

# REVIEW

## Willingness of Health Care Personnel to Work in a Disaster: An Integrative Review of the Literature

Mary Chaffee, PhD, RN, FAAN

### ABSTRACT

Effective hospital surge response in disaster depends largely on an adequate number of personnel to provide care. Studies appearing since 1991 indicate health care personnel may not be willing to work in all disaster situations—and if so, this could degrade surge response. A systematic review of the literature was conducted to determine the state of the evidence concerning the willingness of health care personnel to work in disaster. The aims of this review are to collate and assess the literature concerning willingness of health care personnel to work during a disaster, to identify gaps in the literature as areas for future investigation, and to facilitate evidence-based disaster planning. Twenty-seven studies met inclusion criteria (25 quantitative and 2 qualitative studies). The current evidence indicates there may be certain factors related to willingness to work (or lack of willingness) in disaster including the type of disaster, concern for family, and concerns about personal safety. Barriers to willingness to work have been identified including pet care needs and the lack of personal protective equipment. This review describes the state of an emerging area of science. These findings have significant implications for community and organizational emergency planning and policymaking in an environment defined by limited resources. (*Disaster Med Public Health Preparedness*. 2009;3:42–56)

**Key Words:** willingness, disaster, work, hospital, personnel

The willingness of personnel to provide health care services in a disaster has serious implications for access to health care and the quality of the care provided in a disaster. This issue has been identified as an “untilled or undertilled” research area.<sup>1</sup> Thus, a review of the current literature regarding willingness to work in disaster can provide critical information for policymakers, planners, and health care personnel as well as identify gaps for researchers to explore.

Auf der Heide<sup>2</sup> stated “disaster planning is only as good as the assumptions on which it is based.” The reality of disaster response is that health care personnel may face competing duties to employers, patients, family, loved ones, and self.<sup>3</sup> It is important to understand how personnel may make decisions when facing competing duties so that plans, policies, and organizational decisions can be based on the best evidence available. Willingness to work in disaster is one area in which hospitals and communities may be making assumptions not based on evidence, and this could have serious consequences. For example, Gershon et al<sup>4</sup> reported that both the New York city and state avian influenza plans depend on home health care workers to provide home care to patients in an outbreak. However, in a recent study they found that only 11% of home health workers and 37% of registered nurses would be willing to provide care for

patients during such an outbreak.<sup>4</sup> The plans do not reflect the evidence—and would likely falter due to lack of personnel to provide care as expected.

Although many definitions of disaster have been proposed, there is general agreement that disaster is an inherently social phenomenon involving disruption of an organized human social system.<sup>5</sup> Disasters are likely to cause a sudden and possibly massive demand for services in health care facilities.<sup>6</sup> Surge response (often referred to as surge capacity) is defined as the ability of a health care facility or system to rapidly expand its operations to safely treat an abnormally large influx of patients in response to an incident.<sup>7</sup> Surge response depends on the availability of 3 elements: personnel, equipment and supplies, and structure (facilities and organization).<sup>8</sup> All 3 are important, however, response to a surge in a hospital or other health care organization cannot be successful without adequate personnel to provide patient care and other personnel to support care delivery. Thus it becomes imperative to better understand how hospital personnel may actually behave when faced with a disaster.

Studies over time have shown that people tend to demonstrate responsible, positive, and adaptive behavior in disaster including compliance, orderliness,

and altruism.<sup>9,10</sup> The concept of role abandonment, including how individuals with disaster-related responsibilities would perform in light of family obligations, raised interest and was examined in the 1950s and 1960s and in a later study by Dynes.<sup>11</sup> It was found that some individuals do experience role conflict but almost never abandon their occupational roles due to family conflicts.<sup>12</sup> Quarantelli<sup>13</sup> studied more than 6000 emergency workers in natural disasters that occurred between 1964 and 1974 and found no evidence of role abandonment. However, recently the vulnerability of societies to disaster has increased,<sup>14</sup> the nature of disaster has evolved to include the potential for industrial and technological catastrophe,<sup>15</sup> the risk of terrorism has emerged,<sup>16,17</sup> and the direct risks to health care personnel in biological outbreaks such as severe acute respiratory syndrome became evident.<sup>18</sup> It is unclear whether previously supported findings remain accurate in a contemporary world environment that includes new threats and risks.<sup>19</sup> Early studies of the willingness of health care personnel to work in certain disaster situations indicate that role abandonment may now be a valid concern.

The purpose of this integrative review is to describe and analyze the state of evidence concerning the willingness of health care personnel to work during disaster. The research question for this review is, "What is known about the willingness of health care personnel to work in disaster?" The main objective is to present the best available evidence about the willingness of health care personnel to work in a disaster.

## METHODS

### Identification of Existing Reviews

A search for existing literature reviews on this topic revealed one that reviewed 8 studies.<sup>20</sup> Although the review was published in 2007, this review proceeded because additional studies were known to exist.

### Inclusion Criteria

1. Research design: Original quantitative or qualitative designs.
2. Primary study participants: Clinical, administrative, and support personnel involved in the delivery of health care services; employment site (eg, hospital, clinic, rescue squad) was not a factor.
3. Outcome measure: Willingness to work in a disaster or public health emergency; variations of wording were accepted including "willingness to report to work," "willingness to care for patients," "willingness to work," "willingness to respond," "willingness to report," "willingness to report to duty," and "willingness to provide care."
4. Research methodologies: Reports of published quantitative and qualitative studies were included in this review. Unpublished reports such as conference proceedings and dissertations were included that met specific criteria.<sup>21</sup>

5. Language of studies: English only.
6. Time period: 1950–2007.
7. Dates of review: September 1 to December 1, 2007.
8. Type of research reports: Peer-reviewed research articles, peer-reviewed research abstracts, peer-reviewed summaries of research findings, and nonpublished reports that were subject to a review and approval process.

### Search Strategy

Six methods were used to identify potential candidates for inclusion in this review:

1. Examination of a systematic review database: The Cochrane Library was searched although reports meeting the criteria for this review were not expected; none were found. The Cochrane Library evaluates reports of clinical outcomes.
2. Electronic database searching: Electronic databases were searched: PubMed, LILACS, CRISP (Computer Retrieval Information on Scientific Projects), PsycINFO, EBSCO Psychological and Behavioral Sciences Collection, and SSCI (Social Sciences Citation Index). Search terms used were "willingness," "work," "disaster," "willingness disaster," "willingness work disaster," "willingness to report," "willingness research," "disaster research," "willingness psychometrics," and "willing\*," with the asterisk indicating any search keyword beginning with "willing."
3. Ancestry searching: The references of each publication selected for inclusion were examined for additional relevant publications.
4. Internet searching: A search of publicly available Internet content was conducted using Google and Google Scholar. The same search terms were used as those used with electronic database searches.
5. Hand-searching: Journals with a specific disaster focus were analyzed issue by issue when available. These included *Australasian Journal of Disaster and Trauma Studies*, *Disasters*, *Disaster Medicine and Public Health Preparedness*, *The Internet Journal of Rescue and Disaster Medicine*, and *Disaster Management and Response*.
6. Networking: Individuals with a known interest in the topic were contacted.

### Screening

Research reports were screened using a 3-stage process described by Gifford et al.<sup>22</sup> Articles titles were reviewed for potential relevance and either retained for additional review or discarded. Next, abstracts appearing relevant were reviewed using the inclusion criteria and then retained for further evaluation or discarded. In the third step, full articles were reviewed with the inclusion criteria being applied. The studies included in this review were evaluated using a checklist of specific aspects of quality, reliability, and validity developed by the researcher.

## Integration of Quantitative and Qualitative Studies

Current methods of evidence synthesis tend to favor quantitative data only and systematic reviews generally do not include qualitative data.<sup>23</sup> However, in complex public health issues, quantitative findings may be insufficient to provide clinicians and others with adequate evidence on which to base decisions.<sup>24</sup> To gain the broadest perspective on willingness to work, quantitative and qualitative studies were included in this review. Narrative summary as described by Dixon-Woods et al<sup>23</sup> was used to select, chronicle, and order evidence from the qualitative studies to present it alongside the quantitative findings (Table 1).

