supplies needed, but responders need a plan to use them during a disaster. Healthcare providers will need additional staff to distribute the supplies and will need training in how to use them. They need to be prepared to function without assistance for several days and to change their inventory management to include local supply caches. They will need to assess vendors' disaster capabilities, select and prioritize stockpile contents, manage expiration dates, rotate inventories, select strategic storage locations, and consider how to move supplies and equipment from the cache to the desired location, while ensuring security of their stockpiles.

Community Strategies:

- **Expand Staffing Supply and Capabilities.** To extend the healthcare workforce, organizations may have to consider lengthening shifts, increasing staffing ratios, expanding professionals' scope of practice, organizing staff into specialized disaster teams, and providing incentives to motivate staff to come to work. In some cases, they must address staffs' concerns about the safety of themselves and their family members. Organizations should consider supplementing staff from other sources in the community such as the Emergency Medical Services (EMS) and federal hospitals. Volunteers should be recruited in advance and registered in a coordinated manner.

- **Develop Consistent and Actionable Plans.** Disaster planning needs to be treated as a living, ongoing process rather than a compliance activity. It must include exercises and a constant review of assumptions, training, and capabilities. Communities should actively engage a wider range of stakeholders who have not traditionally been at the planning table, particularly primary care physicians, community clinics, and nursing homes.

- **Collaborate Through Formal Regional Agreements.** Collaboration provides an opportunity for healthcare organizations to share resources, learn from one another, leverage best practices, and combine forces to achieve together what they each could not do alone. Disaster responders should work locally and regionally to organize resources, share expertise, and formalize mutual aid agreements.

Societal Strategies:

- **Develop Disaster Masters.** Leadership is needed to make the many difficult decisions regarding evacuation, standards of care, resource rationing, and guidance for staff during a disaster. To develop leadership competency for disaster preparedness, colleges and universities should develop a standard training curriculum, establish certification requirements, redefine healthcare personnel roles to include disaster preparedness, and align funding to support the development and maintenance of skills.

- **Help the Public Develop a Culture of Preparedness.** Those who have had the most exposure to disasters tend to be the most prepared, but they are in the minority. We can create a broader culture of preparedness with relatively simple, low-cost measures like involving the public in the planning process, empowering them with information, and providing tools. In higher risk areas, we can involve the public more directly by assigning specific roles for disaster response and offering opportunities to interact with first responders and care providers during drills and emergencies.

- **Develop Sustainable Funding Sources.** Disaster preparedness requires both government support and private-sector resources. Accordingly, it needs to be considered as an operational budget item that is funded from both private and public sources over the long term. Ideally, federal funds should be matched with local funds to increase funding and overall commitment. To encourage broader involvement in disaster planning and response, grants should be made accessible to a wider spectrum of organizations, including primary care providers, outpatient facilities, nursing homes, and multistate consortia.

About the Research

To provide research-based insight, HRI conducted 46 in-depth interviews with thought leaders, policy makers, executives representing hospitals and health systems, professional associations, health plans, academic organizations, and federal, state, and local governmental agencies.

HRI conducted an extensive literature review of reports and guidance from associations, analysts, regulators, and academia to gather insights on current challenges and best practices. In addition, publicly available data was analyzed as related to surge capacity and funding sources.

HRI also commissioned a national study of health industry stakeholders and the general public to assess their awareness of, involvement in, and perceptions about disaster preparedness. Respondents were as follows:

- 98 hospital executives (CEOs and COOs)
- 55 practicing primary care physicians in private practice
- 51 practicing hospital staff nurses
- 40 state and local public health officials
- 1,000 U.S. adults

Introduction

Although Congress has appropriated nearly $7.7 billion for disaster preparedness since 2002, the question remains, "Are we better prepared as a result?" Industry watchdogs and experts have responded as follows:

- "Currently there are no standard analyses or reports that enable [the government] to compare data across recipients to measure collective progress, compare progress across recipients' programs, or provide consistent feedback to recipients." —*Government Accountability Office (GAO) study, March 2007*[1]

- "With regard to the status of emergency preparedness across the nation, we know relatively little about how states and localities (1) finance their efforts in this area, (2) have used their federal funds, and (3) are assessing the effectiveness with which they spend those funds." —*William O. Jenkins Jr., director, Homeland Security and Justice Issues*[2]

- "Five years after September 11, 2001, public health emergency preparedness is still not at an acceptable level. Limited progress continues to be made, but the big-picture goals of adequate preparedness remain unmet. As a result, Americans continue to face unnecessary and unacceptable high levels of risk." —*Trust for America's Health*[†] *2006 report*[3]

Part of the problem is the lack of a common definition of "preparedness." When PricewaterhouseCoopers' Health Research Institute (HRI) asked industry leaders to define preparedness, they agreed on only two things: (1) there is currently no universally accepted definition of preparedness; and (2) we must continue getting "better prepared."

Without a definition, it's hard to develop benchmarks. Noted Irwin Redlener, M.D., associate dean and director of the National Center for Disaster Preparedness at the Columbia University Mailman School of Public Health, "Whatever you think about being prepared as an individual or family, extrapolate that to a hospital CEO. They have no idea of what the end point is because there are no satisfactory benchmarks to establish what we mean by '*prepared.*'" Jim Blumenstock, chief program officer for public health practice of the Association of State and Territorial Health Officials (ASTHO), added, "The public health community is getting slammed for not having sufficient measures of preparedness. This is overshadowing the fact that progress is being made every day."

To improve the ability of our government and health systems to plan for and respond to disasters, this report focuses on "the seams" in the state of preparedness. While significant progress has been achieved since 9/11, gaps continue to exist. This report highlights those gaps as well as leading practices that can be leveraged on a wider scale to further increase the health system's ability to handle the unknown.

[†] Trust for America's Health (TFAH) is a nonprofit, nonpartisan, private-sector watchdog group. For the past four years, TFAH has published a state-by-state evaluation of preparedness. The report is the only one of its kind currently being published.
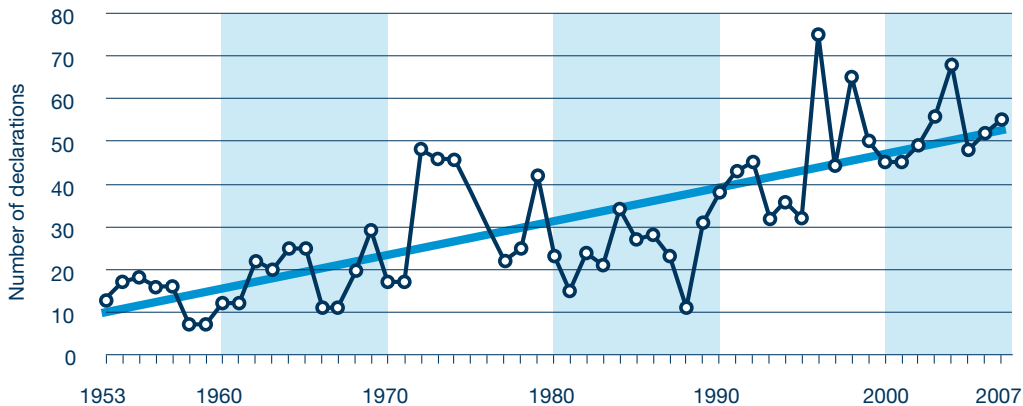
Disasters are Frequent in Nature

Disasters are often regarded as catastrophic and rare occurrences, like 9/11 or Hurricane Katrina. However, disasters are increasingly common. Worldwide, a major disaster occurs almost daily. In the United States, a disaster has occurred, on average, every week for the past 10 years, according to the Federal Emergency Management Agency (FEMA) (Exhibit 2). Every region of the country is at risk for some type of disaster. However, "healthcare workers and the public think of disasters as a 'one-off' issue," said Sandra Shewry, director of the California Department of Health Services. "We need it to be part of the background texture of life—part of what it is to be a doctor, a teacher, a dad."

The most frequent disasters are naturally occurring ones, such as floods and hurricanes, a trend that may be exacerbated with climate change.

Yet, biological disasters, such as pandemic flu, are viewed as far more dangerous. Despite the infrequent nature of an influenza pandemic, concerns that the current strain of avian influenza may mutate into the protagonist in a devastating human viral strain have brought it to the forefront of disaster planning. The 1918 "Spanish" influenza pandemic killed between 50 million and 100 million people worldwide. Peter Marghella, chief executive officer of

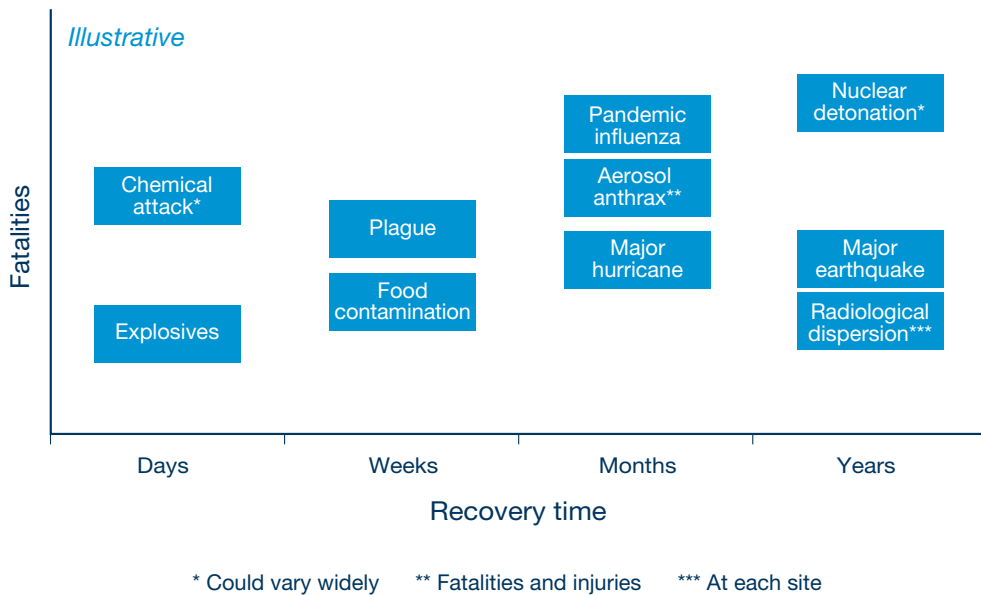**Exhibit 2. FEMA National Disaster Declarations**

Source: PricewaterhouseCoopers' analysis based on data from Federal Emergency Management Agency (2007), accessed at http://www.fema.gov/news/disaster_totals_annual.fema

Note: Data shown is through September 25, 2007

Medical Planning Resources and the former director of medical contingency operations for the Office of the Secretary of Defense, explained: "The impact of a pandemic now could be significantly worse due to three important changes: (1) a tripling of the global human population, creating a significantly larger 'population-at-risk'; (2) large geographic concentrations of immuno-compromised populations due to HIV, straining the medical and public health infrastructure; and (3) the availability of a vast global air transportation network, creating a potential 'vector accelerant' (or exponentially rapid) platform for the spread of the disease." The U.S. Department of Health and Human Services (HHS) Pandemic Influenza Plan estimates that a severe pandemic outbreak similar to 1918 would result in 90 million people sick, 45 million people requiring outpatient care, 10 million people requiring hospitalization, and 1.9 million deaths in the United States.[4] World Health Organization (WHO) spread models estimate that the global mortality level could run anywhere from 180 million to 360 million people worldwide. One report estimated that half of U.S. states "would run out of hospital beds within two weeks of a moderately severe pandemic flu outbreak."[5]

Each disaster's specific impact will vary. The U.S. Department of Homeland Security (DHS) has identified the impact of 15 disaster scenarios (Exhibit 3). Immediate impact events such as an explosion or a chemical attack will require emergency and trauma care, whereas a more sustained event will require more primary and chronic care.

Exhibit 3. National Disaster Planning Scenarios

Illustrative

Fatalities (y-axis) vs. Recovery time (x-axis: Days, Weeks, Months, Years)

- Chemical attack*
- Explosives
- Plague
- Food contamination
- Pandemic influenza
- Aerosol anthrax**
- Major hurricane
- Nuclear detonation*
- Major earthquake
- Radiological dispersion***

* Could vary widely   ** Fatalities and injuries   *** At each site

Source: Planning Scenarios. Executive Summaries, (July 2004), U.S. Department of Homeland Security

Despite the frequency of disasters, planning currently is sporadic and largely based on communities' previous experience with disasters. Communities that have experienced disasters tend to be more prepared than those that have not. "Disasters are supposed to be wake-up calls, but we treat them like snooze alarms," noted Columbia's Redlener, whose book, *Americans at Risk*, describes why the United States is unprepared.

Others concur that planning is highly variable and without standards. For example, Ted Cowan, vice president for plans and operations for Medical Planning Resources, said each state currently has its own pandemic flu plan, ranging between 18 to 660 pages. "Disparate and fractious planning results in a disparate and fractious response," he warns.

A coordinated community response requires established lines of responsibility, sustainable funding, and sufficient surge capacity. The following sections address these key issues.

Lines of Responsibility are Unclear

The delicate balance of power between federal and state authorities can easily become unhinged in a disaster. Disaster planning should ensure proper unity of command, but in practice, this rarely happens. Part of the blame stems from the lack of legislative clarity. A recent DHS report[6] concluded that conflicts in legislation cause overlapping responsibilities and authorities and politically adversarial turf wars among federal agencies.

The health system was not designed to address the complexity of disaster response, which often requires a public-sector response and coordination across multiple organizations and regions. Maintaining a minimum national level of preparedness has national policy implications. Yet the resources to respond exist predominantly within the private sector, in hospitals and health organizations that are managed locally (or sometimes regionally), and regulated at the state level.

Until recently, it was unclear what federal agency was responsible for planning for and responding to a medical catastrophe. In December 2006, greater clarity was achieved when the government created an office for the Assistant Secretary for Preparedness and Response (ASPR) to lead and coordinate multiple HHS medical response programs.

However, the federal law that created this office did not specify how federal entities should align with tribal, state, and local governments. This leaves open the possibility of the types of coordination problems that were experienced during Hurricane Katrina. As shown in Exhibit 4, respondents to HRI's survey indicated that coordination remains a concern. In particular, health professionals questioned the ability of their organizations to coordinate with physicians in private practice, federal agencies, clinics, and nursing homes.

Disaster planning by the federal government strains relationships with states

The National Response Plan (NRP), which was mandated by Congress, establishes a comprehensive framework for coordinating federal agencies and public officials under specified emergency conditions. The plan was designed to be invoked whenever the President issued a major disaster or emergency declaration. However, the 427-page NRP has proven complicated and difficult to execute, prompting stakeholders at the federal, state, and local levels to ask for clarification.

The Bush administration agreed to rewrite the NRP to improve the document's readability and usability. The new plan, titled National Response Framework (NRF), is a simplified playbook that describes various responsibilities of government executives, private sector businesses, and nongovernmental leaders. It is a guide to how the nation will conduct all-hazards incident management and is intended to capture specific authorities and best practices.[7] It is intended to guide how federal, state, and local governments work together during disasters, though many state and local planners have claimed that they were excluded from the planning process. Tension between federal and state/local disaster planners also exists over decreasing federal disaster planning funds, adequacy of resources, and lack of information sharing.[8]

Exhibit 4. Casualty Coordination Among Health Professionals

During a disaster, how confident are you in being able to coordinate casualties with each of the following?

Not at all confident   Not very confident   Somewhat confident   Very confident

Source: PricewaterhouseCoopers' Health Research Institute survey

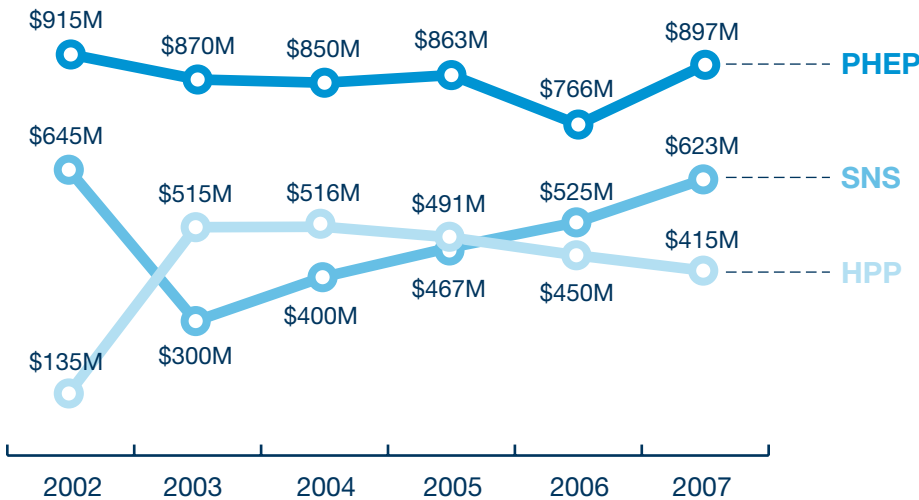**Disaster planners continue to demand clear guidelines**

The NRF is meant to provide a concise and common playbook for all parties involved. But some critics have said that it will be difficult to put into practice and does not substitute for a plan. For example, the framework states that private-sector businesses are expected to play an essential role in protecting critical infrastructure systems and implementing plans for the rapid restoration of normal commercial activities and operations in the event of a disruption, but it does not specify mechanisms or incentives for them to do so. Though the NRF deals with preparation, response, and recovery, groups including the International Association of Emergency Managers believe that it does not address how disasters can be prevented and risks reduced.[9]

Declaration and coordination of mandatory evacuations remains a dilemma. While almost every state has authorized the governor to order an evacuation, local governments also are allowed to do so. This twin delegation can be confusing, as witnessed in Louisiana during Hurricane Katrina. Though the NRF addresses this issue, confusion about the role of the federal versus local government remains.[10] This is a particular concern for healthcare facilities, who want to minimize the risk in evacuating their patients.

