

**State of California
Seismic Safety Commission**

Memo

To: Commissioners

From: Richard McCarthy
Seismic Safety Commission
1755 Creekside Oaks Drive, Suite 100
Sacramento, CA 95833
(916) 263-5506

Date: 9/7/12

**Subject: Engaging Californians in a Shared Value for Resiliency:
Practical Lessons Learned from the Great California Shakeout**

Background

In mid 2011, the Commission approved \$49,900 to: (1) summarize the history and development of the California ShakeOut drill, (2) document prior ShakeOut evaluation efforts and key findings, and (3) develop recommendations to guide future planning and coordination of earthquake drill activities in the State of California. The Commission also requested ways to encourage more participation from business and industry in the drill.

At the July Commission meeting, Dr. Michele Wood from Cal State University Fullerton Department of Health presented a draft of the report to the Commission. Commissioners made comments and requested Dr. Wood to develop an executive summary of the report that could be distributed to the Legislature and the Governor's office.

Recommendation

At the September Commission meeting, Dr. Wood will submit a final draft version for review and final approval by the Commission. Commissioners should pay particular attention to the reports executive summary.

PLEASE NOTE: YOU WILL RECEIVE THE REPORT VIA EMAIL ON MONDAY, SEPTEMBER 10.

**Engaging Californians in a Shared Vision for Resiliency:
Practical Lessons Learned from the Great California Shakeout**

September, 2012

DRAFT

Prepared by:

Michele M. Wood, PhD

CSU Fullerton Department of Health Science

With:

Deborah Glik, ScD

Community Health Science Department, School of Public Health,

University of California, Los Angeles

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1. Executive Summary

Purpose

The purpose of this project is to:

- Summarize the history and development of the California ShakeOut drill;
- Document prior ShakeOut evaluation efforts and key findings;
- Develop recommendations to guide future planning and coordination of earthquake drill activities in the state of California.

Method

This project reviewed available datasets, reports, raw data, and other documents pertinent to the history and evaluation of the ShakeOut.

The ShakeOut Drill

The “Great Southern California ShakeOut” is an annual community-wide earthquake drill that began in 2008. The goal of the drill is to provide southern Californians with an opportunity to learn what to do before, during, and after an earthquake. The drill is based on the ShakeOut Scenario, a theoretical large earthquake that could occur along the southern portion of the San Andreas fault (Jones, Bernknopf, Cox et al., 2008). The ShakeOut Scenario was created by the United States Geological Survey’s Multi-Hazard Demonstration Project and has been used to help understand the effect that a large earthquake could have on the economies and communities of southern California (Jones, Bernknopf, Cox et al., 2008). Since the first year it was implemented, the ShakeOut drill has spread to other states and several other countries, as well.

Evaluating the ShakeOut

Evaluation of the ShakeOut drills has occurred since the first drill in 2008, but has been limited by the lack of funding available for assessment activities. The initial 2008 drill resulted in three different types of funded evaluations:

- A comprehensive program evaluation (Davoudi, Onuma, & Glik, 2009);
- An evaluation of the education sector (Petal & Green, 2009);
- A media-focused evaluation (Blakley, Chen, & Kaplan, 2009).

In the years that followed, funding for evaluating the ShakeOut has not been readily available. SCEC formed a Research and Evaluation Committee consisting of local earthquake preparedness researchers to develop and implement evaluation activities for ShakeOut drills beginning in 2009. The Committee conducted a survey of ShakeOut Registrants, which has been implemented each year from 2009-2012.

The Commission helped fund a statewide household preparedness survey that concluded roughly four years ago. The results from this study can be used as baseline data to evaluate the impact of the ShakeOut on household preparedness throughout the state.

Key Findings

Several key findings emerged from this project.

- SCEC and the ECA have been successful in their efforts to promote the ShakeOut rather than their own organizations, which is likely responsible for its rapid adoption throughout the state and beyond as well as the amount of publicity it has received.
- Just as real earthquakes prompt preparedness behavior, simulated events like the ShakeOut drill also can prompt information seeking and preparedness action.
- California schools remain an underutilized resource for promoting household earthquake preparedness and can do more to encourage staff and student families to prepare for disasters at home and provide support materials for doing so.
- Businesses and other organizations also remain underutilized in efforts to promote household preparedness and can have a tremendous impact on the level of preparedness and rate of recovery in local communities.
- The ShakeOut drill has been successful in prompting individuals to talk to others about the drill itself and about earthquake safety and preparedness, which has been shown to be an effective strategy for motivating household preparedness.

