

## Original Research

# Accountability and Assessment of Emergency Drill Performance at Schools

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Many schools throughout the United States are mandated to hold drills, or operational exercises, to prepare for fires, earthquakes, violence, and other emergencies. However, drills have not been assessed for their effectiveness in improving preparedness at schools. This mixed-methods study measures the quantity and the quality of drills in an urban school district in Los Angeles. Compliance with California mandates was fair; most schools barely met requirements. Drills were not used as opportunities to improve procedures. Sites neither conducted any self-assessments nor made changes to procedures on the basis of performance. Suggestions include developing realistic simulated exercises, debriefing, and better school accountability for drills. **Key words:** *disaster preparedness, evaluation, schools*

**I**N THE PAST DECADE, schools have been an all-too-common location for mass casualty incidents. In 2004, a terrorist overtook

an elementary school in Beslan, Russia, killing more than 300 staff and students.<sup>1</sup> In 2007, a tornado ripped through Alabama, tragically killing 8 high school students.<sup>2</sup> Schools can be at risk even when they are not the direct focus of the emergency. For example, a number of schools were within blocks of the collapsed World Trade Center towers on September 11, 2001,<sup>3</sup> and schools were among the most likely buildings to collapse in the 2008 earthquake in China.<sup>4</sup> Staff, students, and parents were ill prepared for these past large-scale and local disasters, particularly 9/11.<sup>5</sup>

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Hence, the Federal Emergency Management Agency, the US Department of Education, and school safety researchers recommend that schools train staff and students on emergency response procedures.<sup>6-11</sup> One type of schoolwide training mechanism is the drill, an operational exercise that “puts emergency plans into action.” At the management level, drills “are used to validate (pediatric disaster) response plans, policies and procedures.”<sup>9(p480)</sup> At the individual level, drills teach self-protective behaviors to reduce non-fatal and fatal injuries in the face of natural disasters and community and school violence.

Unlike other sectors of the community, for decades schools have been practicing drills to respond to fires, earthquakes, tornados, and most recently school shootings. “Drop, cover, and hold” drills require that students and staff protect their heads and ears and take cover under a desk or heavy table to prepare for an earthquake.<sup>6</sup> During tornado drills, participants evacuate to shelter areas such as basements or interior hallways on the ground floor.<sup>12</sup> Fire drills involve safe evacuation out of the school building to a pre-designated staging area. The lockdown drill is a self-containment strategy for responding to the release of hazardous materials or the presence of armed individuals on or near the school premises.<sup>13</sup>

Although no federal legislation requires schools to routinely conduct drills, states throughout the United States have varying levels of school drill requirements.<sup>14</sup> Illinois requires that schools conduct at least 3 fire drills and 1 tornado drill each year (Public Act 094-0600). California schools are required to hold fire drills at least once a month at the elementary level, 4 times every school year at the intermediate level, and twice every school year at the secondary level.<sup>15</sup> California Education Code also requires at least 1 “drop and cover” drill during each quarter in elementary schools and each semester in secondary schools.<sup>16</sup> Iowa schools do not have any legislative requirements but voluntarily perform drills and actual tornado sheltering several times a year (Iowa Department of Education, oral communication, 2007).

Despite recommendations by Federal Emergency Management Agency and Department of Education, no local or federal agency routinely monitors the frequency and quality of school drills. Guidelines for evaluating drill performance offered by the Department of Homeland Security<sup>9</sup> require many resources unavailable at schools, such as large observation and evaluation teams, and test primarily management of the incident rather than individual behaviors. However, feedback from drills is critical for improving the plans and protocols designed to save lives during an actual disaster or a school emergency.

This study is one of the first attempts to scientifically evaluate drill performance in a Los Angeles County school district in California. As this study was designed as a mixed-methods study,<sup>17-20</sup> we used quantitative methods to describe the types and frequency of drills, identify whether these met California State mandates, and measure the time required for evacuation. Qualitative interviews, focus groups, and observations were also conducted to describe behaviors during school drills and knowledge and attitudes among school community members.

## SUBJECTS AND METHODS

The study school district includes 12 elementary, 3 middle, and 3 high schools and 1 continuation adult school, with 18 211 students enrolled during the 2005-2006 school year. Schools were staffed by 746 full-time equivalent teachers and 505 staff (eg, paraprofessionals, office staff, custodians, bus drivers, and cafeteria workers).

