

Day 30:
The Impact of Mass Evacuations on Host Communities Following Nuclear
Terrorism

A white paper prepared for the January 23-24, 2013 workshop on Nationwide Response to an Improvised Nuclear Device Attack, hosted by the Institute of Medicine's Forum on Medical and Public Health Preparedness for Catastrophic Events together with the National Association of County and City Health Officials. The author is responsible for the content of this article, which does not necessarily represent the views of the Institute of Medicine

*By: Irwin Redlener, MD, Director
David M. Abramson, PhD MPH, Deputy Director
Derrin Culp, MIA MCRP, Research Associate
National Center for Disaster Preparedness
Columbia University Mailman School of Public Health*

INTRODUCTION

Since the Institute of Medicine conducted its 2008 “Workshop on Assessing Medical Preparedness for a Nuclear Event,” scientists, policymakers, and public health and emergency management professionals have dramatically increased their focus on preparedness issues related to a terrorist attack with an improvised nuclear device (IND).¹ In a relatively short time, awareness and understanding of the risks associated with infrastructure damage, radiation, medical countermeasures, sheltering vs. evacuation strategies, inadequate medical and public health surge capacity, mass fatality management and a host of other issues have expanded significantly. This includes an appreciation of the tremendous gaps that remain in every American city’s ability to respond to such an event if it were the target, even with the full resources of state and federal government brought to bear. It also has been widely noted that depending upon the scale of an evacuation that might follow an IND detonation, communities and local governments at the destination end could be overwhelmed, as well.²

This paper sets the stage for a thorough and systematic discussion of an issue that has been widely recognized, but that so far has received little attention: upon an act of nuclear terrorism in a major city, what would be the mid- to long-term public health and related implications for communities that abruptly and involuntarily become host to large numbers of evacuees. In effect, how would a host community accommodate enormous and sudden population expansion under such circumstances?

To the extent that researchers and policy analysts have addressed the implications of an IND detonation for destination communities, they generally have focused on the immediate consequences and aftermath of an evacuation. Recent studies have established that few if any metropolitan regions in the United States have adequate medical, hospital, public health, triage, decontamination, EMS, first responder, mass fatality management, pharmaceutical, or other critical surge capacity to deal (in the short term) with large numbers of displaced people with severe injuries, significant

radiation exposure and contamination, high level anxiety, and a wide range of acute, stress-related mental health conditions and overwhelming psychological trauma.³

Analysts correctly focus on these gaps in capacity and recommend long-term regional and inter-governmental planning processes and collaborations (for example, the Regional Catastrophic Preparedness Grant Program) to fill those gaps.⁴ However, given the nearly 45% reduction in federal funding for homeland security grant programs since 2010, the elimination of Regional Catastrophic Preparedness Grant Program awards after 2011, and uncertainties with respect to the consequences of consolidating sixteen state and local homeland security grant programs (including RCPGP) into the recently announced National Preparedness Grant Program, it is extremely unclear whether existing collaborative efforts will endure.⁵ At the same time, the FY2013 budget reflects a full one-third reduction in the Hospital Preparedness Program in the office of the Assistant Secretary for Preparedness and Response (and a further—albeit modest—reduction for the Public Health Emergency Preparedness cooperative agreement).⁶ Therefore, even if efforts to prepare for an IND detonation continue at some scaled-back level within individual hospitals, local health departments and collaborative venues, it may take years to bridge the identified gaps in IND response preparedness, if it can be done at all.

Rather than simply recap prior recommendations concerning regional planning and collaborations, this paper approaches nuclear terrorism as if we do not have the luxury of years to plan, collaborate and assemble a robust and fully-coordinated regional response. It instead focuses on the kinds of regional public health emergency issues that leaders would have to be prepared to address as best they can if an IND detonation followed by a massive spontaneous evacuation, occurred **tomorrow**.

Therefore, the central focus of this paper is a scenario describing the medical and public health situation in a hypothetical county located 55 miles from ground zero, 30 days after a 10-kiloton IND has detonated and millions in the metropolitan area have evacuated the central city and immediately surrounding areas. A number of authors already have described graphically and in significant detail the potentially chaotic and deadly nature of a mass evacuation as it is unfolding, and the challenges of that initial period for local, state and federal responders.⁷ The purposes of presenting this “Day 30” scenario are to focus on a time frame that has not yet been considered, to create a vivid image and visceral appreciation of how substantial and intractable the crisis is still likely to be a month after the incident, and to suggest the nature of the extraordinary challenges to be faced going forward. The scenario is based on a series of assumptions and it is recognized that changes in the underlying premises could alter the resulting Day 30 conditions in the hypothetical county.

The second section reexamines some of the conventional assumptions about how large an evacuation would be following an IND detonation. It also considers what relevant lessons we can learn from the 2005 evacuation of New Orleans after Hurricane Katrina and the 2011 evacuation of the Tohoku region of Japan. The conclusion discusses some positive actions state and local leaders can take to further prepare.

SCENARIO

Disclaimer

This scenario is not a prediction. It is neither a best case nor a worst case. Rather it is a plausible sense of conditions on the ground. As such, we present it as a tool for stimulating discussion about an event that would prove to be extremely complex and in many ways, unpredictable--a vehicle for presenting and thinking about the generic issues listed in Table 1. Nonetheless, to draw a scenario one is forced to make certain assumptions. Our most critical assumptions are that the detonation has occurred in the central city of one of America's more populous metropolitan areas and that the detonation has prompted a spontaneous and/or managed evacuation that involved several million people. Although those assumptions are consistent with previous writings on this subject (see the section "Questions of Scale"), we acknowledge that those sources are not the final word. Different assumptions, involving fewer people and/or greater geographic dispersion by Day 30 of those who did evacuate, could produce very different outcomes. And given any set of assumptions, myriad unpredictable events and complications could change the Day 30 situation for the worse OR for the better.

Our focus on a county that is only an hour drive from the detonation site under normal conditions is, admittedly, arbitrary; it is meant to make the scope of this paper manageable rather than to suggest that destination communities closer in and further out won't also have severe problems. There may be some unique differences in the kinds of issues that will confront smaller and more distant destination communities compared to closer and larger ones, but we believe that in most cases, the stresses will be a function of how much health care infrastructure and general response capacity the destination had to begin with in addition to how big an increase in population it sustains due to the evacuation.

Roberts County

It is October 1, 30 days after a 10-kiloton improvised nuclear device exploded in midtown Major City on a weekday. Roberts County, located in the same state as Major City, is approximately 55 miles from ground zero. The area is experiencing seasonable daytime temperatures of 55-65 degrees and generally dry weather. With a pre-detonation population of 350,000, it now also is home to 100,000 evacuees from the Major City metropolitan area, including 25,000 children. Two-thirds of the evacuees still lack adequate temporary housing. Media images of certain areas within the county evoke an enormous refugee camp, with local resources stretched well beyond anything imaginable prior to the attack on Major City. County and local governments are operating in sustained crisis mode, with virtually all routine governmental and public and private health care services remaining suspended or radically curtailed. To a greater or lesser extent, similar conditions are unfolding in cities and towns up to one hundred miles from ground zero, located in the four states where fleeing citizens from the Major City metropolitan area ended up. Mired in their own overwhelming challenges, none of these destination communities is in a position to offer mutual aid to any of the others.

