



Lessons learned from school participation in the 2008 ShakeOut

Rebekah Green, Ph.D.
Marla Petal, Ph.D.

August 2010

Resilience Institute Working Paper 2010_2
Manuscript submitted to *Earthquake Spectra*, in second review.



Western Washington University, 516 High Street
Bellingham WA 98225-9085 USA | +1 360.650.2707
www.wvu.edu/huxley/resilience



Lessons learned from school participation in the 2008 ShakeOut

Rebekah Green,^{a)} M.EERI, and Marla Petal^{b)}

The 2008 ShakeOut provided an important opportunity for schools to test state-mandated disaster plans. In conjunction with the event, a research team disseminated two online surveys to registered schools in order to assess preparedness and ShakeOut participation and directly observed three schools during their ‘drop, cover, and hold on,’ evacuation and response drills. Survey responses showed high satisfaction with ShakeOut participation and enhanced drilling. Significant achievements in school disaster planning are also documented - more than two thirds of those surveyed routinely engage in non-structural mitigation and almost all had disaster committees and plans. Private schools lagged behind public schools in both preparedness and drilling complexity. Challenges remain in educational continuity plans, student release procedures, and transportation planning for disasters. Learning could be enhanced by encouraging schools to increase student and parent involvement, vary the time of the drill, and limit advanced warning to only key staff.

INTRODUCTION

In 2008, the Earthquake Country Alliance organized a week of special events focusing on earthquake preparedness and culminating in a region-wide, voluntary earthquake drill on November 13, 2008. The drill was based upon a scenario of a 7.8M earthquake occurring along the southern San Andreas Fault, developed by a team of over 300 scientists, engineers, and others. A series of public announcements, media events, and printed and online material detailed scenario shaking, impacts, and secondary hazards. The drill was intended to

^{a)} The Resilience Institute, Western Washington University, 516 Hugh Street, Bellingham, WA 98225-9085

^{b)} Risk RED, Los Angeles, California. Kandilli Observatory & Earthquake Research Institute, Turkey.



encourage the public to practice how to protect themselves during an earthquake. Simultaneously, the scenario was used as basis of a statewide emergency response exercise.

One audience targeted for ShakeOut participation was southern California public and private schools. By state law, California public and private schools are required to conduct periodic “drop and cover” drills and to have a school building disaster plan (CA Education Code, section 35295-35297).

The Earthquake Country Alliance, through the Southern California Earthquake Center, worked with the California Department of Education and school district emergency management personnel to identify and contact public and private schools in eight southern California counties of Imperial, Kern, Los Angeles, Orange, Riverside, San Bernardino, San Diego, and Ventura. Each district and school was invited by email and through district communication channels to register as ShakeOut participants and engage in actions ranging from conducting classroom “drop, cover, and hold on” drills, to full school evacuations and practice of school’s incident command system.

Drills and simulations have been a cornerstone in training for emergency managers, if not yet for the general public (Simpson, 2002). They provide the opportunity to exercise planning, training, rehearsing and assessing to tackle problems of great complexity, to examine individual and collective behavioral responses, to practice teamwork and to test plans (Herman, 1997; Perry, 2004) . This process can illuminate gaps in risk reduction, roles and responsibilities, and arrangements for the complex coordination of disaster response. Drills and simulations help to visualize possible scenarios, consider and rehearse frightening events in a less threatening environment, encourage dialogue that might otherwise be avoided, showcase institutional and neighborhood efforts, and create pressure and constituent support for increased preparedness (Simpson and Sephto, 1998). However, drills focused on professional responders have limited relationship to the large-scale chaos that may be faced, the transportation and communication challenges that professional responders face, and the absence of convergent responders who appear in real life (White, 1995; Tierney et. al. 2001; Simpson, 2002).



At least one study on community-based disaster preparedness efforts has been shown to have a very positive effect on individual and neighborhood preparedness increasing feelings of social support, providing valuable source of post-disaster assistance, and serving as a model for public-sector preparedness (Simpson, 2002). Members of the public, as young as kindergarten age have been shown to clearly benefit from behavioral training for emergency response (Jones et. al. 1981; Izadkhah and Hosseini 2003). Yet unknown, was the degree to which regional drills, as opposed to individual school drills as mandated by state law in California, could provide a multiplier effect for spurring advancement in school preparedness.

This article discusses findings from two questionnaires administered to schools registered as participants in the 2008 southern California ShakeOut. The questionnaires documented school preparedness and emergency planning prior to the ShakeOut and participation in and perceived benefits of participation following the ShakeOut. In the following section, we briefly discuss the history of California regulations regarding school physical safety and emergency planning. This is followed by a literature review of key research on school emergency preparedness in the state. The methods section discusses the questionnaire development, dissemination, and sample demographics for both the pre-ShakeOut Preparedness Questionnaire and the post-ShakeOut Evaluation Questionnaire. A discussion of results follows. The article ends with conclusions that can be drawn from this benchmark study as well as future research needed to better understand school safety and the role regional drills can play in promoting it.