## Study Quality

The studies were evaluated to determine whether an adequate rationale was made to justify the study and whether an explicit purpose was stated.<sup>50</sup> Each study was found to make a clear and logical case for the investigation. Purpose statements were consistently clear. Research questions or hypotheses were articulated in only 3 of the research reports evaluated. Locke et al<sup>51</sup> identified reasons to suspend trust in research, including technical problems brought to the reader's attention, conflicts of interest, carelessness, sampling inadequacy, lack of replication, poor scholarship, and lack of review by a refereed journal. The studies under review did not appear to have any substantive reasons to suspend trust in their findings, although a number did not report all of the study characteristics that are desirable.

## Justification for Inclusion of Gray Literature

The peer-reviewed scientific literature is viewed as the most widely accepted source of research<sup>52</sup> and these reports were most strongly desired for inclusion in this review. There are circumstances under which including research reports from sources other than the peer-reviewed scientific literature may be advantageous in a systematic review. Benzie et al<sup>21</sup> defined criteria for including "gray" (non-peer-reviewed) sources to determine when to include gray literature. Benzie et al<sup>21</sup> recommend using gray literature if the outcome is complex, if there is lack of consensus concerning the measurement of the outcome, and if there is a low volume of evidence. These criteria were met by this systematic review; thus, gray literature was included. Advantages of using gray literature include that its use may increase the likelihood of a comprehensive search and may offset bias against the null hypothesis.<sup>52</sup> Evaluating the quality of gray literature may be difficult if it is not easily accessible or does not fully describe all aspects of the study. This review includes research abstracts, a doctoral dissertation, and a master's thesis. The research abstracts, although limited in scope, were published in peer-reviewed journals. The thesis and dissertation were evaluated through an academic review and approval process. Both are available online. Table 2 presents a summary of each

report in this review; the type of report (peer-reviewed or not) is noted in the table.

## RESULTS

A total of 27 studies of health care personnel's willingness to work in disaster were identified that met all inclusion criteria for review. Twenty-five were quantitative studies (N = 20,325; range 50–6428) and 2 used qualitative approaches (N = 90; range 30–60). The first report found was a study published in Israel in 1991.<sup>25</sup> No further studies on the topic appeared until 2002, when the first qualitative report appeared. The methodology used most frequently in the quantitative studies was paper-based, self-administered survey (N = 21). Interviews and focus groups were used in the 2 qualitative studies; methodology was not identified in 2 research reports. Twenty-three of the studies that met search criteria were conducted in the United States, and the remainder in Israel, Canada, and Australia. Physicians, nurses, and paramedics were the personnel categories studied most frequently (Figure 1).

## Reliability of Quantitative Studies

Research reports in this review were evaluated for test-retest, alternate form (parallel form), internal consistency, split-half, and interrater reliability.<sup>53–55</sup> Two research reports included evidence of reliability: Crane<sup>38</sup> and Young and Persell<sup>35</sup> report internal consistency reliability. Young and Persell<sup>35</sup> indicated that interrater reliability was evaluated, although findings were not reported (Table 3).

## Validity of Quantitative Studies

Evidence of validity provides the reader with greater confidence that the instrument used in the study did indeed measure what it was expected to measure.<sup>56</sup> (Evidence of validity appears in Table 3.) The types of validity sought were face validity, content validity, construct validity, and criterion validity.

### Face Validity

Not considered evidence of true validity, its presence may encourage participants to respond and may therefore increase response rate.<sup>55</sup> Crane<sup>38</sup> and Young and Persell<sup>35</sup> report that they evaluated face validity.

### Content Validity

Content validity is assessment by content experts, content validity index analysis, content validity ratio, and so forth. Alexander and Wynia<sup>29</sup> report that they assessed content and construct validity a priori but do not describe how. Three investigations used content experts to evaluate the relevance of specific instrument items.

### Construct Validity

Construct validity is hypothesis testing anchored in a conceptual framework, factor analysis, multitrait-multimethod approach, contrasted or known groups approach, and so forth. Balicer et al<sup>40</sup> reported their findings fit well with their theoretical framework (indicating evidence of construct validity).

TABLE 1

## Key Findings in Studies of Willingness of Health Care Personnel to Work in a Disaster (1991–2007)

Year	Study	Key Findings in Chronological Order
1991	Shapira et al <sup>25</sup>	42% of respondents reported being willing to report to work in a chemical attack; this increased to 86% if safety measures were provided. Respondents unwilling to report indicated this was due to fear of leaving home, transportation difficulties, and necessity of caring for family. Previous experience with missile attacks was strongly correlated with willingness to report to work. Variables with the strongest association with willingness to work were sex, disaster plan role, age of youngest child at home, and hospital.
2002	French et al <sup>26</sup>	<i>Participants expressed concern for their family's safety as their primary concern in disasters.</i> <i>Pet care was important to participants; some said they would not come to work if they did not have adequate arrangements for their pets.</i> <i>Concerns were identified regarding the provisions for basic needs of workers in disaster.</i>
2002	Lanzilotti et al <sup>27</sup>	90% of nurses and 83% of physicians were willing to staff a nonhospital field medical facility in a natural disaster. Far fewer were willing in a chemical (59/59%), biological (53/56%), contagious epidemic (49/56%), or radiological incident (45/52%). Physicians and nurses who reported being more knowledgeable and able were more willing to staff a field medical facility in disasters.
2002	Qureshi et al <sup>28</sup>	Nurses' willingness to report to work in an emergency increased from 70% to 82% following emergency preparedness training. Respondents identified perceived barriers to reporting to work in an emergency including child care and eldercare obligations (32%), lack of transportation (14%), and personal health issues (14%).
2003	Alexander and Wynia <sup>29</sup>	80% of respondents were willing to continue to care for patients in the event of an outbreak of an unknown but potentially deadly illness. 40% were willing to put themselves at risk for contracting a deadly illness to save others' lives. 33% would be willing to care for infected smallpox patients even if unvaccinated.
2003	DiGiovanni et al <sup>30</sup>	95% of medical responders indicated they would remain on the job after the hypothetical outbreak was identified as bioterrorism, provided that they received information about medical issues, their work sites were protected, and the community was unlikely to be exposed to another act of bioterrorism.
2003	Chasm et al <sup>31</sup>	27% of respondents indicated they would leave the ED if called to care for victims of the toxins listed. 9% of physicians responding indicated they would vacate the ED and would not expose themselves or their family members. 28% of respondents indicated they would have great concern for their personal safety if exposed.
2003	Martens et al <sup>32</sup>	85% of respondents indicated they would be willing to work in the event of a multiple trauma or weather event; this decreases to 22% willing to work in a nuclear, biological, or chemical event. Barriers to willingness to work included child care and family commitments; facilitating factors included security at work, training, shelter, and medical care.
2004	Gullion <sup>33</sup>	47.6% of participants would be unwilling to care for smallpox patients if they were unvaccinated. 18.9% of respondents were unwilling to put themselves at risk for contracting a deadly illness to save others' lives. 20.2% of respondents were unwilling to care for a patient with a communicable respiratory infection such as severe acute respiratory syndrome.
2004	Steffen et al <sup>34</sup>	Participants were more willing to work additional hours to care for airplane crash victims than victims of a biological outbreak or radiological exposure. Controlling for age, occupation, and parental status, males were willing to work on average 7.47 hours longer than females. Respondents with children were willing to work the same number of hours as those without children.
2004	Young and Persell <sup>35</sup>	74% of respondents identified protection as their primary concern in a terror attack. 90% of students stated they would not work with contagious victims if their families did not receive the appropriate prophylaxis.
2005	Cowan et al <sup>36</sup>	68% of physicians would be somewhat willing or very willing to evaluate patients with suspected reactions to smallpox vaccine. 59% of respondents would be willing to provide contact information for their practice to a federal registry of emergency smallpox vaccinators. 44% would be willing to be a vaccinator in a public health clinic.
2005	DiMaggio et al <sup>37</sup>	Willingness to respond ranged from 84.1% (snowstorm) to 64.8% (smallpox outbreak). Sense of responsibility (83.3%) and ability to provide care (77.3%) were identified as the predominant reasons for willingness to respond. Concern for family (44.3%) was the most frequently cited reason for unwillingness to respond. Respondents who had received terrorism-related training in the previous 2 years were twice as likely to be willing to respond.
2005	Crane <sup>38</sup>	32% of participants were competent and willing to respond to a bioterrorism attack. 83% of respondents were willing to respond in their local community; 54% were willing to respond within the state.