### Drill reports

This school district had an existing reporting form for school personnel to monitor the frequency of drills. Seventeen of the 19 schools provided drill reports from 2005 to 2006 to the district coordinator. The reports described the type of drill conducted (ie, fire, earthquake, lockdown, or combination fire-earthquake drill), date of the drill, weather conditions, time of drill, number evacuated, and time to evacuation. No specific

methodology was used to estimate counts of the number evacuated. District officials indicated that some personnel estimated the number of evacuees on the basis of the average daily attendance, whereas others measured the number of participating classes during the day of the drill.

### Drill observations

During a districtwide meeting with the 19 schools, 3 elementary schools enrolled as drill observation sites. To increase the number of observation sites, 4 additional schools were randomly selected to represent each school type: 1 elementary, 1 middle school, 1 high school, and the adult school. Invitational phone calls were made to principals. In all, 6 schools (ie, 4 elementary, 1 middle, and 1 adult school) participated in a drill observation from April 2006 through March 2007.

Fire, earthquake, and lockdown drills were observed by members of the research team. Between 2 and 4 researchers observed drill proceedings from various locations, including the postevacuation staging area, classrooms,

and the central office. Team members used an open-ended form to document observed activities and behaviors.

### Staff focus groups and interviews

All 4 schools, including the high school, that were randomly selected as drill observation sites agreed to participate in the focus group/interview phase of the study. In-depth interviews were held with 2–3 staff per site (representing administrative, teaching, and/or classified staff) to capture a wide perspective about school preparedness. A total of 18 staff interviews and 4 focus groups with 6–10 nonadministrative staff per group were conducted (Table 1). Staff were recruited either during staff meetings or through invitational letters distributed by the principal.

### Student focus groups

A focus group was held at each of the 4 randomly selected schools with 6–10 students per group. At the elementary school, only students in grades 4 and 5 were included. A purposive sample of students was identified by

**Table 1.** Characteristics of interview and focus group participants

	Staff interview (N = 18), n (%)	Staff focus groups (N = 33 participants), n (%)	Student focus groups (N = 26 participants), n (%)
School Site			
Elementary	5 (27.8)	7 (21.2)	5 (19.2)
Middle	4 (22.2)	11 (33.3)	6 (23.1)
High School	3 (16.7)	7 (21.2)	4 (15.4)
Continuation/adult <sup>a</sup>	3 (16.7)	8 (24.2)	11 (42.3)
District	2 (11.1)	NA	NA
Position			
Principal/administrator	5 (27.8)		
Secretary/office clerk	...	3 (9.1)	
Security personnel	3 (16.7)	4 (12.1)	
Teacher/teacher aide	6 (33.3)	4 (12.1)	
Nurse/health assistant	3 (16.7)	...	
Custodian	...	4 (12.1)	
Librarian	...	1 (3.0)	

Abbreviation: NA, not applicable.

<sup>a</sup>Two focus groups held separately for day and night school students.

school staff on the basis of students' leadership or communication skills.

All focus groups and interviews lasted approximately 1–1.5 hours and were conducted at the school site, digitally recorded, and professionally transcribed. Staff and students who consented were allowed to participate. Respondents were provided a monetary incentive for their participation. This study was approved by the Institutional Review Board Committee on Clinical Investigations at Childrens Hospital Los Angeles.

## ANALYSES

### Quantitative analysis

Counts of all drills overall and by type were summed across schools and school types. An average number of drills by school type was calculated and compared with the number of drills mandated by the California Education Code.

For observations of earthquake and fire drills, the evacuation time was estimated by subtracting the time when all students arrived at the staging area from the time of initiation of the drill (signaled either by an emergency alert system or by a verbal announcement). No evacuation times were estimated for lockdown drills, which do not include an evacuation.

Self-reported times to evacuation from drill reports were compared with observer-estimated times to evacuation during drill observations. We estimated the difference be-

tween the mean evacuation time from reports of all drills in the past year and observed evacuation time during one drill observation.

An evacuation rate (seconds per 100 evacuees) was calculated by dividing the reported evacuation time by the number of persons evacuated. Means, medians, and ranges were calculated for this continuous variable.