SCHOOL SAFETY IN CALIFORNIA

In the past 100 years, eight earthquakes have had significant impacts on schools, children, teachers, and on educational continuity in California. None has taken place during regular school hours, however, damage to school buildings and the potential for widespread casualties had the events occurred during school hours, has spurred a series of legislation aimed at reducing the vulnerability of school buildings to seismic events and mandating school emergency planning.



School seismic safety has been a policy and a community concern in California for 75 years, since the 1933 Long Beach earthquake. Since then, lessons from each earthquake have translated into incremental changes in policy. Requirements for school emergency planning and non-structural mitigation measures began after the 1983 Coalinga earthquake. School safety policies were refined again after both the 1989 Loma Prieta and 1994 Northridge earthquakes. State legislation mandates preparedness planning for schools. California's Standard Emergency Management Systems (SEMS) is required of all local government, offices of education, school districts, and community college districts for nearly a decade (California Government Code, Section 8607). Every public and private school with more than 50 students, from elementary through high schools has been required to establish an earthquake emergency plan since the mid-1980s. The code also requires periodic drills in 'drop and cover' and evacuation procedures (quarterly in elementary schools and twice yearly in secondary schools). More complicated drills are to be held once or twice a year and are to include other emergency response actions such as search and rescue, communications, and damage assessment. Schools are told that they should be prepared to serve as post-disaster shelter for the public. Failure to comply with SEMS, and now with the similar National Incident Management Systems (NIMS), leaves districts at risk of losing state assistance funds for emergency response-related personnel costs (California Education Code, Sections 35295-35297). While these measures have placed responsibility for school preparedness clearly with school boards and school administrators, research on the implementation of these mandates indicate that gaps remain.

In general, there has been a paucity of research on school disaster safety. A decade old comparison of written plans from schools (Burling and Hyle, 1997) and studies of terrorism prevention (Phinney, 2004) and preparedness for mass casualties (Graham et. al., 2006) are notable.

In 2004 the Los Angeles County Office of Education Emergency Response and Crisis Management Project conducted a baseline assessment of staff perceptions and preparedness in 83 schools in three school districts in the County (Kano et. al, 2007). By most accounts preparedness respondents perceived their preparedness levels as high. Almost all knew they were disaster service workers, but fewer than 50% had had specific SEMS



training. Almost all respondents reported that their school had a school safety committee (65% included nurses and custodians, 50% included parents, and 33% of middle schools and 29.2% of high schools had students on them). About 90% of respondents said schools had evacuation plans and 70% had flashlights and batteries, but less than half had a sheltering plan, rescue equipment or supplies for children with special needs (Kano et. al. 2007). The districts had varying experiences with prior emergencies, and while generally participants think that they are well-prepared their plans and actions were not in conformity with SEMS requirements, and training among non-administrative staff was found insufficient. Reliance on 2-way radio and telephone communications was also cause for concern, as was lack of response provisions, sheltering plan and food. The authors were concerned that a sense self-efficacy might be inhibiting action for better preparedness (Kano et. al. 2007).

A 2005 statewide mail study, conducted by the Southern California Injury Prevention Center, provides an important baseline on school preparedness in California (Kano and Bourque 2007a, 2007b, 2008). From a sampling frame of 4,345 schools in 200 California districts, data from 157 of 470 sampled public schools, in 34 of California's 58 counties, revealed that 75% of schools reported that at least one significant emergency or disaster, including various forms of school violence, had occurred between 2002 and 2005 (Kano & Bourque, 2007a). As a result 51% had a lockdown, 48% evacuated classrooms, 24-33% suffered financial loss and damage to buildings or property, 26% suffered illnesses and injuries to students or staff and 15% reported mental health problems among students or staff (Kano & Bourque, 2007a).

Almost all the schools surveyed had school-specific disaster plans reviewed regularly with administrators, teachers and other staff involved in their development. Typically districts provide model plans or templates, technical assistance for developing plans/activities and information on preparedness. Most also provide training, organize and conduct drills, and arrange for equipment and supplies. Less than half provide funding. Surprisingly only 56% reported that their plans were based on the Standard Emergency Management System. While 57% rated their schools overall preparedness very adequate or good, 44% rated their school's preparedness to shelter students for 24 hours as somewhat or not at all adequate (Kano & Bourque, 2007b).



Training and inter-agency coordination also appear as weaker areas. While almost all schools had fire extinguishers and first aid supplies, more than twenty-five percent lacked emergency water supply, flashlights, or emergency alert system. Thirty-three to sixty-three percent of schools did not have supplies on hand for children with special needs, more than half lacked emergency food supplies, and less than 40% had any search and rescue tools or equipment. Seventy-one percent of schools reported having no emergency preparedness coordinator, 27% had no crisis team and 22% had no funding for emergency preparedness (Kano & Bourque, 2007b).