(Continued)

TABLE 1

## Key Findings in Studies of Willingness of Health Care Personnel to Work in a Disaster (1991–2007) (Continued)

Year	Study	Key Findings in Chronological Order
2005	Qureshi et al <sup>39</sup>	More than half of respondents reported they had child care obligations, 27% had eldercare obligations, and 29% had a spouse who would also be expected to report to work in a disaster. Respondents were most willing to report to work in a snowstorm, mass casualty, and environmental disaster. Respondents were least willing to report in chemical, smallpox, radiation, and severe acute respiratory syndrome events. The most frequently cited reason for unwillingness to report to duty was fear and concern for the safety of families and themselves.
2006	Balicer et al <sup>40</sup>	53% of respondents reported they would be likely to report to work in a pandemic flu emergency. 33% of respondents thought of themselves as knowledgeable about the public health impact of pandemic flu. Increased likelihood of reporting to work during a pandemic was associated with perception of the capacity to communicate effectively, perceived importance of one's role in the agency's overall response, and familiarity with one's role-specific response in an emergency.
2006	Katz et al <sup>41</sup>	73.8% of dentists surveyed indicated willingness to provide assistance in the state's bioterrorism response efforts. Only 2.3% of dentists surveyed reported having received bioterrorism preparedness training. 9.2% of respondents indicated that they would be able to effectively respond to bioterrorism.
2006	Shaw et al <sup>42</sup>	<i>All physicians interviewed indicated they would be willing to continue working in a pandemic, but 55 of 60 physicians interviewed indicated that they would not continue to work if PPE was unavailable.</i>
2006	Hogg et al <sup>43</sup>	21% of respondents were unwilling to be contacted in the event of a public health emergency. Of physicians willing to help (75%), most indicated they would be willing to help with immunizations clinics (94%) and medication distribution (84%); 58% indicated they would be willing to assist in assessment and treatment centers (52%).
2006	Cone et al <sup>44</sup>	87% of respondents were willing to work after a fire/rescue/collapse mass casualty incident; 58% were willing to work in a biological or chemical event. 75%–82% were willing to work in various natural disasters or weather-related events. 21% indicated that they had conflicting emergency response obligations. Most frequent support needs were identified as long distance telephone service (41%), mail access (34%), pet care (33%), and child care (30%).
2007	Syrett et al <sup>45</sup>	Rate of willingness to report varied from 18% to 84%. When (hypothetically) health care workers fell ill, respondent's willingness to respond was 55%.
2007	Schechter <sup>46</sup>	80% of respondents were both willing and able to respond to a public health emergency. Primary barriers to willingness to respond were concern for personal health and safety, and lack of PPE. Primary enablers of response were ensuring family care and adequate training.
2007	Mackler et al <sup>47</sup>	More than 80% polled would not remain on duty if there were no vaccine and no protective gear. Even if PPE is available, if vaccine is not, only 39% of respondents would remain on duty. If fully protected, 91% of respondents would remain on duty but this drops to 38% if their family is not protected. If no vaccine and no PPE are available, no one responded that they would "definitely" remain on duty.
2007	Kruus et al <sup>48</sup>	Anticipated effectiveness and importance of working predicted health care workers' willingness and ability to work in disasters.
2007	Irvin et al <sup>49</sup>	50% of respondents indicated they would be willing to report to work in the event of an avian flu pandemic. Financial incentives would not make a difference in willingness to report to work, even up to triple pay.
2007	Smith <sup>20</sup>	Paramedics were more willing to work in conventional disasters. Threats to well-being of self and family were the most frequently reported perceived risks of responding to a nonconventional disaster.
2007	Gershon et al <sup>4</sup>	11% of the home health aides/personal care workers reported they would provide care for a client quarantined due to serious infectious disease exposure. 37% of home health registered nurses indicated they would provide care for avian influenza patient if PPE were available.

Quantitative findings are not italicized; qualitative findings are italicized. ED = emergency department; PPE = personal protective equipment.

There were no reports of the use of convergent or discriminant validity, multitrait–multimethod analysis, or factor analysis.

#### Criterion Validity

No measure of concurrent or predictive validity—for example, criterion-related validity—was noted in these studies.

#### Evaluation of Instrument Development

New instruments were developed for use in 20 of the studies included in this review, thus evidence of psychometric evaluation was sought. This included evidence of reliability and validity, reading level, cognitive interviews or focus groups to

TABLE 2

## Research Report Type, Data Type, Study Purpose, and Sample Characteristics of 27 Reviewed Studies

Study Citation	Type of Report	Type of Data	Study Purpose	Methods	Sample Characteristics		
					N	Population	Sample Design and RR, %
Alexander and Wynia, 2003 <sup>29</sup>	PR research article	QN	To explore physicians' readiness to address acts of bioterrorism and willingness to take on personal risk while caring for patients	Self-administered survey	526	Licensed US physicians	Random sample; RR 56
Balicer et al, 2006 <sup>40</sup>	PR research article	QN	To understand local public health workers' perceptions toward pandemic influenza response	Self-administered survey	308	County health department employees in 3 Maryland counties	Convenience sample of 3 county health departments' personnel; RR 58
Chasm et al, 2003 <sup>31</sup>	Research abstract	QN	To assess the attitudes of ED health care workers about their willingness to expose themselves to victims of a chemical–biological attack	Anonymous interviews	82	US ED physicians, nurses, and technicians	Not stated
Cone and Cummings, 2006 <sup>44</sup>	PR research article	QN	To assess hospital employees' attitudes and needs regarding work commitments during disasters	Self-administered survey	1711	US hospital employees at 9 hospitals in 5 states	Consecutive or convenience sampling; RR 85.3
Cowan et al, 2005 <sup>36</sup>	PR research article	QN	To understand the willingness of primary care physicians to participate in possible smallpox pre- or postevent activities	Self-administered survey	305	Adult primary care physicians in the United States	National random sample; RRs: 22 (initial), 26 (abbreviated survey)
Crane, 2005 <sup>38</sup>	Doctoral dissertation	QN	To assess preparedness level and willingness to respond to a bioterrorism attack	Web-based survey	2279	Physicians, nurses, and pharmacists licensed in Florida	Convenience sample; RR 28
DiGiovanni et al, 2003 <sup>30</sup>	PR research article	QN	To assess community needs for public information during a bioterrorism crisis	Self-administered survey	153	US first responders and others	Random sample
DiMaggio et al, 2005 <sup>37</sup>	PR research article	QN	To assess the willingness of emergency medical services personnel to respond to terrorist events	Self-administered survey	823	US basic and paramedic emergency medical service providers	Systematic national random sampling; RR 42.9
French et al, 2002 <sup>26</sup>	PR research article	QL	To analyze similarities and differences in the written disaster plans of 5 EDs related to hurricane preparedness, to interview nurses from EDs and discover their needs and concerns related to Hurricane Floyd, and to determine whether the written plans address the needs/concerns of ED nurses	Focus groups (4) and record review	30	Emergency nurses at 4 Florida hospitals	Convenience sample
Gershon et al, 2007 <sup>4</sup>	PR summary of ongoing study	QN	To assess willingness of home health care workers to care for clients with a serious infectious disease	Not stated	1242	Home health aides, home attendants, personal care workers, and registered nurses in New York City	Not stated
Gullion, 2004 <sup>33</sup>	PR research article	QN	To assess the preparedness and willingness of school nurses to respond to bioterrorism	Self-administered survey	111	School nurses in Denton County, Texas	Convenience sample; RR not reported