### Qualitative analysis

The qualitative analysis, based on grounded theory, entailed the simultaneous process of data collection, analysis, and theory construction.<sup>21,22</sup> Upon collection, data were immediately analyzed for patterns and themes, with the primary objective of discovering theory implicit in the data. Atlas.ti was used for the coding and analysis of relationships between and within text segments. Inter-coder reliability was assessed through double coding a sample of approximately 15% of the interviews. When discrepancies were identified in the coding, they were discussed among coders until consensus was achieved.

## RESULTS

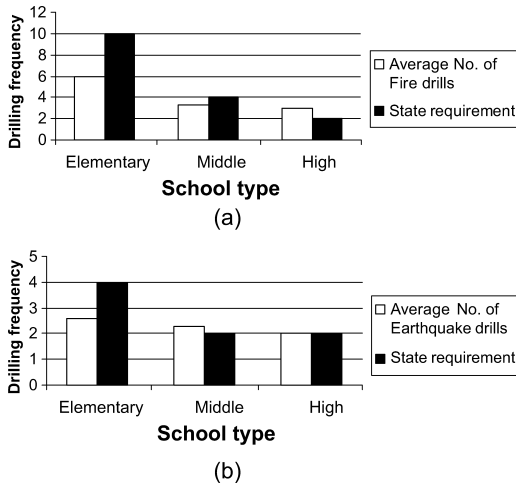
### Quantitative findings

#### *Frequency of school drills*

Schools in this district participated in 131 drills during the 2005–2006 school year (Table 2). A total of 61% ( $n = 80$ ) of exercises were fire drills, 26% ( $n = 34$ ) were earthquake drills, 5% ( $n = 6$ ) were lockdown drills, and

**Table 2.** Frequency (%) of drills by school type, drill reports 2005–2006

	Type of Drill					Total
	Earthquake	Fire	Lockdown	Combined earthquake-fire	Not specified	
Elementary	21 (21%)	61 (62%)	5 (5%)	10 (10%)	1 (<1%)	98
Middle	7 (41%)	9 (53%)	1 (6%)	0	0	17
High	6 (38%)	10 (63%)	0	0	0	16
Total	34 (26%)	80 (61%)	6 (5%)	10 (8%)	1 (<1%)	131



**Figure 1.** Average number of drills compared with California Education Code requirements by school type. (a) Fire drills and (b) earthquake drills.

8% ( $n = 10$ ) combined fire and earthquake procedures into 1 drill.

Elementary schools reported participating in an average of more than 2 earthquake drills and nearly 6 fire drills per school year, both of which are below the 4 earthquake drills and 10 fire drills per year required in California (Figure 1). One elementary school did not perform any drills. Middle schools, with an average of fewer than 3 fire drills, did not meet the state requirement of 4 fire drills each year. However, middle schools did meet the minimum earthquake drilling mandate of 2 drills per year. High schools met all state requirements for drilling and performed an average of 3.3 fire drills and 2 earthquake drills per year. Lockdown drills, which are not mandated by California, were held at 3 elementary schools and 1 middle school.

### Evacuation time and rate

Of 131 drills, only 63 had recorded evacuation times and the numbers of individuals evacuated on their reports. For these drills, we estimated that on average it took 81 seconds to evacuate 100 school members (Table 3). On an average, elementary schools evacuated 100 students and staff in 58 seconds (range = 22 seconds/100 persons to 118 seconds/100 persons). Middle and high schools took an average of 170 seconds, or almost 3 minutes, to evacuate 100 students and staff (range = 10 seconds/100 persons to 600 seconds/100 persons).

For 6 schools, evacuation times (ie, time to evacuate the entire school) estimated during observed drills were compared with average evacuation times estimated from existing self-reports in the past year (Table 4). One elementary school took 15 minutes to evacuate the entire school during an observed drill, which was substantially longer than the average 5.7-minute evacuation time estimated from this school's self-reports in the previous year. During another observed drill, the evacuation time for 1 elementary school took about 2 minutes longer than its average recorded evacuation time in the past year. On the other hand, 2 elementary schools and the middle school had observed evacuation times that were shorter than their average time to evacuate as reported in the past year. These examples illustrate that time indicators estimated from existing self-reports were not consistently longer or shorter than times measured more precisely during real-time observations. Notably, the reported drills and the observations occurred on different days and may reflect unique experiences for each exercise.