Surveying schools participating in the 2008 ShakeOut drill posed a unique opportunity to examine school response actions during an earthquake drill. Further, the participation of private schools provided an opportunity for a first-time examination of school safety issues within Southern California's private schools. Because the ShakeOut was the first regional drill of its kind in California, a survey also served as a benchmark for comparison with future statewide ShakeOut drills.

METHODS

Almost four million children and adults were directly involved in the Great Southern California ShakeOut through the registered participation of schools across eight participating counties. Registered participants included 207 school districts, 277 additional individual public schools and 650 private schools, out of 308 school districts, 4,356 public schools, and 3,369 full time private schools having six or more students. Table 1 summarizes statistics for the eight participating counties and the schools and districts registered for the ShakeOut. Sixty-seven percent of public school districts registered and approximately 19% of the private schools. The low number of public schools registered to participate, 6%, may be a result of public school participation predominately occurring through district level registration. Participating districts well represented the demographics of the region's public schools, having the same percentage of English learners and only slightly lower participation in the free and reduced lunch program.

Table 1. Southern California School Participation in 2008 ShakeOut



	Imperial	Kern	Los Angeles	Orange	Riverside	San Bern.	Sand Diego	Ventura	Public Subtotal	Private Subtotal ^d	TOTAL
OVERALL^a											
School Districts ^b	17	49	87	28	26	35	44	22	308		308
K-12 Schools	36	264	2093	629	485	561	95	193	4356	3369	7,725
K-12 Enroll. (1,000s)	36	174	1,631	504	420	420	497	142	3,825	325	4,150
English Learners (%)	42	22	27	28	23	22	25	23	25		
Free & Red. Lunch (%)	69	64	64	42	54	61	48	42	58		
2008 SHAKEOUT REGISTRANTS^b											
Districts Registered	16	16	68	26	23	25	27	6	207		207
Districts Registered (%)	94	33	78	93	89	71	61	27	67		67
Individual Schools Registered	18	37	79	27	23	33	42	18	277		277
Individual Schools Registered (%)	50	14	4	4	5	6	44	9	6	19	12
K-12 Student + adult participants (1,000s)	36	75	1,767	511	419	332	377	39	3,556	21	3,577
English Learners (%)	43	17	27	28	23	22	25	23	26		
Free & Red. Lunch (%)	69	59	63	43	54	61	48	42	56		

^a<http://dq/cde/ca/gov/Dataquest> for 2008-2009, ^bIncludes Co. Office of Ed., ^cMark Benthien, Earthquake Country Alliance, , ^dRegistered with state having enrollment ≥ 6.

Risk RED and the Resilience Institute at Western Washington University collaborated with the Coalition for Global School Safety and Disaster Prevention Education (COGSS&DPE), Southern California’s Earthquake Country Alliance, and ProVention Consortium to establish an international research team of 13 school safety activists to assess school participation in the 2008 Southern California ShakeOut. A Preparedness Questionnaire and Evaluation Questionnaire were developed using the Los Angeles Unified School District and Los Angeles County Office of Education guidance materials for disaster and emergency planning, SEMS guidance materials from the California Office of Emergency Services, and Risk RED’s School Disaster Resilience and Readiness checklist as guides. Literature on household hazard adjustments was also examined to develop consistencies (Lindell & Perry 2000). The team received inputs from Dr. Marizen Ramirez, consultant to Los Angeles Unified School District. The intention was both to make the questions consistent with the current guidance available to local districts, to generate some new baseline data, and to provide a broad template for future international comparisons.



The questionnaires were input into an online survey tool (Risk RED 2009b). Online surveying has been found to reduce response quality, having increased “don’t know” responses, less differentiation on rating scales, and more item non-response than face-to-face surveying (Heerwegh and Looseveldt 2008), though it can increase the level of reporting of sensitive information and decrease social desirability effect (Kreuter et. al 2008). Item non-response rates were under 12% for schools except when evaluating SEMS activities and classroom emergency supplies where item non-response rate reached 19%. For districts, item non-response rate was under 8%, except on questions asking districts to evaluate parent outreach, classroom supplies, and SEMS roles at district schools; on these questions, non-response reached 36%. Item response was likely highest from districts and individual schools where school emergency preparedness was prioritized and data on preparedness actions already documented prior to the survey.

A link to each questionnaire was distributed by a ShakeOut organizer in an explanatory email sent to all ShakeOut school registrants. While a random sampling of all schools within the eight-county region was preferred, but cost prohibitive and state department of education approval may have delayed research significantly past the date of the ShakeOut. Results are likely to reflect schools that are most concerned about and active in emergency response and preparedness. The Preparedness Questionnaire link was sent one week prior to the ShakeOut; the Evaluation Questionnaire was sent the day after the ShakeOut drill. A reminder email was sent and both questionnaires remained open until December 31, 2008. To complement questionnaire results, the team also directly observed four schools engaging in evacuation and SEMS drills as part of the ShakeOut.