Funding is Not Enough or in the Right Places

After 2001, the federal government dramatically increased its disaster preparedness funding for healthcare systems and agencies. Between 2002 and 2007, Congress made about $7.7 billion available through HHS to support emergency preparedness activities by healthcare facilities and public health agencies. Another $2.9 billion has been spent on funding national stockpiles of drugs and other supplies. Additional funds have been available through the DHS and various bioterrorism programs, although they have not been earmarked specifically for public health or medical providers.

Exhibit 5. Public Health Emergency Preparedness (PHEP), Hospital Preparedness Program (HPP), and Strategic National Stockpile (SNS) Spending

Source: U.S. Department of Health and Human Services, Public Health Emergency Preparedness, and Hospital Preparedness Program Cooperative Agreement documents, 2004, 2005, 2006, 2007

As Exhibit 5 shows, HHS funding is distributed in three streams:

1. The Public Health Emergency Preparedness (PHEP) program is operated by the Centers for Disease Control and Prevention (CDC). It distributes funding to state departments of public health, which then distribute it to state and local public health agencies. PHEP includes the Cities Readiness Initiative, which provides additional funding ($57 million in 2006–2007) to cities that are deemed high risk.[11] It also includes funding for pandemic influenza preparedness ($175 million in 2007).[12]

2. The Hospital Preparedness Program (HPP) is administered by the Office of the Assistant Secretary for Preparedness and Response (ASPR). (HPP was formerly administered by the Health Resources and Services Administration [HRSA]). It allocates funding to state, city, and county health departments, which in turn distribute it to hospitals, hospital associations, outpatient facilities, clinics, rural health facilities, tribes, EMS, and poison control centers.

3. Strategic National Stockpile (SNS) funding is administered by the CDC. The SNS is designed to provide supplies and medications to state and local public health agencies. The SNS program is managed by the CDC, but state and local authorities are responsible for receiving, storing, and distributing the assets.

For 2007, the federal government is spending $1.3 billion through the PHEP and the HPP. While this may sound like a lot, it amounts to only $4.30 per person per year ($2.94 through PHEP, $1.36 through HPP).[13]

Funding is viewed by many hospital executives as insignificant

Based on current HPP funding levels, each hospital was eligible to receive an average of $82,500 in 2007.[††] (Hospitals' actual average amount is even less, since up to 25% of the funds can go to the state, and non-hospital providers such as EMS systems, outpatient clinics, poison centers, and community health centers can access the funds as well.)

Funds are granted in one-year increments, and there's no requirement that hospitals apply for funding, which means that some states and localities may be more prepared than others. HRI interviews with health system leaders indicated that some forgo applying because the cost to comply with training and reporting requirements exceeds what the grants provide. However, this level of funding begs the question of how well a hospital could prepare by spending $82,500 (Exhibit 6). For some hospitals these grant monies may seem unworthy of their time and attention.

These sentiments were evident in responses to HRI's survey. For example 83% of the health industry stakeholders surveyed by HRI (hospital executives and managers, state and local public health officials, practicing nurses, and primary care physicians) reported that funding was not entirely sufficient, and over one-third reported major unmet needs due to limited funding.

†† Calculated using 2007 HPP funding and 2007 U.S. hospitals (excluding territories), according to American Hospital Association statistics

Exhibit 6. Can a hospital do all of this for $82,500?

Hospital Preparedness Program Award recipients are expected to possess the following five capabilities by August 8, 2008

1. **Interoperable Communication System:** Healthcare system must connect both horizontally and vertically as outlined in the Medical Surge Capacity and Capability Handbook.

2. **Bed Tracking System**: System must be capable of reporting bed categories that are consistent with Hospital Available Beds in Emergencies and Disasters (HAvBED) requirements and definitions.

3. **ESAR–VHP System:** Recipients must have a fully operational Emergency System for Advance Registration of Voluntary Health Professionals (ESAR–VHP).

4. **Fatality Management Plans**: Hospitals must possess and exercise integrated fatality management plans.

5. **Hospital Evacuation Plans:** Hospitals must possess and exercise integrated evacuation plans.

6. **NIMS Compliance:** Hospitals must fully implement National Incident Management System (NIMS) Compliance Activities for Hospitals, which includes full implementation of NIMS and completion of four NIMS/NRP–related training courses for designated staff.

Source: Based on Announcement of Availability of Funds for the Hospital Preparedness Program, Department of Health and Human Services

Declining funding is creating tension

HPP funding has been decreasing since 2003 and for 2007 is $100 million less than it was in 2003. Melissa Sanders, ASPR's team leader of healthcare systems preparedness programs, noted: "We had been in a mode of ramping up our preparedness capabilities. States and localities had purchased a lot of equipment, supplies, protective gear. Now with funding levels going down, we're looking at funding shifting into sustainment mode."

But some fear that rather than looking like a maintenance list, the "to-do" list is getting bigger. The Center for Biosecurity at the University of Pittsburgh has estimated that it would cost $5 billion to prepare the United States for a severe pandemic, plus an additional $1 billion for annual maintenance.[14] Mary Selecky, secretary of health for the Washington State Department of Health, noted: "The list of what is expected from states continues to grow. At the same time, the federal government is cutting the funds it provides us to do this work. I have the unenviable position of saying, 'Here are a few dollars less—here are the new requirements.' No one is telling states to stop doing what we are doing." This was underscored by the 2006 report from Trust for America's Health: "The [health preparedness] programs have already experienced cuts, even before many basic preparedness goals could be met."[15]

Separate funding streams create confusion and inefficiencies

CDC and HRSA/ASPR have separate funding and reporting streams that states must manage. Rear Admiral Craig Vanderwagen, HHS's assistant secretary for preparedness and response explained: "Congress established two separate funding streams because they wanted accountability in two separate directions. Hospital preparedness (surge and mass casualty) is different than public health preparedness (mass screening and prophylaxis). There are challenges, but we need to move toward a clearer continuum approach. For example, by putting grants on the same timeframe, coordinating grant requirements, and comparing targeted outcomes, we can get synergies. We should have data systems that are built around the same data elements and are mined for different reports."

But measures and systems have yet to be integrated. "Disaster preparedness should be a way to reconnect public health and health systems. Yet we're planning and funding those worlds separately," noted Columbia's Redlener.

These separate funding streams also create administrative challenges. According to ASPR's Sanders, "There's a patchwork quilt of how states get the monies out to the localities. It depends on the individual state structures." Some states have a single office that handles both CDC and ASPR funding processes; others do not. Some offices are part of the governor's office; others are in budgeting and finance offices.

Although funding is managed separately by CDC and ASPR, a standard methodology is used by both to apportion funds. Each state receives a base amount plus an amount indexed to population (four metro areas—New York, Chicago, Los Angeles County, and the District of Columbia—receive their own funding because of their dense population and higher risk). Even so, some states at relatively low risk receive a relatively large amount of funding. As detailed in Exhibit 7, Wyoming, Vermont, North Dakota, and Alaska rank in the top five states receiving funding on a per capita basis, while Texas and Florida are the lowest (a full listing of funding for all states is provided in Appendix A). While federal officials said they have considered changing the funding formula, no such shift is under way.

Exhibit 7. Per Capita Disaster Preparedness Funding for Selected States, 2007

State	CDC and ASPR Combined Per Capita Spending	Rank (Highest to Lowest)
District of Columbia	$ 20.01	1
Wyoming	$ 13.40	2
Vermont	$ 11.44	3
North Dakota	$ 11.24	4
Alaska	$ 10.73	5
New York*	$ 4.31	31
California*	$ 3.93	44
New Jersey	$ 3.89	45
Texas	$ 3.68	50
Florida	$ 3.64	51

*California and New York include additional funding to LA County and New York City

Source: PricewaterhouseCoopers' analysis based on 2007 Department of Health and Human Services expenditure data and U.S. Census Bureau 2006 population estimates

State-based allocations make it difficult to transfer equipment and personnel during an emergency or engage in planning across a regional area. Sally Phillips, director of Agency for the Healthcare Research and Quality's (AHRQ) Bioterrorism Preparedness Research Program, suggested that if some funding were shifted from states to regional coalitions (such as tri-state areas), it could encourage more cooperation. Recognizing this need, in August 2007 ASPR announced a new grant—the Healthcare Facilities Emergency Care Partnership Program—that is available to regional groups of first responders and providers to strengthen their relationships. Thus far, it is limited to $25 million.

The annual funding cycle discourages long-term planning or development of a sustainable response infrastructure

Funding benchmarks and reporting requirements are modified each year, causing recipients to shift rather than sustain focus. "The current funding forces the funds to be utilized on gidgets and gadgets because you need to liquidize the funds rather than hire and develop infrastructure for the long term," said Jimmy Guidry, M.D., Louisiana's state health officer.

ASTHO's Blumenstock noted that it's difficult to build a sustainable infrastructure under the annual funding cycle: "It is taboo to talk about building a human capital infrastructure. To some, this equates to a bloated bureaucracy with unnecessary overhead. But we need people to build and sustain preparedness capabilities. Having sufficient, adequately trained staff is one of, if not the most important components of preparedness."

Funding limitations are taking a toll on staff support. Only 13% of health organizations surveyed by HRI had full-time positions dedicated to disaster planning. In addition, almost 90% of survey respondents identified additional staff as their greatest unmet need.

A lack of consistent benchmarks impedes sustainable or measurable progress

The government requires grant recipients to spend their funds in specified areas and report their status. But these requirements have changed. A GAO report found that the focus has shifted from capacity to capability over time. For example, rather than measuring the number of training sessions, the government now asks grant recipients to provide information on the effectiveness of training.

Evaluations performed by private-sector organizations also have altered their benchmarks from year to year. Though the Trust for America's Health (TFAH) has published an annual report rating states on their preparedness since 2003, it has changed its methodology each year. For example, TFAH's 2005 benchmark for surge capacity was having sufficient medical equipment and supplies for 10 additional patients requiring ventilation; in 2006, that target had changed to two weeks of hospital bed capacity. The shifting targets make it difficult for states to report status and to ascertain progress.[16]

Some states have taken it upon themselves to set their own targets. For instance, in 2003 the Florida Department of Health published a five-year public health preparedness strategic plan and established a series of measurable goals and objectives for that time horizon.

Surge Capacity is Limited and Will Depend on a Private Sector Response

Surge capacity is dependent on hospitals, which have strong incentives and market pressures to make operational decisions that may run counter to preparedness needs. Stated emergency planning consultant Ted Cowan: "We're reliant on our private medical system for healthcare disaster response, because the public sector doesn't have the assets. But hospitals don't work together on a day-to-day basis—they're in competition."

Disaster response must start at the local level because it takes up to 72 hours for outside resources to arrive, while 95% of survivors are rescued by local emergency responders within the first 24 hours after a disaster.[17] Therefore, local communities need to have facilities, staff, equipment, and systems available to meet patient needs during a healthcare surge. These are frequently referred to as the four "S's" of surge capacity: structure (facilities), staff, supplies (including pharmaceuticals and equipment), and systems (communications and information technologies).[18] Each will be described separately in this section.

Structure: Facility capacity hinges on market demands, not potential surge needs

While all components of surge capacity are important, facility planning is the first priority. "We initially thought that we needed to focus on the patient first in disaster planning. We learned that we need to focus first on securing the facilities, then on the staff. Once those two factors are in control, then we can focus on the patient," said Karen Drenkard, Ph.D., R.N., senior vice president and chief nurse executive at Inova Health System in Northern Virginia.
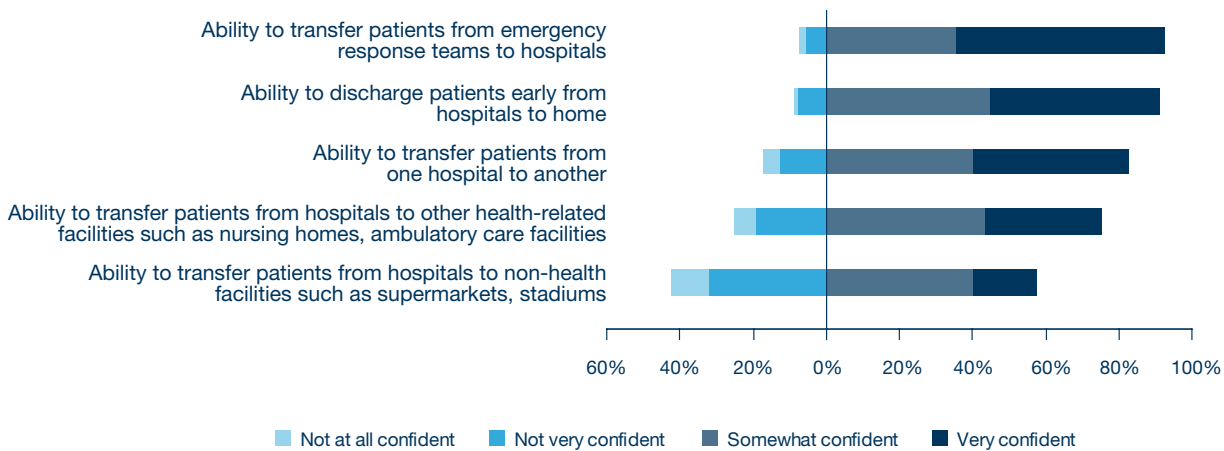
Lacking standard requirements, surge capacity today is a matter of chance and market forces

There is no federal or state requirement for communities to maintain a certain level of hospital capacity for disasters. While maintaining capacity for disasters seems prudent given the frequency of disasters, market forces pull in the opposite direction. In an immediate impact event, victims of a disaster will show up first in the hospital emergency room and then flow quickly to available inpatient beds, but neither area is necessarily able to respond quickly. Experts have estimated that hospitals could free up to 25% of their beds for emergency use during a disaster, but many are skeptical of how quickly and safely that could take place.[19] As shown in Exhibit 8, HRI's survey found that over 40% of health professionals lacked confidence in their ability to transfer patients to non-health facilities, and 25% lacked confidence in their ability to transfer patients to other health-related facilities.

Emergency and trauma services are strained under normal conditions, primarily because of decreasing funding, maldistribution of physicians, and a growing population of uninsured who use them for primary care. Emergency department (ED) visits grew by 32% between 1990 and 2005, while the number of emergency departments decreased by 11% (561).[20] Nearly half of U.S. hospitals report that their emergency departments are at or over capacity (Exhibit 9).
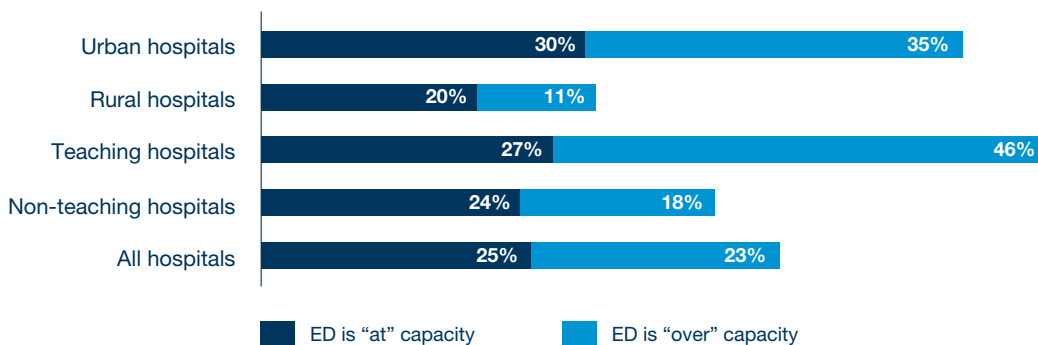
Exhibit 8. Health Professionals' Confidence in Ability to Coordinate Care

In the event of a disaster, how confident are you that each of the following would occur in a coordinated manner?

