Snapshot From Superstorm Sandy: American Red Cross Mental Health Risk Surveillance in Lower New York State

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Study objective: Disasters often cause psychological injury, as well as dramatic physical damage. Epidemiologic research has identified a set of disaster experiences and predisposing characteristics that place survivors at risk for post traumatic stress disorder (PTSD), depression, and anxiety. Rapid triage of at-risk survivors could have benefits for individual and population-level outcomes. We examine American Red Cross mental health risk surveillance data collected from October 29 to November 20, 2012, immediately after Hurricane Sandy in 8 lower New York State counties to evaluate the feasibility and utility of collecting these data.

Methods: PsySTART, an evidence-based disaster mental health triage tool, was used to record survivor-reported risk factors after each survivor contact. Red Cross disaster mental health volunteers interfaced with survivors at disaster operation sites, including shelters, emergency aid stations, and mobile feeding and community outreach centers. Risk data were called into the operations center each day and reported by county.

Results: PsySTART risk surveillance data for 18,823 disaster mental health contacts are presented for adults and children. A total of 17,979 risk factors were reported. Overall levels of risk per contact were statistically different ($\chi^2_{(1,\ N=6,045)}=248.1$; $P<.001$) across the 8 counties. Survivors with high levels of risk were found in locations apart from the areas with the greatest physical damage.

Conclusion: Aggregated PsySTART data in Superstorm Sandy indicate substantial population-level impact suggestive of risk for disorders that may persist chronically without treatment. Mental health triage has the potential to improve care of individual disaster survivors, as well as inform disaster management, local health providers, and public health officials. [Ann Emerg Med. 2013;■:1-7.]

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INTRODUCTION

Background

Superstorm Sandy, the largest hurricane ever recorded along the northeastern seaboard of the United States, struck the mid-Atlantic region on October 29, 2012, with high winds and a huge storm surge. Many coastal areas, including New York City, experienced severe flooding and wind damage. Thousands were evacuated from low-lying areas and were forced to flee to family, friends, shelters, or alternative medical facilities; others remained in their homes and struggled with home damage and loss of electricity, heat, and gasoline. Forty-three deaths in the 5 boroughs of New York City and 14 on Long Island were attributed to the storm, mostly among older persons because of flooding.[1] The American Red Cross immediately mounted its largest response since Hurricane Katrina. Among the many services provided by Red Cross disaster relief is assistance from disaster mental health volunteers who work in shelters, bulk supply distribution centers, roving feeding stations, and door-to-door home visits. During the first several weeks, in New York State alone, more than 200 local and nationally deployed disaster mental health volunteers engaged in more than 18,000 mental health contacts with survivors in the 8 lower counties of New York State.

Importance

Epidemiologic research from disasters around the globe has identified a set of disaster experiences or exposures that are associated with risk of acute and subsequent psychological distress and impairment.[2-5] Indeed, longitudinal surveys find that as the dose of exposure increases, the likelihood of new-incidence disorder and impairment also increases.[6-8] It is typical for many survivors to display immediate distress after a disaster; however, not all have experienced the types of exposures that increase risk for long-term PTSD, depression, and anxiety.[3,9] Thus, in the immediate aftermath (≈30 days), overt distress symptoms belie who is at risk: those at risk can "look" the same as those without risk. Moreover, acute distress has minimal predictive value in the early aftermath of disaster.[3,9] For example, a diagnosis of acute stress disorder in the first month after a traumatic event does not identify the majority of individuals who develop an enduring disorder assessed a year later.[10]

Editor's Capsule Summary

What is already known on this topic

Disasters can cause short- and long-term psychological damage to survivors.

What question this study addressed

This 8-county ecological study of a convenience sample of 18,823 survivors of Superstorm Sandy used a standardized reporting form (PsySTART) to examine the psychological risk of persons who have lived through a disaster.

What this study adds to our knowledge

Insight into the psychological status and mental health needs of persons who have recently lived through a disaster.

How this is relevant to clinical practice

This assessment method, if validated in future disasters, may help identify individuals with immediate and longer-term need for psychological treatment and support.

