

The Willingness of U.S. Emergency Medical Technicians to Respond to Terrorist Incidents

CHARLES DiMAGGIO, DAVID MARKENSON, GEORGE T. LOO, and IRWIN REDLENER

A nationally representative sample of basic and paramedic emergency medical service providers in the United States was surveyed to assess their willingness to respond to terrorist incidents. EMT's were appreciably (9–13%) less willing than able to respond to such potential terrorist-related incidents as smallpox outbreaks, chemical attacks, or radioactive dirty bombs ($p < 0.0001$). EMTs who had received terrorism-related continuing medical education within the previous 2 years were twice as likely (OR = 1.9, 95% CI 1.9, 2.0) to be willing to respond to a potential smallpox dissemination incident as those who indicated that they had not received such training. Timely and appropriate training, attention to interpersonal concerns, and instilling a sense of duty may increase first medical provider response rates.

THE EXPLOSIONS AT New York's World Trade Center on February 26, 1993, the bombing at the Murrah Federal Building in Oklahoma City on April 19, 1995, and the attacks of September 11, 2001, along with the anthrax cases that followed, defined a new era in public health, safety, and healthcare in the United States. Health professionals have worked to define their roles during disasters,^{1,2} establish minimum competencies,^{3,4} and propose training and curriculum changes.⁵ The willingness of health providers such as emergency medical technicians and paramedics to respond to potentially fatal disease outbreaks, chemical exposures, or radiation releases has received less attention.

It has been said that local emergency care systems will bear the brunt of any terrorist attack⁶ and that "emergency service organizations are 'in combat' every day."⁷ Press reports that police officers "walked away from their jobs"⁸ in the wake of Hurricane Katrina, while not related to terrorism, throws into stark relief the crucial role of reliable local response. It is clear that "if lives are going to

be saved from an act of terrorism, it will be the actions of organizations that can respond within minutes, not hours or days . . ." ⁹ and that an "Emergency Medical Services System that functions well on a day-to-day basis constitutes the very underpinnings" of disaster response.¹⁰ During the 1993 bombing of the World Trade Center, "New York's emergency medical service workers . . . played a heroic role in saving lives [and] . . . quickly and successfully treated a seemingly unmanageable number of people."¹¹ This level of response is not without consequence for rescuers: 343 New York fire department rescue workers died on September 11, 2001.¹²

In Turkey, a country that has suffered 35,000 terrorist-related deaths since 1984, local systems are the mainstay of emergency response.¹³ A review of the emergency medical response to a 2000 Singapore airliner crash cited "good compliance of responders" as being "among the most important factors for successful emergency response to any multi-casualty incident."¹⁴

The recent worldwide SARS outbreak also illustrated

Charles DiMaggio, PhD, MPH, PA-C, is Assistant Professor of Clinical Epidemiology; George T. Loo, MPA, MPH, EMT-B, is Project Coordinator; and Irwin Redlener, MD, is Director, National Center for Disaster Preparedness; all are at the Columbia University Mailman School of Public Health, New York, NY. David Markenson, MD, EMT-P, is Chief of Pediatric Emergency Medicine and Assistant Professor of Pediatrics, Maria Fareri Children's Hospital, Westchester Medical Center/Emergency Medical Associates, and Director, Center for Disaster Medicine, and Assistant Professor of Public Health, School of Public Health, New York College of Medicine, New York, NY.

the importance of health workers' willingness to report for duty. One study found that 76% of healthcare workers sampled in Singapore believed that they were at increased risk of contracting SARS, but 69.5% tolerated the risk as an obligation of duty.¹⁵ The study also suggested that healthcare workers were stigmatized because of their potential exposure to the SARS virus. These findings were echoed in Toronto and Hong Kong, where healthcare workers refused to care for the ill and quarantined themselves from loved ones to avoid exposing them.¹⁶ These psychosocial reactions parallel the behavior observed during the early phases of the HIV/AIDS epidemic more than 15 years ago, when some hospital staff refused work assignments, avoided physically examining patients, and stayed away from home to protect their families.¹⁶

The willingness of local first responders to perform reliably is essential; however, there have been few systematic or analytic studies of how local first responders would react to a potentially deadly incident such as a smallpox outbreak. We explore this issue with a nationally representative sample of U.S. emergency medical technicians and paramedics and discuss their self-reported willingness to respond to bioterrorist incidents and the role of training in improving response rates.