Table 2 tabulates the number of district responses by county for the two questionnaires. Response rates, based upon ShakeOut registrants, were 5.8% for the Preparedness Questionnaire and 14.5% for the Evaluation Questionnaire. Nearly 20% of registered private schools responded to the Preparedness Questionnaire; nearly 30% responded to the Evaluation Questionnaire. Conversations with private school representatives suggest that many private schools registered to participate in ShakeOut to receive support for school emergency preparedness that many public schools receive through district office emergency

and safety personnel, potentially leading to higher response rates. Internal reporting activities also may have lowered for public sector response rates.

Table 2. Response Count and Rates for the Preparedness and Evaluation Questionnaires

County	Pre-Drill Preparedness		Post-Drill Evaluation	
	District	Individual K-12 School	District	Individual K-12 Schools
Imperial	6.3% (1)	1	6.3% (1)	7
Kern	0.0% (0)	1	12.5% (2)	4
Los Angeles	2.9% (2)	23	17.6% (12)	51
Orange	7.7% (2)	19	15.4% (4)	44
Riverside	13.0% (3)	12	17.4% (4)	30
San Bernardino	12.0% (3)	1	16.0% (4)	16
Sand Diego	3.7% (1)	6	7.4% (2)	20
Ventura	0.0% (0)	8	16.7% (1)	13
Other		5		2
<i>Public Subtotal</i>	5.8% (12)	76	14.5% (30)	187
<i>Private Subtotal</i>		18.6% (121)		29.4% (191)
TOTAL	12	197	30	378

District responses to the post-drill Evaluation Questionnaire represented 14.5% of registered districts, a student population of 419,000, and roughly 12% of public school-based participants.

While a voluntary, list-based sampling approach and lack of inclusion of non-participating schools precluded statistical significance testing or extrapolation for regional representation, the survey did allow exploration of how schools participated in a regional drill, and to a limited extent, whether regional drills prompted expanded school preparedness activity. Further, the questionnaires allowed a comparison of preparedness and drill activities across public and private schools.

A brief summary of survey findings is reported below in sections on the Preparedness Questionnaire, sent out to ShakeOut school registrants prior to the drill, followed by a section on the post-drill Evaluation Questionnaire results. A third section, briefly discusses qualitative observations made at four school sites during the ShakeOut drill that add insights to questionnaire responses. A full report on the 2008 ShakeOut school participation survey can be found elsewhere (RiskRED 2009b); full data can be obtained by request.



PRE-DRILL PREPAREDNESS QUESTIONNAIRE RESULTS

One-hundred and ninety-seven individual schools and 12 districts completed the Pre-Drill Preparedness Questionnaire. School responses represented roughly a quarter of all individually registered schools. District responses represented 5.8% of registered districts, a student population of 889,000, and about a quarter of ShakeOut participants in public schools. Results from the Pre-Drill Preparedness Questionnaire are discussed in sections on assessment and planning activities, physical protection activities, and response skills and provisions.

ASSESSMENT AND PLANNING ACTIVITIES

Responding schools and districts reported extensive pre-ShakeOut emergency planning activity at the administrative level. Ninety-five percent responded affirmatively that they have a school preparedness committee. Virtually all schools have administrators on their committees, and more than 90% have teachers. While 78% of public schools include staff, only 54% of private schools report including staff (e.g. school nurse, facilities maintenance and nutrition services personnel). Similarly while 36% of public schools report including parents, this falls to 24% for private schools. Only about 10% include other community representatives. Student participation is reported on only 17% of committees overall, increasing to 25% in schools with students in grades 9-12.

The overwhelming majority of schools report no plan for alternate schedules and methods for continuing instruction during a period of school closure. Individual schools report having an off-site, secure back-up of educational records and emergency contact and release information in an alternate location, though there was a wide discrepancy by school type. Seventy-eight percent of public school respondents secured backup records while only 37% of the private schools did. Of those schools located near the coast or near a hazardous materials site, plans for evacuation to a safer location are reported by only 58%, with a higher rate for public than for private schools.

Staff were involved in school emergency planning. Of the 186 schools that responded to this segment of the survey, about three-quarters stated that all or most staff had reviewed their school emergency plan in the past year and revised it. While 92% said that all or most



school staff is aware that they are expected to stay on the job as disaster service workers, only 14% could affirm that all or most staff has completed their own family disaster plans.

For effective response, parents and the wider community need to understand and support school preparedness and response plans. All but 12% of individual schools respondents completed questions about parent notification of plans and drills. Three-quarters report that parents are notified about school emergency plans and drills. Only one-third reported that they encourage staff and students to prepare for disasters at home and provide support material for doing so.