This challenges informed delivery of immediate mental health services and the ability to estimate the degree of psychological injury within the population of affected communities and across regions. Moreover, the majority of people who experience trauma and who transition into new-incidence disorder and impairment do not receive timely or appropriate treatment,[11] in part because of the lack of early recognition and assessment of their injury.[12]

Goals of This Investigation

This article describes a novel mental health surveillance and triage tool, PsySTART, which has been adopted by Red Cross disaster operations in the last several years. PsySTART records the presence of a set of traumatic exposures, losses, health effects, and predisaster risk factors (previous mental health care or disaster experience) in individuals in the immediate aftermath of disaster. This tool facilitates informed delivery of psychological first aid and connections for secondary assessment and care that might be needed in the period of disaster recovery to mitigate long-term disorders. Red Cross disaster mental health workers used PsySTART during Superstorm Sandy disaster operations, and this is the first report of PsySTART disaster surveillance data from a Red Cross disaster operation. Risk factor data are reported for the 8 counties of New York State along the coastline and New York City.

MATERIALS AND METHODS

Study Design and Setting

Superstorm Sandy affected a number of states along the eastern seaboard and inland areas. The Red Cross organizes its disaster operations by geographic area. This article reports on data from Red Cross Disaster Response Operation 145-13 in lower New York State.

This is a routine data-based study using aggregated (ecological) data collected by disaster mental health workers at Red Cross disaster service sites in the month after landfall of Superstorm Sandy in October to November 2012. Collection of these data is now routine within the Red Cross during disaster operations. Because of pragmatic issues associated with the time necessary to place disaster workers in affected regions and putting in place the logistic framework for collection of data, the first several days of response often have few data, as was the case in the Sandy operation. As the response expands, greater numbers of disaster mental health workers are in place calling into the disaster operations center PsySTART information about their survivor contacts daily.

Selection of Participants

Privacy and safety are 2 of the highest priorities of the Red Cross as it serves disaster survivors. As a result, current policy is to record only whether the contact by disaster mental health was with an adult ($\geq$18 years) or child; no other demographic or identifying information is recorded. Disaster mental health can have a survivor contact at any location in the disaster region (eg, in a subway station, at a shelter, food distribution sites, roving emergency response vehicles, hospitals, morgues). Thus, the data are not systematic and epidemiologic but represent those individuals who are encountered by a Red Cross disaster mental health worker at service delivery sites and community outreach efforts. As staffing allows, disaster mental health workers reach out to as many survivors as possible. Likewise, especially at shelters where survivors may stay for a time, PsySTART data from a single individual may be recorded several times because of multiple contacts with disaster mental health during the days and weeks of disaster recovery.

Methods of Measurement

Disaster mental health response that prioritizes focusing on trauma exposure is more effective than simply responding to visible acute distress. This approach is in stark contrast to traditional approaches, in which disaster mental health workers relied heavily on overt distress to direct their efforts. Epidemiologic research has shown that exposure to certain types of disaster trauma is associated with significant increased risk of psychiatric disorders in subsequent years.[2-4,13,14]

PsySTART includes 13 risk factors plus an item to explicitly indicate no observed risk (Figure 1), as well as an item to capture acute suicidal or homicidal ideation. Each day, disaster mental health workers carry a PsySTART recording sheet with them. Red Cross disaster mental health workers receive training in the use of the PsySTART tool in 2 Red Cross courses, Foundations of Disaster Mental Health and Psychological First Aid, as well as "just in time" training on arrival at a disaster operation. As disaster mental health responders interact with survivors, they