METHODS

We surveyed a nationally representative sample of 1,919 basic and paramedic emergency medical service providers in the U.S. in 2003. A total of 823 (42.9%) returned completed questionnaires. The study employed a sampling methodology developed and validated by the National Registry of Emergency Medical Technicians and was an extension of an earlier prospective survey of a random population of prehospital providers certified at either the EMT-Basic or EMT-Paramedic level.^{17,18,19} This sample was created to be representative of the national population for use both in an ongoing longitudinal study and in periodic surveys related to specific areas of interest, such as child maltreatment, regarding prehospital providers.

A two-stage systematic random selection sampling process was employed based on state use of national EMT registrations as either the sole basis for or as part of their initial licensure/relicensure requirements and levels of EMT-Basics and EMT-Paramedics. The precision of the estimates for the sample was calculated to be +4.2%.

Multiple-choice items asked individuals whether they were willing to respond to a variety of mass casualty incidents, including natural, biological, chemical, and radiological disasters, and the reason they would or would

not feel able or willing to respond, such as concern over contracting a disease. ("Please indicate your 'willingness' to report to your EMS place of work if the following natural disaster or mass casualty scenario occurred in your community.") The term *willingness* was defined as whether an individual would report for duty or respond positively to a request to report for duty.

The "willingness" responses were contrasted to a second set of questions exploring the individual's "ability" or availability to respond to the same incidents. ("Please indicate your 'ability' to report to your EMS place of work if the following natural disaster or mass casualty scenario occurred in your community.") The term *ability* was defined as whether an individual would be available and have the necessary means to report for duty. A person who was both "willing" and "able" would have the desire and motivation to respond as well as the wherewithal to act on that motivation.

Additional information was obtained on employment setting (paid vs. volunteer), concern over contracting a disease, the presence of other EMS responders in the same household, whether respondents had received training on weapons of mass destruction (either as part of their initial training or through continuing medical education [CME] during the previous 2 years), and whether any training involved "hands-on" components or simulations as a part of the curriculum.

The statistical significance of any difference between an individual's willingness versus his or her ability to respond to specific incidents was tested with McNemar's nonparametric test for comparing differences in a one or paired sample.²⁰ The relationship between variables addressing pay, concern over contracting a disease, training experiences, and the outcome measure of willingness to respond to potential terrorist incidents was tested using odds ratios for association, which can be interpreted as a measure of the strength of the association between two variables. Variables that were determined to be associated with willingness in a statistically significant fashion in these one-to-one tests were entered into a logistic regression equation to determine the strength of the association while controlling for other significant variables. Statistical analyses were conducted using SPSS version 11.5 (SPSS, Chicago, Ill) and SAS version 9.0 (SAS Institute, Cary, NC). This study was approved by the institutional review board of Columbia University.

RESULTS

EMTs were appreciably (9–13%) less willing than able to respond to potential terrorist-related incidents such as a smallpox outbreaks, a terrorist chemical attack, or a radioactive dirty bomb ($p < 0.0001$) (Table 1). They were