PHYSICAL PROTECTION ACTIVITIES

Survey responses are not considered reliable with respect to school structural safety, however, results of non-structural safety are revealing. Sixty-seven percent of the 180 schools responding to this segment of the survey say that most or all supplies, lighting fixtures, roof elements, railings and parapets, heating and cooling devices, kitchen equipment, storage tanks and other items that could kill or injure people, or impair instructional continuity had been secured, while 10% said few or none had been secured. While 72% said that all or most furnishings that could slide or fall during earthquake shaking and could kill or injure has been secured, 7% said that few or none had been secured. It is unclear whether this non-structural mitigation occurred prior to awareness of the ShakeOut and its extensive promotion of earthquake protective action. Districts overwhelmingly responded with the assessment that “most” has been secured. In most cases, hazardous materials seem to have been limited, isolated and secured. Most (75% of those who are sure) say that emergency lighting is available in all or most places where needed leaving a substantial proportion in the dark. More definitively, the overwhelming majority (>90%) assert that most or all exit routes are marked and kept clear and that smoke detectors, fire alarms, automatic sprinkler systems, fire hoses and fire extinguishers are in place and maintained regularly.

RESPONSE SKILLS AND PROVISIONS

Student and staff response capacity was high across the board. Over 80% of respondents reported that *all* students had practiced ‘drop, cover, and hold on’ in their classrooms and building evacuation and 10% more said *most* had. Sixty-nine percent of individual schools



report that all or most teachers know how to use a fire extinguisher, leaving 27% with few, some, or none (5% not sure). The largest numbers of staff are trained in basic first aid. Substantial numbers are also trained in turning off utilities and student release procedures. Roughly 90% schools or more had at least one staff member with this type of training. About a third of schools have staff who have taken a Red Cross Disaster training class.

Only about a quarter of schools had anyone with SEMS/NIMS/ICS, CERT or military training. Overall only about 20% report staff with fire suppression training, 13% amateur radio, 3% HAM DCS. In addition, 26% of public schools and 7% of private schools have someone with law enforcement training. The 9 school districts responding report much higher rates of training across the board.

When asked about school emergency supplies, 95% report having first aid supplies. Over three quarters of individual schools have sanitation and food supplies to last at least 72 hours. Roughly half also have alternative communication, shelter and emergency lighting. A quarter of schools or fewer have emergency power or alternative transportation.

POST-DRILL EVALUATION QUESTIONNAIRE RESULTS

Three-hundred seventy-eight schools and 30 districts completed the Post-Drill Evaluation Questionnaire. School responses represented nearly 30% of the registered schools. District responses to the post-drill Evaluation Questionnaire represented 14.5% of registered districts, a student population of 419,000, and roughly 12% of public school-based participants.

Schools reported a wide range of engagement with the ShakeOut drill. Seventeen percent of responding schools did ‘drop, cover, and hold-on’ drills only. Fifty-five percent did this, followed with a building evacuation to the designated assembly area. Thirty percent practiced the full mandated ICS/SEMS drill. At least twice as many public schools as private schools did full ICS/SEMS drills.

When asked about other drills performed throughout the year prior to the ShakeOut, the fire drill was the most frequently exercised drill across all school types with 66% of schools reporting doing fire drills monthly. Thirty-seven percent report doing a full evacuation and ICS/SEMS drill at least 2 times per year and another 27% to them annually. However, 29%

of individual schools (34% of private schools and 23% of public schools) report doing a full simulation drill only once every couple years or never. Similarly, 15% of individual schools (22% of private and 7% of public schools) report never having done a lock-down or shelter-in-place drill. Since the respondent group is likely skewed towards those who *do* participate in regular drills, it is likely that a higher percentage of schools are not practicing these drills.

Table 3 shows ShakeOut drill activity by past frequency of full disaster drills. Of the 14 public schools and 15 private schools had never performed a disaster drill with evacuation and full ICS/SEMS, over three quarters performed an evacuation drill during the ShakeOut. Of the 54 schools that had only performed full disaster drills every couple years in the past, 10 did a full ICS/SEMS drill. A higher percentage of public schools that had never or infrequently engaged in full disaster drills did so during the ShakeOut than private schools. Most schools that frequently did full disaster drills did not use the ShakeOut to do a full drill, performing ‘drop, cover, and hold on’ with or without evacuation. Discussions with a school safety officer for a large public school district indicate that some districts already had set dates for their full disaster drills that did not correspond to the ShakeOut.

Table 3. ShakeOut Drill Participation Level by Past Frequency Full Disaster Drills

Frequency of past disaster drills with evacuation and full ICS/SEMS ^a	School Type	Drill Performed During the 2008 ShakeOut					Total
		DCH	EVAC	ICS/SEMS	EOC	(blank)	
Never	Public	0%(0)	93%(13)	7%(1)	0%(0)	0%(0)	100%(14)
	Private	24%(6)	72%(18)	4%(1)	0%(0)	0%(0)	100%(25)
1 x every couple years	Public	12%(3)	65%(17)	23%(6)	0%(0)	0%(0)	100%(26)
	Private	18%(5)	64%(18)	14%(4)	0%(0)	4%(1)	100%(28)
1 x year or more	Public	9%(11)	45%(55)	43%(53)	2%(3)	0%(0)	100%(122)
	Private	19%(12)	71%(45)	40%(25)	0%(0)	2%(1)	100%(63)

^aForty-one public and private schools did not answer this question (13%).