	Not at all confident	Not very confident	Somewhat confident	Very confident

Source: PricewaterhouseCoopers' Health Research Institute survey

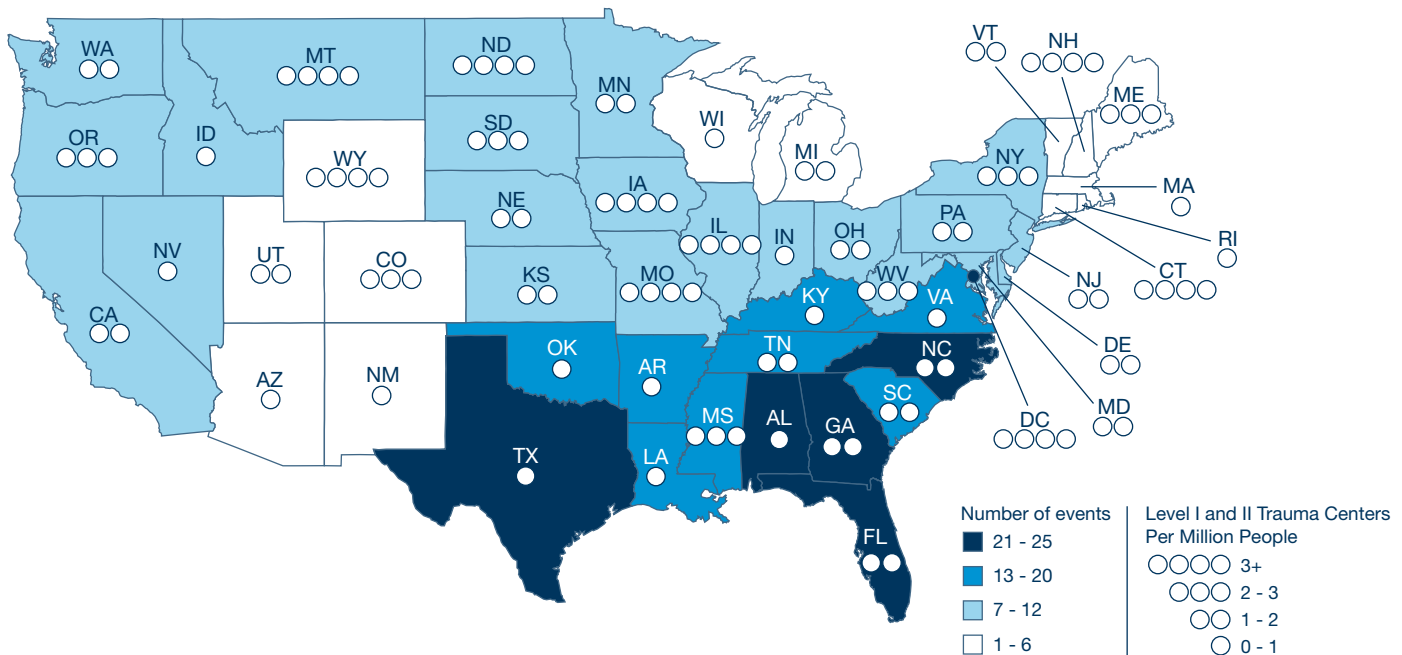**Exhibit 9. Percent of Hospitals Reporting ED Capacity Issues by Type of Hospital, 2007**

Hospital type	ED is "at" capacity	ED is "over" capacity
Urban hospitals	30%	35%
Rural hospitals	20%	11%
Teaching hospitals	27%	46%
Non-teaching hospitals	24%	18%
All hospitals	25%	23%

Source: "The 2007 State of America's Hospitals: Taking the Pulse, Chartpack," American Hospital Association, July 2007. Available at http://www.aha.org/aha/research-and-trends/index.html

Trauma centers are the backbone of a disaster preparedness system, but they are often based in financially challenged public hospitals, are not evenly dispersed in all states, and often are not located in areas most likely to experience disasters (Exhibit 10). Ninety percent of Level I and II centers[‡] are in metropolitan areas.[21] If a downtown area experiences a disaster, large tertiary hospitals that are often located there may be compromised, and outlying suburban and rural hospitals will need to be prepared to accommodate their caseloads.

Trauma centers are expensive to maintain because they require highly skilled staff to be on call 24 hours a day. Moreover, approximately 20% of trauma patients are uninsured, leading to a high proportion of uncompensated care.[22] According to a 2003 estimate by the National Foundation for Trauma Care, each year, "trauma centers collectively experience a $1 billion loss, and with increasing costs, this problem will worsen over time."[23] Despite the frequent

Exhibit 10. Billion-Dollar Climate and Weather Disasters, 1980-2006 and Trauma Centers Per Capita, 2003

Note: Weather disasters restricted to those causing $1Bn+ in total damage. A trauma center is a hospital that is designated by a state or local authority or is verified by the American College of Surgeons. Excludes hospitals that are solely pediatric trauma centers.

Source: PricewaterhouseCoopers' Health Research Institute analysis based on NOAA's National Climate Data Center, Asheville, North Carolina; "National Inventory of Hospital Trauma Centers," by Ellen J. MacKenzie, Ph.D., David B. Hoyt, M.D., John C. Sacra, M.D., et al., Journal of American Medical Association. March 26, 2003. Available at www.jama.com

[‡] Level I trauma centers are required to have immediate availability of trauma surgeons, anesthesiologists, physician specialists, nurses, and resuscitation equipment. They provide comprehensive trauma care and serve as a regional resource. Level II trauma centers provide trauma care either as an additional resource in a large city or the lead resource in a less population-dense area. Level III trauma centers provide assessment and stabilization for patients prior to their transfer to a Level I or II facility, as necessary. Level III facilities provide trauma services for communities that do not have access to Level I and II centers.

losses experienced by trauma centers, they were at the forefront of the response to 9/11 in 2001 and the Gulf State hurricanes in 2005.[24] The federal program to expand trauma care to all areas of the United States, the EMS Trauma Program, has been unfunded for fiscal year 2006 and fiscal year 2007.[25] DHS, HHS (through the CDC) and the National Highway Traffic Safety Administration (NHTSA) provide some funding, but the money is not coordinated. Michael Cronin, director of disaster preparedness and response programs for the American Trauma Society, explained: "Trauma centers are very expensive, and some areas of the country spend more resources than others. The North spends more money than the South. There is no mandate requiring a specific number of trauma centers per population. A lead federal agency with funding attached might make the distribution of trauma centers more even, and underwriting trauma centers might prevent them from closing, as many are now."

Treatment is moving to outpatient venues, prompting hospitals to reduce their bed numbers. For the past 25 years, U.S. hospital bed capacity has been steadily decreasing. Available hospital beds decreased 2.6% between 2000 and 2005, according to the AHA. And since the population is increasing, the number of beds per capita has dropped even faster, down 7.8% during that same period. Hospitals have been on a building boom since 2000, but new construction favors single-occupancy rooms. Such structures reduce the ability of hospitals to increase capacity when needed.

Surge benchmarks are misleading and difficult to put into practice

HRSA recommends that communities have the resources to care for 500 cases per 1 million population within 24 hours.[‡‡] This requirement is stated from a general system perspective and requires mathematical manipulation to be relevant to individual hospitals and communities. For example, in a city of 1 million being served by multiple hospitals, how is preparation for the 500 cases distributed among the hospitals? Bed

availability varies by region, and census fluctuates widely by time of day, day of the week, and month or season. An analysis of New Jersey hospital occupancy rates showed a weekly range of 10 percentage points or more, with surge capacity plentiful on the weekends but scarce on Tuesdays through Fridays.[26]

On average, the HRSA requirement translates to about 18% of existing staffed beds. With hospital occupancy rates averaging about 67% (i.e., 23% of beds are empty), the existing bed supply is generally sufficient to meet this benchmark.[27] However, this does not mean that beds will be available during a disaster. Occupancy rates reflect midnight census, while actual daytime available capacity is much less than 23%. Additionally, intensive care unit (ICU) occupancy is typically 90% or higher. HRI's analysis of the surge capacity of 71 cities funded as part of the Cities Readiness Initiative found that 11 cities lacked sufficient capacity within the current healthcare infrastructure to meet surge needs based on this benchmark. This is because occupancy levels in major metropolitan areas are often above 85%. (See Appendix B for details of the analysis.)

Another problem is that the current benchmark does not specify whether "beds" includes licensed versus staffed beds. "A bed is not a bed," said Bob Chason, executive director of surge/disaster planning and response at the California Hospital Association. "We need critical care beds, but not all available beds in a hospital could be used for that purpose."

Recently, AHRQ refined surge bed definitions to give communities a better idea of what beds are available during a disaster. The definitions are part of AHRQ's National Hospital Available Beds for Emergencies and Disasters (HAvBED) system, an electronic hospital bed tracking/monitoring system that can communicate acute care hospital and alternative care site bed availability in "real time" on a regional and national basis. To receive HPP funding, states must enter bed tracking data directly into the Web-based HAvBED portal or use their own complementary system.[28]

[‡‡] The Health Resources and Services Administration (HRSA) developed a national standard for surge capacity, which requires grant recipients to "establish a system that allows for the triage, treatment, and initial stabilization of 500 adult and pediatric patients per 1 million awardee jurisdiction, above the current daily staffed bed capacity, with acute illnesses or trauma requiring hospitalization from a chemical, biological, radiological, nuclear, or explosive (CBRN&E) incident" to demonstrate compliance with the minimum level of readiness. HRSA referenced data from the National Disaster Medical System, national trauma system databases, and mass casualty systems from other countries to determine this ratio.

When a disaster hits, emergency personnel and patients need to know what hospitals have immediate capacity, but few areas have tracking capabilities. The Health Emergency Response Data System in New York tracks beds as well as availability of vaccines and isolation rooms, but the information is not universally available.[29] For example, individual Kaiser Permanente hospitals know their own capacity, but they routinely do not share that information with other non-Kaiser Permanente hospitals. Skip Skivington, interim vice president of supply chain at Kaiser Permanente, said, "The government is currently developing criteria and standards for hospitals to follow in tracking and reporting capacity, and Kaiser Permanente is sharing its learnings toward this effort."

Staff: Disasters will exacerbate existing manpower shortages

Availability of staff during a disaster is another major challenge. "Personnel are a major limiting factor and a critical need," said Sally Phillips of AHRQ. The average hospital has an 8.5% vacancy rate among its nurses,[30] and many have shortages in the physician specialists needed in an emergency.
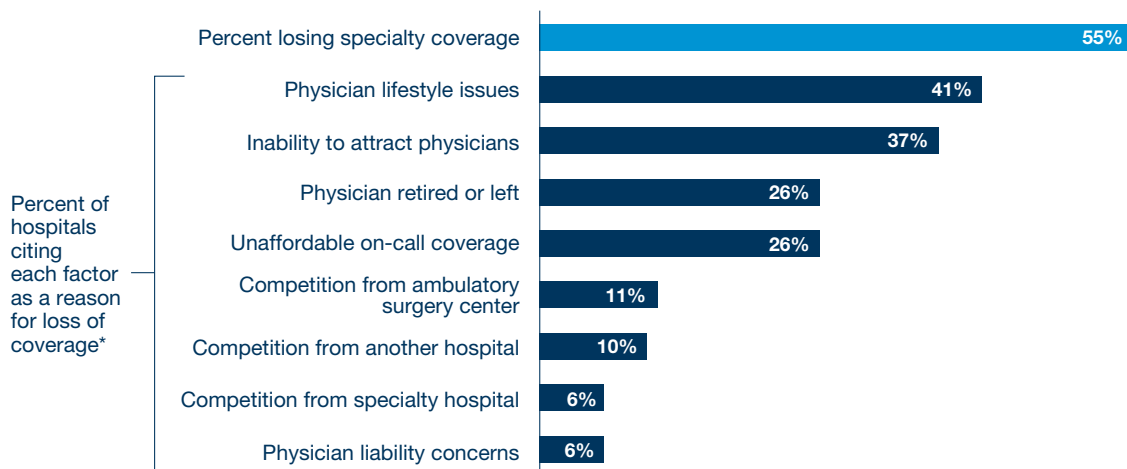
The situation is not expected to improve. The federal government is predicting that by 2020, nurse and physician retirements will contribute to a shortage of approximately 24,000 doctors and nearly 1 million nurses.[31] The same issues that plague clinical staffing needs are exacerbated in the public health workforce, where vacancy rates have been reported as high as 20%, and turnover was at 14% in various regions.[32]

A major concern in assessing staffing resources is the possibility of double-counting

Nurses and physicians frequently work at multiple facilities, and volunteers are frequently registered with multiple agencies. While it is likely that all hospital staff will be needed to respond to a mass casualty event, specialists will be in particularly high demand, given the significant shortages already apparent.

According to the AHA, 55% of hospital executives surveyed reported gaps in specialty coverage in emergency departments (Exhibit 11).[33] HRI's report, *What Works: Healing the Healthcare Staffing Shortage*, points out that staffing emergency departments is particularly difficult because of physicians' reluctance to provide high levels of uncompensated care.[34]

Exhibit 11. Percent of Hospitals Losing Specialty Coverage in the ED for Any Period of Time in Last 24 Months and Reasons Cited

Percent of hospitals citing each factor as a reason for loss of coverage*

Reason	Percent
Percent losing specialty coverage	55%
Physician lifestyle issues	41%
Inability to attract physicians	37%
Physician retired or left	26%
Unaffordable on-call coverage	26%
Competition from ambulatory surgery center	11%
Competition from another hospital	10%
Competition from specialty hospital	6%
Physician liability concerns	6%

Source: "The 2007 State of America's Hospitals—Taking the Pulse," 2007 survey of hospital leaders, AHA

*Respondents could check more than one reason for loss of specialty coverage.
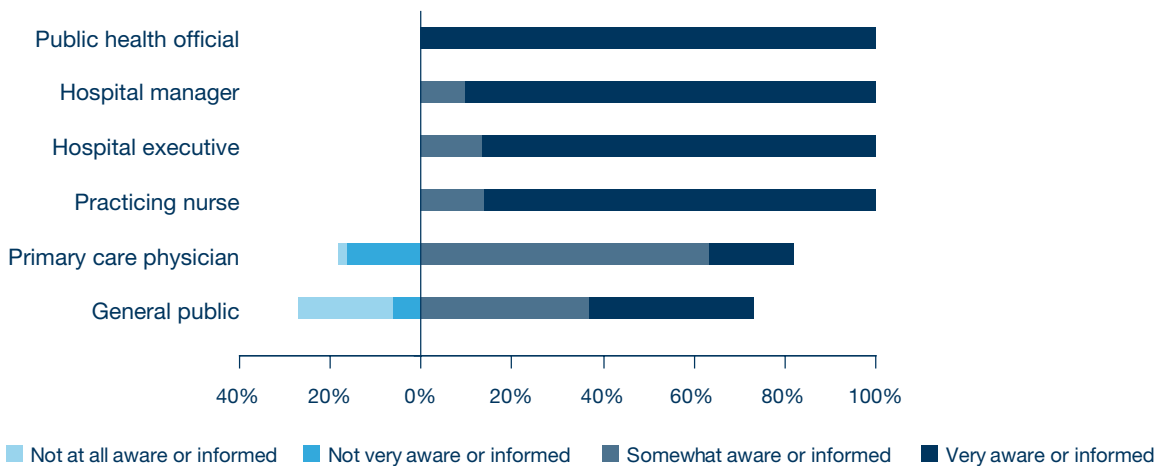
Primary care is often overlooked in disaster planning

Different specialists are required for different types of disasters, and in a pandemic influenza outbreak, primary care physicians would be required for a prolonged time. However, HRI's survey found that primary care physicians are often uninvolved in disaster preparedness activities. Primary care physicians were substantially less knowledgeable than other health professionals surveyed regarding what to do in natural or manmade disasters. Fewer than 20% of primary care physicians said they were "well prepared" about what to do in a disaster, which was substantially less than other health professionals (Exhibits 12 and 13).