**Table 3.** Evacuation rate (seconds) per 100 students and staff

	Mean	Median	Range	SD
Elementary schools ( $N = 50$ drills)	58.0	42.0	21.7-118.5	33.76
Middle and high schools ( $N = 13$ drills)	169.9	49.7	10.4-600.0	204.02
Overall ( $N = 63$ drills)	81.1	42.3	10.4-600.0	105.07

**Table 4.** Evacuation (Evac) time reported in 2005–2006 drill reports and estimated during observations<sup>a</sup>

	Drill reports (2005–2006)		Observations (1 per site)	
	Drills reported	Evac time, min, Mean (range)	Evac time, min	Observed time-mean reported time
Elementary schools				
A	11	2.0 (2.0–2.1)	5	+3.0
B	4	4.7 (3.3–7.0)	4	–0.7
C	6	5.5 (3.0–8.0)	5	–0.5
D	13	5.7 (3.5–10.0)	15	+9.3
Middle school				
E	5	13.3 (10.0–20.0)	10	–3.3
High school				
F	4	No data	No data	NA
Adult school				
G	No data	No data	4	NA

Abbreviation: NA, not applicable.

<sup>a</sup>Data represent fire and earthquake drills observed at 6 schools. Lockdown drills were not included because they did not involve evacuation of the school building.

### Qualitative findings—Challenges to conducting emergency drills

From qualitative interviews and focus groups with 77 staff and students and 6 drill observations, we identified various challenges in performing drills at school.

#### *Attitudes toward drilling*

Drills were not typically recognized as a training vehicle but rather as a compulsory exercise with little meaning. Observations indicated that students, particularly in the middle and high schools, often did not evacuate in an orderly fashion (eg, in lines) and that staff generally did not correct this behavior. Staff reported that students saw drills as free time to talk with friends. In contrast, students said that they were not encouraged to take the drills seriously, and that teachers rarely required them to fully participate in the drills.

#### *Infrastructure and supplies*

*Challenging school layout.* Staff often described the conditions of building struc-

tures, the campus layout, and equipment as challenges to fully implementing emergency drills. For example, staff at several schools described narrow stairways or single exits as problematic in the case of a real emergency. Evacuation routes clogged with students could create a chaotic situation if students panic, as described by a participant of a staff focus group from a middle school with about 2 000 students:

I noticed during our fire drills like a mob of kids squeezing through this tiny little hole, like between the gate and pole . . . right now we're all very calm; actually, it's kind of fun; we get to get out of the class and go stand around. But, when there's a real fire, people are going to be trampled because they can't get through the narrow little area.

Students, too, mentioned that they feared a "stampede" when rushed to evacuate.

*Inadequate protective equipment.* During an earthquake drill, students are supposed to "duck and cover" under a desk or table, and staff and students were knowledgeable of these procedures. However, teachers and students at the high school and adult school

reported that desks were often too small for the “duck and cover” position during an earthquake drill.

All we know [is to duck and cover]—and to me this is not even good because . . . [these desks] are not big enough for all of our big boys. . . . You ask one of them to get up underneath and see how well they do. . . .that’s not right.

—High School Teacher

*Broken communication and emergency alert systems.* Staff mentioned that not all classrooms were equipped with telephones. This was a particular challenge during lockdown drills or actual emergencies requiring lockdowns (eg, person with a gun on campus, community shooting) as classrooms may not be properly notified.

Emergency bells were often cited as being in disrepair; also, student pranks occurred so often that teachers became desensitized to emergency bells, as this staff member described:

There is a frequency of ringing the bells . . . sometimes the bells don’t work there; sometimes they blink all the time, and teachers have become somewhat desensitized. . . . It doesn’t happen every day but at least happens once a quarter where someone tampers with the bells because it’s a high school campus so someone touches or pulls it . . . it does not add to a sense of emergency because . . . that’s just kids playing . . . .

—Adult School Administrator

During drill observations, inadequate or dysfunctional emergency alert systems were among the most commonly noted challenges. For example, during 1 lockdown drill, a class in one of the portable buildings was not notified of the drill as students wandered in and out of the classroom; during this time, no staff member seemed to notice. One observer noted that emergency bells continued to ring throughout and well after the completion of an earthquake drill. During a fire drill observation at the adult school, the fire alarm was inoperable.