Risk Factors

Extreme panic/fear

Felt life threat

Saw/heard injury/death

Family member death

Pet death

Disaster-related physical injury

Trapped/delayed evacuation

Family member currently missing

Child currently unaccompanied

Home not livable

Family separated during event

Mental health history

Disaster/trauma history

No risk factors observed

Acute Assessment Required

Danger to self or others

Figure 1. PsySTART items

listen for and record disaster exposure experiences as adults and children tell their disaster "story." After the encounter, in less than a minute the observed risks and the adult/child status of the survivor are checked off on the PsySTART sheet. To improve the accuracy of the reporting, a box is available for "no risk factors" to clearly communicate the risk status on that individual. Disaster mental health workers do not record "casual" exchanges; records are limited to meaningful interactions, usually a minimum of 15 minutes. At the end of the disaster mental health worker's shift, data from the PsySTART recording tool are given to a supervisor or called directly into the disaster operation headquarters. The data are entered on a separate data sheet for each day and then aggregated by county for each 24-hour period. Aggregation by county is consistent with the geographic organization of emergency services, thus enabling disaster operation managers to monitor their region.

Red Cross uses an observer model for PsySTART assessment, rather than a systematic interview of the risk factors to preserve the compassionate and supportive role of disaster mental health workers. This reduces the discomfort and potential stigma of a mental health interaction in these nonclinical settings when the disaster mental health worker does not routinely conduct a formal evaluation. Nevertheless, experienced disaster mental health workers familiar with PsySTART are skilled at weaving questions into their exchange with the survivor to elicit disaster exposures. However, because the risks are not routinely and explicitly queried, PsySTART data may underestimate risk exposure.

PsySTART can serve a triage function in large disasters, especially when disaster mental health staff is limited. They can use the PsySTART tool to prioritize services to survivors in greatest need. These individual risk factors are also aggregated to create disaster-wide risk metrics that can directly inform estimates of population-level mental health risk in the sites where it is captured, the need for additional manpower and types of resources (eg, child mental health specialists), and plans for long-term recovery. Thus, PsySTART is a tool to facilitate standardized individual mental health triage and to create surveillance information to help manage disaster-related mental health emergencies in shelters, emergency departments (EDs), and other disaster response settings to facilitate a coordinated approach and align resources equitably consistent with recent Institute of Medicine recommendations on crisis standards of care in disasters.[15]

PsySTART risk ratios were calculated by summing the number of risk factors reported across all survivor contacts and dividing by the number of survivor contacts. χ^2 was used to determine whether risk varied by county across all 8 counties and specifically between Richmond and Suffolk Counties.

RESULTS

PsySTART data are reported for the first 3 weeks of the Red Cross disaster response (October 30 to November 23, 2012). These data are based on 18,823 disaster mental health contacts in the lower 8 counties of New York State, 9% younger than 18 years. Across these contacts, a total of 17,979 risk factors were recorded. The Table lists each risk factor and the number of contacts in which the risk was observed. There was a high degree of variability in the number of survivor contacts by county, ranging from 61 in Westchester County to 6,620 in Nassau County. In addition, there were 39 contacts in which "danger to self/others" was recorded, which was less than 1% of all contacts. Ten were in Nassau County and 15 in Richmond County.

A per-contact risk ratio was computed to convey the average number of risk factors observed per contact for each county. It ranged from 0.67 for Suffolk County to 2.00 for Bronx County. Figure 2 displays the geography of the 8 counties and the associated risk ratios. To determine whether the level of risk varied by county a χ^2 was computed (number of contacts with risk/number without risk by 8 counties). It was highly significant ($\chi^2_{(7,\ N=18,823)}=385.0$; $P<.001$).

Red Cross organizes the aggregated PsySTART data daily in ways that facilitate rapid visual evaluation of risk profiles for each county. Richmond County (Staten Island) and Suffolk County on eastern Long Island were 2 of the disaster-affected counties along the Atlantic coastline. PsySTART data were collected on more than 3,000 contacts in each county. For the purpose of illustrating geographic comparisons, we compare rates of risk in Richmond County to those of Suffolk County (Figure 3). Differences in visual inspection are confirmed with a χ^2 analysis that found significance in the difference in overall level of risk

Table. PsySTART risk factors by county among contacted survivors in the aftermath of Hurricane Sandy.