Moreover, respondents to HRI's survey expressed a general lack of confidence in the ability of primary care physicians and clinics to provide care during a disaster. While 42% of health professionals believed that local hospitals were very well prepared to deal with casualties from a disaster, less than 10% believed that primary care physicians and community clinics were (Exhibit 14). This could place even greater strain on limited hospital resources. "Planning has focused on trauma care, but some disasters will have an even greater need for primary and chronic care," noted Phillips of AHRQ. "We need to do a better job of bringing primary care physicians into the emergency preparedness discussion, particularly for pandemic flu. This is difficult because federal agencies involved in disaster preparedness have no purview over primary care. We need to look for opportunities to engage individual primary care providers, such as through their professional associations." A National Association of County and City Health Officials survey underscored this view, noting that more than half of local health departments only include EMS and hospitals in emergency planning.[35]

Exhibit 12. Preparedness of Health Professionals and General Public

In your professional capacity, how aware or informed are you of what to do in the event of a disaster?
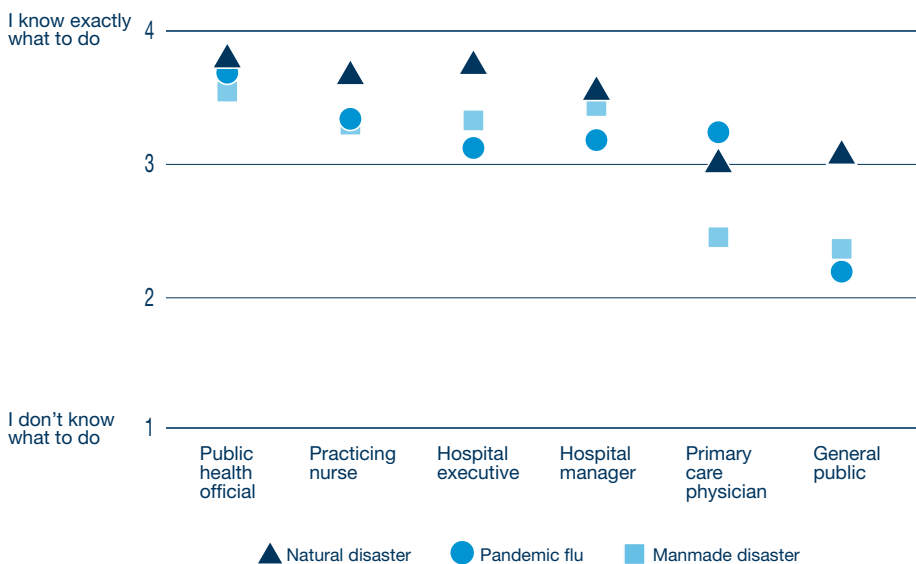

■ Not at all aware or informed ■ Not very aware or informed ■ Somewhat aware or informed ■ Very aware or informed

Source: PricewaterhouseCoopers' Health Research Institute survey

Disaster response skills have not been defined, meaning that marshaling resources across state lines brings a variety of skill levels

While a number of academic and professional education programs in disaster planning are in operation across the country, there are no national standards or consistency for training curricula or certification. Without standards, a plethora of certification programs have been created. There are at least 39 licensure categories between the level of an Emergency Medical Technician (EMT) and the level of a paramedic.[36] Without consistency, two problems emerge. First, it is not possible to easily identify the areas in which staff are licensed to practice (their scope of practice), limiting the transferability of their credentials to other jurisdictions. Second, there is no standard by which to consistently gauge staffs' preparedness. "There is no consistency in curriculum, certification, or degree requirements in emergency/disaster preparedness," noted Bill Gentry, director of the University of North Carolina School of Public Health's Community Preparedness and Disaster Management Program. "The profession is still at the early stages of defining itself. The curriculum oftentimes depends upon the state's level of risk of disasters—those at higher risk tend to raise their course levels. It creates a problem with having the system and the nation assure a certain minimum level of competency in disaster preparedness."

Exhibit 13. Preparedness of Health Professionals and General Public for Different Types of Disasters

In your professional capacity, to what extent do you know what to do in each of the following potential emergencies?

Source: PricewaterhouseCoopers' Health Research Institute survey

Closing the seams: Developing an integrated approach to health system disaster preparedness

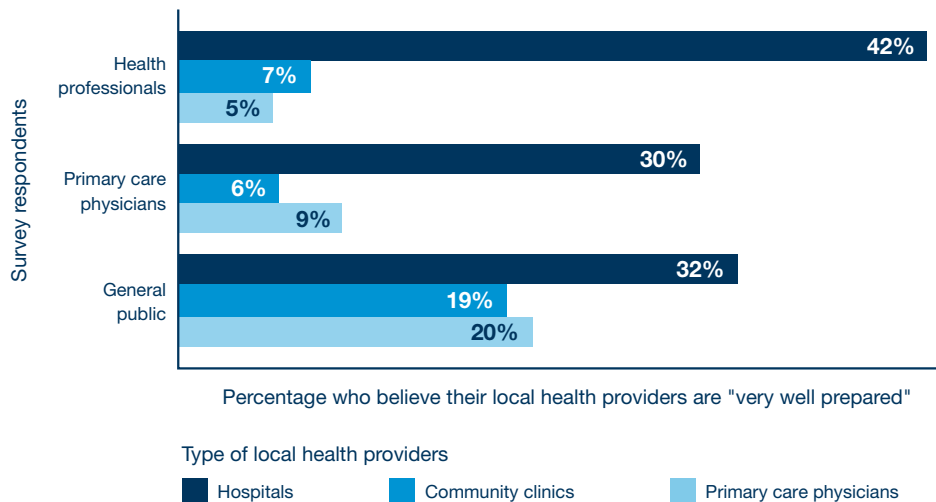## Training is constrained by underfunding and manpower shortages

Ideally, training can identify where the seams exist in disaster preparedness. For example, Chason, of the California Hospital Association, said training exercises show weaknesses "in how fire and police coordinate with hospitals. Many hospitals don't really interact with these organizations."

Disaster planners can select from a number of training methods, all of which are resource intensive. A single drill can cost more than $100,000; full-scale exercises more than a million dollars. A 2001 AHA survey found that metropolitan hospitals spent an average of $500,000 on disaster preparedness drills and exercises.[37] While HPP grants cover direct costs for staff to attend disaster planning training or exercises, they do not cover salary and overtime to replace them while they are away.

Manpower shortages make it even more difficult to sacrifice staff coverage for disaster preparedness training. UNC's Gentry has seen an annual decline in training attendance at every level, despite using an online training platform, which normally helps draw people in. "There have been staffing cuts that require people to perform multiple tasks and jobs," Gentry said. "They have less time and interest in spending time in training; they're more interested in patient census, patient care, and specific issues such as blood-borne pathogens."

Exhibit 14. Health Professionals' Preparedness for Casualties

To what extent are each of the following prepared to deal with casualties from a disaster?

Percentage who believe their local health providers are "very well prepared"

Type of local health providers

■ Hospitals   ■ Community clinics   ■ Primary care physicians

Source: PricewaterhouseCoopers' Health Research Institute survey

Supplies: We have more "stuff" but need to invest in the systems and staffing to deploy them

While funding for the Strategic National Stockpile (SNS) has more than doubled since 2003, funding for the staffing, training, and systems required to manage and use the supplies has declined. Funding to public health agencies has remained fairly stable (growing by just 3%), but funding to hospitals has declined by more than 19%. Spending on the stockpile now exceeds that for hospitals ($623 million compared to $415 million in 2007).

National stockpiles face development and logistical challenges

An act of terrorism or natural disaster may require quick access to a large number of medical supplies and pharmaceuticals. The quantities necessary are likely to be unavailable without the creation of a stockpile. The mission of the SNS program is to provide supplies and medications to state and local public health agencies in the event of a national emergency. While the SNS program is managed by the CDC, it is the responsibility of state and local authorities to plan to receive, store, and distribute the assets.

Information regarding the locations, contents, and quantities of materials in the stockpile is highly classified, to prevent them from being tampered with or raided. But some have questioned whether first responders will know how to access the materials during a disaster. And there is concern as to whether the supply is sufficient to handle demand.

For years, pharmaceutical and life sciences companies have been reluctant to invest in biodefense drugs that would go into a national stockpile, since the drugs might never be used or purchased. Colleen Duffy, executive director, public sector customer marketing group in the vaccine division at Merck, explained: "A company needs to know that there's a market before it makes an investment to enter a particular therapeutic category. Without a stable market, a company would incur too much risk and wouldn't build up inventory. A stable market encourages companies to invest." In 2004, the federal government authorized Project BioShield, which allows the government to act as both a buyer and a guaranteed funding source. The program was designed to create a market for drugs that can be used against bioterrorism. While the program has faced strategic and funding challenges, in 2006, Biomedical Advanced Research and Development Authority (BARDA) was enacted to provide an additional $1 billion to help companies commercialize their products.

The SNS involves two lines of support: (1) a "12-hour push package," consisting of a range of medical materials that can be distributed to a designated site within 12 hours of the federal decision to deploy them and (2) vendor-managed inventory (VMI) supplies that can be specifically tailored to the needs and are shipped to arrive within 24 to 36 hours. The affected state's governor's office must directly request the deployment of the SNS assets from federal officials, who then evaluate the situation and determine a course of action.
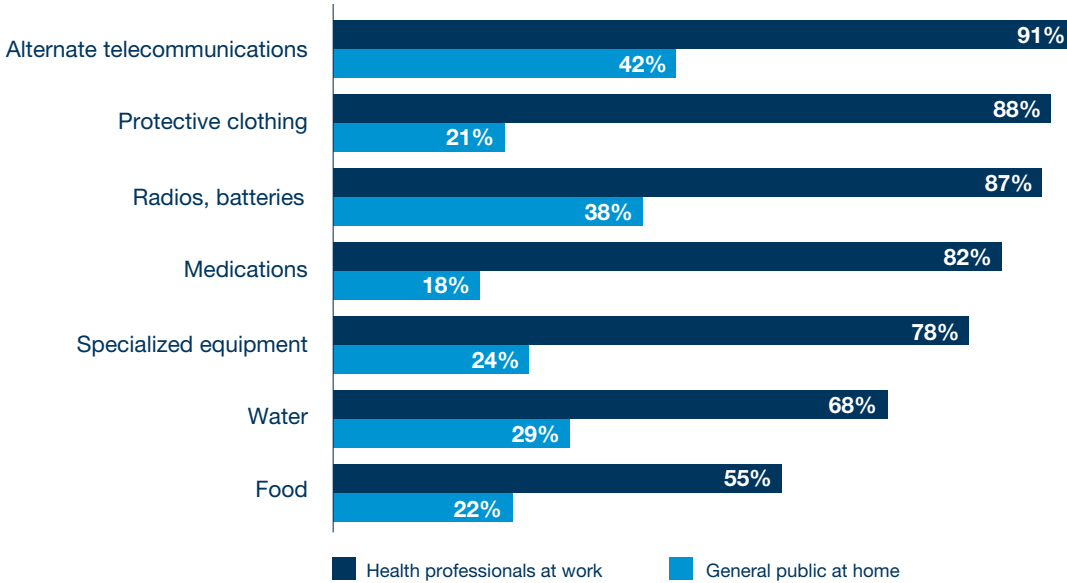
The SNS was not designed as a first-response tool, but rather a resource to aid state and local first responders in strengthening their responses. Outside assistance typically arrives between 24 to 96 hours after a disaster, while peak demand typically occurs within 24 hours.[38] The National Governors' Association has indicated that states and localities should be prepared to rely on their own resources for the first 72 to 96 hours of an emergency.[39]

Surge requirements run counter to common inventory management practices

Because of financial pressures, many hospitals manage their supplies on a just-in-time basis and measure their inventory cycles in terms of days or even hours. Although the majority of health professionals stockpile a variety of supplies, the practice is far from universal. And as shown in Exhibit 15, basics like food and water are often neglected. Stockpiled supplies are often buried behind those used on a more routine basis, and because they are rarely accessed, often staff members do not know how to use them.

Exhibit 15. Stockpiling Practices of Health Professionals and General Public

What supplies have you stockpiled for a disaster?

Supply	Health professionals at work	General public at home
Alternate telecommunications	91%	42%
Protective clothing	88%	21%
Radios, batteries	87%	38%
Medications	82%	18%
Specialized equipment	78%	24%
Water	68%	29%
Food	55%	22%

■ Health professionals at work ■ General public at home

Source: PricewaterhouseCoopers' Health Research Institute survey

Coletta Barrett, head of hospital operations at the Louisiana Emergency Operations Center during Hurricane Katrina, explained that hospitals typically are underprepared. "At Charity Hospital, we knew we needed enough food and water to support the facility for three days. We didn't take into consideration any of the staff that would remain in-house, or family members of patients or staff that would come and shelter in place." Due to the effects of the disaster on the surrounding community, families of the injured and of hospital staff are likely to be present in the hospital, in addition to casualties.

To ensure that their local supplies of equipment and pharmaceuticals are sufficient to last for at least three days, local planners must develop processes for monitoring expiration dates and replacing old supplies, securing additional space to store larger stockpiles than they traditionally keep on hand, staging the supplies so that they can be accessed easily during a disaster, and training on how to use them.

Systems: Technologies abound, but disaster planning and response are under-informed activities

It's not simply a matter of having more and better systems, but rather making sure that all systems, both high-tech and low-tech, can provide useful information during a disaster. Systems currently struggle to enable efficient and secure communications across responders, provide an interoperable platform for collaboration, and define the specific types of information and how it will flow to support effective decision making during a response.

Information systems to track events and manage responses are available, but often can't communicate with one another

William Gillis Jr., deputy director of emergency management for Derry, New Hampshire, described biosurveillance and early recognition as one of the challenges his state faces when considering pandemic flu. "How do you integrate multiple tracking systems at many hospitals and report that to the state in a timely fashion so the state can identify trends and take appropriate action?" Gillis asked.

While healthcare providers are legally required to log and communicate the incidence of any nationally notifiable infectious disease to their health departments, there are significant challenges in aggregating this input across local, state, regional, federal, and international jurisdictions. Chris Braden, M.D., a medical epidemiologist with the CDC, pointed out that none of the current systems "readily incorporates laboratory and epidemiological data. If there was an outbreak of national significance, we would need to build an information system from scratch every time. This requires a lot of manual work, gathering information through rudimentary tools and manually putting the database together." Additionally, the technology platforms used in emergency operations centers to support disaster response across local and state jurisdictions are often different and not interoperable. While there is a trend to move away from paper-based to computer-based systems, paper remains an essential contingency in the event that electronic systems fail in a disaster.

Medical and emergency responders are not speaking the same language in a disaster

Historically, agencies and departments have used their own special code words and phrases to quickly convey details about a situation. When first responders from Virginia, Maryland, and Washington, DC, arrived at the Pentagon on 9/11, "their codes were of no value because they meant different things to each agency or jurisdiction."[40] Following the Oklahoma City bombing, one area hospital indicated that it was "code black," meaning it had availability to take on victims of the blast. The command center interpreted this code to mean the exact opposite and diverted patients to another hospital. As a result, one hospital was overwhelmed and the other was standing by.[41]

Since then, the federal government has required first responders to use "plain language" (i.e., simple, clear, and easy to understand words) rather than codes during an emergency. Healthcare providers must incorporate plain language directives into their disaster preparation plans and training by September 2008. For example, rather than using "code red," staff would say that "there is a fire on the premises." However, some have questioned whether responders will really be able to use plain language during an emergency if they are accustomed to using code on a daily basis. Protocols that contradict routine practices are difficult for workers to follow during situations of stress and fatigue. Those that leverage daily operations will be easier implement.

Communications technologies often don't work together

Radios provide critical communication capabilities, but different groups use different brands of radios, which are not designed to work with each other. Donald Appleby, project director of Pennsylvania's Statewide Radio Systems, recalled one jurisdiction in which EMTs needed seven brands of radios to communicate with the various fire and police departments. The EMTs had to "color-code the microphones to know which was which." And the cost of the equipment was said to rival the "cost of the ambulance itself."[42]

DHS recently initiated the SAFECOM program to address interoperability issues by setting manufacturing standards for a digital wireless radio communications system. It also calls for establishment of mutual agreements for multiple jurisdictions to collectively decide which technology solutions will work for them, and establish rules and guidelines for how they will work together and who will be in charge. The 2006 Homeland Security Grant program requires states to "develop and adopt statewide communications interoperability plans" by December 2007 and encourages them to include emergency responders in the planning process.[43]

Over the next two years, the departments of Homeland Security and Commerce have allocated nearly $1 billion to cities and states to help first responders solve interoperability issues. This announcement was subsequent to a DHS study that showed only six of 75 cities surveyed would receive a top grade in emergency communications.[44] While officials believe the money will help the United States reach a "basic standard of effective emergency communication" within the next two years, it will only be achieved if the "local authorities coordinate with each other and avoid turf fights."[45]

A lack of standards hampers response and recovery efforts

Information technology can help responders track the location of casualties, manage surge capacity demands, and monitor patients' medical conditions. But these systems are rarely interoperable and often overloaded by too many users. Problems became readily apparent in Louisiana when 6,000 people were still considered to be missing three months after the storms[46] or recently in the aftermath of the Virginia Tech shootings, when family and friends of the victims were unable to confirm their whereabouts.[47]

Medical records are often paper-based and virtually impossible to retrieve during a disaster. In many cases, a single patient has multiple sets of records at different providers that are not necessarily accessible to other doctors. In addition, privacy and HIPAA requirements can hamper efforts to share information during a disaster. Such problems can be compounded by the geographical spread of the casualties.

Following the Katrina disaster, the Louisiana Department of Health and Hospitals, in conjunction with leaders in the private sector, developed KatrinaHealth.org to help link up patients with their prescription drug information. This information was then passed along to pharmacies. More recently, the state has developed ICE (in case of emergency) Rx. This nationwide system aims to certify medical professionals well before the next event so they can have access to better distribute and manage their patients' medications.