## ***Drills do not address realistic human reactions and behaviors in an emergency***

One of the most consistent messages from staff is that drills do not prepare the school community for the “what if” and “human factors” during an actual emergency. A staff member reported that, in spite of the drills and knowledge that she had about emergencies, her first instinct was “to run.” Other staff reported that drills taught them to evacuate, but little else:

We know what the bell sounds like. . . . We know to march out like little tin soldiers and go to the field in our appropriate places if we hear these sounds. But, what if? They never prepared us for **‘what if’**.

—High School Teacher

Others expressed that drills may help with the logistics and the routine, but cannot assist with people’s reactions. In these cases, individuals drew from their experiences during real-life emergencies such as the Los Angeles riots or violence on campus. A middle school teacher described a situation in which staff were asked to remain on campus until all of the students had left the campus with a parent:

When the LA riots happened, I heard teachers saying ‘the heck with my students, I’m getting out of here’. . . . They were afraid . . . they became frightened, and they weren’t acting like they would normally act. It could have been the most caring, sensitive teachers, and when there was really an emergency . . . they really freaked out.

—Middle School Teacher

In the classroom, teachers can more easily direct students to follow the proper protocols. However, if an earthquake occurs and some students are not currently in a classroom, the practiced routine is not always followed as this middle school student explained:

I was in the library. Then, I was fixing the books and the whole room started shaking. I just stood there and then after it finished, I just ran outside.

—Middle School Student

Many staff members suggested that the district implement more realistic simulated drills. Several described a prior districtwide drill that simulated an emergency toxic gas spill in the surrounding community (an incident described as among the most likely given the close proximity of gas plants to the school) that occurred several years prior. In this simulated drill, members of the emergency committee were given specific roles (eg, incident commander or lead or manager of the emergency response teams, morgue, triage). Staff felt that this drill gave them the opportunity to rehearse some of the actual duties rather than the more routine duck and cover and evacuation drills. This particular districtwide drill was conducted soon after 9/11. A similar type of exercise has not occurred since that time.

## DISCUSSION

Because disasters and emergencies are rare, unexpected incidents, simulations are assumed to be the best approach for enhancing preparedness in the community.<sup>9</sup> To our knowledge, no studies thus far have evaluated the quantity and quality of drill performance in school settings. Our research found that almost all schools in this urban district participate in drills. Students and staff, for example, know the basic procedures when the alert system is activated for a drill: take the cover-and-hold protective position, exit the building to a designated staging area, and take roll. While a few students exhibited some behavioral problems and a number of classrooms did not participate during 2 drill observations, by and large the majority of the school community knew these basic drill procedures. Mortlock calls these routine drills the “minimum level of safety practice.”<sup>23(p17)</sup>

Drills were not used as opportunities to adopt changes in problematic procedures. For example, evacuation routes that did not work were not changed and retested during the next drill. Children who did not fit under desks were not instructed to seek cover underneath a table in the classroom,

or if no table existed, directed to shield their heads under their desks. Granted, the repair or replacement of communication devices or other emergency equipment in schools requires resources beyond that available in many schools. Nonetheless, administrators must be alerted of equipment needs. Districts could seek support from grant initiatives with state Homeland Security Programs, the Urban Areas Security Initiative, and Citizens Corps<sup>24</sup> or from parents, local community members, and local public health agencies.

In *School Health Guidelines to Prevent Unintentional Injuries and Violence*, the Centers for Disease Control and Prevention calls for coordinated, school-based efforts that address policies and procedures.<sup>25</sup> While research on their effectiveness is limited, drills may be a perfect yet unrecognized schoolwide coordinated safety program mandated in many schools throughout the United States. Because they occur during school hours, drills are not seen as an additional burden, and there is no hesitancy to participate, as is often a problem among teachers asked to voluntarily participate in emergency training activities.<sup>5</sup> To increase the seriousness of drilling, school safety committees established by many US schools with student, staff, parent, and community representation<sup>25</sup> can and should coordinate drills.