	New York Counties, No. (%)							
PsySTART Risk Factors	**Westchester**	**Bronx**	**New York**	**Richmond**	**Kings**	**Queens**	**Nassau**	**Suffolk**
Extreme panic/fear	2 (3)	34 (11)	5 (6)	547 (18)	201 (12)	330 (8)	310 (5)	259 (9)
Felt life threat	5 (8)	50 (16)	0	439 (14)	81 (5)	298 (7)	199 (3)	117 (4)
Saw/heard injury/death	0	4 (1)	0	327 (11)	40 (2)	71 (2)	54 (3)	24 (1)
Family member death	0	0	0	27 (1)	9 (1)	20 (<1)	9 (<1)	3 (<1)
Pet death	1 (2)	0	0	47 (2)	7 (<1)	21 (1)	29 (<1)	0
Disaster physical injury	1 (2)	0	0	37 (1)	32 (2)	42 (1)	62 (1)	36 (1)
Trapped/delayed evacuation	11 (18)	30 (10)	4 (5)	322 (11)	235 (14)	505 (12)	307 (5)	90 (3)
Missing family member	1 (2)	10 (3)	0	79 (3)	13 (1)	22 (1)	113 (2)	20 (1)
Child currently unaccompanied	0	0	0	10 (<1)	1 (<1)	9 (<1)	32 (<1)	1 (<1)
Home not livable	32 (52)	247 (79)	46 (53)	1,582 (52)	641 (39)	2,036 (50)	2,100 (32)	800 (27)
Family separated during event	4 (7)	2 (1)	0	49 (2)	51 (3)	38 (1)	76 (1)	9 (<1)
Mental health history	21 (34)	240 (77)	13 (15)	92 (3)	314 (19)	243 (6)	817 (12)	341 (11)
Disaster/trauma history	20 (33)	6 (2)	5 (6)	240 (8)	162 (10)	494 (12)	1,335 (20)	328 (11)
No risk identified*	12 (20)	6 (2)	30 (35)	365 (12)	232 (14)	920 (23)	1,289 (19)	849 (28)
Total reported risk factors	98	623	73	3,798	1,787	4,129	5,443	2,028
Total number survivor contacts	61	311	86	3,039	1,655	4,045	6,620	3,006
Risk ratio per contact	1.61	2.00	0.85	1.25	1.08	1.02	0.82	0.67
Age distribution of contacts								
Adults	52 (85)	309 (99)	69 (80)	2,841 (93)	1,516 (92)	3,432 (85)	6,191 (94)	2,749 (81)
Children	9 (15)	2 (1)	17 (20)	198 (7)	139 (8)	613 (15)	429 (6)	257 (9)

*No risk identified indicates the number of survivor contacts in which a risk factor was not detected.

in the 2 counties ($\chi^2_{(1,\ N=6,045)}=248.1$; $P<.001$). Twice as many contacts in Richmond reported extreme panic/fear (18% versus 9%), and more than 3 times as many reported feeling their life was threatened (14% versus 4%). Likewise, double the number of contacts in Richmond reported loss of home (52% versus 27%). Overall, Richmond contacts had on average 1.25 risk factors, whereas Suffolk contacts had half as many (0.67).

DISCUSSION

This snapshot of mental health risk captured during the first weeks after New York disaster relief operations for Superstorm Sandy is the first information of this type to be reported, to our knowledge. It represents an important evidence-driven innovation for guiding mental health incident operations in disaster relief, the ED, and other key disaster systems of care settings. It demonstrates the feasibility and utility of having Red Cross disaster mental health volunteers collect this information from a large geographic area and communicate the data to the disaster operations center within the chaotic nature of the initial phase of disaster response. It provides near real-time situational awareness and a common operating picture. Within days of Superstorm Sandy's landfall, Red Cross had disaster mental health workers in all 8 counties of lower New York State.