(Continued)

TABLE 2

## Research Report Type, Data Type, Study Purpose, and Sample Characteristics of 27 Reviewed Studies (Continued)

Study Citation	Type of Report	Type of Data	Study Purpose	Methods	Sample Characteristics		
					N	Population	Sample Design and RR, %
Hogg et al, 2006 <sup>43</sup>	PR research article	QN	To describe perceptions of preparedness to respond to public health emergencies and to assess capacity and willingness to assist in such emergencies	Self-administered survey	246	Ottawa, Canada, family physicians	Convenience sample; RR 41
Irvin et al, 2007 <sup>49</sup>	Research abstract	QN	To determine the willingness of hospital personnel to report to work in a hypothetical avian pandemic	Self-administered survey	169	US hospital-based physicians, nurses, and clerical personnel	Sampling procedures not described; RR not reported
Katz et al, 2006 <sup>41</sup>	PR research article	QN	To assess dentists' knowledge of, perceived readiness for, and willingness to respond to bioterrorism	Self-administered survey	133	Licensed dentists in Hawaii	Random sample; RR 56.8
Kruus et al, 2007 <sup>48</sup>	Research abstract	QN	To assess health care workers' perceptions and expectations about their role in disaster response and their influence on willingness and ability to work during disasters	Self-administered survey	306	Clinical, support, and administration personnel at 5 urban US hospitals	Sampling not reported; RR not reported
Lanzilotti et al, 2002 <sup>27</sup>	PR research article	QN	To determine a city's capacity to provide emergency medical care to victims of a weapon of mass destruction incident or natural disaster  To determine the level of expertise of health care professionals in the community	Self-administered survey	3334	Physicians and nurses licensed in Hawaii	Convenience sample; RR not reported
Mackler et al, 2007 <sup>47</sup>	PR research article	QN	To determine whether fear of infection would compromise paramedics' ability to care for people potentially infected with smallpox	Self-administered survey	95	US paramedics (employees of an ambulance company)	Convenience sample; RR 32
Martens et al, 2003 <sup>32</sup>	Research abstract	QN	To determine anticipated availability of ED staff during various disaster scenarios, importance of personnel support factors that may enhance participation during a prolonged disaster, reliance of employee dependents on the medical center for basic needs during extended staff work hours, willingness of dependents to act as volunteers	Self-administered survey	74	US emergency physicians, trauma surgeons, nurses, flight crew, technicians, and secretaries	Sampling not reported; N had to be calculated (not reported); overall participation reported to be 72%
Qureshi et al, 2002 <sup>28</sup>	PR research article	QN	To evaluate outcomes of an emergency preparedness training program  To measure intention to report to work in an emergency	Self-administered survey	50	Public health nurses in New York City	Convenience; RR 94

(Continued)

TABLE 2

## Research Report Type, Data Type, Study Purpose, and Sample Characteristics of 27 Reviewed Studies (Continued)

Study Citation	Type of Report	Type of Data	Study Purpose	Methods	Sample Characteristics		
					N	Population	Sample Design and RR, %
Qureshi et al, 2005 <sup>39</sup>	PR research article	QN	To determine the ability and willingness of health care workers to report to work during various catastrophic events	Self-administered survey	6428	Health care workers (nurses, physicians, administrators, and others) at 47 health care facilities in New York City	Convenience sample; described as "roughly proportionate to occupational category"; RR not reported
Schechter, 2007 <sup>46</sup>	Master's thesis	QN	To determine the ability and willingness of MRC volunteers to volunteer in a public health emergency	Self-administered survey	198	Nassau County, NY, MRC members	Convenience sample; RR 61.1
Shapira et al, 1991 <sup>25</sup>	PR research article	QN	To explore the willingness of staff to report following an unconventional missile attack described in a hypothetical scenario	Self-administered survey	1374	Hospital staff in all job categories in 10 Israeli hospitals	Convenience sample; RR 52
Shaw et al, 2006 <sup>42</sup>	PR research article	QL	To assess general practice preparedness To identify issues that need to be addressed to enhance preparedness	Semistructured interviews	60	Australian general practice physicians	Purposive sample
Smith, 2007 <sup>20</sup>	Brief review within a literature review	QN	To investigate the issue of paramedics' risk perception and assessment and their impact on willingness to work during conventional and nonconventional disasters	Not reported	Not reported	Australian paramedics	Sample and RR not reported
Steffen et al, 2004 <sup>34</sup>	Research abstract	QN	To examine willingness of ED personnel to respond to various multiple casualty events	Self-administered survey	103	ED personnel from 4 Chicago-area hospitals	Surveys were "randomly administered"; RR not reported
Syrett et al, 2007 <sup>45</sup>	PR research article	QN	To determine emergency health care providers' willingness to report to work during a mass casualty incident	Self-administered survey	180	ED personnel in an upstate New York hospital	Convenience sample; RR 100
Young and Persell, 2004 <sup>35</sup>	PR research article	QN	To assess nursing student's perceptions of terrorism To determine whether students' perceptions and major concerns relate to willingness to work	Self-administered survey	95	Junior- and senior-level students in a US baccalaureate nursing program	Convenience sample; RR 100

ED = emergency department; MRC = Medical Reserve Corps; PR = peer-reviewed; QN = quantitative; QL = qualitative; RR = response rate.

evaluate comprehension, and expert panel evaluation of survey items. Overall, little description of the instrument development process appeared in the reviewed reports.

### Additional Factors Evaluated

#### Pretesting

Eight investigators reported doing a pretest or pilot test. Five of these describe the test or that the results led to instrument

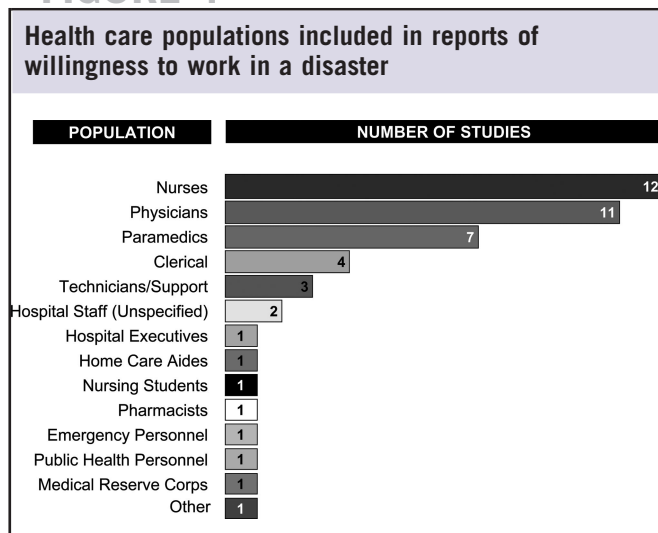
revision. Three do not report the outcome of the pretest or whether it was used to revise or refine the instrument or administration methods. Mackler et al<sup>47</sup> and Qureshi et al<sup>28</sup> indicate that their studies were pilot tests.

#### Use of a Theoretical or Conceptual Framework

Two research reports described the use of a conceptual or theoretical framework (Balicer et al<sup>40</sup> and Crane<sup>38</sup>). Not



FIGURE 1



using theory to guide research can leave a gap in the scientific process. Theories predict the presence of new phenomena and generate hypotheses that can be translated into questions that can be answered through scientific study.<sup>57</sup>

### Sampling Strategy

Sampling procedures were evaluated to discern whether the sample groups were representative and were not distorted by the selection process.<sup>51</sup> Five of the 27 studies reviewed used random sampling, a sampling strategy that improves external validity; 14 used convenience sampling and 7 did not report sampling procedures.