School safety committees could prepare and distribute realistic scenarios to participants well in advance of the scheduled drill, which would help ensure that routine as well as extraordinary response procedures are considered and practiced. For example, fire drills require immediate evacuation, whereas many earthquake drills involve a delayed evacuation—a distinction rarely considered during drills. A well-designed earthquake scenario may include aftershocks and secondary fires with instructions on how to take cover if *en route* to a staging area. Professional emergency planners can assist in designing drills that include realistic human behaviors and reactions in scripted scenario cards, mannequins, and mouled patients.<sup>26,27</sup> Advanced preparation will allow for coordinated participation from local emergency



responders, as recommended by the Medical Emergency Response Plan for Schools.<sup>26</sup>

School safety committees should also assess their safety strategies, as recommended by the Centers for Disease Control and Prevention.<sup>25</sup> Debriefing is used in disaster preparedness to self-assess strengths and weaknesses and suggest changes for future exercises.<sup>6</sup> In this study, debriefings were neither documented in drill reports nor mentioned by interview or focus group participants.

### Drill performance indicators

We also developed 2 performance indicators that may be used as a standard for future evaluation of school drills. *Frequency of drilling* may be compared across schools and with state requirements, providing a measure of compliance with drill mandates. To our knowledge, there are no standards for the frequency of drills, as different states carry various drill mandates. And, our study did not determine the number of drills that optimize emergency preparedness and learning. Thus, additional evidence is needed to determine the optimal levels that ensure learning before desensitization occurs or schools are excessively burdened.

Another indicator used to assess performance is *evacuation time*. Currently, no standard evacuation time is indicated in the California code nor have attempts been made to estimate evacuation rates. We present a new measure that accounts for time and the evacuated population—an evacuation rate per 100 students. Our sample of middle and high schools took a much longer time, 3 minutes on average, to evacuate 100 students than did the average elementary school in this district (~1 min/100 students). Without data on evacuations during actual incidents, we were unable to specify the ideal evacuation rate. A lower rate, however, assumes that more lives may be saved during an event that requires immediate evacuation.

Our study also identifies areas for further research. For example, why do elementary schools evacuate students/staff faster than middle and high schools? Perhaps, the younger age group is easier for school staff

to manage during an evacuation. Middle and high schools may be more crowded, leading to a bottleneck situation in which exiting through a single doorway or gate. Middle and high schools have fewer drill requirements than elementary schools; more may not necessarily be better without research on evacuation logistics and supervision.

Further study is also needed to understand the relaxed attitude toward drill participation. This includes studying risk perception as it relates to self-protective behaviors performed during drills. Another critical area of future research involves comparing performance during simulated drills with behaviors during actual incidents.

Finally, our study underscores the need for schools' greater accountability for drills. Improving drill tracking forms and training staff on procedures for collecting critical evaluation measures (ie, evacuation times, number evacuated, behavioral observations, and equipment) would improve the assessment of drill performance over time.

Our study has some limitations. Data from one school district limit the generalizability of results. Schools were also asked to report evacuation times without instructions for calculating evacuation start and stop times and for counting the number evacuated. Less than half the records contained enough information to estimate evacuation rates, whereas measurements based on complete data may be inaccurate. Our qualitative sample was small and purposive but appropriate to capture perspectives and experiences from a school wide audience.

### CONCLUSIONS

While our findings do not indicate the frequency of school drills that optimizes school preparedness, it is clear that school drills, as they are currently being performed in this district, are not adequately training students and staff. Drills should be seen as opportunities to improve, change, and test realistic protocols for emergency response and management. To improve performance, drills may be coordinated by school safety committees

or local public health agencies to ensure the safety and well-being of children at school. Ultimately, successful emergency planning

can save lives, reduce injury severity, and build psychological resilience to the effects of the next community emergency or disaster.<sup>28</sup>