PsySTART data from this operation provided important information on Red Cross disaster mental health incident response tactics. They reflected where Red Cross disaster mental health workers were making contact with survivors and where

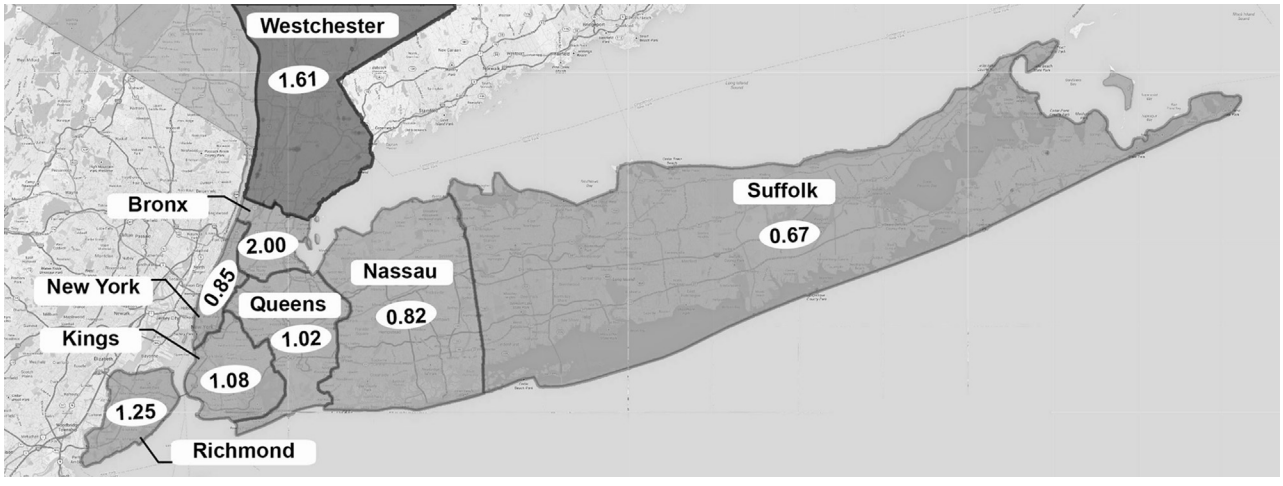

Figure 2. Geography of reporting counties with aggregate per-contact risk.

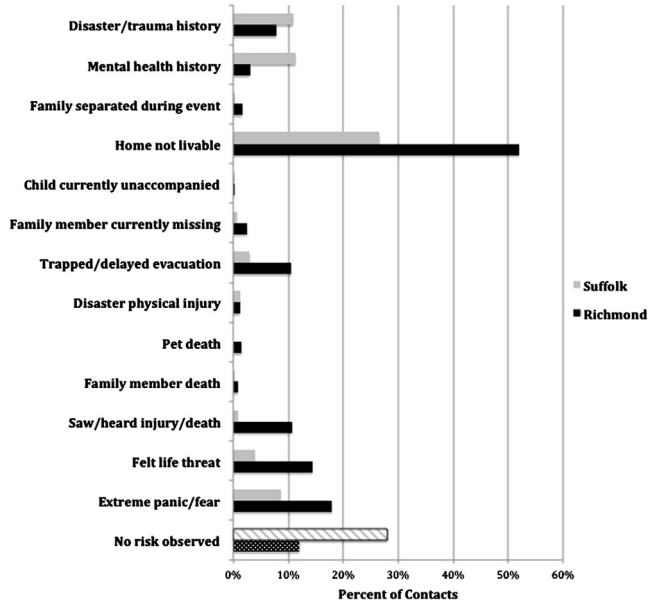

Figure 3. PsySTART risk factors for Richmond and Suffolk Counties: percentage of contacts.