Recommendations

This project identified a number of challenges and opportunities, and yielded the following key recommendations.

#1. Target businesses and other organizations for an increased role in motivating household preparedness:

- Only 38% of small employers have an emergency preparedness plan (National Federation of Independent Businesses, 2004);
- At least 30% of small businesses have been closed for 24 hours or longer in the past three years following a natural disaster (National Federation of Independent Businesses, 2004);
- Businesses and other organizations should play a larger role in conducting ShakeOut drills, distributing earthquake safety and preparedness information, and modeling preparedness efforts;
- Disaster preparedness, having an emergency response plan in place, and having the equipment and supplies necessary to enable business continuity, increase the likelihood that businesses will recover following disaster (Tierney, Lindell, & Perry, 2001);
- If workers and their households are better prepared for a major earthquake, they will be able to return to work more quickly, leading to increased community resilience and faster recovery.

Recommendation: *The Commission should identify and recognize businesses and other organizations that can serve as role models because of their participation in the ShakeOut drill and evaluation, and their efforts to foster preparedness within the workforce and broader community. The Commission also should seek ways to motivate businesses to provide their employees with earthquake kits and information, and encourage increased preparedness within households.*

#2. Target schools for an increased role in motivating household preparedness:

- Schools are important because engaging one school in earthquake safety and preparedness can potentially affect hundreds, and perhaps, thousands, of individuals;
- Schools can and should play a larger role in motivating household preparedness through the transmission of information, support materials, and engagement from students to their families;
- The ShakeOut already provides materials to schools to facilitate this effort, and this activity should be expanded;
- Recognition that can be posted on school websites can help school's publicize their efforts, and can help motivate families, as well as other schools, to also take action.

Recommendation: *The Commission should identify and recognize schools that can serve as role models because of their participation in the ShakeOut drill and evaluation, and the efforts they have made to motivate students and families. The Commission also should seek ways to motivate schools to encourage increased preparedness within employee and student households.*

#3. Use the ShakeOut as an opportunity to test and provide public education about new alert and warning systems:

- The Earthquake Early Warning system (EEW) currently is being tested in California and can provide up to a minute warning before strong shaking is felt;
- The Commercial Mobile Alert System (CMAS) delivers alerts and warnings to handheld mobile devices through commercial providers, and is currently being tested in selected communities prior to nationwide release;
- Alert and warning messages can be passed through Twitter and other forms of social media;
- The ShakeOut drill provides an ideal opportunity to acquaint the public with these systems and to provide public education about what they are and how they work;
- Using the ShakeOut as a vehicle for introducing these mobile alert systems to the public and providing needed education can help people learn what to do when they receive earthquake related alert messages in the future.

Recommendation: *The Commission should organize pilot testing of the Earthquake Early Warning system (EEW) and the Commercial Mobile Alert and System (CMAS) in connection with the ShakeOut drill to test the systems and to help educate the public about them.*

#4. Support program evaluation:

- In-kind, volunteer efforts coordinated through the ECA formal committee structure to evaluate the ShakeOut can provide useful data to guide program activities;
- Efforts to increase data integrity and credibility through longitudinal evaluation and linkage with registrant data should be encouraged;
- In-kind efforts have created a wealth of data, but lack of funding has limited data analysis and documentation;

Recommendation: *The Commission should identify ways to provide support for cost-efficient evaluation efforts so that the effects of the ShakeOut can be assessed and the program can be improved. This may include identifying ways to provide incentives to businesses that make financial contributions to ShakeOut evaluation efforts.*

#5. Facilitate a follow-up statewide household preparedness survey:

- The statewide household preparedness survey should be repeated at regular intervals to provide ongoing monitoring;
- Data collection for the statewide household preparedness survey concluded roughly four years ago, and much has happened since that time;
- The questionnaire that was used in the baseline survey should be re-administered with minimal change to facilitate baseline comparison and to maintain cost-efficiency;
- Follow up data should be collected at a fraction of the initial baseline cost;
- Data can be used to:
 - a. Assess the impact of the ShakeOut throughout the state;
 - b. Guide future program activities; and
 - c. Help first responders and emergency managers anticipate community needs following a major earthquake.