## REFERENCES

1. Brandenburg M, Regens J. Terrorist attacks against children: vulnerabilities, management principles and capability gaps. *Journal of Homeland Security and Emergency Management*. 2006;3(4):1-17.
2. Rash of tornadoes kills 14 in Alabama, Missouri. *National Public Radio*. February 8, 2007.
3. Green B, Barrios LC, Blair JE, Kolbe L. Schools and terrorism: a supplement to the report of the National Advisory Committee on Children and Terrorism. *Journal of School Health*. 2004;74(2):39-51.
4. MSNBC. Massive quake kills nearly 10,000 in China. 2008. <http://www.msnbc.msn.com/id/24573168/>. Accessed 2008.
5. Pfefferbaum R, Fairbrother G, Brandt E, et al. Teachers in the aftermath of terrorism: a case study of one New York City school. *Family Community Health*. 2004;27(3):250-259.
6. Federal Emergency Management Agency. FEMA for kids. [www.fema.gov/kids/schdizr.htm](http://www.fema.gov/kids/schdizr.htm). Accessed April 23, 2007.
7. US Department of Education. *Practical Information on Crisis Planning: A Guide for Schools and Communities*. Washington, DC: Office of Safe and Drug-Free Schools; 2003.
8. Brandenburg MA, Arneson WL. Pediatric disaster response in developed countries: ten guiding principles. *American Journal of Disaster Medicine*. 2007;2(3):151-162.
9. Cicero MX, Baum CR. Pediatric disaster preparedness: best planning for the worst-case scenario. *Pediatric Emergency Care*. 2008;24(7):478-481.
10. Hohenhaus SM. Pediatric emergency preparedness in schools: a report from the 2001 Southeastern Regional EMSC annual meeting. *Journal of Emergency Nursing*. 2001;27(4):353-356.
11. Olympia RP, Wan E, Avner JR. The preparedness of schools to respond to emergencies in children: a national survey of school nurses. *Pediatrics*. 2005;116(6):e738-e745.
12. Indiana Department of Education, School Traffic Safety and Emergency Planning. Tornado actions: Tornado safety rules in schools. <http://ideanet.doe.state.in.us/safety/tornado.html>. Accessed May 1, 2007.
13. Public Acts of 2006 Act No. 187 (House Bill 4460), Act No. 187 (2006).
14. Krisberg K. Planning ahead for health threats—school preparedness crucial for safety of children, communities. *The Nation's Health*. 2007;1:20-21.
15. California Education Code 32001. 32001. Official California Legislative Information. <http://www.leginfo.ca.gov/calaw.html>. Accessed 2008.
16. California Education Code 35295-35297. 35295-35297. Official California Legislative Information. <http://www.leginfo.ca.gov/calaw.html>. Accessed 2008.
17. Creswell J. Mixed-method research: introduction and application. In: Cizek G, ed. *Handbook of Educational Policy*. San Diego, CA: Academic Press; 1999:455-472.
18. Creswell J, Plano Clark V. *Designing and Conducting Mixed Methods Research*. Thousand Oaks: Sage; 2007.
19. Dufresne J. Keeping students and schools safe. *Reclaiming Children and Youth*. 2005;14(2):93-96.
20. Phillips B. Qualitative methods and disaster research. *International Journal of Mass Emergencies and Disasters*. 1997;15(1):179-195.
21. Glaser B. *Basics of Grounded Theory Analysis: Emergence vs Forcing*. Mill Valley, CA: Sociology Press; 1992.
22. Glaser B, Strauss A. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, IL: Adline Publishing Company; 1967.
23. Mortlock M. A disaster report card: almost five years after 9/11 and nearly a year after Hurricanes Katrina and Rita, how well prepared are we for the next disaster? *The Public Manager*. 2006;35(1):26-29.
24. Government Accounting Office. *Emergency Management: Most School Districts Have Developed Emergency Management Plans, But Would Benefit From Additional Federal Guidance (No. GAO-07-609)*. Washington, DC: Government Accountability Office; 2007.
25. Centers for Disease Control and Prevention. School health guidelines to prevent unintentional injuries and violence. *MMWR. Recommendations and Reports*. 2001;50(RR-22):1-73.
26. Hazinski M, Markenson D, Neish S, et al. Response to cardiac arrest and selected life-threatening medical emergencies: the medical response plan for schools—a statement for healthcare providers, policymakers, school administrators, and community leaders. *Annals of Emergency Medicine*. 2004;43(1):83-99.
27. Gaines SK, Leary JM. Public health emergency preparedness in the setting of child care. *Family Community Health*. 2004;27(3):260-265.
28. Pfefferbaum B, Reissman D, Pfefferbaum R, Klomp R, Gurwitsch R. Building resilience to mass trauma events. In: Doll L, Bonzo S, Sleet D, Mercy J, eds. *Handbook of Injury and Violence Prevention*. New York: Springer; 2007:347-358.