### Statistical Power

One group of investigators reported a power analysis (Katz et al<sup>41</sup>).

### Selection Associated With Nonresponse

Alexander and Wynia<sup>29</sup> evaluated nonresponse bias and found nonresponders differed from responders on a few variables. Balicer et al<sup>40</sup> and Schecter<sup>46</sup> evaluated nonresponse and found no differences. DiGiovanni et al<sup>30</sup> acknowledge that sample bias may have occurred in their study as did DiMaggio et al.<sup>37</sup>

### Social Desirability Bias

Alexander and Wynia<sup>29</sup> discussed the potential for social desirability bias in their study.

### Missing Data Management

There were no discussions of analysis or management of missing data in the research reports in this review.

## Data Synthesis

Although studies of willingness to work have appeared largely since 2002, a body of research findings has emerged that is beginning to describe the phenomenon of willingness to work in disaster.

### Influence of Type of Disaster

Willingness to work was found to be influenced by the type of disaster.<sup>20,27,32,39,44</sup> In general, respondents indicated they were more willing to work in weather-related disasters and mass casualty events than in radiological, nuclear, biological, or chemical disasters. Biological outbreaks appear to be a significant barrier to willingness to work. In the Balicer et al<sup>40</sup> study of public health department employees, 53.8% indicated willingness to work in a pandemic influenza outbreak. This is consistent with other reports. Qureshi et al<sup>39</sup> found 48% of health care workers in New York City indicated they would be willing to work in a severe acute respiratory syndrome outbreak. Cone and Cummings<sup>44</sup> found that 58% of hospital employees would be willing to work in a biological event. DiMaggio et al<sup>37</sup> found 64.8% of emergency medical services workers would be willing to report to work in a smallpox outbreak (whereas 87.7% would be willing to respond to an explosion). Fifty percent of hospital personnel in the Irvin et al<sup>49</sup> study indicated willingness to work in an avian influenza outbreak. The lowest willingness data to date were the Gershon et al<sup>4</sup> study of New York home health workers in a hypothetical avian flu outbreak, in which 11% of home health aides and 37% of registered nurses indicated that they were willing to care for an infected, quarantined patient.

### Concern for Family and Loved Ones

In both the quantitative and qualitative studies, concern for the well-being of family and loved ones emerged as a potentially powerful barrier to willingness to work in disaster.<sup>20,26,35,37,39,46,48</sup> The importance of family in influencing willingness was identified in both the first quantitative study<sup>25</sup> and the first qualitative study<sup>26</sup> and has continued to be a factor in subsequent studies. Concern for family was the most frequently cited reason for unwillingness to respond in the Qureshi et al study of New York City hospital personnel<sup>39</sup> and the DiMaggio et al study of emergency medical technicians.<sup>37</sup> In Young's study of nursing students, 90% of respondents indicated that they would not work with contagious patients if their families did not receive prophylaxis.<sup>35</sup> Kruus et al found that family support and concern about family support influenced willingness to work.<sup>48</sup>

### Concern for Pets

The 2002 qualitative study by French et al appears to be the first evidence that concern for pets may influence willingness to work.<sup>26</sup> Concern for pets emerged again in the Qureshi et al study of New York City hospital personnel.<sup>39</sup> Thirty-three percent of Cone and Cummings's<sup>44</sup> respondents desired pet care if they were to be on duty for a prolonged period. The

TABLE 3

## Variables, Evidence of Reliability, and Evidence of Validity in 27 Quantitative Studies of Willingness to Work in Disaster

Study	Independent Variable (s)	Dependent Variable (s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Alexander and Wynia <sup>29</sup>	Unknown potentially deadly illness	Willingness to care for patients, preparedness for bioterrorism	Pretest done (but results not described)	Random sample, variables well conceptualized, authors state content and construct validity were assessed a priori but do not include details	Limitations acknowledge potential for social desirability bias, authors noted potential bias in initial results and added additional random sample, authors note that nonresponders differed from responders on a few variables
Balicer et al <sup>40</sup>	Influenza pandemic	Ability to report to duty in an influenza pandemic, willingness to report to duty in an influenza pandemic	Not stated	Nonresponse bias assessed, 3 results were consistent among 3 health departments in study, findings support risk perception theory (conceptual framework), findings are similar to Qureshi (2005)	3 data collection sites not randomly selected noted by authors as a limitation, authors note sample size limited power but no power analysis discussed
Chasm et al <sup>31</sup>	Various biologics and chemicals (anthrax, Sarin, smallpox, etc)	Willingness to be exposed to victims of chemical or biologic attack	Not stated	Not reported	Limited information available for review due to type of report (abstract), no information available about sampling, limited information about interview questions or procedures
Cone and Cummings <sup>44</sup>	Various disaster types; mass casualty, biological, chemical, radiological events, and various natural disasters	Willingness to work in disaster, support services that would encourage working extra hours	Not stated	Pilot test done; several revisions made	Researchers at each of 9 hospitals determined whether to use "consecutive or convenience" sampling, varied administrative procedures were used to enter data; authors did accuracy check on random sample of forms, full survey published
Cowan et al <sup>36</sup>	Need to vaccinate patients with smallpox vaccine	Willingness to offer smallpox vaccine in their practice, willingness to evaluate and care for patients suspected of having smallpox or with adverse reactions to smallpox vaccine	Not stated	Random sample, respondents to long and short survey compared (no differences found), pilot test done with random sample	Due to a low response rate after 3 mailings, survey was cut from 23 to 7 items, limited generalizability noted by authors due to low response rate and prediction of future behavior
Crane <sup>38</sup>	Biological terrorism attack	Willingness to respond, preparedness level	Survey pilot tested in 30 subjects, Cronbach $\alpha$ reported to be 0.81	Expert panel used to develop survey, theoretical framework used to develop study (theory of reasoned action), known groups technique used to evaluate bioterrorism knowledge, face validity evaluated	Research questions and hypotheses clearly stated, scale scoring clearly described
DiGiovanni et al <sup>30</sup>	Hypothetical Rift Valley fever outbreak	Willingness to remain at work, information that influenced the decision to work or not	Not stated	Random sampling	Full survey available online, nonresponse bias assessed, methods/instrument well described
DiMaggio et al <sup>37</sup>	Variety of mass casualty incidents (smallpox, radiological, chemical, explosion) and snow	Ability to report to duty in a terrorist incident, willingness to report to duty in a terrorist incident	Same items used as Qureshi (2005) but comparison not made	2-stage systematic random sampling	Used same survey questions and scenarios as Qureshi's study (2005)

(Continued)

TABLE 3

## Variables, Evidence of Reliability, and Evidence of Validity in 27 Quantitative Studies of Willingness to Work in Disaster (Continued)