For the past 10 days or so, local newspapers and citizens have been referring, disparagingly, to the displaced individuals as “evacs.” Immediately after the catastrophe, local residents were relatively welcoming, although concerned about radiation contamination of evacuees. Now, as it is sinking in that life in Roberts County may not return to normal for months or years (if ever), the initial compassion and caring is giving way to growing anger and resentment toward the uninvited “guests.”

Health authorities have not closely monitored the radiation exposure status of the evacuees. Some 500 deaths among displaced individuals have been recorded since their arrival. Many of these fatalities were due to injuries and radiation exposure from the IND. Other individuals who were unable to get needed medications or timely medical care died from heart attacks, stroke, complications of diabetes or acute asthma. Staff of local child protective service agencies are unaware that due to the chaotic nature of the evacuation, which caused members of many families to become separated, approximately 500 of the 25,000 children that arrived in Roberts County were traveling with someone other than their parent or legal guardian.

Local conditions are conducive to the degradation of water supplies, with E. coli and salmonella outbreaks out of control. The local school system, whose ranks were depleted by the exodus of 300 teachers and administrators, has been unable to accommodate the influx of evacuee children, most of whom have been out of school since June. Crime rates are extremely high and steadily rising. Financial assistance is limited for the “evacs” and part-time or temporary employment opportunities are non-existent. Food stamps, school lunch and breakfast programs and virtually all other public assistance programs have reached their limits in terms of resources and administrative capacity. Legislation to provide additional resources to these programs is bogged down in partisan Congressional bickering over the extent and distribution of supplemental support for these safety net programs.

Because of the direct consequences of the IND event in Major City, the entire region, including Roberts County, is experiencing widespread disruptions of telecommunications, transportation, health and social services. Workforce absenteeism from deaths, injuries and overwhelming anxiety among government personnel, responders and service providers has been partly compensated for by an influx of deployed personnel from other regions and volunteers from across the nation – in addition to assistance deployments from many countries. The county’s local chapters of national emergency assistance organizations also are struggling to assist the evacuees however they can, but their resources are no match for the scale of this crisis. Many of the volunteers are already exhausted from the work load, traumatized with the conditions they encounter, frustrated with lack of comfortable living arrangements and increasingly anxious to return home to families and familiar environments.

In addition, due to the destruction or radiation contamination of governmental offices caused by the detonation, and widespread confusion at all levels of government about how the various applicable annexes of the National Response Framework (NRF) interact with each other and with Homeland Security Presidential Directive-5 in this

instance, the Unified Command envisioned in the NRF has been fully functional for only the last ten days.⁸

The federal/state Joint Field Office for the incident is based 150 miles from Major City. Senior federal emergency response officials who have deployed to the Major City area from around the United States in order to step into the shoes of the deceased and injured government officials are being introduced for the first time to their federal, state and local counterparts—people with whom they’ve never planned or exercised, and with whom (in most cases) they haven’t had any opportunity to develop bonds of cooperation or trust. The National Disaster Medical System (NDMS) has activated 90% of its DMAT, IMSURT, DMORT and NVRT resources (consisting of approximately 4500 personnel in aggregate) and deployed them to the periphery of the moderate damage zone surrounding the detonation site, where life-saving opportunities are considered to be the greatest and there are numerous injuries and fatalities. The Department of Defense has activated and deployed to the Major City airport and other close-in staging most of the 9,200 federal military personnel in the national "CBRN (Chemical, Biological, Radiological and Nuclear) Response Enterprise." These are soldiers with expertise in search and rescue, decontamination, emergency medicine, logistics, evacuation, and mortuary operations.

The governor of the state in which Major City is located has deployed the equivalent CBRN specialist National Guard units under her command, accounting for about 800 soldiers, and in an incredible show of unity, the governors of other states have deployed a large percentage of the other 9,000 National Guard CBRN specialists to the Major City area. However, numerous command, control and coordination issues have arisen, as there never has been a military and/or National Guard exercise that tested capacity and effectiveness of such a large joint operation. All of these responders—NDMS, the US armed services and the National Guard—have faced severe logistical and operational challenges that have hindered their ability to operate at full efficiency.

Immediately after the detonation, the governor also invoked her disaster emergency powers under the state constitution and laws, and activated every available member of the state’s National Guard to be deployed among dozens of areas that, like Roberts County, are demanding supplemental assets to assist with newly displaced high-need evacs. After consulting with the Roberts County Commissioner (elected chief executive) and his counterparts in other destination counties, the Governor issued unprecedented and expansive executive orders. Those orders temporarily suspended many county and local (as well as state) laws and regulations under the relevant public health, environmental, corrections, criminal justice, public safety, insurance, civil service, finance and taxation, and social services codes, and effectively commandeered some local government assets and some private property. Members of the governor’s staff, supported by National Guard officers, are the de facto administrators of the county, dispensing and enforcing orders to implement the governor’s emergency edicts. The 7PM curfew imposed on the county two weeks ago and enforced by the National Guard, will change to 6 PM next week, consistent with shorter days and the anticipation of increasing crime rates.

Various parties in Roberts and other affected counties are challenging the appropriateness and legality of the governor's orders in the media and state courts. However, political leaders of the state's legislature have not objected to the governor's sweeping assumption of emergency powers other than to state that they expect the governor to rescind those orders once the situation is stabilized. The state courts have not yet responded to advocacy groups' petitions to review the governor's actions.

Contours of the Evacuation

The 100,000 evacuees still in Roberts County represent just one fourth of the total that passed through during the prior month. Those who kept going consumed large amounts of available gasoline, food, water and over-the-counter medications along their way, creating temporary shortages for county residents. During the same period, sixty thousand county residents (about seventeen percent of the population) fled their homes, worried about fallout and safety if throngs of Major City evacuees arrived.⁹ Among the 10,000 Roberts County residents who have not yet come home are 300 county employees (including staff of the health, public works, EMS, and police departments) and at least 200 private doctors, nurses and other healthcare professionals.

Roughly 15,000 of the evacuees have settled in each of the county's two primary cities, which normally have limited commuter bus service to Major City. Each city had approximately 30,000 residents and now has 45,000. The other 70,000 evacuees have clustered in a section of the county with about 200,000 residents, bounded by interstate highways offering access to several other mid-size cities and the innermost suburbs of Major City.

Of the 75,000 adult evacuees, at least 45,000 no longer have a job or health insurance, as their former places of employment were destroyed or put indefinitely out of commission. Another 20,000 are in limbo, unable to get clear information about what happened to their employers or their employers' health plans. This is not an issue for the evacuees only. Of the 30,000 Roberts County residents who commute to Major City daily, approximately 3,000 died or were critically injured or permanently disabled from the results of the detonation. Most of the remaining commuters cannot get to work because of continuing travel restrictions into and around Major City, or because their workplaces were destroyed or utterly reliant upon other businesses that did not survive. Many cannot get clear answers from anybody about whether or not their health coverage is still in effect. All existing Roberts County health care providers and facilities are facing extraordinary financial challenges in the absence of clear understandings of how and when reimbursement for services will be provided.

Radiation Issues¹⁰

About 5,000 of the evacuees underwent decontamination at official mass decontamination facilities, usually several days after their exposure to fallout. Another 75,000 self-decontaminated and disposed of their evacuation clothing in the regular

garbage, potentially creating unrecognized cross-contamination issues. The decontamination status of the remaining 20,000 evacuees is completely unknown.