Similar to Kano and Bourque’s (2007a) findings, a large proportion of schools have had unexpected emergency response events in the past two years. Districts reported responding to fire (50%), violence or bomb threats (47%), earthquakes (33%) and other unexpected events



(43%). A third of individual schools reporting having responded to fire and earthquake, and a sixth to violence or bomb threats. . Fifty-seven percent of schools and 33% of districts engaged in informal post-event evaluations. Forty-one percent had post-event evaluation discussions with students (59% in private schools and 24% in public schools). Twenty-two percent of public schools would have this reviewed at the district level while 67% of responding districts said reports would be reviewed.

Most drill elements were very positively evaluated with *all* or *most* students and teachers adopting the ‘drop, cover and hold on’ position and staying there during the shaking. Following the shaking *all* or *most* teachers and staff check to see if anyone is injured and make a mental note of any damage or hazardous materials and assemble in a safe area outside. A full 71% of the districts reported no problems encountered during ‘drop, cover, and hold on’ though district reported non-participation of staff (10%) and distractions (14%) affecting schools, with individual schools reporting similar findings. Student non-participation was minimal and no cutting of school was reported.

In most cases where students with disabilities were present they participated in the drills. However districts reported that in about 15% of schools, some or all children with disabilities did not participate. Anecdotal reports suggest that some special education classes may organize their own drills at other times to avoid adverse health and behavior consequences.

Of individual schools responding to the question, fewer than half had parent participation in the drill. Where they were involved parents were volunteers and/or observers.

All respondents were asked to evaluate their school-based incident command functions in the drill. For the most part individual schools and districts met their own expectations, and many exceeded them. The strongest areas were Incident Command and Command Center with 77% of individual schools and 81% of districts meeting or exceeding expectations, and Assembly Area with 83% of individual schools and 95% of districts meeting or exceeding expectations. Districts also rated the following highly: Communications & Public Information with 72% meeting or exceeding expectations and First Aid & Mental Health Team with 87% meeting or exceeding expectations.



In a real disaster school respondents expect to have problems with shelter (48%), student reunion (39%), nutrition (29%), physical safety 30%, educational continuity (23%), and health (16%). Concerns over shelter mirror earlier research finding that's 44% of schools rated their shelter preparedness poorly (Kano and Bourque, 2007b). In all areas by nutrition and student reunification, a higher percentage private schools expected problem. These expectations are probably quite realistic.

For 88% of individual school respondents, the ShakeOut was a significant opportunity to improve their own response, 84% found it an opportunity for greater public awareness and 80% an opportunity to collectively improve response. Seventy-one percent appreciated the opportunity to practice unified command and to know that they are drilling with other schools. Most individual schools (68% of public schools and 72% of private schools) believed the ShakeOut should occur annually. District respondents put an even higher premium on the value of the ShakeOut for public awareness and improving collective response, 73% saying it should be every year.

SCHOOL-SITE OBSERVATIONS

The research team observed the ShakeOut drill in one public high school, one public middle school, one public school district emergency operations center, and one private elementary school. These observation sites, rather than being considered 'typical', must be considered among the best prepared schools, those that have accomplished sufficient amount to be willing to open themselves up to observation, as well as being interested in feedback as part of a continuous process of improvement. As individual case studies, these highlight some of the great strengths, and some of the continuing concerns for school disaster preparedness in California (Risk RED 2009b).

In the schools observed, the school safety plan was in constant use, reviewed annually and updated, and "never got dusty." The School Site Council provided inputs into the plan. Regular fire drills were held monthly and one to two full "SEMS" drills were held every school year with different scenarios. In the public schools observed, faculty were well prepared. School administrators, staff, teachers and students had rigorously and regularly practiced emergency drills, and staff had implemented a SEMS coordination system,



achieving a high degree of mastery in these efforts. New staff members typically received training in basic emergency procedures and continued to learn through rotating assignment of responsibilities and mentoring during regular drills. Some drills have taken place when principal was off campus, encouraging others to take leadership and practice flexible role adoption.

In the drill itself, students evacuated in an orderly fashion using stairs. There was no pushing or dangerous behavior. All buildings were evacuated efficiently and quietly and students assembled on outdoor fields. All students were accounted for within 15 minutes of the start of the drill. Older students were involved in response activities, including distribution of water, shelter, and communications. Children with disabilities practiced separately and accommodations were made for them in drill procedures. On-site communications were clear and did not involve any unnecessary codes. Student-family reunification was accomplished with care and appropriate accountability.