Study	Independent Variable (s)	Dependent Variable (s)	Evidence of Reliability	Evidence of Validity	Quality Considerations
Qureshi et al <sup>39</sup>	Seven hypothetical disaster scenarios	Ability to report to duty in a disaster, willingness to report to duty in a disaster	Not reported	Findings are noted to be consistent with those of Gullion and Shapira, investigators feel the convenience sample was representative; it was compared to the demographic profile of the population (members of the Greater New York Hospital Association)	Outcome variables well defined, discussion acknowledges that predicted behavior could differ from actual behavior
Schechter <sup>46</sup>	Need to staff vaccine distribution site	Willingness to respond to a public health emergency	Not reported	Nonrespondent bias evaluated; no differences noted	Varied survey administration procedures used (some distributed directly, some mailed to participants)
	Smallpox outbreak	Ability to respond to a public health emergency			Variables conceptualized like Qureshi et al (2005), Balicer et al (2006), and Crane (2005)
	Hurricane	Barriers and enablers to willingness to respond			Complete survey reported
Shapira et al <sup>25</sup>	Hypothetical chemical attack	Willingness to report to work	Not reported	Hospitals were selected to represent all national regions and role in the Persian Gulf War	Seminal publication on willingness to work in disaster, authors also report on a separate survey of hospital executives concerning the extent to which they believe their staff would report to duty, authors acknowledge predicted behavior may differ from actual behavior
Smith <sup>20</sup>	Conventional and nonconventional disasters	Willingness to work	Not reported	Not reported	Due to brief nature of discussion of research findings within a literature review article, little information is available to evaluate study quality; additional information was not available
Steffen et al <sup>34</sup>	Hypothetical disaster scenarios (air crash, biological outbreak, radioactive bomb)	Willingness to respond	Not reported	Not reported	Due to brief nature of research abstract, little information is available to evaluate study quality
Syrett et al <sup>45</sup>	Two hypothetical biological outbreaks; 1 with a treatment and 1 without	Willingness to report to work	Not reported	Not reported	Hypothesis clearly stated, methodology related to scenario-driven decision points clearly described
Young and Persell <sup>35</sup>	Victims of hypothetical disasters	Willingness to be exposed to victims	Internal consistency reliability evaluated with Cronbach $\alpha$ (0.745)	Face validity and clarity evaluated by a panel of registered nurses and a student representative	Research questions clearly stated
	Likelihood of disaster		Interrater reliability assessed (but unclear what ratings were assessed)		
	Concerns about disaster care				

impact of the need for safe pet care became evident during the Hurricane Katrina response in 2005. James Montgomery, chief executive officer of Tulane University Hospital and Clinic in New Orleans, had to set up a veterinary care center in the hospital's parking deck to care for his employees' 79 dogs, cats, and birds. Montgomery said, "Don't underestimate unwillingness to leave them behind."<sup>58</sup>

### *Relation of Education/Training to Willingness*

The influence of education on willingness to work has been examined, although not in a consistent manner. Lanzilotti et al<sup>27</sup> found that in a sample of physicians and nurses, those with greater knowledge of biological agents reported greater willingness to work in a field medical facility during a biological event. DiMaggio et al<sup>37</sup> found that emergency medical technicians were more willing to respond to chemical, radiological, or smallpox events if they had recently undergone hands-on training. Gullion<sup>33</sup> found a correlation between school nurses' education concerning their response role and willingness to respond when at risk. Qureshi et al<sup>28</sup> found in a pilot study of nurses that intention to work in an emergency increased by 12% after a training program. Several studies report descriptive data that summarizes disaster education, but the studies do not report associations between education and willingness to work.

### *Influence of Personal Obligations*

Personal responsibilities to others were identified as barriers to willingness to work. Qureshi et al<sup>39</sup> found that child and eldercare obligations were related to decreased willingness to work. Child care was identified as a service employees desired so that respondents could work.<sup>44</sup>

### *One's Value in the Response*

The perception of one's effectiveness or importance in disaster response was a significant factor identified by Balicer et al<sup>40</sup> and Kruus et al.<sup>48</sup> In the Balicer et al study of Maryland public health department personnel, respondents indicated that the single most important factor that influenced their willingness to work was the perception of the importance of their role in the agency's response.<sup>40</sup> Kruss et al reported that "importance of working" was a significant predictor of willingness to work in a riot situation and a power outage (although the variable's conceptual definition is not offered).<sup>48</sup>

### *Belief in Duty to Care*

Alexander and Wynia<sup>29</sup> found that willingness to treat in their sample of physicians was associated with belief in a duty to treat. Of the emergency medical service workers who indicated to DiMaggio et al<sup>37</sup> that they were willing to respond to terrorism, 83.3% reported their willingness was due to a sense of responsibility.

### *Availability of Personal Protective Equipment*

The availability of personal protective equipment (PPE) emerged in several studies as a factor that would influence

willingness to work.<sup>42,46,47</sup> A study of paramedics by Mackler et al<sup>47</sup> highlighted the influence of PPE. More than 80% of paramedics surveyed indicated they would not remain on duty in a smallpox outbreak if PPE and vaccine were not available. If fully protected, then 91% indicated they would remain on duty (although that number dropped to 38% if the family was not protected). All 60 participants in the Shaw et al<sup>42</sup> study of Australian physicians indicated that they would be willing to work in a pandemic influenza outbreak, but nearly 92% stated they would cease to work if PPE were not available. Shapira et al<sup>25</sup> found that willingness to work in a chemical attack would increase from 42% to 86% if safety measures were provided to hospital personnel.

### *Support for Basic Needs*

Nurses in a study by French et al<sup>26</sup> raised concerns about having basic needs met during hurricane response (eg, water, food, rest, shelter). Cone and Cummings<sup>44</sup> found respondents desired telephone service and e-mail access if they were to be on duty for a prolonged period.

### *Length of Response*

Steffen et al<sup>34</sup> examined the variable of willingness to work additional hours and the potential factors associated with it. They found emergency department personnel were more willing to work extra hours to respond to an air crash than to a biological or radiological event. They also found respondents with children were willing to work the same number of extra hours as those without children. Cone and Cummings<sup>44</sup> attempted to quantify how long hospital employees would be willing to remain on duty assuming basic needs were met. The mean was 3.6 days.

## **DISCUSSION**

Each study in this review has revealed certain facets of the complexities of human behavior in disaster. The seminal study by Shapira et al<sup>25</sup> of willingness to work in disaster was an important one that, surprisingly, did not seem to initially generate interest. This study, however, was the spark that initiated a growing body of evidence, although it was more than a decade before the next study appeared in the literature. Shapira et al found that in a sample of Israeli hospital personnel, only 42% would be willing to report to work in a missile attack with a chemical weapon. Equally important was their finding that willingness to work could be manipulated. Of the respondents who indicated unwillingness to work, 33% reported they would change their mind if provided adequate protective gear. The willingness rates increased when gas mask lenses, transportation, or an "all clear" announcement was made. These findings are the first that demonstrate how hospital (or government) leadership may be able to influence willingness to work through both actions taken in advance to prepare for disaster response and during a disaster. The studies reported following Shapiro et al have uncovered additional evidence that indicates willingness to work can be enhanced. An example of evidence being used

to improve willingness to work appeared at a Florida hospital that frequently dealt with hurricanes and personnel problems. Cape Canaveral Hospital, located on Florida's east coast, evacuated 5 times for hurricanes during a 9-year period. In 1999, during Hurricane Floyd, about 100 employees failed to work—and 30 were terminated.<sup>59</sup> The hospital examined the problem, assessed employee needs, revised policies and training, and clearly communicated employer and employee expectations in a hurricane, and significant improvements were found in personnel response.

Although the sociological literature has not demonstrated large-scale abandonment of duties in disaster, the nature of disasters is evolving to include situations that may be personally threatening to health care personnel and may threaten their loved ones. This review identifies the type of disaster as an important influence on willingness to work. Respondents indicated a willingness to work that varied from a low of 11% in home health aides in the Gershon et al study of New York City home health personnel in a hypothetical pandemic flu outbreak to a high of 95% in DiGiovanni's study of a Rift Valley fever outbreak. DiGiovanni's high reported willingness to work was contingent, however. Respondents indicated their willingness was based on receiving adequate information and protection at their workplace and no further acts of bioterrorism.<sup>30</sup> This review indicates biological events may seriously reduce willingness to work, although the provision of protective gear and education may improve willingness to work in these incidents. This is an area that would benefit from additional investigation.

The influence of education, knowledge, and competency on willingness to work in disaster is unclear, and is an important gap in current knowledge. There have not been systematic studies of the influence of disaster preparedness training nor has the level of education been evaluated in relation to willingness to work. DiMaggio et al<sup>37</sup> did find increased willingness to work after training. Emergency medical technicians who had received terrorism-related training in the 2 years before the study were twice as likely to be willing to respond to a smallpox outbreak or chemical incident.