Few of the evacuees were screened for cumulative radiation dose in any way. However, it is estimated that at least 20,000 of the evacuees sustained cumulative doses of ionizing radiation of at least 2 Gy (200 rad). It also is unrecognized that 30% percent of the evacuees are suffering from varying degrees of immunosuppression and that wherever evacuees are located, there are atypically high levels of colds and infections. Few of the evacuees have yet received a flu shot for the upcoming winter.

Roberts County has six geographically dispersed hospitals, including a 250-bed state psychiatric facility and five acute care hospitals with 1200 beds in aggregate. Since evacuees first arrived in the county, all six of these facilities have been overwhelmed by the appearance of distraught, disoriented, exhausted, sometimes angry evacuees (adults and children), many with severe injuries, symptoms consistent with acute radiation syndrome (ARS), and/or in urgent need of medications or medical devices to address chronic health issues. Many have presented without visible injuries, without knowledge of whether or not they have received high doses of radiation, and without personal medical records. Simultaneously, the hospitals have received substantial demands for services by residents and evacuees alike who can no longer demonstrate that they have valid health insurance. Since the detonation, the State's health department, which regulates hospitals in the state, has insisted that the Roberts County institutions accept 250 severely injured patients who have been evacuated by air from Major City.

Over the past month, thousands of evacuees have gone to county emergency rooms presenting with severe GI distress or high fevers, but have been offered little more than OTC symptomatic relief, usually without seeing a nurse or MD. In the last week, 500 evacuees were admitted with symptoms of hematologic ARS. None of the hospitals has sufficient staff, blood, fluids or pain medication to adequately provide supportive care for these patients and many will not survive.

The hospitals long since have discharged everybody whom they safely could release and postponed indefinitely all elective treatments. Even so, between the evacuees and the transferred patients from Major City, hospitals are all running at far in excess of their approved capacity, and have implemented triage protocols and altered standards of care more radical than anything they considered or exercised in connection with planning for pandemic flu. The hospital staffs are now physically and emotionally spent. There have been fifty documented instances of evacuees threatening or actually assaulting medical staff who lacked the resources to treat them. As a result, the hospitals have state police posted continuously—both inside and outside—to manage patient access to the buildings, protect the hospital staff, and prevent severely contaminated people from entering at will. All hospitals have established “priority and triage committees” (PTC) to monitor acquisition, dispersal and accountability for all consumable supplies, medications, and medical equipment. The PTC decisions are final—and without appeal.

Current Conditions for the Evacuees

After the detonation, the county's rental vacancy rate dropped abruptly from nearly 15% to zero, as evacuee households snapped up anything minimally habitable and bid the median monthly rent up from \$1100 to \$1700. 500 good Samaritans opened their homes to evacuee families, as did most of the county's 80 houses of worship. An estimated 35,000 evacuees have found housing through these channels. The other 65,000 evacuees--including as many as 17,000 children--currently are in whatever hotels or motels they could find, or still living in their cars, in tents, in makeshift shelters or in the open. They occupy county parks, shopping center parking lots, school athletic fields, conservation and watershed lands, public golf courses and any other place from which the municipal police and county sheriff officers have not forcibly ejected them. Many have changed location night after night.

Within three weeks of the detonation, FEMA committed to make an extraordinary 200,000 temporary housing units--50% more than for the whole Gulf Coast following Katrina--available in the Major City metropolitan area by January 1 (still three months away). The governor has promised the Roberts County Executive 10,000 of those units, enough for about one third of the evacuees who have not obtained adequate temporary housing or lodging.

In the two primary cities, the 50% increase in population has been accompanied by a palpable increase of congestion, noise and unsanitary conditions. Many evacs ignore parking restriction, thereby impeding access for garbage trucks, not to mention emergency vehicles and police. There are not enough tow trucks and impound lots in the county to physically remove all the illegally parked vehicles. It is far beyond the planning and resources of either city—even with help from the county and state—to provide sufficient temporary toilets, showers, refuse collection, food and water for that many additional people in just one month. Conditions in the makeshift settlements can only be described as primitive, grossly unsanitary and highly conducive to continuing infectious disease outbreaks.

A week earlier, with cooler fall weather approaching, various county and municipal public works departments, along with the state government, national disaster relief organizations, volunteers and humanitarian assistance agencies, began a strictly local effort to construct bare bones temporary shelters that will provide minimally adequate protection from the elements, safety, and sanitation for up to another 10,000 families. The governor has redirected virtually all municipal and county employees with relevant skills from their regular tasks and ordered them to help meet this challenge. She has put on hold all government-funded construction, repair and maintenance projects that can be deferred without imminent risk to public safety, regardless of the financial consequences and contractual implications of those delays.

The typical issues that accompany a mass influx of spontaneous volunteers—coordinating their efforts, credentialing them and ensuring that they don't inadvertently

interfere with the formal incident response process—are further complicated by absence of suitable temporary housing for them. Whereas in many prior domestic disasters, houses of worship, private homes and school facilities have opened their doors to volunteers, in Roberts County and the other destination communities, evacuees already have occupied those spaces. As a result, a substantial number of volunteers are compounding the health and safety issues associated with the temporary encampments.

Prices have shot up dramatically at most local merchants, and people wait in line for hours, rain or shine, for tractor trailers to arrive—now with National Guard escorts—to replenish local inventories. Yet many food items, OTC medications, diapers, bottled water, soap, and hand sanitizer sell out immediately and are chronically out of stock. Hoarding is widespread.

Mental Health Issues

Local authorities have been reporting extraordinary needs for mental health support for displaced people. Acute stress disorder, withdrawal, sleeping disorders, and depression symptoms all have been observed among both the evacuee population and the permanent residents.¹¹ In addition, many individuals with pre-existing mental health and behavioral challenges are experiencing severe exacerbations. Yet the resources available simply to monitor such behavioral trends, much less to intervene are grossly inadequate. Although NDMS teams have been deploying to the Major City area as quickly as possible, federal officials so far have elected to position the great majority of the DMAT resources as close as they can to the detonation zone, where there is the highest absolute number of survivors needing treatment. And the DMAT teams include few mental health specialists.

Since several days following the detonation, the National Disaster Medical System (NDMS), working with the Department of Defense, has been transporting the most seriously injured patients out of the areas closest to ground zero. These patients have been distributed among hundreds of the hospitals that belong to the NDMS national network of more than 1,600 facilities. Overall, the system has had mixed results. Loss of medical records, refusal of many “participating” hospitals to actually accept patients, wide-spread problems with children being separated from parents, loss of identification for a number of infants, and other logistical problems have been major concerns that have slowed down this process.

Due to the delays in establishing the Unified Command and the Joint Field Office, a SAMHSA-funded psychological first aid program executed by community-based mental health workers only has been visible in the cities and towns of Roberts County for one week. The Governor’s executive orders temporarily waived many of the credentialing requirements for out of state mental health workers, but even so, the few volunteer mental health professionals now in the county cannot possibly meet the need.

Many permanent residents shun the evacuees out of fear of radiation exposure. Some blame them for a perceived increase in crime, the retrenchment at the hospitals and local doctors' offices, as well as for the 50% increase in rents, for gridlock on local streets, and even for the sudden crowding on the commuter buses. Of the 5,000 displaced children whose parents were able to enroll them in Roberts County schools, many are ostracized and taunted by local resident children, placing additional burdens on highly stressed school officials. Serious concerns are being expressed regarding physical confrontations between resident and evacuee adolescents.