TABLE 1. DIFFERENCE BETWEEN ABILITY AND WILLINGNESS TO RESPOND TO DISASTERS

	<i>Percent able to report</i>	<i>Percent willing to report</i>	<i>Difference</i>
Snowstorm with 36 inches of snow in a 24-hour period occurs where you live.	62.2	84.1	(-)21.9
Smallpox outbreak, 200 patients admitted to 10 hospitals	77.5	64.8	12.7
Chemical terrorism attack with 5,000 victims requiring treatment and transport	83.3	74.3	9.1
Explosions in stadium with 2,000 seriously injured	89.7	87.7	2
Fire in landfill, 1,000 nearby residents with smoke inhalation	91.4	87.5	3.9
Radioactive dirty bomb explodes in school; 500 children injured.	83.4	73.8	9.6

Nationally representative sample of emergency medical service providers, United States, 2003.

least willing to respond to a potential bioterrorist incident characterized by 200 patients admitted to 10 area hospitals with a presumptive diagnosis of smallpox. There was little or no difference between respondents' willingness and ability to respond to an incident characterized by mass trauma. For natural weather disasters such as snowstorms, respondents were likely to be more willing than able to respond.

"Sense of responsibility" (83.3%) and "ability to provide care" (77.3%) predominated as reasons chosen by those individuals who were willing to respond to a terror-

ist-related disaster incident (Figure 1). Concern for family (44.3%) led the list of reasons respondents would not be willing to respond to a major bioterrorist, chemical, or nuclear disaster. Personal health problems (7.8%) was the least-cited reason for not being willing to respond. A significant minority (26.2%) of EMS workers reported that a spouse or partner would also be expected to report to work in the event a biological, radiological, or chemical disaster.

Table 2 compares willingness to respond versus unwillingness to respond for several responder factors in a

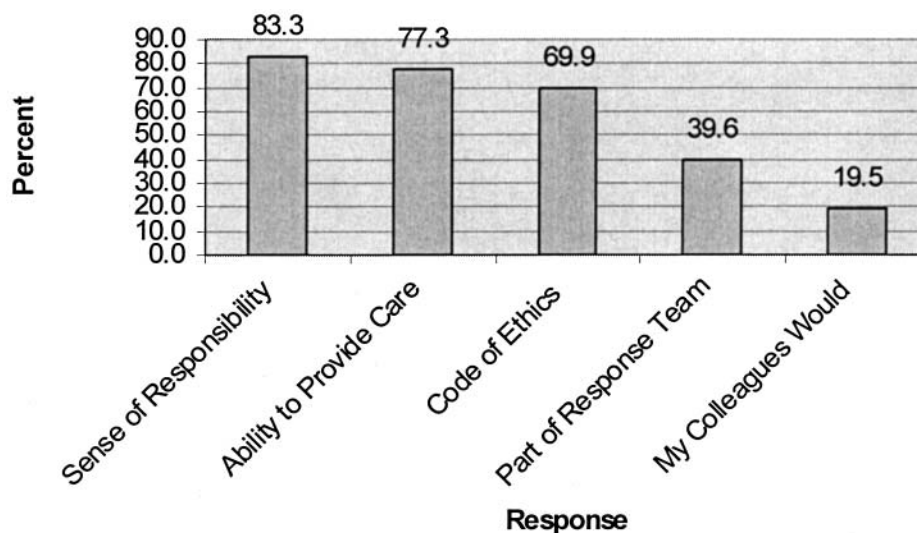


FIGURE 1. PROPORTION OF TOTAL SAMPLE CHOOSING RESPONSES TO: "Which of the following indicates why you would 'be willing' to provide care to victims during a major bioterrorism, nuclear, or chemical disaster?" (Mark all that apply.) Nationally representative sample of emergency medical service providers, United States, 2003.