they were not but may need to. For example, the number of contacts in New York County (Manhattan) was low relative to the size of the affected population and the storm impact, owing, in part, to many of the shelters and other services being provided by agencies other than Red Cross and to the initial difficulty of placing Red Cross disaster mental health workers in Manhattan. Another finding was the number of contacts and the level of observed risk in contacts in the Bronx and Westchester areas that are geographically away from the water surge. The survivors being served in those areas had been evacuated north away from the flood zones or had experienced severe home damage or deaths because of wind damage in areas above the city. Thus, although the contacts were relatively far from the areas with the most severe physical effect, PsySTART alerted the disaster operations leadership to locations of significant psychological injury and need. In fact, this is one of the major assets of PsySTART: its ability to identify psychological impact that is outside the physical damage area. It highlights the need to avoid isomorphic assumptions about patterns of risk and instead rely on aggregated risk data emanating from discrete sites. Tornados are another example of this. Although their home may be unscathed by the funnel, survivors who seek shelter and hear the "roaring of the train coming through" often report extreme fear, feel direct threat to life, and may not know whether their family members are safe, each a PsySTART risk factor. Survivors in these physically undamaged areas can be ignored in disaster operations, yet they have experienced psychological injury and deserve attention along with those with damaged homes and businesses.

At an individual level, PsySTART enables field disaster responders and hospital-based providers to recognize risk factors in survivors and to use that information to guide their interactions and actions.[16] The individual triage aspect of PsySTART informs providers which survivors are in greater need of attention, particularly in operations with many thousands of survivors. Emerging evidence suggests that evidence-based, rapid, trauma-focused treatment can achieve higher rates of improvement with fewer treatment visits compared with delayed treatment.[17-20] Thus, a current goal is to use PsySTART for early triage followed by secondary assessment and, when indicated, referral for services. This could have significant public mental health implications and holds the potential to improve resilience and clinical outcomes.

The Red Cross recently adopted PsySTART based upon the experience and evidence of international teams responding to tsunami disasters. Two large disaster operations coordinated by the Centers for Disease Control and Prevention, the US Public Health Service, and other federal and international offices used PsySTART to conduct psychological risk surveillance and to improve mental health recovery efforts in Thailand and American Samoa.[6,21] Longitudinal assessment of survivors confirmed the increased risk for posttraumatic stress disorder and depression in the months after the disaster among survivors testing positive for PsySTART factors.[5,22] Indeed, there is evidence showing that multiple risk factors convey substantially higher burden of disorder in both adults and children.[6,8,23]

At the population level, more comprehensive approaches to psychological risk surveillance can also inform health providers, EDs, disaster managers, and public health officials of observed risk, using geographic information to prioritize and rationally allocate limited mental health resources. Just as physical damage assessment teams are deployed at the onset of a disaster operation to locate and characterize the effect of the disaster so also teams should survey the psychological effect, and although there will be overlap in these geographic regions, they will not be synonymous. This approach is consistent with Institute of Medicine recommendations for crisis standards of care in large-scale events.[15] PsySTART data that are captured daily enable near "real time situational awareness" and a "common operating picture" that can be shared with local, state, and federal health authorities to improve decision support and coordinated response. This facilitates maximal use of mental health resources within the Red Cross and across partner organizations during the immediate response and during long-term recovery to individuals at heightened risk. During the New York Superstorm Sandy relief operation, markedly higher rates of risk were observed in Richmond County than in Suffolk County. Additionally, higher risk levels were observed in the Bronx and Westchester. These aggregated county-level data validated the strategy to prioritize deployment of disaster mental health workers to areas that were seriously affected by the storm and to those that were not, where higher-risk individuals were thought to have evacuated. In contrast, counties where lower levels of risk were anticipated or observed were prioritized much lower for the deployment of disaster mental health resources. This approach is among the guidelines outlined by the American Red Cross.[24]

PsySTART is neither a diagnostic tool nor a sufficient stand-alone means for determining the need for clinical care. As implemented by the Red Cross, after every disaster mental health encounter, disaster mental health workers record