A number of findings that have appeared are intriguing, but have only been reported once or twice and deserve more attention. Sex may influence willingness. Shapira et al found female respondents less willing to work than males.<sup>25</sup> It is not yet clear whether other demographics (eg, age, race, occupation, distance to work, years of experience, type of employment) may predict willingness to work. There may be a link between immunization status and willingness to work in certain situations. Some areas have not yet been examined. There have been no reported studies of military personnel or of federal employees; all studies to date have sampled civilian employees (and 1 study of county public health department employees). There has not yet been an investigation of the role of organizational culture on willingness to work. There is a need for the exploration of the ethical and legal implica-

tions of not working in disaster and how this may influence decision making.

The body of evidence in this review should be considered in relation to studies that examine how health care personnel have behaved in actual disasters, the literature concerning duty to care in disaster, and the literature concerning vicarious traumatization (or secondary traumatization) of health care personnel who work in disaster. Disaster responders experience a broad range of physical and mental health consequences as a result of disaster exposure.<sup>60</sup> It is unclear how the knowledge that a person may sustain these sequelae from working during disaster may influence willingness to work, and does not appear to have been investigated. The influence of compensation has been examined only in 1 quantitative study<sup>49</sup> and was described in 1 qualitative study; it deserves further investigation.

Based on this integrative review, future methods used in studies of willingness to work in disaster could be strengthened. Consumers of research findings on willingness to work in disaster would benefit when they include a description of sampling strategy, evidence of reliability and validity, descriptions of the psychometric evaluation of new instruments, conceptual frameworks, and descriptions of pretesting procedures and results. Concept analyses of "willingness" and "willingness to work" will assist researchers in understanding these concepts and in defining variables. A description of the data collection instrument is valuable for investigators considering replication of a study. Only a few of the studies in this group included publication of their instrument, part of the instrument, or a detailed explanation of the scoring scheme.

Willingness to work in disaster is a phenomenon that has no political or disciplinary boundaries. It has been recognized by multiple disciplines (eg, medicine, nursing, public health, emergency management) as a problem worthy of scientific scrutiny and future studies may be strengthened through studies undertaken by multidisciplinary teams. Although most studies of the phenomenon have taken place in the United States, others have taken place in Canada, Australia, and Israel—indicating early global interest in how willingness to work may affect disaster response. Multination studies may be a future strategy that uncovers important evidence.

The primary purpose of studying the willingness of health care personnel to work in disaster was not always well described in the studies in this review. The word "patient" rarely appears, but it is indeed the needs of vulnerable individuals seeking care during a disaster that drives these investigations. Hospital surge capacity depends on the availability of 3 elements: personnel, equipment and supplies, and structure (facilities and organization).<sup>8</sup> This review has found that there will likely be disaster situations in which hospital personnel are not willing to work, and that will directly degrade surge capacity. This review also reveals, however, that there appear to be actions that organizations can take to improve willingness to work. It is these actions that have the

potential to improve surge capacity and ultimately the quality and availability of care in times of disaster.

### Limitations

Despite extensive searching, it is possible a study may have been missed. The topic is multidisciplinary and studies could appear in a wide variety of journals. Studies in languages other than English may exist that are not indexed in major English databases. Research reports that have not been fully peer reviewed were included in this integrative review because of the low volume of studies on this topic to date. Caution must be used in the use of research findings in the gray (unpublished) literature.

### CONCLUSIONS

This integrative review of the literature uncovered a number of valuable findings. The review revealed that the phenomenon has been the subject of scientific investigation only since 1991, with nearly all studies being reported since 2002. In this 17-year period, 27 studies were reported, although only 18 of these appeared in the peer-reviewed scientific literature. The science concerning the phenomenon of willingness to work in disaster can be said to be “immature” or “emerging.” Nonetheless, important data already have been produced that may have value for policymakers, emergency planners, and others involved in disaster response. The early findings have uncovered numerous areas ripe for further exploration—especially the influence of family, education, personal obligations, concerns for personal safety, and the type of disaster.

In the early stages of examining a phenomenon, qualitative exploration can be a particularly useful method. Only 2 qualitative studies have been completed that explored willingness to work; additional qualitative exploration as well as mixed methods designs should be considered. It is critical that evidence of the reliability and validity of the instruments being used to measure willingness to work be obtained and reported. Only then can we have confidence in the quality of the data being produced.

The frequency of disaster is increasing and vulnerable populations will continue to experience the health effects of disaster. The demand for health care services will continue to be significant in many disaster situations, and due to economic trends surge capacity is expected to be an ongoing challenge. Future explorations of willingness to work in disaster have the potential to improve the effectiveness of hospital disaster response. The critical factor will be merging the evidence with policymaking and planning. Future research that builds logically upon the body of work that has emerged will enhance understanding of the phenomena and will support evidence-based policymaking, leadership, and planning—and ultimately the care available for those who are harmed in disasters.

### About the Author

Dr Chaffee is Disaster Research Coordinator, Disaster Information Management Research Center, National Library of Medicine, National Institutes of Health.

Address correspondence and reprint requests to Dr Mary Chaffee, Disaster Information Management Research Center, National Library of Medicine, One Democracy Plaza, Suite 1030, 6701 Democracy Blvd, Bethesda, MD 20892 (e-mail: chaffeem@mail.nlm.nih.gov).

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### REFERENCES

1. Abramson D, Morse S, Garrett A, et al. Public health disaster research: surveying the field, defining its future. *Disaster Med Public Health Preparedness*. 2007;1:57–62.
2. Auf der Heide E. The importance of evidence-based disaster planning. *Ann Emerg Med*. 2006;47:34–49.
3. Chaffee M. Making the decision to report to work in a disaster. *Am J Nurs*. 2006;106:54–57.
4. Gershon R, Qureshi K, Stone P, et al. Home health care challenges and avian influenza. *Home Health Care Manag Pract*. 2007;20:58–69.
5. Perry R. What is a disaster? In: Rodriguez H, Quarantelli E, Dynes R, eds. *Handbook of Disaster Research*. New York: Springer; 2006:1–15.
6. Alexander D. *Principles of Emergency Planning and Management*. New York: Oxford University Press; 2002.
7. Bonnett C, Peery B, Cantrill S, et al. Surge capacity: a proposed conceptual framework. *Am J Emerg Med*. 2007;25:297–306.
8. Kaji A, Koenig K, Bey T. Surge capacity for healthcare systems: a conceptual framework. *Acad Emerg Med*. 2006;13:1157–1159.
9. DiGiovanni C. The spectrum of human reactions to terrorist attacks with weapons of mass destruction: early management considerations. *Prehosp Disaster Med*. 2003;18:253–257.
10. Tierney K. Disaster beliefs and institutional interests: recycling disaster myths in the aftermath of 9–11. In: Clarke L, ed. *Terrorism and Disaster: New Threats, New Ideas*. Vol 11. New York: Elsevier; 2003:33–51.
11. Dynes R. The concept of role in disaster research. In: Dynes R, DeMarchi B, Pelanda C, eds. *Sociology of Disasters: Contribution to Sociology of Disaster Research*. Milan: Franco Angeli; 1987:71–102.
12. Webb G, Beverly M, McMichael M, et al. *Role Improvising Under Conditions of Uncertainty: A Classification of Types*. Newark: University of Delaware Disaster Research Center; 1999.
13. Quarantelli H. *Structural Factors in the Minimization of Role Conflict: A Reexamination of the Significance of Multiple Group Membership in Disasters*. Columbus: Ohio State University Disaster Research Center; undated.
14. Bankoff G, Frerks G, Hilhorst D. *Mapping Vulnerability—Disasters, Development, & People*. London: Earthscan; 2004.
15. Perrow C. *Normal Accidents*. New York: Basic Books; 1984.
16. Alexander Y. Terrorism in the twenty-first century: An overview. In: Alexander Y, Prior S, eds. *Terrorism and Medical Responses: U.S. Lessons and Policy Implications*. Ardsley, NY: Transnational Publishers; 2001.
17. Garwin R. The many threats of terror. In: Silvers R, Epstein B, eds. *Striking Terror—America's New War*. New York: New York Review Books; 2002.
18. Koh D, Lim M, Chia S, et al. Risk perception and impact of severe acute respiratory syndrome (SARS) on work and personal lives of healthcare workers in Singapore: what can we learn? *Med Care*. 2005;43:676–682.
19. Chaffee M. *A Predictive-Correlational Study of the Willingness of Personnel*