TABLE 2. UNIVARIATE ODDS RATIOS FOR ASSOCIATION BETWEEN LISTED VARIABLE AND WILLINGNESS TO RESPOND TO A POTENTIAL TERRORIST INCIDENT

		Smallpox			Radiological			Chemical								
		Willing	Not willing	OR	95% CI	Willing	Not willing	OR	95% CI	Willing	Not willing	OR	95% CI			
Pay	Paid	93203	34256	1.4	1.3	1.4	106605	19368	1.8	1.7	1.8	103709	23467	1.0	0.9	1.0
	Volunteer	38546	19297				43647	14196				47530	10313			
Concern about disease	Yes	40844	17438	0.9	0.9	0.9	44621	12814	0.7	0.7	0.7	44630	13390	0.6	0.6	0.6
	No	89222	35215				103309	20488				104550	19886			
Initial terrorism training	Yes	27303	8417	1.4	1.4	1.4	28473	6024	1.1	1.0	1.1	29902	5818	1.2	1.1	1.2
	No	104446	45136				121779	27541				121337	27983			
WMD CME	Yes	84572	25812	1.9	1.9	2.0	89960	18939	1.2	1.1	1.2	94228	15894	1.9	1.8	1.9
	No	47177	27740				60292	14626				57011	17907			
Hands-on BT CME	Yes	33974	7721	2.1	2.0	2.1	34742	5991	1.4	1.3	1.4	52068	8818	1.5	1.5	1.6
	No	97775	45832				115509	27573				114277	29330			

Nationally representative sample of emergency medical service providers, United States, 2003. Numbers weighted.

biological, radiological, and chemical incident. Respondents who had received terrorism-related CME within the previous 2 years were twice as likely to be willing to respond to smallpox dissemination or chemical incidents as those who indicated that they had not received such training. Those who were concerned about contracting a disease were less willing to respond to potential smallpox, radiological, or chemical incidents. Paid EMTs were significantly more willing to respond to likely terrorist scenarios such as smallpox dissemination and radiological dirty bombs than were their volunteer colleagues, but this increased willingness did not extend to chemical spills. In a logistic regression analyses (Table 3), recent hands-on training consistently indicated a willingness to respond to chemical, biological, and radiological incidents despite the inclusion of the other entered variables. Concern about contracting a disease was consistently associated with less willingness to respond.

DISCUSSION

That an appreciable number of emergency medical technicians and paramedics would be unwilling to respond to a terrorist incident is consistent with the biomedical literature on studies of first responder willingness. Reports of actual response rates are difficult to come by, but in one of the studies to prospectively address the issue, 42% of 2,650 Israeli hospital personnel surveyed on the eve of the first Gulf War were willing to respond to an unconventional missile attack.²¹ The 65% of U.S. prehospital personnel who say they are willing to respond to a smallpox incident compares favorably.

It is noteworthy that 86% of the Israelis indicated they would respond if “safety measures” were provided. Similar results were noted in Singapore, where a large majority of healthcare workers indicated that provision of safety measures would give them a feeling of security in responding to SARS.¹⁵ This is consistent with our finding

that recent training was consistently associated with willingness to respond to potentially dangerous mass casualty incidents. This kind of information is valuable in planning for future terrorist events.

Previous U.S. studies of willingness to respond have been limited in number and scope.¹⁶ In a 1997 study of 27 paramedics and 77 EMTs based at one New York City hospital, none of the paramedics would perform mouth-to-mouth resuscitation on an adult stranger. Only 37% would perform it on a child.²² The study’s small size, limited geographic distribution, and focus on nonterrorist infectious diseases preclude direct comparisons with the nationally representative sample presented here, although it does add to the evidence that concerns about safety must be addressed before first responders can be expected to reliably perform their duties.

A 2003 study of physicians found 80% willing to “continue caring for patients in the event of an outbreak of an unknown but potentially deadly illness.”²³ But this question implies an existing therapeutic relationship and does not explicitly address terrorism. Another survey of physicians on their willingness to participate in smallpox preparedness indicated that only a third would vaccinate civilians in their offices and a similar number would be willing to serve in a public health clinic.²⁴

More recently, a 2002 study conducted at the Columbia University Center for Public Health Preparedness looked at the ability and willingness of New York City hospital personnel to respond to disaster situations. Although there was variation by the type of disaster event, there was a clear inverse relationship between risk perception and willingness to report to work.²⁵