More broadly, some people are considering the potential role of regional health information organizations (RHIOs) or other types of health information exchanges. For example, the American Health Information Community, a federal advisory body established by the Secretary of Health and Human Services to accelerate the adoption of health information technology, has identified 58 data points that make up a minimum biosurveillance data set. Yet, the RHIOs themselves are struggling financially and must grapple with multiple technologies and data standards. Dale Nordenberg, M.D., former associate director and chief information officer for the National Center for Infectious Diseases, noted, "RHIOs and their component entities struggle with the complexity of harmonizing the implementation of data standards, and thus standards-based interoperability remains a significant challenge both within a RHIO as well as across RHIOs or other health information exchanges." Furthermore, most RHIOs are of relatively small scale and include only a small percentage of healthcare delivery sites. RHIOs will need to develop a sustainable business model before they can become a critical component of emergency preparedness and response planning and execution.

The information supply chain is not adequate to support key decisions

Even when technology does exist, the data is often inadequate to plan for and manage a disaster response. Information is needed to help leaders make decisions such as when to mobilize responders; where to send supplies such as vaccine, masks, pharmaceuticals, and in what quantities; and how to monitor an outbreak. Yet in many cases, the information needed to support these decisions has not been specifically defined. Once the data requirements are identified, people and processes are needed to build the systems, run reports, analyze the data, and produce information that can ultimately be used for decision-making.

Recommendations

Healthcare systems must adopt a systems approach and infrastructure for disaster response. The Health Research Institute has identified a framework of organizational, community, and societal best practices that can be leveraged to close the seams in our state of preparedness (Exhibit 16).

Exhibit 16. A Framework for Preparedness

Organization
Altered Care Standards
Alternate Care Sites
Supply Stockpiles

Community
Staffing Supply and Capabilities
Cohesive and Consistent Planning
Regional Collaboration

Society
New Leadership Roles
A Culture of Preparedness
Sustainable Funding Sources

Source: PricewaterhouseCoopers' Health Research Institute

Organizational Strategies

Plan for Altered Standards of Care

During a disaster, medical priorities should shift from focusing on patient-based outcomes to population-based outcomes. This is a dramatic shift and was described by Donna Barbisch, chief executive officer of Global Deterrence Alternatives, as follows: "People must be educated on the need to break away from traditional medical response where unlimited resources are available. When resources become scarce, it is critical to identify those patients that have the greatest chance of survival and reprioritize to save the greatest number of patients overall. Treating the worst patient first will often cost more lives."

Hospitals can begin by revising their patient-care policies to free up capacity. They can discharge the healthiest patients and move others to a lower level of care (e.g., general medical patients to an ambulatory area for observation, ICU patients without a ventilator to med/surg beds). Potential procedural changes include:[48]

- Rapid discharge of emergency department patients and other outpatients who can continue their care at home safely

- Cancel elective surgeries and procedures, with reassignment of surgical staff members and space

- Reduce the usual use of imaging, laboratory testing, and other ancillary services

- Transfer patients to other institutions in the state, interstate region, or nation

- Facilitate home-based care for patients in cooperation with public health and home-care agencies

- Group like types of patients to maximize efficient delivery of patient care

- Expand critical-care capacity by placing select ventilated patients on monitored or step-down beds or by using pulse oximetry and ventilator alarms

- Convert single rooms to double rooms or double rooms to triple rooms if possible

- Designate areas that can be converted to negative pressure or isolated from the rest of the ventilation system for contagious patients

- Use cots and beds in flat-space areas (e.g., classrooms, lobbies) within the hospital for noncritical patient care

Authority must be given to physicians and nurses to provide care in unconventional locations such as the cafeterias, waiting rooms, and hallways. In addition, resources must be rationed and redistributed to care for those most likely to survive. Finally, resources will need to be recycled for more than one patient's use to extend limited quantities of supplies.

The standards for scope of practice of physicians, nurses, and paraprofessionals will need to be waived so that those who are available can care for patients efficiently. The adjustments to the standard of care will need to be authorized to protect medical professionals from risk of litigation.

The American Medical Association developed a framework to give ethical guidance to healthcare facilities and providers in making resource allocation decisions during a healthcare surge event, as summarized on the next page.
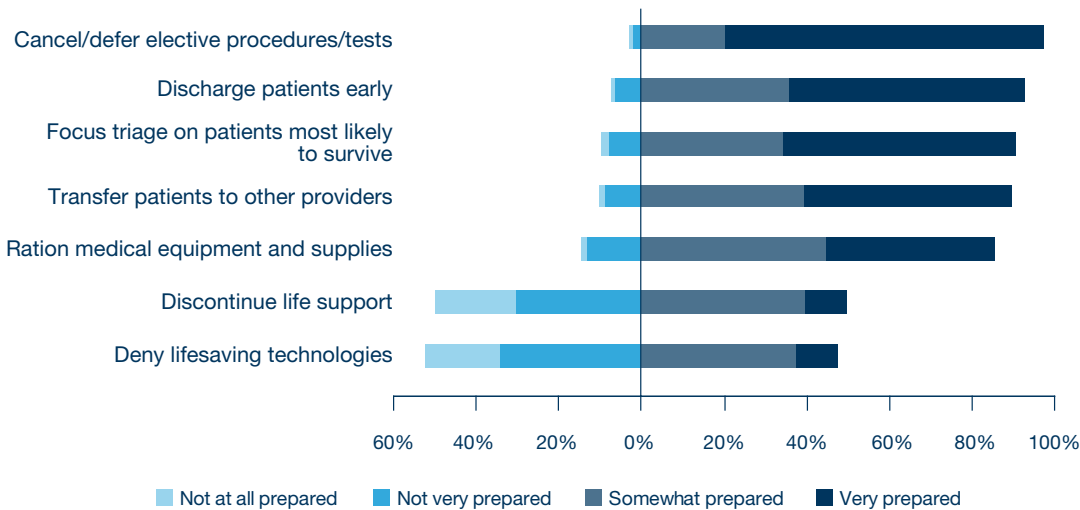
Appropriate Criteria for Resource Allocation	Inappropriate Criteria for Resource Allocation
• Likelihood of survival	• Ability to pay
• Change in quality of life	• Provider's perception of social worth
• Duration of benefit	• Patient contribution to disease
• Urgency of need	• Past use of resources
• Amount of resources required	

Source: Adapted from "Ethical Considerations in the Allocation of Organs and Other Scarce Medical Resources Among Patients," *Archives of Internal Medicine,* 1995;155: 29-40

HRI survey results indicate that health professionals have varied degrees of willingness to implement such altered standards of care. As shown in Exhibit 17, they are generally prepared to delay elective procedures but are much more reluctant to consider discontinuing life support or denying lifesaving technologies. Because of this, altered standards of care are likely to be an additional source of stress on providers. Specific training can help mitigate this stress by better preparing providers for these situations. It also ensures that the decisions regarding standards of care are made in advance when there is time for thoughtful dialogue and decision-making.

Exhibit 17. Health Professionals' Comfort with Altered Standards of Care

During a disaster, to what degree are you/your organization prepared to follow altered care standards and practices?

Source: PricewaterhouseCoopers' Health Research Institute survey

Identify Alternate Care Sites

Since many hospitals function at nearly full capacity during ordinary circumstances, they may not be able to handle surge as necessary during a major disaster. Alternate care sites, such as the following, can provide additional capacity:

- **Shuttered hospitals.** If these facilities are available and a formal agreement is developed in advance, they may already have medical equipment and hospital beds, in addition to plumbing and cafeteria space to provide for the needs of patients and staff. However, shuttered hospitals that are identified as alternate care sites will need continual funding to keep them in good condition.

- **Mobile medical facilities.** These are most useful when there is no healthcare in the area or if an existing hospital has been damaged. However, they are expensive and usually beyond the financial reach of any one hospital. North Shore–Long Island Jewish Health System purchased the only mobile facility in New York state for $500,000. It is 100 feet by 100 feet and can hold 100 beds. California purchased three 200-bed mobile hospitals for $18 million and will spend an additional $1.6 million a year to maintain the facilities and have them fully operational within 72 hours of when they are needed.[49] Greg Hughes, principal at the architectural firm Perkins + Will in Houston, Texas, said it is important to ask, "Is there a regional response, and is there some sort of regional entity that is able to fund and manage the construction for the regional good?"

- **Ambulatory care centers.** Outpatient centers, many of which have some bed capacity, are often overlooked in disaster planning. Milla Jones, vice president of communication and government relations at United Surgical Partners International, noted, "From a traffic standpoint, you can't bring everyone to the downtown facilities. Beginning with the initial plan you have to look at all the options available in your healthcare provider community—you have to have a tiered plan." Jones said disaster planning will always be hospital-centric, and rightfully so, but for the sake of the community and the lives of those who will be touched by a disaster, plans should include providers who are often competitors to hospitals.

- **Large public buildings.** Schools and convention centers can accommodate large numbers of people, and schools carry an additional advantage since they are dispersed throughout the community. After the Louisiana hurricanes, the Basketball Arena and Field House at Louisiana State University, Baton Rouge, accommodated victims. Additionally, disaster planners designated the Houston Astrodome as a shelter and called it the "Katrina Clinic." It served 25,000 people during the two-and-a-half weeks after the hurricane. Similarly, the Department of Health and Human Services had a longstanding relationship with Louisiana State University, which is why an 800-bed facility was quickly established there.[50]

> **Potential Alternate Care Sites:**
>
> Aircraft hangars, churches, community/recreation centers, convalescent care facilities, convention facilities, dormitories, fairgrounds, government buildings, hotels/motels, meeting halls, military facilities, National Guard armories, same-day surgical centers/clinics, schools, sports facilities/stadiums, trailers/tents

Prioritize Pharmaceuticals and Other Supplies

Federal funding for disaster preparedness provides much of the equipment needed, but it is only valuable if there is a plan in place to effectively distribute the equipment in the event of a disaster. Many of those interviewed noted that adequate supplies exist, but emphasis needs to shift to storage and distribution. Planners should perform the following activities:

- **Assess vendors' disaster capabilities.** Surge plans typically incorporate vendor supplies into their assessment of available resources. However, vendors frequently have contracts with numerous facilities in a region, and the contracts may overlap. Sandy Shewry, director of the California Department of Health Services, said, "Who are we going to be competing with to get supplies? How many hospitals have contracts with vendors to get disaster supplies?"

- **Select and prioritize stockpile contents.** Staging of supplies, pharmaceuticals, and equipment to ensure ease of access is vital. When determining the pharmaceutical drugs and medical supplies to be stockpiled, responders need to evaluate the availability of medical materials, current biological and chemical threats, available storage space, and the ease of dissemination of pharmaceuticals. Some planners would like to include off-label drugs (i.e., drugs used for a purpose other than the purposes approved by the Food and Drug Administration [FDA]). The Emergency Use Authorization program permits the FDA to approve the off-label use of approved products in certain well-defined emergency situations.

- **Manage expiration dates and rotate inventories.** Equipment such as batteries for portable monitoring equipment and ventilators are a high priority. Temperature-sensitive medications and ventilator seals need to be stored carefully, their expiration dates monitored, and their inventories rotated regularly. Initiatives such as the Shelf-Life Extension Program (SLEP) operated by the Department of Defense qualifies selected drugs for an extended shelf life, and emergency waivers can allow the use of some expired drugs. For example, the California Department of Public Health recommends keeping non-expiring medical supplies separate from medical supplies with expiration dates to better manage this process.[51]

- **Select secure, strategic locations and consider how to move supplies and equipment from the cache to the desired location.** Those who are aware of the stockpiles' locations and involved in distribution must have a plan that is coordinated among the federal government, states, localities, private sector organizations, and disaster-relief agencies, as well as the civilian population. Distribution protocols will vary depending on the agent, medication, and scope of the incident as well as the age, weight, and health conditions of the affected individuals. Children and other populations with unique treatment and mental health needs also must be addressed. Locations must remain secured. Gillis, of Derry, New Hampshire, noted, "In a life or death situation, people are going to do what they have to do to survive. Emergency planning has to take that into consideration."

Community Strategies

Expand Staffing Supply and Capabilities

To expand the healthcare workforce, hospitals need to plan how to lengthen employee shifts and change staffing ratios. For example, Israel expands its workforce by moving healthcare workers from eight-hour shifts to 12-hour shifts in a national emergency or full-scale war.[52] Planners can take a variety of steps to extend staff schedules:

- **Extend scope of practice.** When the demand for patient care is greater than the supply of providers who can provide it, it may be necessary to allow healthcare professionals to practice outside of their licensed scope of practice. Pharmacists are currently the only type of practitioners who are specifically allowed to provide services outside their licensed scope of practice during a surge. Chason of the California Hospital Association said, "Scope of practice needs to be examined. Physicians in a particular field may be able to do other work in an emergency. For example, podiatrists could work above the ankle. This applies for any of the physician specialties and for other healthcare workers such as nurses. The medical community should set new standards."

- **Organize staff into teams based on skill sets and capabilities.** Staffing resources must be coordinated to provide a cohesive response. A new initiative called "resource typing" involves the categorization and description of response resources–like a SWAT or Disaster Medical Assistance team–that are commonly exchanged in disasters through mutual aid agreements. Resource typing definitions can give emergency responders the information they need to make sure they request and receive the appropriate resources during an emergency or disaster. A division of FEMA has established working groups to develop the definitions.

- **Clearly define and label staff roles.** All of the roles that play a part in a disaster response need to be clearly identifiable to both other responders and the community. For example, personnel assigned to an incident command role should wear identification that correctly communicates his or her role. Some hospitals use a vest that clearly identifies the person's position on the front and back in both normal and low-light conditions. The vests may also be color-coded to the incident management team chart (gray/black, command staff; red, operations; blue, planning; yellow, logistics; and green, finance and administration). They should contain large pockets for holding a portable radio, tablet, pens, markers, and a job action sheet that provides an overview and checklist of the responsibilities for a given position.

Patient/staffing ratios also can be modified. For example, the number of RNs per patient can be decreased from 1:5 to 1:15 or even as low as 1:40 during a disaster, with appropriate support from LPNs, aides, and ancillary support staff.[53]

Unfortunately, in a major surge event, extending staff schedules may not provide sufficient coverage. Research has shown that a significant proportion of healthcare staff may not come to work in an emergency. Loss of staff after a disaster can range from 10% to 60%, depending on the situation and level of disruption to family routine (school closing, childcare, eldercare, etc.)[54] Therefore, employers may have to provide incentives to motivate staff to come to work and must take steps to address staffs' concerns about their own personal risk and the safety of their family members. Healthcare organizations need to address these concerns in advance to ensure they will have adequate staff to care for patients during a disaster.

Additional steps that should be taken to encourage staff to come to work include:

- **Inform and educate staff.** Staff and physicians need to know their risks and roles in a disaster. This can be accomplished through in-service training, employee newsletters, and staff meetings.

- **Immunize staff.** Though the CDC and major professional associations have recommended yearly influenza vaccinations for all healthcare workers, only 36% are immunized each year.[55] To increase vaccination rates, healthcare organizations can require immunizations, set up onsite clinics, or include them as part of employees' compensation package.

- **Accommodate family members.** Hospitals need to be prepared for the reality that many employees will come to work with their families, especially if their homes are at risk. North Shore–Long Island Jewish Health System in New York City has contracted with a local hotel to shelter family members during a disaster. In the aftermath of Hurricane Katrina, Ochsner in New Orleans set up a makeshift store (calling it Ochsmart) to distribute to its employees items such as toiletries and other donated supplies. Inova Health System in Northern Virginia offers childcare and stockpiles prophylactic medications for family members to encourage staff to come to work during an emergency.

- **Provide psychosocial support.** Short- and long-term stress management measures are essential for providers. "A large number of officials working in Louisiana after Katrina were deeply traumatized and had impossible workloads," said Columbia's Redlener. "There is so much trauma down there; we had wounded people trying to solve big problems."

In a large-scale disaster, existing staff resources may not be sufficient. Disaster responders may need to supplement clinical staff from other sources in the community:

- **Coordinate with EMS.** The Institute of Medicine's report, *Hospital-Based Emergency Care: At the Breaking Point,* points out that emergency medical service personnel are underutilized: "In many disaster scenarios, the pre-hospital component is over in 1–2 hours, making a large number of EMS personnel available just as hospital activity is peaking."[56]

- **Partner with the Veterans Health Administration (VHA).** "VHA knows how to deliver healthcare like no one does," said Lawrence Deyton, M.D., VHA's chief public health and environmental hazards officer. The nation's largest healthcare organization has dedicated staff working on disaster planning, and training drills are required for all facilities. In addition, the VHA may have shuttered facilities or other resources and expertise that could provide additional support to local responses. This was demonstrated in the aftermath of Hurricane Katrina. State and community emergency medical planning would be enriched by active inclusion of local and regional VHA leaders. This is in the VHA's interest as well, since joint decision-making about veterans' health care and the role local VHA facilities will play in emergencies is in everyone's best interest. Unfortunately, there is no mandate by DHS or HHS for the VHA to be included in disaster planning, and often they are not included in community efforts.