- in a Military Hospital to Work in a Disaster. Baltimore: University of Maryland; 2007.
20. Smith E. Emergency health care workers' willingness to work during major emergencies and disasters. *Aust J Emerg Manage.* 2007;22:21–24.
  21. Benzie K, Premij S, Hayden K, et al. State-of-the-evidence reviews: advantages and challenges of including grey literature. *Worldviews Evid Based Nurs.* 2006;3:55–61.
  22. Gifford W, Davies B, Edwards N, et al. Managerial leadership for nurses' use of research evidence: an integrative review of the literature. *Worldviews Evid Based Nurs.* 2007;4:126–145.
  23. Dixon-Woods M, Agarwal S, Jones D, et al. Synthesizing qualitative and quantitative evidence: a review of possible methods. *J Health Serv Res Policy.* 2005;10:45–53.
  24. Jack S. Utility of qualitative research findings in evidence-based public health practice. *Public Health Nurs.* 2006;23:277–283.
  25. Shapira Y, Marganitt B, Roziner I, et al. Willingness of staff to report to their hospital duties following an unconventional missile attack: a state-wide survey. *Isr J Med Sci.* 1991;27:704–711.
  26. French E, Sole M, Byers J. A comparison of nurses' needs/concerns and hospital disaster plans following Florida's Hurricane Floyd. *J Emerg Nurs.* 2002;28:111–117.
  27. Lanzilotti S, Galanis D, Leoni N, et al. Hawaii medical professionals assessment. *Hawaii Med J.* 2002;61:162–173.
  28. Qureshi K, Merrill J, Gershon R, et al. Emergency preparedness training: a pilot study. *J Urban Health.* 2002;79:413–416.
  29. Alexander G, Wynia M. Ready and willing: physicians' sense of preparedness for bioterrorism. *Health Aff.* 2003;22:189–197.
  30. DiGiovanni C, Reynolds B, Harwell R, et al. Community reaction to bioterrorism: prospective study of a simulated outbreak. *Emerg Infect Dis.* 2003;9:708–712.
  31. Chasm R, Wie DV, Wegner S. Chemical-biological attack: will the providers put themselves at risk? [abstract]. *Ann Emerg Med.* 2003;42 (Suppl 1):390.
  32. Martens K, Hantsch C, Stake C. Emergency preparedness survey: personnel availability and support needs. *Ann Emerg Med.* 2003;42 (Suppl 1):389.
  33. Gullion J. School nurses as volunteers in a bioterrorism event. *Biosecure Bioterror.* 2004;2:112–117.
  34. Steffen C, Masterson L, Christos S, et al. Willingness to respond: a survey of emergency department personnel and their predicted participation in mass casualty terrorist events. *Ann Emerg Med.* 2004;44 (Suppl):S34.
  35. Young C, Persell D. Biological, chemical, and nuclear terrorism readiness: major concerns and preparedness of future nurses. *Disaster Manag Response.* 2004;2:109–114.
  36. Cowan A, Ching P, Clark S, et al. Willingness of private physicians to be involved in smallpox preparedness and response activities. *Biosecure Bioterror.* 2005;3:16–22.
  37. DiMaggio C, Markenson D, Loo G, et al. The willingness of U.S. emergency medical technicians to respond to terrorist incidents. *Biosecure Bioterror.* 2005;3:331–337.
  38. Crane J. *Assessment of the Community Healthcare Providers' Ability and Willingness to Respond to Bioterrorist Attack in Florida.* Tampa: University of South Florida; 2005.
  39. Qureshi K, Gershon R, Sherman M, et al. Health care workers' ability and willingness to report to duty during catastrophic disasters. *J Urban Health.* 2005;82:378–388.
  40. Balicer R, Omer S, Barnett D, et al. Local public health workers' perceptions toward responding to an influenza pandemic. *BMC Public Health.* 2006;6:1–8.
  41. Katz A, Nekorchuk D, Holck P, et al. Dentists' preparedness for responding to bioterrorism. *J Am Dent Assoc.* 2006;137:461–467.
  42. Shaw K, Chilcott A, Hansen E, et al. The GP's response to pandemic influenza: a qualitative study. *Fam Pract.* 2006;23:267–272.
  43. Hogg W, Huston P, Martin C, et al. Enhancing public health response to respiratory epidemics—are family physicians willing to help? *Can Fam Physician.* 2006;52:1254–60.
  44. Cone D, Cummings B. Hospital disaster staffing: if you call, will they come? *Am J Disaster Med.* 2006;1:28–36.
  45. Syrett J, Benitez J, Livingston W, et al. Will emergency health care providers respond to mass casualty incidents? *Prehosp Emerg Care.* 2007; 11:49–54.
  46. Schechter S. *Medical Reserve Corps Volunteers' Ability and Willingness to Report to Work for the Department of Health During Catastrophic Disasters.* Monterey, CA: Naval Postgraduate School; 2007.
  47. Mackler N, Wilkerson W, Cinti S. Will first-responders show up for work during a pandemic? Lessons from a smallpox vaccination survey of paramedics. *Disaster Manag Response.* 2007;5:45–48.
  48. Kruus L, Karras D, Seals B, et al. *Healthcare Worker Response to Disaster Conditions.* Chicago: Society of Academic Emergency Medicine; 2007.
  49. Irvin C, Cindrich L, Patterson W, et al. Hospital personnel response during a hypothetical influenza pandemic: will they come to work? *Acad Emerg Med.* 2007;14 (Suppl 1):S13.
  50. Girden E. *Evaluating Research Articles.* 2nd ed. Thousand Oaks, CA: Sage; 2001.
  51. Locke L, Silverman J, Spiraduso W. *Reading and Understanding Research.* 2nd ed. Thousand Oaks, CA: Sage; 2004.
  52. Conn V, Valentine J, Cooper H, et al. Grey literature in meta-analyses. *Nurs Res.* 2003;52:256–261.
  53. Nunnally J, Bernstein I. *Psychometric Theory.* 3rd ed. New York: McGraw-Hill; 1994.
  54. Litwin M. *How to Assess and Interpret Survey Psychometrics.* 2nd ed. Thousand Oaks, CA: Sage; 2003.
  55. Waltz C, Strickland O, Lenz E. *Measurement in Nursing and Health Research.* 3rd ed. New York: Springer; 2005.
  56. Polit D, Beck C. *Nursing Research—Generating and Assessing Evidence for Nursing Practice.* 8th ed. Philadelphia: Lippincott Williams & Wilkins; 2008.
  57. Wilson E. *Consilience: The Unity of Knowledge.* New York: Vintage Books; 1998.
  58. Montgomery J. The Katrina experience: emergency management lessons learned. Presented at The National Emergency Management Summit, New Orleans, LA, March 4–6, 2007.
  59. McCoy J, Stackpoole S. When a hurricane strikes: the challenge of crafting workplace policy. In: Mason D, Leavitt J, Chaffee M, eds. *Policy and Politics in Nursing and Health Care.* 5th ed. St Louis: Elsevier; 2007.
  60. Benedek D, Fullerton C, Ursano R. First responders: mental health consequences of natural and human-made disasters for public health and public safety workers. *Annu Rev Public Health.* 2007;28:55–68.