The Role of the Public Health and Safety Agencies

The county's health department, which had cut back its professional staff by 20% and closed three community clinics over the last five years, is down to a core of 130, including its mental health case workers, social workers and clinical staff (in addition to clerical and administrative). Since the detonation, it has deployed in accordance with its public health emergency plans, suspending its women-infants-children and early intervention programs and all educational services other than risk communications via TV, radio, cell phones and social media. It has scaled back nurse visits, home health care and clinical services (including mental health) to those which are for immediate lifesaving purposes.

The nursing staff is administering twenty times the normal level of tetanus and DPT shots. The supervising engineers and technicians have deployed with their staffs on repeated missions to check that the improvised settlements of evacuees in parks, golf courses, and watershed lands are not compromising ground or surface water quality. The sanitarians have devoted large portions of their time to inspecting temporary shelters and settlements, as well as the opportunistic and unlicensed food and water vendors that have materialized to serve (and, in many cases, take advantage of) the evacuees. The frequency and thoroughness of inspections of existing restaurants, school and nursing home food service operations, markets and other food distributors has suffered as a result.

The department also has suspended periodic inspections of the county's 60 mobile home parks, residential lead assessments and child lead testing, enforcement of state and county indoor non-smoking ordinances, pre-natal care services, substance abuse prevention programs, youth bureau services, air quality monitoring, and evaluation of new subdivisions for compliance with water supply and wastewater disposal rules (this effectively has halted new residential development in the county). The lone county epidemiologist is stretched to the breaking point, even with assistance from a state health department and a CDC epidemiologist who also are helping out in three other host counties, and from a nurse with an MPH and some basic epidemiological training, commandeered from a city health agency.

Although 50% of the county's water supply comes from local surface sources and 20% of its fresh food historically has been produced locally, the health department also is constrained in its ability to provide reassuring messages about food and water safety.

The regional shortage of trained technicians and lab facilities to perform the necessary agricultural and water radioactivity monitoring has compounded the public's concern.

Other public agencies that support public health and safety also are still in emergency mode. County and municipal public safety officials have diverted firefighting and hazmat resources to conducting impromptu and ad hoc inspections of risks in the temporary settlements. Sanitation agencies have abandoned their regularly scheduled trash collection schedules; at most homes and businesses, garbage has been picked up only twice in the more than four weeks since the detonation. Garbage is piling up everywhere.

The 125-officer county police force and the small municipal police departments are totally overwhelmed, managing a huge increase in traffic on local streets and county roads and responding to an unprecedented number of 911 calls. These calls have arisen from long-time residents' fear of unfamiliar cars and people in their neighborhoods, from residents' inability to get in and out of their neighborhoods due to street obstruction, from evacuees in physical, mental or emotional distress, and from violent confrontations among residents and evacs who are now in competition for limited local food, water, and healthcare. The state troopers routinely assigned to Roberts County have been diverted from most of their normal operations in order to support municipal and county law enforcement and protect the hospitals. Consequently, they devote little time to highway safety enforcement. The result is a substantial increase in highway accidents involving death or life-threatening injuries, and also of illegal roadside dumping of trash, human wastes and hazardous materials.

Not everyone in Roberts County is cooperating fully with the overall effort to accommodate the evacuees. One quarter of the overwhelmingly volunteer EMS ambulance crews have refused to respond to dispatches to shelters or encampments housing "evacs" for fear of radiation contamination or for safety concerns. Twenty health department nurses, technicians and sanitarians (about 15% of the professional staff) simply have refused to engage in activities that involve contact with evacuees or potentially contaminated materials. Some of the private garbage haulers who provide routine pickups under county or municipal contract have refused to service areas with a high concentration of evacuees due to fear of radiation. Three of ten private funeral homes in the county already have declined to work with families of deceased evacuees.

Summary

Table 1 summarizes the key issues raised in the scenario.

A month after a detonation, federal, state and local authorities that would still be severely handicapped by the difficulty of accessing the detonation site, should at least have acquired a consistent and fairly clear situational awareness and established all the

Table 1-Key Issues One Month After Detonation
Competition for federal and regional response resources: even with deployment of unprecedented high levels of outside personnel and resources, communities hosting evacuees may have to compete for attention with the detonation city; potential for delayed federal response overall.
Shelter: potential for high incidence of heat exhaustion, hypothermia and other exposure-related morbidity and mortality; rapid absorption of temporary housing opportunities; abrupt rental housing inflation; competition for housing among evacuees, volunteers, and relief workers.
Loss of jobs, income, schools, health care and other basics of daily life: this will be an issue primarily among evacuees but destination residents will not be exempt. Beyond basic shelter, households that have lost everything will need food, water, transportation, schools and myriad other services to get back on their feet.
Overwhelmed local medical and public health systems: deferral of elective and non-urgent procedures; diminution of response capacity due to evacuation from destination county and unwillingness to report to work; physical security requirements for hospitals and health professionals; limited potential for mutual aid assistance; loss of health insurance by evacuees and residences/loss of payment for health services provided; overworked and demoralized personnel; severe triage and altered standards of care in effect.
Public safety: evacuee cars obstruct EMS, police and fire service; state police neglect routine highway safety patrols; local law enforcement diverted from public safety responding to evacuee-related 911 calls.
Mental Health: unprecedented incidence of acute stress disorder, withdrawal, sleeping disorders, and depression symptoms without resources to service those needs; pre-existing mental health and behavioral challenges severely exacerbated; limited mental health resources of NDMS and delayed deployment of community-based psychological first aid program.
Radiation: inadequate knowledge of evacuees' radiation status (both decontamination and total radiation dose sustained); latent acute radiation syndrome coupled with lack of resources to provide supportive care; high rate of immunosuppression and infections among evacuees; lack of information about fallout contamination of water supplies and local agricultural products; cross-contamination due to discarded clothing.
Sanitation: uncollected garbage in built up areas; insufficient sanitary facilities in makeshift, spontaneous evacuee encampments; roadside dumping of hazardous materials and human wastes; deferred inspection of restaurants, food markets, institutional food services; appearance of unlicensed and unsupervised opportunistic food and water vendors; insufficient mass fatality management to arrange proper temporary interment.
Water safety: evacuee encampments in watershed lands; possible contamination of public water supplies with infectious agents due to inadequate sanitation; possible radiation contamination from fallout.
Vulnerable Populations: children separated from their families/guardians during the evacuation, children with special health care needs, adults with disabilities or chronic medical and mental health conditions, frail elderly, and other identifiable segments of the evacuee population will need additional attention and resources.
Social problems: discrimination against/antagonism towards evacuees; some local service providers "redline" evacuees; evacuees blamed for increased crime rates, higher prices and shortages, "ruining" the community; competition among evacuees and permanent residents for goods and services; taunting, shunning, stigmatizing, and avoidance of evacuees; violence between evacuees and permanent residents.
Suspension and curtailment of routine state and local government public health and safety functions.

essential elements of the response command structure required by the National Response Framework. They also should have begun to understand the scale of the disruption and destruction at ground zero and the magnitude of population movement in reaction to the incident. However, the situation in destination localities is likely to still be extraordinarily dire and, because of wide and dynamic population dispersion, difficult to assess.