- **Recruit volunteers in advance.** When deployed in an organized fashion, volunteers can provide a valuable source of qualified individuals willing to assist in disaster response. However, volunteers need to be credentialed and trained. In the aftermath of 9/11, many medical volunteers were unable to offer assistance because it was not possible to verify the volunteer's basic identity, licensing, credentials, or employment.[57] Since that time, two entities have been established to solve that problem: The Emergency System for Advance Registration of Volunteer Health Professionals (ESAR–VHP, a network of standardized state systems that provides real-time information regarding the volunteers' personal information, licensing, credentialing, and accreditation) and the Medical Reserve Corps.

Develop Consistent and Actionable Plans

In many organizations, a lack of funding and dedicated resources has shifted the focus from "quality" of planning to the "existence" of plans. As a result, continuity plans often contain significant amounts of boilerplate information. The plans are compliant with regulations but are unworkable in practice.

Instead, organizations' disaster plans should have three components: (1) a framework or methodology; (2) planning approach; and (3) template(s) to document the outcome of the planning process.

- **Framework.** The business continuity planning profession has a national standard that can be leveraged for medical planning. It defines 10 areas to be addressed: (1) Project initiation and management; (2) risk evaluation and control; (3) business impact analysis; (4) developing business continuity strategies; (5) emergency response and operations; (6) developing and implementing business continuity plans; (7) awareness and training programs; (8) exercising and maintaining business continuity plans; (9) public relations and crisis coordination; and (10) coordination with external agencies.[59]

Virtual Training Approaches Yield Real Value

Modeling how systems and people respond to disasters is an important part of disaster preparedness. The U.S. government and several universities have ventured into the Second Life, a 3-D online virtual world, to help professional and volunteer first responders learn how to work together and train for disasters on their own schedules. Launched four years ago by San Francisco-based Linden Lab, Second Life is entirely user-created and even has its own economy. Inhabitants create electronic figures called avatars to engage in a wide range of activities, from social networking to online conferencing and collaboration, to outreach and education.

The CDC's virtual space is currently designed for education and outreach efforts among the general public, facilitated through such events as the 2006 health fair. Roughly 100 people attended the fair to learn about such diverse topics as carbon monoxide poisoning prevention and pandemic flu resources. The site also posts a "Real Life Health Alert" to warn (and inform) the public on such things as the relatively recent E. coli outbreak.

Under the yearlong SEERS project which began in October 2005 under the direction of Dartmouth College's Emergency Readiness and Response Research Center (ER3C), project leaders utilized virtual environments to stage mass casualty incidents. For example, "Unreal Triage" was a modified version of a commercial, first-person shooter game, in which professional emergency response participants tended to 30 victims of a simulated airplane crash. In another module, citizens undergo a series of training sessions taught by area EMS and emergency response personnel, with training topics ranging from general disaster preparedness to search/rescue and medical care.

Another effort is Play2Train, which is funded by an ASPR grant and overseen by the Idaho Bioterrorism Awareness and Preparedness program in conjunction with Idaho State University. Two islands have been created to simulate disasters ranging from smallpox outbreaks to explosions as a result of terrorist attacks. The first island is called Asterix, and is designed to resemble a typical city based on existing tabletop exercise dioramas. The second island, called Obelix, contains a fully developed hospital, complete with a wide range of technology (including MRIs) and medical teaching tools (such as virtual mannequins, videos, and medical journals). To enhance realism, weather conditions can be adjusted (e.g., from sunny to stormy) and the number of resources varied (e.g., manpower, technology, medical supplies). In addition, a number of emergency response vehicles (ambulances, fire trucks, and police cars) can be used by avatars in the simulations. As demonstrated by one sample video on the Play2Train home page,[58] participants from a number of agencies gather to prepare for sidewalk triage activities to handle patients affected by influenza. This preparation included setting up tables, chairs, barricades, and cones, as well as assigning people to stations to be medical screeners (who will then interview the incoming patients) and outfitting these stations with the necessary supplies.

Second Life offers several benefits in disaster planning and training. The virtual platform is an alternative to standard tabletop exercises that typically require more time and money. Participants log in from anywhere and can test responses to a wide range of scenarios (such as chemical spills or hurricanes). Disasters can be re-created and tweaked to test an infinite number of scenarios. Planners also can manipulate an infinite number of variables (ranging from the number of open beds to the availability of needed staff) and engage in a host of activities (from transporting patients to dispensing vaccines or needed medicines). However, the virtual platform offers participants a more limited view of the disaster than they would have on the ground at the scene.

- **Planning approach.** Most organizations use the traditional all-hazards approach, which focuses on the similarity of outcomes that occur across a range of disasters. These commonalities can be addressed in a plan that provides the basis for responding to unexpected events. Hazard-specific details can then be added to the base plan. This planning approach can be more cost effective as well.

- **Appropriate template(s).** Planning tools, templates, and checklists are abundant. Some are listed below:

  - *Community Medical Disaster Planning and Evaluation Guide*, by the American College of Emergency Physicians, is a practical, hands-on working guide to disaster plan assessment and plan development. It offers a unique interrogatory format, with more than 1,900 questions, organized into logical categories that identify the kinds of problems or tasks typically faced in disasters.

  - *Are You Prepared? Hospital Emergency Management Guidebook*, by the Joint Commission, provides checklists, case studies, and hospital emergency management standards and elements of performance.

  - *Medical Surge Capacity and Capability Handbook*, from HHS, addresses the principles of emergency management and the incident management system that health systems need to coordinate with emergency management systems (fire service, law enforcement, etc.).

  - *Computer Staffing Model*, by AHRQ, predicts the number and type of staff needed to respond to a major disease outbreak or bioterrorism attack on a given population.

  - *FluSurge 2.0*, by CDC, is a spreadsheet-based model that enables hospital and public health officials to estimate hospitalizations and deaths during an influenza pandemic. FluSurge compares the number of patients hospitalized, requiring ICU care, and requiring ventilator support.

  - *Homeland Security Exercise and Evaluation Program*, by the DHS, is a capabilities and performance-based exercise program that provides a standardized policy, methodology, and language for designing, developing, conducting, and evaluating exercise programs.

Scenario Planning in California

In 2007, PricewaterhouseCoopers employed an innovative planning approach to develop the standards and guidelines for healthcare surge in California. PricewaterhouseCoopers chose a scenario-focused, problem-solving approach as the most effective and efficient means to surface and resolve surge issues as well as provide a visible test for the solutions offered.

The approach was comprised of three components: (1) Three hypothetical scenarios (nuclear detonation, earthquake, and pandemic flu) were selected to demonstrate a wide range of needs and uncover as many potential surge gaps in the healthcare system as possible. (2) Five patient profiles were created as a representative sample of the diverse population that would be affected by the disasters. The patient profiles were a combination of attributes such as age, special needs, and geographic location of a victim from the incident. (3) Fifteen clinical flows were generated as each patient was subjected to the three scenarios. The clinical flows described the healthcare experience of the selected patient as they moved through the healthcare system in "surge mode."

The scenarios and use cases were utilized to highlight the gap between the surge system that exists in California today and a more effective future state. From the gap analysis, specific issues were identified and prioritized, and stakeholders drove their resolution in work groups. An iterative approach was applied to funnel the issues through the three components of surge preparedness: operational planning, standards and liability guidelines, and reimbursement systems. Resolution of issues resulted in the development of standards and guidelines, planning tools, and training materials for surge preparedness in California.

Collaborate Through Formal Regional Agreements

Collaboratives in New York, California, and Northern Virginia provide a template on the importance of regional planning. For example, the Greater New York Hospital Association created the Emergency Preparedness Coordinating Council, which includes hospitals as well as local, state, and federal public health and emergency management organizations. The council, in conjunction with the New York City Office of Emergency Management (OEM), has purchased 800 MHz radios to aid in disaster situations. This collaboration also resulted in the reestablishment of the "healthcare talk channel" within the OEM's radio system, creating a dedicated line of communication between the OEM and healthcare organizations.

California created the California Office of Emergency Services, which divided the state into six mutual aid regions. If requests for aid overwhelm a region, the state coordinates with other unaffected regions for resources. Local authorities have a span of control over local personnel and supplies, while the state can provide support from a larger pool of resources, if necessary. At the local, county, and state levels, medical health operation area coordinators communicate medical needs, collect and provide consistent information, and relay mutual aid requests.

Collaboration in the Capital Area

Like many hospitals in 2001, Inova Health System, the largest hospital system in the Northern Virginia metro area, had no regional disaster plan, no coordinated plan for surge beds, no linked radio systems, and no central command structure. To achieve fiscal efficiency, inventory systems had moved to just-in-time supply management.

When 9/11 occurred, Inova and others recognized that only by working together would they be able to respond to threats to the nation's capital area. Karen Drenkard, Inova's chief nurse executive, said, "Nurses have a great role model for disaster response in Florence Nightingale, a nurse who worked in wartime and had really limited resources—no technology, water, supplies, radios—but she managed to organize care for 5,000 casualties. We may be in the same position. We may not have many resources. We need to be prepared to be able to rely on the best thinking of the people there at the moment. Along with whatever supplies and equipment we may have, our ability to respond will rest on how well we have built relationships and trained together."

To facilitate their ability to work together, 14 area hospitals and five free-standing emergency centers formed the Northern Virginia Hospital Alliance, which works collaboratively with representatives from fire, rescue, ambulance, hospital operations, public health, and local political organizations. The group of hospitals across the Northern Virginia region is bound together by a mutual-aid agreement to coordinate preparedness and response activities, including the exchange of resources and manpower during disasters.

The alliance developed a regional coordinating center as the single point of contact for patient transfers and tracking, information on bed and service availability, personnel support, coordination of supplies and stockpile requests, development of a common public information message, and establishment of regional medical treatment protocols. The center is staffed by a full-time director and on-call staff provided on a rotational basis by the member hospitals. On-call staff members are available to respond by pager and cell phone and report to the center for duty.

The center maintains three levels of activation. At the most basic level, the center collects information, monitors for events that could impact the hospitals' operational capabilities, and conducts planning activities regularly. At the next level, the center coordinates, tracks, and manages the movement of patients after an event. At the highest level, the center coordinates requests for mutual aid support, manages supply stockpile distribution and deployment of a regional manpower pool, and coordinates public communications.

Six years after 9/11, the alliance has enough supplies to last at least three days and has identified 1,131 beds of surge capacity. The regional hospitals have redundant 800 MHz radio units that are linked in a communication network. A Web-based system communicates availability of clinical staff, beds by type, and specialized equipment such as ventilators for each of the hospitals in the alliance—even competitors. All-hazards drugs and supplies are rotated periodically and stockpiled in trucks strategically located across the region.

In the future, the alliance plans to establish partnerships with food vendors, suppliers, and hotels to provide staff accommodations during a disaster. It is also looking at developing a plan to manage altered standards of care, including clinical algorithms and ethical frameworks for use in the field.

Societal Strategies

Develop Disaster Masters

Leadership is needed to make the many difficult decisions regarding evacuation, standards of care, and resource rationing. Leaders must be able to operate under stressful circumstances, guiding physicians, nurses, and volunteers. However, in reality, "initiatives are started and enacted by the 'coalition of the willing'—those with time are put in charge rather than people with experience in disaster planning," said Nabil Issa, associate director of the National Center for Environmental Health within CDC.

Ellen Embrey, deputy assistant secretary of defense for force health protection and readiness within the Department of Defense, added: "Learning how to apply leadership to ambiguous situations is a core competency that every community should have. NIMS provides the 'plug and play' of how to bring together the pieces, but leadership is missing."

Following are steps to develop leadership competency for disaster preparedness:

- **Develop a standard curriculum and establish certification requirements.** Disaster planners must have unique skill sets to deal with a disaster situation—skill sets that their other responsibilities may not require.

- **Redefine staff roles to include preparedness.** Mark Fussell, CDC senior management official to Texas said, "In recruiting new staff, we can redefine roles so that preparedness is part of everyone's responsibilities—not a separate class of 'preparedness jobs.'"

- **Align funding to support the development and maintenance of on-going leadership skills.** Funding must be provided to support the development of leadership. Kristi Koenig, M.D., professor of clinical emergency medicine and codirector of the EMS and disaster medical sciences fellowship at the University of California at Irvine School of Medicine, said that multiyear cooperative agreements would allow organizations to do a better job of investing in people and processes that will become part of an infrastructure of preparedness.

On-the-Job Training in New York

While most people run from a disaster, the emergency preparedness staff at North Shore–Long Island Jewish Health System runs toward it. Brian O'Neill, vice president of emergency services for the 15-hospital system, has sent members of his 10-person team "to the September 11, 2001, response; to the anthrax incidents; to the SARS outbreak in Toronto; to the four hurricanes in 2004; to the Katrina and Rita response … all to learn from the experiences. They need to experience disasters hands-on in order to learn."

O'Neill's operation stands out as a leading practice but also an anomaly in the industry: a 10-person team that draws from a variety of backgrounds and is dedicated to emergency preparedness. His team is large by most standards, but his responsibility for disaster preparedness is large also. The system, which ranks fifth nationally in annual revenues, covers the third-largest service area in the country. Individuals trained in emergency preparedness and response have been brought into the organization including emergency service workers, an NYPD/FBI joint terrorism task force member, federal Disaster Medical Assistance Team nurses, emergency department nurses, paramedics, and firefighters. These backgrounds have provided them with deep and diverse knowledge in emergency management.

O'Neill's Center for Emergency Services leverages its size to advantage. All of the hospital's grant funds are pooled so the system is able to negotiate better pricing on equipment, coordinate training activities, and pay for its staff. Each facility has a dedicated staff person who coordinates disaster planning with the corporate team.

The Long Island system's expertise in this area is an open book, literally. "There's no competition in emergency preparedness," said O'Neill. "If the guy next to us is not prepared, they are going to be a burden to us. We have carte blanche to share information on emergency preparedness." Once training modules and preparedness plans are developed centrally, they're shared with the surrounding community. This establishes a consistent approach to disaster preparedness that ensures interoperability during a disaster.
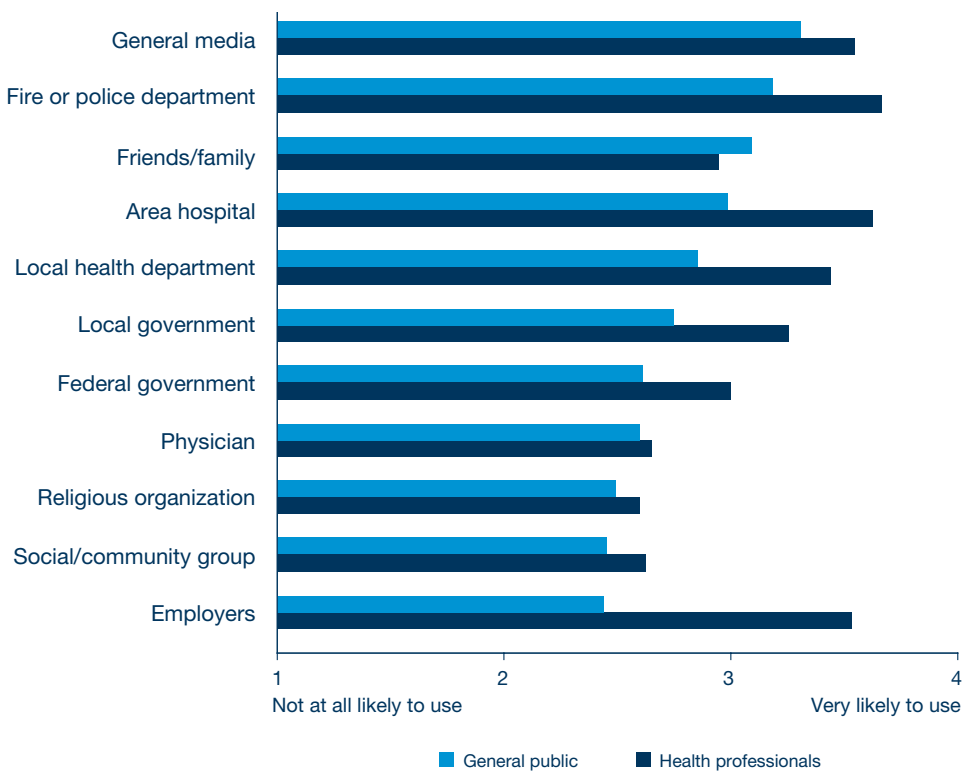
The North Shore system approaches disaster preparedness as a true community effort. For example, its memorandum of understanding with the Catholic Church allows the system to use the church's area facilities in the event of a disaster. This allows NS-LIJ to use the Catholic schools as alternate care sites and soup kitchens as a source of stockpiled food. In addition, the system has an agreement with local hotels that allows them to lodge their staff and families during a disaster.