Many of the sampled EMTs expressed concern for their families, and over a quarter of them had spouses who would also be expected to respond to potential terrorist incidents. The impact of spousal or partner obligations may have a profound influence on the provider response rate. This could be of particular importance in communities where EMS staffing is characterized by

TABLE 3. RESULTS OF LOGISTIC REGRESSION FOR ASSOCIATION BETWEEN LISTED VARIABLE AND WILLINGNESS TO RESPOND TO A SMALLPOX, RADIOLOGICAL, OR CHEMICAL INCIDENT

	<i>Smallpox</i>			<i>Radiological</i>			<i>Chemical</i>		
	<i>OR</i>	<i>95% CI</i>		<i>OR</i>	<i>95% CI</i>		<i>OR</i>	<i>95% CI</i>	
Pay	1.1	1.1	1.1	1.9	1.8	1.9	0.8	0.8	0.8
Concern about disease	0.9	0.9	0.9	0.7	0.7	0.7	0.6	0.6	0.6
Initial terrorism training	1.2	1.2	1.2	1.0	0.9	1.0	0.9	0.9	0.9
WMD CME	1.5	1.5	1.6	0.9	0.9	0.9	1.6	1.6	1.7
Hands-on BT CME	1.6	1.6	1.6	1.4	1.4	1.5	1.9	1.8	2.0

Weighted, nationally representative sample of emergency medical service providers, United States, 2003.

many spousal/partner family members. Additional studies should be initiated to understand the family dynamics that may influence the responder rate in families where a spouse or partner is also an EMS provider who may need to answer the call to duty.

We are only beginning to explore the behavioral consequences of terrorism and public health emergencies, yet it is clear that such events can lead to psychosocial manifestations such as fear and feelings of vulnerability that contribute to the inability of individuals, communities, and government infrastructure to function. We may accept that adequate preparation for these psychological aspects is essential.^{26,27} Addressing providers' perceptions of their risk is a reasonable place to start.

In Singapore, providing healthcare workers with protective equipment, training, and direction enhanced their sense of security, safety, and welfare.¹⁵ Providing EMTs with clear risk assessments and practical information on how to protect themselves and their families may account in part for the association of training with willingness to respond. In our study, the majority of those who were willing to respond also reported a sense of responsibility. Discussing and reinforcing the duty to respond should be an important part of all first responder training. Any detailed plan to address the psychological paralysis that may impair response should include risk communication and education for medical first responders.

LIMITATIONS

This study is subject to a number of limitations. Although the 42% response rate in this study is higher than the 22–26% response rate reported in other studies of provider willingness,²⁴ it is still low enough to raise the possibility of responder bias. Respondents to this survey may be more conscientious or motivated than their nonresponders colleagues, and their rates of willingness to report to potential terrorist incidents are likely overestimates. However, surveys of an earlier, similar sample of EMTs revealed “no statistically significant differences in demographic or socioeconomic factors between nonrespondents and respondents.”^{19,28} Also, cross-sectional surveys such as this can demonstrate only association, not causation. It may be, for example, that individuals who seek out training in the first place are likely to be more willing to respond.

Terms such as *ability* and *willingness* may be subject to misinterpretation. Still, respondents demonstrated a reasonably clear-cut distinction as illustrated by the contrast between responses to the snow emergency scenario, where people were more willing than able to respond, and the potential terrorist scenarios where they were able but less willing.

These results are applicable primarily to basic and paramedic EMTs. While many firefighters and police of-

ficers are also certified as EMTs at the basic and advanced support levels, their training and institutional culture may differ significantly from those whose primary role is to be a medical first responder. Finally, such studies as this need to be validated against actual response rates.