Gaps noted by observers are students and parents are not as aware of school emergency planning procedures as faculty. For the most part, students have not received special training for disaster prevention and preparedness, other than regular guidance throughout their schooling on ‘drop, cover, and hold on’ under their desks and evacuation procedures. It is of real concern that in an actual event, both parents and students will not be prepared for the length of waiting time required to process and reunify large numbers of students. Of great concern to developers of standardized messaging is that neither students nor teachers know what to do if there are no desks drop, cover and hold under, or if they do not fit under them.

At one school the principal instructed students to send a text message to their parents that they were participating in the community-wide earthquake drill and that they were with their class and were safe.¹

¹ Mass telecommunications have impacted even text messaging in previous disaster events, and spikes in text messaging may well exacerbate telecommunication failures in the event of a major earthquake (Stidham, 2010, AP 2005).



DISCUSSION

The 2008 ShakeOut provided an opportunity for schools to engage in expanded school and district level drilling of emergency plans. Comparison of drill complexity achieved during the ShakeOut with reports of past drills indicates that the ShakeOut prompted first time full evacuation drills for several responding schools. It prompted practice of a full ICS/SEMS drill for others that only infrequently engaged in full drills. A majority of schools and districts, especially private schools, found it to be a significant opportunity to practice emergency response and expressed support for an annual regional drill. Annual ShakeOut drills may see rates of full drill participation grow.

A unique aspect of this survey was the inclusion of private schools, a group about which little is known regarding emergency preparedness. A comparison of private and public schools responding to this survey indicates that private schools were less likely to include staff and parents in school preparedness committees. Public schools responding were much more likely to have off-site backups or their reports than responding private schools, suggesting better preparedness for educational continuity in the public sector. Staff training in emergency preparedness related fields was low for all schools, but especially for private schools. During the ShakeOut, at least twice as many public schools as private schools did full ICS/SMES drills; higher frequency of past full disaster drilling was also found in responding public schools. However, in past emergencies, private schools led public schools in discussing drills with students. Results indicate the need for further outreach and support for emergency planning and drill practice among California's private schools and the potential for annual regional drills to support private school preparedness.

CONCLUSIONS

This study has been able to document a variety of strengths as well as potential weaknesses and priorities of major concern to school readiness for major earthquake impacts. Issues needing further attention include broadening participation, streamlined planning for reunification, planning for students and staff with disabilities, enhancing drill realism, and planning for event occurrence before or after school while students are in transport or on-site licensed care programs.



While many schools have been extremely conscientious in addressing school disaster prevention and preparedness through staff training, regular practice and reflective self-assessment schools, responses to this survey indicate that parents, students, and classified staff remain in peripheral roles and can play a much greater role in both advocacy and support for school disaster management goals than they currently do. Students are not fully engaged in the knowledge, skills and competencies for disaster prevention and preparedness, nor in carrying these messages home. Few are involved in school disaster management committees. In spite of rote training to ‘drop, cover, and hold on,’ students may be unprepared to think through and apply a range of behaviors for safety in different situations. Engagement of parents is also an area that needs further attention. Little thought has gone into how to involve parents in successful response, and how to communicate with them to prepare them for a range of roles and responsibilities.

Schools are aware that one of the most problematic areas is ensuring child protection and safe student/family reunification. Schools must be diligent in ensuring that emergency contact information is updated at the beginning of every school year. School-based signage directing parents to separate request and reunification gates are likely to help this process. As yet little attention has been paid to parent training, perhaps the weakest link.

In many cases the particular challenges of drilling with students with disabilities may be avoided rather than addressed and problem-solved. While emergency planning is not a routine part of each disabled student’s Individualized Educational Plan, this would be an effective way to ensure that each student’s unique needs in case of disaster were properly considered. Specialized task groups including teachers, parents and older students are needed in school districts to address the range of challenging issues (Kailes, 2008). Regional drills may be an appropriate venue for highlighting and supporting fuller inclusion of both children and adults with disabilities in disaster planning.

While schools evaluated participation in the ShakeOut positively, and participation seems to have particularly spurred first time drills or more complex drills among schools that infrequently engaged in full disaster drills, the ShakeOut Drill, as practiced by observed schools, lacked realism. Expected damages were known in advance and the mid-morning time announced well in advance for all participants. The most effective ShakeOut drills



would be those where the timing and specific scenario were unknown to the widest possible number of participants, allowing for more realistic improvisation. Of particular importance would be consideration for events occurring when students may be on buses, commuting long distances, or in before or after school programs. School-based exercises and table-top drilling would be a first step to discovering the myriad of unaddressed problems expected to arise during these times.