Help the Public Develop a Culture of Preparedness

Those who are most aware of disasters tend to be most prepared, but they are in the minority. According to a Harris Interactive poll, "Ninety percent of Americans who have a disaster kit feel prepared. Yet, only 28% actually have a kit."[60] The health and medical community has a major role to play in informing the public about disasters. As shown in Exhibit 18, HRI survey results indicate that the general public looks to the media, first responders, and hospitals as primary sources of information during a disaster. Mary Selecky, secretary of health for the Washington State Department of Health, said, "Part of the challenge we face is keeping the interest and level of engagement up in the absence of any events."

Exhibit 18. Disaster Information Resources of Health Professionals and General Public

How likely are you to use each source of information regarding what to do during an actual disaster?

General media
Fire or police department
Friends/family
Area hospital
Local health department
Local government
Federal government
Physician
Religious organization
Social/community group
Employers

1 — Not at all likely to use 2 3 4 — Very likely to use

■ General public ■ Health professionals

Source: PricewaterhouseCoopers' Health Research Institute survey

Following are steps that communities can take to create a culture of preparedness:

- **Involve the public in the planning process.** The Los Angeles Emergency Preparedness Department invites representatives from area neighborhood councils to talk about disaster preparedness planning efforts at the local level. In September 2006, the city of Mesa, Arizona, held an Emergency Preparedness Day, sponsored by the fire and utilities departments, FBI, local hospital, Salvation Army, Red Cross, and the National Guard. Demonstrations included how to use a fire extinguisher and how to use a ham radio. In Florida, officials encourage involvement in such groups as Citizen Corps and Community Emergency Response Teams.

- **Involve employers.** Employers often feel corporate and civic responsibilities to inform, train, and support their employees in disaster preparedness and response. According to Dale Nordenberg, M.D., corporations should "realize that they can leverage their communication infrastructure and the established patterns of communication that they have with their employees to provide critical support to employees, their families, and the community at large in the form of health alerts and response messages. Corporate health strategies must span from prevention to preparedness if corporations want to successfully mitigate the impact of significant large-scale disasters on their employees and business."

- **Empower through information.** Individuals in Israel are empowered to take action in the event of an emergency, knowing what steps to take when a threat occurs. This level of preparedness was demonstrated in the 1991 Gulf War. During this time, nearly 40 missiles were directed toward Israel. While these missiles were only equipped with conventional warheads, the country was prepared to manage a chemical attack. These preparations included distributing gas masks and teaching residents how to seal a room in their houses to stay safe. When the missiles struck, people retreated to these rooms as instructed. This could not have been achieved without information prepared and distributed ahead of time, as well as drills to practice for the event.

- **Provide online tools.** The state of Florida developed and promoted a Web-based "do-it-yourself" personal disaster planning tool to help community members prepare for a wide range of disasters. This tool helps residents plan for food and water stockpiles, provides contact information for emergency response agencies, and includes maps of evacuation zones, as well as checklists to help people manage all stages of a disaster.

- **Assign specific roles to community members.** In Cuba, each resident "understands the role he or she will undertake before and after a storm."[61] For example, block captains are identified and instructed to visit each house to make sure people know when to evacuate before a hurricane hits. To facilitate this, citizens make plans in advance to relocate to homes of friends and family or to government-run shelters. Furthermore, residents go through evacuation drills to determine deficiencies in the system.

- **Use automated systems.** Summit County, Ohio, has implemented "ALF": A for answer the phone; L for listen to the message; and F for follow the instructions. Used to alert people about such events as a chemical spill or water-borne bacterial outbreak, the system dials all residential numbers listed in the phone book (as well as businesses included in the white pages). It provides a warning message and additional information about the event.

The CDC recommends that individuals have the following items on hand for an extended stay at home:

Examples of medical, health, and emergency supplies
Prescribed medications and supplies such as glucose and blood-pressure monitoring equipment
Soap and water, or alcohol-based hand wash (60% to 95% alcohol)
Medicines for fever, such as acetaminophen or ibuprofen
Thermometer
Antidiarrheal medication
Vitamins
Fluids with electrolytes
Cleansing agent/soap
Flashlight
Batteries
Portable radio
Manual can opener
Garbage bags
Tissues, toilet paper, disposable diapers

Source: http://www.pandemicflu.gov/plan/individual/checklist.html

Develop Sustainable Funding Sources

Disaster preparedness needs to be an operational budget item. In some cases, state and local governments are filling in where federal funds are lacking. California is a national leader, allocating $214 million for the 2006–07 fiscal year for public health emergency response, which included $78.2 million for medical supplies and equipment, and $53.4 million for 3.7 million courses of antiviral medications.

- **Build disaster preparedness into business continuity planning and funding.** Health organizations need to consider preparedness as another cost of doing business. Kaiser Permanente's Skip Skivington said, "Our disaster planning budget is part of our operating budget. That is, it's treated as core to our mission." Pat Quinlan, M.D., chief executive officer of Ochsner Health System in Louisiana, added: "Disaster planning is woven into our capital planning and annual tactics for executing our strategic plan. It is part of our business."

- **Foster public-private relationships.** "The private sector corporations have a huge investment and interest in ensuring an effective response," noted the DoD's Embrey. Some health organizations have partnered with food vendors, area hotels, and technology companies to provide support during a disaster. Pharmaceutical trade groups have formed a coalition to help speed the distribution of medications in disaster-stricken areas. Called Rx Response, the group will coordinate distribution with DHS and HHS and will centralize information about which airports, highways, and bridges are open for vendors trying to move supplies.

- **Support funding policies that incentivize collaboration and long-term planning.** A variety of changes in funding policy could be considered to enhance the development of a sustainable disaster planning and response infrastructure. Some states that have developed innovative solutions include:
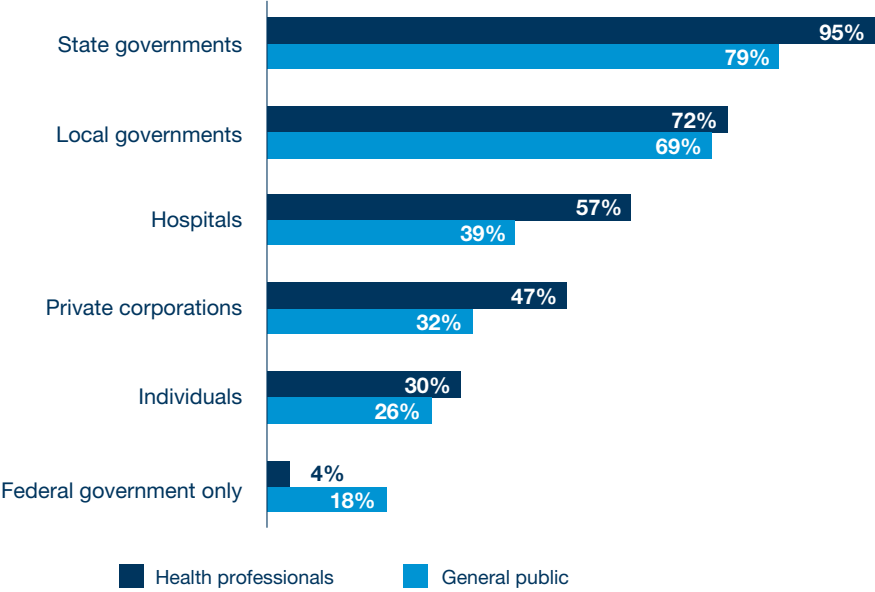
State	Initiative
Wisconsin	Financial Incentives: dangling the carrot of extra funding for departments that can meet higher-than-average standards. As a result, 85% of the local health departments have achieved high-level certification.
North Dakota	It created a strategic health plan that condensed 545 objectives into 10 broad health topics. The health department partnered with the University of North Dakota to develop a corresponding legislative strategy.
Washington	Since 1994, Washington biannually has published a state Public Health Improvement Plan that sets out standards, recommendations, and strategies in seven key areas of public health.

Other potential funding policies that might be considered include:

- **Extend current annual and biannual grant terms to multiyear periods.** This would encourage long-range planning and investment in human capital.

- **Require matching dollars from states and localities** to enhance their commitment toward preparedness activities and increase the amount of funds for disaster preparedness. HRI survey results indicate widespread support for additional funding sources beyond the federal government (Exhibit 19).

- **Develop risk-based allocation methods** to adjust communities' funding levels based on their relative risk of disasters.

- **Expand types of grant recipients** to encourage their participation in community planning and response efforts, potentially to include multistate regions, primary care physicians, ambulatory care centers, nursing homes, EMS, VHA, and private-sector organizations.

- **Issue standards and template**s for risk assessments and disaster plans for grant recipients to follow.

- **Adopt a consistent set of benchmarks and metrics** to establish a baseline level of preparedness and track progress over time.

- **Increase transparency** regarding health and medical preparedness and the use of state and federal funds.

Exhibit 19. Support by Health Professionals and General Public for Additional Funding Sources

In addition to the federal government, who else should fund health system disaster preparations?*

	Health professionals	General public
State governments	95%	79%
Local governments	72%	69%
Hospitals	57%	39%
Private corporations	47%	32%
Individuals	30%	26%
Federal government only	4%	18%

■ Health professionals   ■ General public

*Respondents could provide more than one answer to the question.

Source: PricewaterhouseCoopers' Health Research Institute survey

Conclusion

The one thing that all potential disasters have in common is the potential for casualties. Earthquakes may harm buildings and roads, dirty bombs may impact the power grid, chemical explosions may affect a small local radius, while a pandemic influenza may know no boundaries. Some may prove fatal, but all have the potential for casualties.

Casualties create a need for healthcare—for emergency, trauma, and critical care; sophisticated specialty services; and basic primary care. Disasters will require that all of these various providers work together as seamlessly as possible, in a coordinated response effort, though resources are strained and collaboration rare even on a routine basis. Moving the health system from a focus on individual outcomes to population-based outcomes—saving the most people rather than every person in a disaster—will continue to challenge leaders, practitioners, staff, administrators, and the citizenry.

Now is the time for the healthcare system to close the seams. We can use the lessons of the past to change how our organizations, communities, and society as a whole prepare for the unknown. As author John Barry noted in *The Great Influenza,* "The clock is ticking. We just don't know what time it is."

Appendix A

Per Capita Spending on Disaster Preparedness, 2007

State	2007 ASPR HPP Funding	2007 CDC PHEP Funding	Combined Funding	Combined Per Capita Spending**
Alabama	$6,330,289	$12,951,863	$19,282,152	$4.19
Alaska	$1,349,441	$5,838,752	$7,188,193	$10.73
Arizona	$8,317,173	$17,681,799	$25,998,972	$4.22
Arkansas	$4,063,403	$9,389,729	$13,453,132	$4.79
California*	$47,218,016	$96,015,180	$143,233,196	$3.93
Colorado	$6,525,958	$14,009,943	$20,535,901	$4.32
Connecticut	$4,943,121	$11,324,491	$16,267,612	$4.64
Delaware	$1,581,970	$5,911,495	$7,493,465	$8.78
District of Columbia	$1,737,218	$9,898,128	$11,635,346	$20.01
Florida	$23,432,938	$42,467,776	$65,900,714	$3.64
Georgia	$12,370,869	$23,156,267	$35,527,136	$3.79
Hawaii	$2,129,653	$6,418,428	$8,548,081	$6.65
Idaho	$2,359,069	$6,637,005	$8,996,074	$6.13
Illinois*	$17,267,363	$40,278,625	$57,545,988	$4.48
Indiana	$8,503,785	$16,965,990	$25,469,775	$4.03
Iowa	$4,280,453	$9,779,223	$14,059,676	$4.71
Kansas	$4,004,077	$9,548,745	$13,552,822	$4.90
Kentucky	$5,832,130	$12,441,275	$18,273,405	$4.34
Louisiana	$5,935,695	$13,243,220	$19,178,915	$4.47
Maine	$2,175,388	$6,526,615	$8,702,003	$6.58
Maryland	$7,619,177	$16,047,435	$23,666,612	$4.21
Massachusetts	$8,660,567	$18,039,563	$26,700,130	$4.15
Michigan	$13,298,463	$26,992,552	$40,291,015	$3.99
Minnesota	$7,050,445	$15,591,574	$22,642,019	$4.38
Mississippi	$4,189,754	$9,722,248	$13,912,002	$4.78
Missouri	$7,906,932	$16,566,343	$24,473,275	$4.19
Montana	$1,697,530	$5,982,933	$7,680,463	$8.13
Nebraska	$2,741,751	$7,324,390	$10,066,141	$5.69
Nevada	$3,663,636	$9,340,451	$13,004,087	$5.21
New Hampshire	$2,166,921	$6,447,504	$8,614,425	$6.55
New Jersey	$11,560,312	$22,337,726	$33,898,038	$3.89
New Mexico	$2,977,887	$8,690,645	$11,668,532	$5.97
New York*	$25,474,862	$57,697,211	$83,172,073	$4.31
North Carolina	$11,727,581	$21,306,097	$33,033,678	$3.73
North Dakota	$1,306,102	$5,839,560	$7,145,662	$11.24
Ohio	$15,050,914	$28,837,726	$43,888,640	$3.82
Oklahoma	$5,037,444	$11,101,950	$16,139,394	$4.51
Oregon	$5,191,530	$11,468,821	$16,660,351	$4.50
Pennsylvania	$16,271,242	$31,306,870	$47,578,112	$3.82
Rhode Island	$1,853,432	$6,073,925	$7,927,357	$7.43
South Carolina	$5,978,140	$12,548,500	$18,526,640	$4.29
South Dakota	$1,491,255	$5,878,521	$7,369,776	$9.43
Tennessee	$8,155,520	$16,418,187	$24,573,707	$4.07
Texas	$30,301,320	$56,222,601	$86,523,921	$3.68
Utah	$3,732,769	$8,878,797	$12,611,566	$4.95
Vermont	$1,290,942	$5,843,658	$7,134,600	$11.44
Virginia	$10,189,048	$21,300,739	$31,489,787	$4.12
Washington	$8,608,090	$17,735,544	$26,343,634	$4.12
West Virginia	$2,805,313	$7,412,363	$10,217,676	$5.62
Wisconsin	$7,544,102	$15,868,646	$23,412,748	$4.21
Wyoming	$1,152,882	$5,748,448	$6,901,330	$13.40
Total	$407,053,871	$881,056,077	$1,288,109,948	$4.30

*California, New York, and Illinois include additional funding to Los Angeles County, New York City, and Chicago
**Based on 2006 population data

Source: PricewaterhouseCoopers' analysis based on Department of Health and Human Services expenditure data and U.S. Census Bureau 2006 population estimates

Appendix B

Surge Capacity for Regions in the Cities Readiness Initiative, 2005

City	2005 Occupancy Rate*	Additional Beds Needed During Surge**	City	2005 Occupancy Rate*	Additional Beds Needed During Surge**
Albany, NY	65%	(575)	Miami, FL	67%	(2,972)
Albuquerque, NM	83%	166	Milwaukee, WI	65%	(622)
Anchorage, AK	60%	(104)	Minneapolis, MN	70%	(308)
Atlanta, GA	73%	(112)	Nashville, TN	63%	(989)
Baltimore, MD	78%	(175)	New Haven, CT	81%	(96)
Baton Rouge, LA	65%	(497)	New Orleans, LA	65%	(617)
Billings, MT	71%	(124)	New York City, NY	81%	(193)
Birmingham, AL	67%	(897)	Oklahoma City, OK	64%	(800)
Boise, ID	53%	(275)	Omaha, NE	67%	(559)
Boston, MA	75%	(545)	Orlando, FL	73%	(365)
Buffalo, NY	79%	(457)	Peoria, IL	68%	(198)
Burlington, VT	66%	(64)	Philadelphia, PA	77%	(1,463)
Charleston, WV	64%	(278)	Phoenix, AZ	70%	(288)
Charlotte, NC	73%	(205)	Pittsburgh, PA	72%	(1,280)
Cheyenne, WY	59%	(45)	Portland, OR	67%	41
Chicago, IL	68%	(3,272)	Providence, RI	76%	(41)
Cincinnati, OH	65%	(842)	Richmond, VA	69%	(498)
Cleveland, OH	73%	(997)	Riverside, CA	74%	357
Columbia, SC	79%	(59)	Sacramento, CA	72%	74
Columbus, OH	64%	(860)	Salt Lake City, UT	63%	(263)
Dallas, TX	66%	(1,385)	San Antonio, TX	65%	(758)
Denver, CO	60%	(738)	San Diego, CA	75%	113
Des Moines, IA	65%	(234)	San Fransisco, CA	71%	(745)
Detroit, MI	72%	(671)	San Jose, CA	73%	37
District of Columbia	75%	568	Seattle, WA	68%	(93)
Dover, DE	86%	28	Sioux Falls, SD	63%	(331)
Fargo, ND	68%	(76)	St. Louis, MO	67%	(1,668)
Fresno, CA	77%	(66)	Tampa, FL	62%	(1,826)
Hartford, CT	85%	207	Trenton, NJ	69%	(204)
Honolulu, HI	77%	(39)	Virginia Beach, VA	77%	109
Houston, TX	66%	(1,720)	Wichita, KS	60%	(426)
Indianapolis, IN	63%	(1,059)			
Jackson, MS	56%	(959)			
Kansas City, MO	63%	(405)			
Las Vegas, NV	78%	132			
Little Rock, AR	65%	(677)			
Los Angeles, CA	70%	(1,463)			
Louisville, KY	73%	(324)			
Manchester, NH	57%	(162)			
Memphis, TN	72%	(505)			