An additional concern, for an unpredictable period of time following the IND detonation, will remain with respect to the possibility of a secondary follow-up incident in another target zone. At the federal level, it is conceivable that some response assets will be reserved for such a scenario until it can be determined that another IND detonation or other major terrorism event is not likely. In any case, uncertainty and caution resulting in asset and resource readiness may put a finite limit, even if temporarily, on deployment for the original event.

UNCERTAINTIES RELATED TO AN IND-PROMPTED EVACUATION

Questions of Scale

Many believe that following an IND detonation, there likely would be a large and spontaneous self-evacuation from both the targeted city and its suburbs. For example, in the National Level Exercise 2010 Operations-Based Exercise, built around the hypothetical detonation of a 10-kiloton nuclear device in downtown Indianapolis, the scenario included 270,000 people evacuating the city (about 30% of the total population), 200,000 of their own volition. The scenario also reflected the self-evacuation of nearly 50% of the residents of three counties located 40-60 miles northeast of the city, which were sitting in the path of the approaching fallout plume.

Generally speaking, the driving factors behind such an evacuation would include the public's feelings of insecurity that the United States had been attacked again, worry that a second or third detonation could occur, fear of radiation, lack of awareness of the relative risks of moving vs. staying put, loss of workplace and income, short-term failures of electronic communications media, poorly conceived risk communication strategies and messages, and—for at least some portion of the population—lack of confidence in government to give trustworthy information and advice about the safest options.

The scale of such an evacuation could be huge. An expert who participated in the earlier IOM workshop estimated that “more than a million would be displaced by lingering radiation.”¹² The Department of Homeland Security's March 2010 “Strategy for Improving the National Response and Recovery from an IND Attack” says that the number of evacuees potentially could be in the millions.¹³ Ventura County California's Nuclear Explosion Response Plan rests upon a working assumption that at least 2 million residents of Los Angeles County (about 20% of the total population) would evacuate to the north following a detonation in downtown LA.¹⁴ Based upon their review of the literature concerning the evacuation from the Three Mile Island nuclear power accident and from major U.S. hurricanes, researchers at the University of Chicago's National Opinion Research Center argued that following an IND detonation in

Manhattan, more than 7 million people might flee in all directions, and that at least half of those evacuees would settle in communities more than 150 miles away from ground zero.¹⁵

These are highly informed and well-educated guesses, however; there is no accepted methodology for estimating either the magnitude or directionality of a mass evacuation following an IND detonation. Therefore, it is worth reexamining some of the basic assumptions that lead many to conclude that any evacuation necessarily would involve millions.

Leaders' Ability to Manage Scale and Direction

Many challenges would emerge regarding effective and informed leadership needed to oversee the state and local response to an unprecedented catastrophe. For example, would mayors or governors have access in real time to both high quality modeling and analysis of a fallout plume, and expert scientific advice to help them interpret these data? Would these officials have immediate access to all the necessary subject matter experts, and would they have enough history with them to be confident in relying upon their judgment? Such analysis and advice should, ideally, play a critical role in any governor's decisions to pursue an evacuation, sheltering-in-place or hybrid response strategy. Would the telecommunications infrastructure upon which a governor or mayor would rely to receive and disseminate information and instructions to the public, survive the blast, fires and electromagnetic pulse created by the detonation? Would there be critical delays in pushing out time-sensitive messages? Would officials receive accurate information as to which messages had been pushed out and which had not?

Another question, barely recognized in discussions of a potential evacuation, is whether governors have emergency powers and law enforcement resources sufficient to suppress a mass evacuation or at least manage it if they believe that would be in the public interest? The governor of New York State, for example, has broad emergency powers that enable the governor, with minimal constraints, to "temporarily suspend specific provisions of any statute, local law, ordinance, or orders, rules or regulations, or parts thereof, of any agency during a state disaster emergency, if compliance with such provisions would prevent, hinder, or delay action necessary to cope with the disaster."¹⁶ The Governor may also "alter or modify" the requirements of any provision of law suspended. Would this authority enable the governor to prevent a mass exodus from New York City by closing down the bridges connecting four of the city's five boroughs—home to 85% of the city's entire population—to the mainland? While the governor clearly could employ National Guard troops for that purpose, would this broad authority allow her or him to commandeer county or local police officers and vehicles if necessary?

Do the governors of California, Illinois, Texas and other states containing major cities that are potential targets of nuclear terrorism have equivalent broad powers that would enable them to intervene at transportation choke points and to muster law enforcement above and beyond their state national guard? There is not a readily available national inventory of governors' emergency powers and their legal ability to manage an evacuation. The National Governors Association (NGA) publication entitled "A

Governor’s Guide to Homeland Security” indicates that in some states, gubernatorial emergency powers include “suspending state regulations and statutes; commandeering the use of private property; rationing food, water and fuel; and authorizing emergency funds without prior legislative consent.” The NGA, however, has not codified these.¹⁷

The mere existence of legal authority to manage an evacuation begs the critical political question: even in an unprecedented crisis such as an IND detonation, would any governor be willing to assume such extraordinary powers and to make decisions of this magnitude, potentially influencing the long-term health and possibly even the survival, of hundreds of thousands? Or would governors be unwilling to impinge on personal liberty in such a consequential way?

Regardless of whether gubernatorial discretion would ever function to constrain the scale of an evacuation, sympathetic evacuations could arise in other major cities among citizens fearing a second or third terrorist detonation. It is not likely that a sympathetic evacuation would head in the direction of the first detonation, but it could interfere with the transportation of relief workers, temporary hospitals and mortuaries, critical medical stockpiles, and other resources needed in the vicinity of the first detonation. It also could compound economic and social disruption in ways that would have unpredictable cascading effects and implications for the destination communities surrounding the original detonation.

Finally, the role of the FBI in evacuation-related decisions is not discussed in any publicly-available DHS or FEMA documents. An IND detonation would be treated as a terrorist event. Therefore, under the National Response Framework, the FBI would have a prominent—maybe even a controlling—role in the short-term response related to its criminal investigation.¹⁸ We have not found anything in the public domain that illuminates how the FBI’s control of a post-detonation criminal investigation might impinge on a governor’s or the Department of Homeland Security’s ability to support and manage a controlled evacuation.

Nature of Complex Public Health Emergencies: Are there Lessons from Evacuations following Katrina and the Great East Japan Earthquake

Even if we accept the consensus view that an IND-prompted evacuation would be immense in scale, recent mass evacuations offer few insights as to the public health implications of an IND-spurred mass evacuation for destination communities. Estimates of number of people who evacuated the Tohoku region of Japan in response to the March 2011 tsunami and nuclear power plant accident vary considerably, with the highest official estimate to date being approximately 350,000.¹⁹ Although even the high end estimate appears quite small compared to what one might expect following an urban IND detonation in the United States, it still represents a massive movement of people that potentially could overwhelm destination communities. Although U.S. media and Japanese newspapers with English editions have reported extensively on the travails of the evacuees and the indignities they have faced, journalists have barely documented the evacuees’ ultimate destinations within Japan, or how their arrival impacted the host cities.²⁰

One also must be cautious in making inferences from the well-documented 2005 resettlement of Hurricane Katrina evacuees in Houston/Harris County and in Baton Rouge, the two cities that hosted the greatest number of people. The evidence from the Katrina evacuation is not a strong model for how suburban and exurban cities and counties outside a major U.S. city might respond to a 30-50% population increase such as postulated in the scenario of fictional Roberts County and its two primary cities.