Annual statewide ShakeOut drills are now scheduled in California, with several other states interested in replicating a similar statewide drill event. The survey discussed here forms a benchmark for evaluation of future ShakOut and regional drills. In future research, it will be particularly important to examine how school drill complexity and role proficiency change over time, whether parents and students -- especially those with disability -- become more engaged in the drill and school emergency planning, and how differences in public and private schools change over time. Expanded research is needed to examine emergency planning issues associated with school transport and before and after school care. A single new preparedness and drill evaluation survey was implemented in 2009 for individual K-12 schools and for school districts, for colleges and universities, private sector, and community-based organizations. The survey report for 2009 will be available in the fall of 2010 at www.riskred.org.

REFERENCES

- Associated Press, 2005. *Katrina outages reveal phone system quirks*, 31 Aug. 2005. <http://www.msnbc.msn.com/id/9120503/>
- Burling, W.K. and Hyle, A.E. 1997. Disaster preparedness planning: Policy and leadership issues. *Disaster Prevention and Management* **6:4** 234-244.
- Graham, J., Shirm, S., Liggin, R., Aitken, M.E., & Dick, R. 2006. Mass casualty events at schools: A national preparedness survey, *Pediatrics*, **9:4**, 222-225.
- Heerwegh, D. and Loosveldt, G., 2008. Face-to-face versus web surveying in a high-internet-coverage population: Differences in response quality. *Public Opinion Quarterly* **72**, 836-849.
- Herman, C. 1997. In Conclusion, The Multiple Payoffs of Crisis Simulation, *Journal of Contingencies and Crisis Management*, **5:4**, 198-206.
- Kailes, J. I., 2008. *Accommodating Individuals with Disabilities in the Provision of Disaster Mass Care, Housing, and Human Services*. <http://www.jik.com/disasters.html>.
- Kano M, Franke T, Afifi AA, Bourque, L.B. 2008. Adequacy of Reporting Results of School Surveys and Non-Response Effects: A Review of the Literature and Case Study. *Educational Researcher*. **37**: 480-490.



- Kano M, and Bourque LB. 2007a. Experiences with and preparedness for emergencies and disasters among public schools in California. *NASSP Bulletin*. **9:1**, 201-218.
- Kano, M. and Bourque, L., 2007b. *School Emergency Preparedness Survey Report: Improving Coordination is Vital for School Districts*, Southern California Injury Prevention Research Center, UCLA, Los Angeles, CA.
- Kano, M. and Bourque, L. 2008. Correlates of School Disaster Preparedness: Main Effects of Funding and Coordinator Role, *Natural Hazards Review*, Feb. 2008, 49-59.
- Kano, M, Ramirez, M., Ybarra, W.J., Frias, G., and Bourque, L.B. 2007. Are schools prepared for emergencies? A baseline assessment of emergency preparedness at school sites in three Los Angeles County school districts." *Education and Urban Society*. **39:3** 399-422.
- Kreuter, F., Presser, S., and Tourangeau, R., 2008. Social desirability bias in CATI, IVR, and web surveys: The effects of mode and question sensitivity. *Public Opinion Quarterly* **72**, 847-865.
- Lindell, M. & Perry, R. 2000. Household adjustments to earthquake hazard: A review of research, *Environ. Behav.* **32:4** 461-501.
- Perry, R., 2004. Disaster Exercise Outcomes for Professional Emergency Personnel and Citizen Volunteers, *Journal of Contingencies and Crisis Management* **12:2**, 64-75,
- Phinney, A. 2004. *Preparedness in America's schools: A comprehensive look at terrorism preparedness in America's twenty largest school districts*, America Prepared Campaign, New York
- Risk RED, 2009a. Model Drill and Templates. <http://www.shakeout.org/schools/drillplans/index.html>
- Risk RED, 2009b. *School Disaster Readiness in California: Lessons from the first Great Southern California ShakeOut*, Earthquake Country Alliance, Los Angeles. <http://www.preventionweb.net/english/professional/trainings-events/edu-materials/v.php?id=10582>
- Simpson, D. M., 2002. Earthquake drills and simulations in community-based training and preparedness programmes. *Disasters* **26**, 39-56.
- Simpson, D. M. and Sephon, S. E., 1998. *Citizen Participation, Social Support, and Disaster Preparedness Promoting Self-protection Action in Risk-prone Environments*, Working Paper No. 53-P, Texas A&M University, Hazard Reduction and Recovery Center, College Station, Texas.
- State of California, 2006. California State Government Code Section 8607-8607.2, *Standardized Emergency Management System (SEMS) Regulation*, Sacramento, CA.
- Stidham, B. 2010. Crisis response and SMS systems management for NGOs and governments, iRevolution, 15 April. 2010. <http://bit.ly/9GIJD2>
- Tierney, K.J., Lindell, M.K. and Perry, R.W. 2001. Facing the unexpected: Disaster preparedness and response in the United States, John Henry Press, Washington, D.C.
- White, D. 1995. Neighborhood Organization Activities: Evacuation Drills, Clusters, and Fire Safety Awareness, *The Biswell Fire Symposium*, USDA Forest Service Gen. Tech. Rep. PSW-GTR-158, 99-104.