CONCLUSION

First medical responders' willingness to report for duty is affected by both the type of incident and the responder's own risk perception. This perception may be informed by initial training and CME that specifically address weapons of mass destruction and include practical hands-on components. Education and training that increase the willingness of providers to respond can have profound effects on surge capability and preparedness planning. Timely and appropriate training, attention to interpersonal concerns, and instilling a sense of duty may increase the response rates of emergency prehospital medical care providers.

The local emergency response system is the thin thread that ties governmental public health and safety to institutional medical care. While it is a cause for concern that emergency planners may at best expect no more than 65–75% of first responders to be willing to report to work in the event of a terrorist incident, timely and appropriate training, attention to interpersonal concerns, and instilling a sense of duty may increase that response rate.

ACKNOWLEDGMENTS

The authors acknowledge with appreciation the contributions of Drs. Kristine Quereshi, Robyn Gershon, and Kristine Gebbie of the Columbia University Center for Public Health Preparedness to the development of the survey instrument used to assess health provider ability and willingness to respond to disasters, as well as the assistance provided by the National Registry of EMTs and its staff, without whom this research project could not have been conducted. We also acknowledge the National Registry of EMTs LEADS project, which provided the mechanism for data collection and provided the data for this project. We wish to thank the leadership of the National Association of EMTs, who, in their ongoing efforts to advocate for and support the work done by EMS professionals, provided the organizational support for this project. In particular, we thank former president Nathan Williams, current president Ken Bouvier, and Lisa Lindsay.

This work was supported in part by Centers for Disease Control and Prevention Health Protection Initiative grant number 1 K01 CE000494-01, Center for Public Health Preparedness grant number U90/CCU22421-01-2, and Na-

tional Center for Injury Prevention and Control grant numbers U38/CCU422276-01 and U38/CCU424164-01-1.