The evacuation of New Orleans abruptly added as many as 250,000 people to Houston/Harris County (with a 2005 population of roughly 2.0/3.9 million) and as many as 235,000 people to Baton Rouge (2005 population of about 415,000).²¹ Between one half and two thirds of the evacuees left those host cities within about a year. In neither city was there evidence of what one might describe as a public health emergency or a massive retrenchment of basic public health services, in spite of such large and abrupt increases in population. Certainly, there is no evidence that major disease outbreaks occurred in either metropolitan area after the arrival of the Katrina evacuees. The Houston/Harris County metropolitan area was able to absorb 150,000-250,000 people without having to house tens of thousands of them in sprawling tent cities or communities of FEMA-provided temporary units, whereas much smaller Baton Rouge had a much harder time integrating the evacuees into the private housing market.

Some residents of the host cities blamed and resented the evacuees for increasing crime, creating illegal overcrowding of apartments, competing for already scarce public services, bidding up rents, and increasing traffic congestion. Local and state officials lamented the fiscal burden of being good Samaritans and what they perceived as a never-ending struggle to receive reimbursement from the U.S. government. However, the only health issue that persistently appears in discussions of the Katrina evacuees in Houston and Baton Rouge is the particularly intense burden on the local mental health and substance abuse prevention and treatment systems, perceived as overtaxed long before Katrina sent a flood of new clients into those two cities.²²

The evidence from Houston and Baton Rouge is more relevant to thinking about a mass migration to a largely independent and unaffected metropolitan area (for example, several hundred thousand IND evacuees from New York settling in Philadelphia or in Boston) than to speculating about the potential impacts in the suburban or exurban portions of an extended metropolitan area where the entire physical, economic, social and psychological equilibrium has been totally upended by a nuclear explosion.

Furthermore, within most major metropolitan areas, the central city is home to a disproportionate population of people who are socially marginalized, undocumented, uninsured, medically vulnerable, disabled or impaired, addicted, or homeless, who often exhibit complex arrays of these attributes and who require a high level of support services. Typically, the primary city also provides a significantly greater support system for these populations than exists in the suburbs or exurbs. This urban "safety net" consists of well-established networks of governmental and non-profit service providers, affinity groups and advocates. If an IND incident destroyed or disrupted this safety net and displaced this population to the suburbs and exurbs, their issues and needs would place exceptional burdens on local public health systems and private medical and social

service providers that might lack the required expertise and be unaccustomed to dealing with these problems in such volume.

CONCLUSION

Public Health Priorities

In the scenario presented in this paper, a month after an IND detonation in an American city, the social and functional fabric of society—at least in the region where the detonation occurred—would still be stretched to limits never tested before. The response would challenge the resourcefulness, the creativity, the heroism, the compassion, and the endurance of all levels of government and all sectors of society in ways no previous disaster had. Leaders would need to take a long view and think about how society ultimately could stabilize and regain a sense of security and normalcy.

In the near term, however, leaders—particularly those responsible for public health—would need to focus on preventing the detonation from having massive morbidity and mortality ripple effects throughout the region. Amidst dozens, maybe hundreds of worthy possible objectives, their highest near-term priorities would be to shelter evacuees from the elements; establish the most basic sanitation and hygiene so as to minimize the chances of infectious disease outbreaks; protect the safety of food and water; provide psychological first aid and some level of clinical mental health services to a disoriented and traumatized population of evacuees; and establish emergency protocols (in terms of triage and altered standards of care) for the allocation of scarce health care and medical resources.

What if It Happened Tomorrow?

If the “unthinkable” were to occur tomorrow, leaders from all sectors would have no choice but to leap into the breach, notwithstanding the absence of comprehensive, collaboratively-developed multi-sector plans and response mechanisms. What advice can we offer about such an eventuality?

First, several post-mortems on the governmental responses to the 2010 Gulf Coast oil spill indicate that upon the occurrence of a major disaster, the public rapidly will demand a clear response leader, someone to whom they can look for information and reassurance, and someone whom they can hold accountable.²³ Those studies also concluded that governors will establish themselves as a leading public face and voice of the response, even to the extent of taking significant actions outside the formal joint response command structure or selectively opposing or complicating decisions of the formal command structure.²⁴

These findings, coupled with the fact that some governors have substantially greater emergency powers than any has yet exercised, strongly suggest that future efforts to prepare for nuclear terrorism should include another element besides traditional planning and regional collaborations. Such efforts also should prepare governors to be ready to take extraordinary, unprecedented action if their state constitutions and statutes allow. Governors should understand as fully as possible the potential

applications of their emergency powers in response to an IND detonation, even if political considerations ultimately might constrain how governors used those powers.

Second, the Coast Guard's internal evaluation of the federal response to the oil spill noted that "superb crisis leadership is essential for effective response to a major national domestic incident" and that "the characteristics necessary for crisis leadership are well documented and identifiable."²⁵ Consequently, the report recommended significant additional investment in how the Coast Guard identifies, trains, and cultivates officers to be future crisis managers.

That report also noted that "many federal, state, and local officials and industry executives do not have crisis leadership experience and training or are not temperamentally suited to the role of crisis manager..."²⁶ Governors and other elected officials who are *ex officio* crisis managers may or may not have "the right stuff" for that role. The same may be true with respect to members of a governor's cabinet, even if they are superb administrators and have outstanding political skills. Given the critical role these officials would have to play in responding to an IND detonation and the sheer unpredictability of how such an incident would unfold, they should have real-time access to highly trained and certified crisis managers to advise them—tested individuals who meet the highest crisis leadership standards of U.S. military or federal civilian agencies.

Where to Begin?

Even though a low-yield IND detonation is one of the 15 national disaster planning scenarios developed by the federal government, planning for such an event may be one of the most difficult and complex challenges any leader could ever undertake. Understandably, many emergency response professionals and public officials hesitate to contemplate, much less confront the challenges of an event as improbable and horrific as nuclear terrorism. The scale and scope of the effort and resources required to respond to an IND detonation remain largely beyond the capacity that exists in any local jurisdiction or region.

However, serious discussion and planning on a local and regional level is critically important. That is why programs such as the Regional Catastrophic Preparedness Grant Program were necessary – and why discontinuation of those initiatives is troubling. Even though the likelihood of nuclear terrorism is believed to be small, the probability is not zero – and the consequences would be extremely high. Moreover, we must recall that the ferocity and complexity of the attacks of 9/11 seemed unimaginable at the time; similar perceptions of improbability must not paralyze planning and preparation to react to a nuclear event. As long as we think it possible that an IND detonation and related evacuation could occur at any time—that we may not have the luxury of years and years to devise optimal plans—dialogue must continue and focus on straightforward consensus and best practices. This is especially true as recent studies have clearly shown that proper information and planning could make a substantial difference in lives saved.

So, where to begin?

Elected officials with responsibility for public safety could initiate high level discussions of post-IND scenarios (such as the one presented in this paper) with leaders in health, public health, housing, law enforcement, sanitation and so on. Participants would be encouraged to think creatively and broadly—well outside their own areas of expertise and their professional silos—about the issues raised. New ideas or elaboration of cascading consequences would likely emerge from such discussions.