*Occupancy rate based on 2005 AHA average daily census data and total hospital beds
**Parentheses around number for additional beds indicates excess surge bed capacity based on HRSA recommendation of 500 beds per million people

Source: PricewaterhouseCoopers' analysis based on data from American Hospital Association Statistics 2007 and "Annual Estimates of the Population of Metropolitan and Micropolitan Statistical Areas: April 1, 2000, to July 1, 2006 (CBSA-EST2006-01). Population Division, U.S. Census Bureau (April 5, 2007)

Health Research Institute

Carter Pate
Partner, Health Industries Leader
(703) 918-1111
carter.pate@us.pwc.com

David Chin, M.D.
Partner, Health Research Institute
(617) 530-4381
david.chin@us.pwc.com

Sandy Lutz
Managing Director
(214) 754-5434
sandy.lutz@us.pwc.com

Hindy Shaman
Director
(703) 453-6161
hindy.shaman@us.pwc.com

Nicolas Beard, M.D.
Director
(206) 398-3293
nicolas.beard@us.pwc.com

Benjamin Isgur
Assistant Director
(214) 754-5091
benjamin.isgur@us.pwc.com

Stephen Gillis
Research Analyst
(617) 530-4115
stephen.j.gillis@us.pwc.com

Kimberly Rothrock
Research Analyst
(617) 530-4220
kimberly.rothrock@us.pwc.com

Kristyn Ippolito
Research Analyst
(973) 236-4602
kristyn.ippolito@us.pwc.com

Daniel Cummins
Research Analyst
(267) 330-1403
daniel.e.cummins@us.pwc.com

Justin Loring
Research Analyst
(646) 471-2413
justin.r.loring@us.pwc.com

Health Research Instiutive Advisory Board

David Levy, M.D.
Principal, Health Industries Advisory
(201) 486-5487
david.l.levy@us.pwc.com

Peach Taylor, M.D.
Managing Director, Washington Federal Practice
(703) 918-1588
peach.taylor@us.pwc.com

Melissa Glynn, Ph.D.
Principal, Washington Federal Practice
(703) 918-1268
melissa.glynn@us.pwc.com

W. McKay Henderson
Partner, Washington Federal Practice
(703) 918-1282
w.mckay.henderson@us.pwc.com

Scott McIntyre
Principal, Washington Federal Practice
(703) 918-1352
scott.mcintyre@us.pwc.com

Dale Nordenberg, M.D.,
Managing Director, Health Industries Advisory
(678) 419-1230
dale.nordenberg@us.pwc.com

Marisa Daley
Director, Washington Federal Practice
(678) 419-1216
marisa.s.daley@us.pwc.com

Jill Olmstead
Director, Washington Federal Practice
(703) 918-1138
jill.olmstead@us.pwc.com

Ryder Smith
Director, Health Industries Advisory
(312) 298-4064
ryder.smith@us.pwc.com

Vivek Chakrabortty
Manager, Health Industries Advisory
(443) 690-7749
vivek.chakrabortty@us.pwc.com

Patrick Ryan
Manager, Washington Federal Practice
(703) 918-1011
patrick.e.ryan@us.pwc.com

Johanna Valladares
Senior Associate, Health Industries Advisory
(310) 753-2811
johanna.valladares@us.pwc.com

Endnotes

1   GAO-07-485R Public Health and Hospital Emergency Preparedness, March 23, 2007.

2   Emergency Preparedness and Response: Some Issues and Challenges Associated with Major Emergency Incidents, testimony before the Little Hoover Commission, State of California. Statement of William O. Jenkins Jr., director, Homeland Security and Justice Issues, GAO, Feb. 23, 2006.

3   "Ready or Not? Protecting the Public's Health from Diseases, Disasters and Bioterrorism," Trust for America's Health, December 2006. Available at http://healthyamericans.org/reports/bioterror06/BioTerrorReport2006.pdf.

4   "HHS Pandemic Influenza Plan," U.S. Department of Health and Human Services, November 2005.

5   "Ready or Not? Protecting the Public's Health from Diseases, Disasters and Bioterrorism," Trust for America's Health, December 2006. Available at http://healthyamericans.org/reports/bioterror06/BioTerrorReport2006.pdf.

6   Medical Readiness Responsibilities and Capabilities: A Strategy for Realigning and Strengthening the Federal Medical Response, U.S. Department of Homeland Security, January 2005.

7   National Response Framework (draft). Department of Homeland Security, July 2007.

8   Hsu, S., "States Feel Left Out of Disaster Planning," The Washington Post, Aug. 8, 2007.

9   "National Response Framework is Not a Good Replacement for the NRP," news release, International Association of Emergency Managers, Aug. 9, 2007.

10 Posner, M., "Federal disaster management plan running into criticism," CongressDaily, Sept. 12, 2007. Available at http://www.govexec.com/dailyfed/0907/091207cdam1.htm.

11 Key Facts about the Cities Readiness Initiative (CRI). Available at http://www.bt.cdc.gov/cri/facts.asp.

12 "HHS Announces $896.7 Million in Funding to States for Public Health Preparedness and Emergency Response," news release, U.S. Department of Health and Human Services, July 17, 2007. Available at http://www.hhs.gov/news/press/2007pres/07/pr20070717c.html.

13 "Ready or Not? Protecting the Public's Health from Diseases, Disasters, and Bioterrorism, 2006," from Trust for America's Health, December 2006. Original sources from which "Ready or Not" was drawn are the National Conference of State Legislators, State Budget Actions: FY 2005 and FY 2006 and Census Bureau, Annual Estimates of the Population for the United States and Puerto Rico, April 2000–July 1, 2005. Available at http://healthyamericans.org/reports/bioterror06/.

14 "Roundtable on All Hazards Medical Preparedness and Response," Center for Biosecurity at the University of Pittsburgh Medical Center, April 5, 2006. Available at http://www.upmc-biosecurity.org/website/resources/hearings/content/Hearings_2006/20060405allhazardsmedprep.html.

15 "Ready or Not? Protecting the Public's Health from Diseases, Disasters and Bioterrorism," Trust for America's Health, December 2006. Available at http://healthyamericans.org/reports/bioterror06/BioTerrorReport2006.pdf.

16 ibid.

17 Koenig, K., Cone, D., Burstein, J., and Carnargo, C., "Surging to the Right Standard of Care," Academic Emergency Medicine, February 2006;13(2). Available at http://www.aemj.org/cgi/content/full/13/2/195.

18 Schultz, C., and Koenig, K., "State of Research in High-consequence Hospital Surge Capacity," Academic Emergency Medicine, 2006;13(11). Available at http://www.aemj.org/cgi/content/full/13/11/1153.

19 "Reopening Shuttered Hospitals to Expand Surge Capacity," prepared by Andrea Hassol and Richard Zane, M.D., of Abt Associates, for Agency for Healthcare Research and Quality, under IDSRN Task Order No. 8, AHRQ Publication No. 06-0029. Rockville, MD, February 2006.

20 "2007 Chartbook: Trends Affecting Hospitals and Health Systems," American Hospital Association, April 2007. Available at http://www.aha.org/aha/researchand-trends/trendwatch/2007chartbook.html.

21 MacKenzie, E., Hoyt, D., Sacra, J., et al, "National Inventory of Hospital Trauma Centers," Journal of American Medical Association, March 26, 2003. Available at www.jama.com.

22 "U.S. Trauma Care System Unprepared to Deal with Major Terrorist Attack, Surgeons Group Says," Kaiser Daily Health Policy Report, the Henry J. Kaiser Family Foundation, May 29, 2003. Available at http://www.kaisernetwork.org/daily_reports/rep_index.cfm?hint=3&DR_ID=17984.

23 "U.S. Trauma Center Crisis: Lost in the Scramble for Terror Resources," National Foundation for Trauma Care, May 2004.

24 "U.S. Trauma Center Preparedness for a Terrorist Attack in the Community: The Study of the Impact of a Terrorist Attack on Individual Trauma Centers," National Foundation for Trauma Care, September 2006.

25 "President Bush Signs Bill to Improve U.S. Trauma Systems," News from the American College of Surgeons, May 4, 2007. Available at http://www.facs.org/news/traumabill.html.

26 DeLia, D., "Annual Bed Statistics Give a Misleading Picture of Hospital Surge Capacity," Annals of Emergency Medicine, October 2006, Volume 48, No. 4.

27 "2007 Chartbook: Trends Affecting Hospitals and Health Systems," American Hospital Association, April 2007. Available at http://www.aha.org/aha/researchand-trends/trendwatch/2007chartbook.html.

28 "Announcement of Availability of Funds for the Hospital Preparedness Program," Department of Health and Human Services (DHHS), 2007.

29 Page, Douglas. "Is This Bed Taken? States, hospitals harness technology to track vacant beds and avert overcrowding," 2004.

30 "The Perfect Storm: An Rx for Effective Nurse Staffing," AMN Healthcare. Nov. 1, 2006. Available at http://www.amnhealthcare.com.

31 "What Works: Healing the Healthcare Staffing Shortage," PricewaterhouseCoopers LLP, May 2007.

32 "Building Preparedness Capacity through Workforce Development: Challenges to Full Implementation," Association of State and Territorial Officials, February 2006. Available at http://www.astho.org/pubs/BuildingPreparednessCapacity.pdf.

33 "The 2007 State of America's Hospitals: Taking the Pulse, Chartpack," American Hospital Association, July 2007. Available at http://www.aha.org/aha/research-and-trends/index.html.

34 "What Works: Healing the Healthcare Staffing Shortage," PricewaterhouseCoopers LLP, May 2007.

35 "Fact Sheet: Emergency Preparedness Planning & Response: Primary Care and Local Health Departments," National Association of County and City Health Officials, 2006. Available at http://www.naccho.org/pubs/documents/ms051_emergencyprepfactsheet.pdf.

36 National EMS Scope of Practice Model, from the National Highway Traffic Safety Administration, February 2007.

37 "The Fragile State of Hospital Finances," American Hospital Association. Available at http://www.aha.org/aha/content/2005/pdf/05fragilehosps.pdf.

38 "Development of Standards and Guidelines for Healthcare Surge During Emergencies," California Department of Health Services, 2007. Available at http://bepreparedcalifornia.ca.gov/EPO/CDPHPrograms/PublicHealthPrograms/EmergencyPreparednessOffice/EPOProgramsServices/Surge/SurgeStandardsGuidelines.

39 "Lessons Learned: Louisiana's Perspective on Emergency Management," National Governors Association, Aug. 17, 2006. Available at http://www.nga.org/Files/pdf/0608OMCTLESSONSKATRINA.PDF.

40 McKay, J., "Just Say No," 2007. Available at http://www.govtech.com/gt/print_article.php?id=103876.

41 Guide to Emergency Planning in Health Care, Joint Commission Resources, 2002.

42 Smith, B., and Tolman, T., "Can We Talk? Public Safety and the Interoperability Challenge," National Institute of Justice Journal, April 2000:6 (source 40; p3). Available at http://www.safecomprogram.gov/NR/rdonlyres/547652B4-C5A6-4A93-BA5D-4842A4FDCAF8/0/Can_we_Talk.pdf.

43 "Criteria for Statewide Interoperability Strategic Plans," Department of Homeland Security. Available at http://www.safecomprogram.gov/NR/rdonlyres/ABF324DF-6623-4EBF-B5FA-A7E904FD590C/0/FY07StatewidePlanningCriteria_FINAL6_.pdf.

44 Tactical Interoperable Communications Scorecards, Department of Homeland Security, January 2007.

45 Barrett, D., "U.S. Works to Fix Emergency Communications," The Washington Post, July 18, 2007.

46 Ferns, N., "Wanted: Systems to Track Disaster Victims," 2005. Available at http://www.govhealthit.com/online/news/91640-1.html.

47 "Mass Shootings at Virginia Tech: Report of the Review Panel," Virginia Tech Review Panel (Chapter 11, pp. 139–140), August 2007.

48 "Mass Medical Care with Scarce Resources: A Community Planning Guide," Agency for Healthcare Research and Quality, February 2007.

49 Lin, R., "State Purchases Three Mobile Hospitals," The Los Angeles Times, Aug. 26, 2007. Available at http://www.latimes.com/news/printedition/asection/la-me-hospital26aug26,1,4354495.story?coll=la-newsa_section.

50 "Surge Hospitals: Providing Safe Care in Emergencies," Joint Commission on Accreditation of Healthcare Organizations, 2006. Available at http://www.jointcommission.org.

51 "Development of Standards and Guidelines for Healthcare Surge During Emergencies," California Department of Health Services, 2007. Available at http://bepreparedcalifornia.ca.gov/EPO/CDPHPrograms/PublicHealthPrograms/EmergencyPreparednessOffice/EPOProgramsServices/Surge/SurgeStandardsGuidelines.

52 "Israel's Preparedness for Responding to the Health Requirements of its Civilian Population in the Event of Deployment of a Nuclear, Biological or Chemical Weapon of Mass Destruction," by Leonard Marcus, PhD, Harvard School of Public Health, October 2002.

53 "Reopening Shuttered Hospitals to Expand Surge Capacity," prepared by Andrea Hassol and Richard Zane, M.D., of Abt Associates, for Agency for Healthcare Research and Quality, under IDSRN Task Order No. 8, AHRQ Publication No. 06-0029. Rockville, MD, February 2006.

54 Wise, R., "The Creation of Emergency Health Care Standards for Catastrophic Events," Society for Academic Emergency Medicine, 2006.

55 "Improving Influenza Vaccination Rates in Health Care Workers: Strategies to Increase Protection for Workers and Patients," National Foundation for Infectious Diseases, 2004. Available at http://www.nfid.org/pdf/publications/hcwmonograph.pdf.

56 "Hospital-Based Emergency Care: At the Breaking Point," Committee on the Future of Emergency Care in the United States Health System, National Academy of Sciences, 2007.

57 Emergency System for Advance Registration of Voluntary Health Professionals, U.S. Department of Health and Human Services, Health Resource and Service Administration. Available at http://www.hrsa.gov/esarvhp/.

58 Idaho Bioterrorism and Awareness Program's Play2Train, February 2007. Available at http://play2train.hopto.org/.

59 "Professional Practices," Disaster Recovery Institute International, 2007. Available at http://www.drii.org/DRII/ProfessionalPractices/about_professional.aspx.

60 "New Poll Reveals Only Seven Percent of Americans are 'Red Cross Ready' for a Disaster or Emergency; Free Online Tutorial Now Available to Help Families Get Prepared in Three Easy Steps," PR Newswire Association LLC, June 12, 2007. Available at https://www.redcross.org/pressrelease/0,1077,0_489_6778,00.html.

61 Schleifstein, M., "Cuba's Emergency Plans Well-Rehearsed; Strategies Compared at Meeting in Mexico," The Times-Picayune, New Orleans, Louisiana, June 3, 2007.

About PricewaterhouseCoopers

PricewaterhouseCoopers' Healthcare Industry Practice provides assurance, tax, and advisory services to providers, payers, entitlements, suppliers, employers, and health sciences organizations. Visit PwC on the Web at www.pwc.com/healthindustries, or call 800-211-5131.

PricewaterhouseCoopers (www.pwc.com) provides industry-focused assurance, tax, and advisory services to build public trust and enhance value for its clients and their stakeholders. More than 130,000 people in 148 countries across our network share their thinking, experience, and solutions to develop fresh perspectives and practical advice.

Health Research Institute (www.pwc.com/HRI)

PricewaterhouseCoopers' Health Research Institute provides new intelligence, perspectives, and analysis on trends affecting all health-related industries, including healthcare providers, pharmaceuticals, health and life sciences, and payers. The Institute helps executive decision-makers and stakeholders navigate change through a process of fact-based research and collaborative exchange that draws on a network of more than 3,000 professionals with day-to-day experience in the health industries. The Institute is part of PricewaterhouseCoopers' larger initiative for the health-related industries that brings together expertise and allows collaboration across all sectors in the health continuum.

Washington Federal Practice (www.pwc.com/WFP)

PricewaterhouseCoopers' Washington Federal Practice helps federal agencies solve complex business issues, manage risk, and add value through our comprehensive service offerings in financial management, program management, operational effectiveness, and IT effectiveness, all of which are delivered seamlessly throughout the world.

pwc.com/healthindustries
pwc.com/hri