deidentified survivor reports of trauma risk factors revealed in the survivor's narrative. Because the same survivor may interact with disaster mental health staff more than once during disaster operations, PsySTART data represent risk associated with cumulative survivor encounters, not individual survivors. This approach has obvious strengths and weaknesses. Strengths include rapid, unobtrusive assessment in chaotic environments, eliminating concerns about confidentiality, and the need to create mechanisms to track individuals for nonduplication of risk assessment. Additionally, by daily tracking of relative risk density (total risk factors/number of contacts), needs for mental health staffing can be identified that reflect the ongoing shifts in populations at sites such as shelters. Weaknesses include potential multiple encounter bias, and the absence of individual demographic characteristics, other than noting adult and child contacts, that would permit identification of subgroups with variable levels of risk. In addition, in large events such as Sandy, disaster mental health workers often are not able to interact with all disaster survivors. Survivors who are difficult to access will not be represented in the data. Some of these survivors could be trapped in areas where initially it is not possible for emergency vehicles to penetrate. However, sooner or later, the waters recede, roads or bridges are repaired, or helicopters are enlisted and disaster mental health workers accompany the disaster teams that go into these areas. There are also disaster survivors who decline disaster assistance and who do not access any service delivery centers. These survivors' risk is not assessed and remains unknown. Nevertheless, the implementation of PsySTART by the American Red Cross has propelled disaster mental health operations into a new era with the potential to significantly improve services for survivors and community awareness for recovery planning, with broad applicability to other key disaster settings, including EDs and field hospitals.

Looking ahead, the next-generation system includes PsySTART Mweb, a mobile-optimized smart-phone application using Web-based computing, that may further speed the capture of mental health surveillance information with improved accuracy in real time. The PsySTART Mweb system is currently being piloted in 83 hospitals in Los Angeles County, as well as EDs in the District of Columbia, 18 counties in Texas, and Minnesota. Providers will be able to electronically record risk factors and geographic location with instantaneous aggregation, eliminating the current need for paper records to be manually entered into a database. In recent years, even in large disasters, cellular telephone service has usually been maintained. However, it is not hard to imagine events that would seriously affect telecommunication networks and that would require reverting to paper records.

The routine collection of PsySTART data on Red Cross disaster operations is a first step in the advancement of the practice and the science of disaster mental health. With a volunteer disaster response workforce becoming increasingly familiar with the tool and leadership learning how to glean important information to drive decisionmaking and to plan for long-term recovery, there is the potential to deliver smarter and more effective disaster mental health services. Too many survivors of disaster slowly recover from the physical damage, yet remain burdened by their psychological injuries long after recovery.[12] Identifying individuals at risk and developing protocols for shepherding them to secondary assessment and, if indicated, rapid treatment would be a tremendous advance in reducing the largely invisible psychological sequelae of disasters.

There also are tremendous opportunities for research that could further our understanding of the relative effect of different trauma experiences and for different demographic subgroups. Indeed, there is evidence that some risk factors convey greater risk than others.[25] For example, the risk factor "felt/expressed extreme fear or panic" was found to have the largest odds ratio for predicting PTSD in the Thailand tsunami work.[6] This finding is also observed in meta-analytic evidence that peritraumatic panic is among the strongest predictors of PTSD outcomes.[4] There is also evidence for both adults and children that suggests that multiple risk factors convey multiplicative increased risk for a clinical PTSD outcome.[8,25] Can we further distinguish among individuals with risk exposures who will be resilient and those who will progress to psychiatric disorder? Does risk predict higher use of emergency and routine medical care? How do trauma exposures interact with preexisting psychiatric conditions, including adherence to medication and other interventions? Is risk associated with exacerbation of preexisting medical conditions? Will rapid identification of risk and delivery of trauma-focused treatment successfully mitigate the long-term impact of the psychological injuries?

In conclusion, the American Red Cross has demonstrated the feasibility and utility of using a novel mental health and surveillance tool to advance the delivery of disaster mental health services in the context of a large, chaotic disaster. The PsySTART data collected in the lower New York State disaster operation of Superstorm Sandy covering 8 counties indicated varying levels of psychological injury and risk for long-term disability among the contacted survivors. These data inform the response to individual survivors, as well as provide important surveillance information to emergency managers, public health officials, and those planning long-term recovery efforts. Future directions include electronic data capture of risk factors, as well as preparedness initiatives that develop protocols for providing at-risk survivors with access to rapid, evidence-based, trauma-focused treatment to mitigate the long-term effects of the psychological injury.

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