Important questions might include: What would actually happen in *our* county or state? What are our critical resources and unique risks? What assets must be protected and deployed? How would we stay in touch with officials from outside the jurisdiction? How would we handle hostilities that might arise between local citizens and evacuees? Such discussions would be held intermittently, over time, giving participants the opportunity to really think about what might happen, what would be needed, and what they could do, individually and collectively. From the outset, many functional ideas and different, useful perspectives would emerge. For example, perhaps someone will think that guidelines for interacting with displaced persons would be helpful. Or that psychological first aid training should be provided for responders, local leaders, clergy and interested citizens.

On their own, such discussions will not ensure sufficient supplies, hospital beds or classroom space for evacuees. Guided by thoughtful leadership, however, a level of serious forethought will help create an environment in which citizens are mentally prepared, and have far better capacity to respond to and recover from the unprecedented conditions that would inevitably unfold after a detonation of an IND.

¹ Benjamin, George, McGeary, Michael, McCutchen, Susan R., ed. 2009. *Assessing Medical Preparedness to Respond to a Terrorist Nuclear Event: Workshop Report*: Institute of Medicine of the National Academies. http://www.nap.edu/catalog.php?record_id=12578.

² See Redlener, I., Garret, Andrew, Levin, Karen, Mener, Andrew. 2010. *Regional Health and Public Health Preparedness for Nuclear Terrorism: Optimizing Survival in a Low Probability/High Consequence Disaster*. New York City: National Center for Disaster Preparedness; National Center for Disaster Preparedness. *Day Three: Regional Resilience and Health Challenges in the Aftermath of Nuclear Terrorism* 2010. Available from http://www.ncdp.mailman.columbia.edu/daythree/executive_summary.pdf; National Security Staff, *Planning Guidance for Response to a Nuclear Detonation* (Second) 2010. Available from <http://www.epa.gov/rpdweb00/docs/er/planning-guidance-for-response-to-nuclear-detonation-2-edition-final.pdf>; Buddemeier, B.R., J.E. Valentine, K.K. Millage, and L.D. Brandt. 2011. *National Capital Region Key Response Planning Factors for the Aftermath of Nuclear Terrorism*. <https://responder.llnl.gov/?q=home>; and Lessons Learned Information Sharing. 2011. *Mass Evacuation Reception Planning: Overview of Planning Issues after a Nuclear Incident*. Washington, DC: FEMA.

³ These are summarized in Redlener, I., Garret, Andrew, Levin, Karen, Mener, Andrew. 2010. *Regional Health and Public Health Preparedness for Nuclear Terrorism: Optimizing Survival in a Low Probability/High Consequence Disaster*. New York City: National Center for Disaster Preparedness.

⁴ FEMA's regional offices also have collaborated with local agencies in formulating early-stage IND response plans. See FEMA Region V Newsletter 2012: Vol. 3, http://www.iesma.org/docs/FEMA%20Region%20V%20Newsletter%20-%20Volume%203_2012.pdf, and comments from Tom Wolfe of the Arizona Division of Emergency Management, at <http://www.emforum.org/vforum/111130.htm>.

⁵ In FY2010, the total budgeted for the sixteen grant programs that are being replaced by the National Preparedness Grant Program was \$2.75 billion. The FY 2013 executive budget request for the National Preparedness Grant Program is \$1.54 billion. See Office of Management and Budget. *Budget of the U.S. Government FY2013: Cuts, Consolidations and Savings*. Executive Office of the President 2012, p.138, Available from <http://www.whitehouse.gov/sites/default/files/omb/budget/fy2013/assets/ccs.pdf>.

⁶ See Department of Health and Human Services. 2012. Public Health and Social Services Emergency Fund, FY 2013 Justification of Estimates for Appropriations Committees. <http://www.hhs.gov/budget/safety-emergency-budget-justification-fy2013.pdf>, p.8.

⁷ Levin, Robert M., and Steve Johnston, 2011, Ventura County Nuclear Explosion Response Plan. Ventura, CA: Ventura County Department of Public Health, pp. 7-13 and *Day Three: Regional Resilience and Health Challenges in the Aftermath of Nuclear Terrorism*, 2010. Available from http://www.ncdp.mailman.columbia.edu/daythree/executive_summary.pdf.

⁸ This is a critical assumption of the scenario that may evoke substantive objections. However, the notion that it could take three weeks to fully establish the Unified Command is reasonable in light of both recent experiences with the Deepwater Horizon oil spill and the complexity of the nominal federal response structure to an IND. Various post mortems on the federal response to the 2010 Gulf Oil Spill (see notes 23 and 24) identified ambiguity in (or absence of) response doctrine, absence of operational plans, confusion about officials' roles, and other deficiencies in preparedness and execution as causes for a slow and inefficient mobilization of the federal response to the oil spill. According to the Coast Guard's formal internal assessment (the Incident Specific Preparedness Review), the National Incident Commander (NIC) organization was not established until twelve days after the well blowout, in a situation where no federal, state or local government personnel lost their lives, no government facilities were destroyed or compromised, and no transportation or telecommunications were disrupted. The functions of the National Response Team (NRT) were not fully in place for another week to ten days, and only after the NIC appointed his own Interagency Support Group to compensate for the difficulties in getting the NRT operational. Looking to the National Response Framework, in addition to the standard Emergency Support Function annexes, an IND detonation would invoke the Terrorism Incident Law Enforcement and Investigation Annex, the Catastrophic Incident Annex, the Catastrophic Incident Supplement, the Nuclear/Radiological Incident Annex, and the Mass Evacuation Incident Annex. HSPD-5 also appoints the Secretary of the Department of Homeland Security as the "Principal Federal Official" for any major national incident. Hopefully the many experiences the federal government has had and the lessons it has learned from mobilizing responses to major natural disasters—both domestic and international—would serve it well in responding to an IND detonation. But like the 2010 gulf oil spill—which was the largest of its kind and the first Spill of National Significance—an IND detonation has never happened, there is no incident specific experience base, and there would be a huge learning curve.

⁹ This is a much smaller percentage than was assumed in National Level Exercise 2010, when 50% of the residents of three counties outside of Indianapolis—all roughly 50 miles away but in the path of the fallout plume—attempted to evacuate.

¹⁰ This section is informed by DiCarlo, Andrea, Carmen Maher, and John L. Hick. 2011. Radiation Injury After a Nuclear Detonation: Medical Consequences and the Need for Scarce Resources Allocation. *Disaster Management and Public Health Preparedness* 5 (Suppl. 1):S32-S44; by Garty, Guy, Andrew Karam, and David J. Brenner. 2011. Infrastructure to support ultra-high throughput biodosimetry screening after a radiological event. *International Journal of Radiation Biology* 87 (8):754-765; and by Anderson, Victor E. 2010. Public Health Effects of an Improvised Nuclear Device Attack, California Department of Public Health Radiologic Health Branch.