REFERENCES

1. Redlener I, Markenson D. Disaster and terrorism preparedness: what pediatricians need to know. *Adv Pediatr* 2003;50:1–37.
2. Guay AH. Dentistry's response to bioterrorism: a report of a consensus workshop. *J Am Dent Assoc* 2002;133(9):1181–1187.
3. Columbia University School of Nursing Center for Health Policy. *Bioterrorism and Emergency Preparedness: Competencies for All Public Health Workers*. New York: Center for Health Policy; 2002.
4. International Nursing Coalition for Mass Casualty Education. *Educational Competencies for Registered Nurses Responding to Mass Casualty Incidents*. August 2003.
5. Association of American Medical Colleges. *Training Future Physicians About Weapons of Mass Destruction: Report of the Expert Panel on Bioterrorism Education for Medical Students*. Washington, DC: Association of American Medical Colleges; 2003.
6. Green R, reviewer. An insider's grasp on first response. Homeland Security Technology Council, Public Sector Institute. 2003 Aug;1(2). Review of Maniscalco PM, Christen HT. *Understanding Terrorism and Managing the Consequences*. Available at: <http://www.publicsectorinstitute.net/ELetters/HomelandSecurityStrategies/v1n2/art3.lsp>. Accessed August 27, 2005.
7. Maniscalco PM, Christen HT, Rubin DL, Kim P. Terrorism. Part 1: Calibrating your risks and response. *JEMS* 1998 Nov;23(11):38–40, 42–44, 46–51.
8. Treaster JB. Police quitting, overwhelmed by chaos. *New York Times* September 4, 2005:A1.
9. Sanderford D. WMD terrorism and the role of first responders. *ASA Newsletter* 1999. Available at: <http://www.asanlr.com/ASANews-99/993FirstResp.htm>. Accessed August 27, 2005.
10. National Association of State Emergency Medical Services Directors. *Domestic Terrorism: Issues of Emergency Medical Services (EMS) Preparedness*. Available at: <http://www.nasemsd.org/TPN071505.doc>. Accessed August 27, 2005.
11. Nadler G. Testimony before the U.S. House of Representatives. *Congressional Record* March 10, 1993. Available at: http://www.fas.org/irp/congress/1993_cr/h930310-terror.htm. Accessed August 27, 2005.
12. Centers for Disease Control and Prevention. Injuries and illnesses among New York City Fire Department rescue workers after responding to the World Trade Center attacks. *MMWR Morb Mortal Wkly Rep* 2002 Sep 11;51 Spec No:1–5.
13. Rodoplu U, Arnold J, Ersoy G. Terrorism in Turkey. *Prehospital Disaster Med* 2003 Apr–Jun;18(2):152–160.
14. Lee WH, Chiu TF, Ng CJ, Chen JC. Emergency medical preparedness and response to a Singapore airliner crash. *Acad Emerg Med* 2002 Mar;9(3):194–198.
15. Koh D, Lim MK, Chia SE, et al. Risk perception and impact of severe acute respiratory syndrome on work and personal lives of healthcare workers in Singapore. What can we learn? *Med Care* 2005;43(7):676–682.
16. Stein BD, Tanielian TL, Eisenman DP, Keyser DJ, Burnam MA, Pincus HA. Emotional and behavioral consequences of bioterrorism: planning a public health response. *Milbank Q* 2004;82(3):413–455.
17. Brown WE Jr, Dawson D, Levine R. Compensation, benefits, and satisfaction: the Longitudinal Emergency Medical Technician Demographic Study (LEADS) Project. *Prehosp Emerg Care* 2003 Jul–Sep;7(3):357–362.
18. Brown WE Jr, Dickison PD, Misselbeck WJ, Levine R. Longitudinal Emergency Medical Technician Attribute and Demographic Study (LEADS): an interim report. *Prehosp Emerg Care* 2002 Oct–Dec;6(4):433–439.
19. Dawson DE, Brown WE Jr, Harwell TS. Assessment of nationally registered emergency medical technician certification training in the United States: the LEADS Project. Longitudinal Emergency Medical Technician Attributes Demographic Study. *Prehosp Emerg Care* 2003 Jan–Mar;7(1):114–119.
20. Bland M. *An Introduction to Medical Statistics*. 3rd ed. New York: Oxford University Press; 2000:260.
21. Shapira Y, Marganitt B, Roziner I, Shochet T, Bar Y, Shemer J. Willingness of staff to report to their hospital duties following an unconventional missile attack: a state-wide survey. *Isr J Med Sci* 1991 Nov–Dec;27(11–12):704–711.
22. Hew P, Brenner B, Kaufman J. Reluctance of paramedics and emergency medical technicians to perform mouth-to-mouth resuscitation. *J Emerg Med* 1997 May–Jun;15(3):279–284.
23. Alexander GC, Wynia MK. Ready and willing? Physicians' sense of preparedness for bioterrorism. *Health Aff (Millwood)* 2003 Sep–Oct;22(5):189–197.
24. Cowan AE, Ching PLYH, Clark SJ, Kemper AR. Willingness of private physicians to be involved in smallpox preparedness and response activities. *Biosecur Bioterror* 2003;3(1):16–22.
25. Qureshi K, Gershon R, Sherman M, et al. Health care workers' willingness and ability to report to duty during catastrophic disasters. *J Urban Health* 2005;82(3):378–388.
26. Hall MJ, Norwood AE, Ursano RJ, Fullerton CS. The psychological impacts of bioterrorism. *Biosecur Bioterror* 2003;1(2):139–144.
27. Flynn BW. Behavioral health aspects of bioterrorism. *Biosecur Bioterror* 2004;2(3):232.
28. Markenson D, Tunik M, Cooper A, et al. A national assessment of knowledge, attitudes, and confidence of prehospital providers in the treatment of child maltreatment. Paper submitted for publication.

Address reprint requests to:

Charles DiMaggio, PhD

Assistant Professor of Clinical Epidemiology

Columbia University Mailman School of Public Health

National Center for Disaster Preparedness

722 West 168 Street, 10th Floor

New York, NY 10032

E-mail: cjd11@columbia.edu