¹¹ Although we have neither identified nor performed a comprehensive review or meta-analysis specifically of the literature concerning the association between evacuation and mental health, there are numerous articles addressing that issue in connection with evacuations following natural or technological disasters. See, for example, Bonanno, G. A.; Brewin, C. R.; Kaniasty, K.; La Greca, A. M. 2010. Weighing the Costs of Disaster: Consequences, Risks, and Resilience in Individuals, Families, and Communities. *Psychological Science in the Public Interest* 11 (1):1-49; Mortensen, Karoline, Rick K. Wilson, and Vivian Ho. 2009. Physical and Mental Health Status of Hurricane Katrina Evacuees in Houston in 2005 and 2006. *Journal of Health Care for the Poor and Underserved* 20 (2):524-538; Carr, V. J., T. J. Lewin, R. A. Webster, and J. A. Kenardy. 1997. A synthesis of the findings from the

Quake Impact Study: a two-year investigation of the psychosocial sequelae of the 1989 Newcastle earthquake. *Social Psychiatry and Psychiatric Epidemiology* 32 (3):123-136; Jenkins, J. Lee M. D. MSc, Edbert B. M. D. M. P. H. Hsu, Lauren M. B. A. Sauer, Yu-Hsiang PhD Hsieh, and Thomas D. M. D. M. P. H. Kirsch. 2009. Prevalence of Unmet Health Care Needs and Description of Health Care-seeking Behavior Among Displaced People After the 2007 California Wildfires. *Disaster Medicine & Public Health Preparedness Developing the Science of Health Care Emergency and Response* 3 (2):S24-S28; Ruggiero, Kenneth J. PhD, Kirstin PhD Gros, Jenna L. PhD McCauley, Heidi S. PhD Resnick, Mark Morgan, Dean G. PhD Kilpatrick, Wendy M. A. Muzzy, and Ron PhD Acierno. 2012. Mental Health Outcomes Among Adults in Galveston and Chambers Counties After Hurricane Ike. *Disaster Medicine & Public Health Preparedness* 6 (1):26-32; Ohta, Yasuyuki, Kenichi Araki, Naomi Kawasaki, Yoshibumi Nakane, Sumihisa Honda, and Mariko Mine. 2003. Psychological distress among evacuees of a volcanic eruption in Japan: A follow-up study. *Psychiatry and Clinical Neurosciences* 57 (1):105-111; Kato, H., N. Asukai, Y. Miyaki, K. Minakawa, and A. Nishiyama. 1996. Post-traumatic symptoms among younger and elderly evacuees in the early stages following the 1995 Hanshin-Awaji earthquake in Japan. *ACTA Psychiatrica Scan* 93:477-481; Weems, Carl F., Sarah E. Watts, Monica A. Marsee, Leslie K. Taylor, Natalie M. Costa, Melinda F. Cannon, Victor G. Carrion, and Armando A. Pina. 2007. The psychosocial impact of Hurricane Katrina: Contextual differences in psychological symptoms, social support, and discrimination. *Behaviour Research and Therapy* 45 (10):2295-2306; and Tally, Steven, Ashley Levack, Andrew J Sarkin, Todd Gilmer, and Erik J Groessl. 2012. The Impact of the San Diego Wildfires on a General Mental Health Population Residing in Evacuation Areas. *Administration and Policy in Mental Health and Mental Health Services Research*: 1-7.

¹² Benjamin, 2009. *Assessing Medical Preparedness*, p. 73. quotes James Blumenstock of the Association of State and Territorial Health Officials

¹³ DHS Strategy for Improving the National Response and Recovery from an IND Attack. 2010. Washington, DC: Department of Homeland Security, p. A-11

¹⁴ Ventura County Department of Public Health, P. 9. FEMA features this plan prominently in Lessons Learned Information Sharing. 2011, pp. 12-14.

¹⁵ Meit, Michael, Redlener, Irwin, Briggs, Thomas W., Kwanisai, Mike, Culp, Derrin, Abramson, David. 2011. Rural and Suburban Population Surge Following Detonation of an Improvised Nuclear Device: A New Model to Estimate Impact. *Disaster Medicine & Public Health Preparedness* 5:P. S146

¹⁶ N.Y. EXC. LAW § 29-a : NY Code - Section 29-A: Suspension of other laws.

¹⁷ National Governors Association. 2007. A Governor's Guide to Homeland Security.

<http://www.emd.wa.gov/grants/documents/03-15-07-govs-guide.pdf>, pp.14-15, and Author email exchange with Thomas Maclellan, National Governors Association.

¹⁸ The FBI's role derives from Homeland Security Presidential Directive-5 and is defined in the National Response Framework's "Terrorism Incident Law Enforcement and Investigation Annex."

¹⁹ Government of Japan. 2012. Road to Recovery. Tokyo, Japan: Reconstruction Agency, p. 3,

http://www.kantei.go.jp/foreign/policy/documents/2012/_icsFiles/afieldfile/2012/03/07/road_to_recovery.pdf.

²⁰ See, for example, *Voices of Fukushima's Evacuees*. Available from

<http://www.nytimes.com/interactive/2011/12/06/world/asia/Voices-of-Fukushima-Evacuees.html>.

²¹ For various estimates of the number of Katrina evacuees who arrived and remained in these two cities after one year, see Dyer, Scott. 2006. Overflow City. *Planning* 72 (4):28-31; Chamlee-Wright, Emily, and Daniel M. Rothschild. 2008. Hosting a Disaster: Tips for Host Cities. *Mercatus on Policy* 23, p.1; Axtman, Kris. 2006. With bulk of Katrina evacuees, Texans begin to feel burden. *The Christian Science Monitor*, August 22; Sallee, Rad. 2007. County to get \$20 million for Aiding Evacuees. *The Houston Chronicle*, November 7.

²² Excellent sources of these perspectives include the testimony of nine witnesses at U.S. Senate 2007, Committee on Homeland Security and Governmental Affairs. *Host Communities: Analyzing the Role and Needs of Communities that Take in Disaster Evacuees in the Wake of Major Disasters and Catastrophes*. December 3; Perry, Rick, and Michael Williams. 2006. Texas Rebounds: Helping our Communities and Neighbors Recover from Hurricanes Rita and Katrina. <http://www.governor.state.tx.us/files/press-office/Texas-Rebounds.pdf>.

<http://www.hsgac.senate.gov/hearings/host-communities-analyzing-the-role-and-needs-of-communities-that-take-in-disaster-evacuees-in-the-wake-of-major-disasters-and-catastrophes>; Feldman, Claudia. 2006.

Overburdened Long Before Katrina, the Public Mental Health Network Here Is finding it Impossible to Meet Need.

Houston Chronicle, August 20; Markley, Melanie. 2007. Making Therapy Free for Those in Need; Pro bono Push Began as Katrina Evacuees Arrived. *The Houston Chronicle*, February 4; Nichols, Bruce. 2006. Houston Weary of Katrina Evacuees: Survey Shows Stresses from Absorbing 150,000 from Storm. *The Dallas Morning News*, April 15.

²³ U.S. Coast Guard. 2011. BP Deepwater Horizon Oil Spill: Incident Specific Preparedness Review.

<http://www.uscg.mil/foia/docs/dwh/bpdwh.pdf>, p.60; and Allen, Thad W. 2010. National Incident Commander's Report: MC252 Deepwater Horizon. [http://www.nrt.org/production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1065NICReport/\\$File/Binder1.pdf](http://www.nrt.org/production/NRT/NRTWeb.nsf/AllAttachmentsByTitle/SA-1065NICReport/$File/Binder1.pdf), p.12.

²⁴ National Commission on the BP Deepwater Horizon Oil Spill. *Deepwater: The Gulf Oil Disaster and the Future of Offshore Drilling. Report to the President*, 2011,

http://www.oilspillcommission.gov/sites/default/files/documents/DEEPWATER_ReporttothePresident_FINAL.pdf, pp. 138-139, 265; Coast Guard 2011, Incident Specific Preparedness Review, pp. 75-79, and Allen 2010, National Incident Commander's Report, p.17.

²⁵ Coast Guard 2011, Incident Specific Preparedness Review, p.60.

²⁶ Ibid.