Recommendation: *The Commission should, with state partners, help identify resources to fund a follow up cross-sectional survey to assess change over time.*

2. Purpose

The purpose of this project is to: (1) summarize the history and development of the California ShakeOut drill, (2) document prior ShakeOut evaluation efforts and key findings, and (3) develop recommendations to guide future planning and coordination of earthquake drill activities in the state of California. This includes how California engages business and industry in mitigation and preparedness. Recommendations have been formulated to assist the California Seismic Safety Commission, California government officials, and other related agencies in improving the quality and maximizing the impact of future ShakeOut earthquake drill and related activities. Methods included document review and analysis of existing data.

3. History of California's "Great ShakeOut" Drill

The Role of Drills

Disaster drills are an important component of emergency preparedness in schools, organizations, businesses, and communities (DeMars, Buss, & Cleland, 1980). Many types of drills, including fire drills, tornado drills, tsunami drills, and earthquake drills, have been conducted in many countries around the world in an effort to support a culture of preparedness in world populations and to decrease loss of life during various types of disasters (Manion & Golden, 2004; Parsizadeh & Ghafory-Ashtiany, 2010; Schumacher, Lindsey, Schumacher et al., 2010; Simpson, 2002). Drills have been identified as a method of helping increase readiness among participants so that, in the event of a real disaster, individuals will know how to appropriately and automatically respond (Johnston, 2007). Disaster drills are frequently conducted in organizational settings such as hospital and school as these locations hold at-risk populations as well as the organizational structure necessary to coordinate successful drills (Fujieda, 2008; Hosseini & Izadkhah, 2006; Lao & Lao, 1997). Earthquake drills, in particular, are becoming increasingly well organized and are expanding quickly in response to the large-scale hazard potential and their relative lack of predictability. Earthquake drills, in addition to earthquake mitigation, have the potential to decrease physical, socio-economic, and other losses related to earthquakes (Nateghi-A, 2000).

The ShakeOut Earthquake Drill

The "Great Southern California ShakeOut" was a widespread earthquake drill first conducted in 2008 to encourage dissemination of earthquake preparedness and mitigation techniques to the public. The goal of the drill was to provide southern Californians with an opportunity to learn what to do before, during, and after an earthquake. The drill was based on the ShakeOut Scenario, consisting of a theoretical earthquake of magnitude 7.8 that could occur along the southern portion of the San Andreas fault (Jones, Bernknopf, Cox et al., 2008). An earthquake of this nature occurs, on average, every 150 years. Based on an

analysis of earthquake probabilities in California, it has been determined that there is a 99.7% chance of a 6.7 Magnitude or greater earthquake occurring in the state in the next 30 years. The Scenario was created by interdisciplinary members of the United States Geological Survey's Multi-Hazard Demonstration Project in order to help understand the effects an event of this size would have on the economies and communities of southern California (Jones, Bernknopf, Cox et al., 2008).

The Earthquake Country Alliance (ECA) coordinated the development and implementation of the first ShakeOut drill, which was conducted on November 13, 2008 at 10:00 am in Southern California and emphasized the message, "drop, cover, and hold on." The ECA was created by the Southern California Earthquake Center (SCEC), the United States Geological Survey (USGS), California Emergency Management Agency (Cal EMA), the American Red Cross (ARC), and others to mitigate the effects of earthquakes by increasing public awareness, creating tools to share messages about earthquakes, and sharing and developing resources. Stakeholders of the ECA along with government officials, businesses, schools, and individuals helped to organize and execute the drill (Southern California Earthquake Center, 2012). The drill was intended as a one-time event to increase preparedness, and took place concurrent with the annual 2008 Golden Guardian event to encourage collaboration of emergency responders and to maximize participation. The "Golden Guardian" event series is an annual comprehensive statewide exercise to assess emergency operations plans, policies, and procedures for catastrophic incidents at the local, regional, and state levels. Initiated in 2004, this annual exercise has become the most comprehensive exercise program nationwide (California Emergency Management Agency, 2011). The 2008 ShakeOut included 5.4 million participants in eight counties of California, making it the largest earthquake drill in United States history at the time (Petal & Green, 2009).

The 2008 Great Southern California ShakeOut resonated with stakeholders, eliciting broad participation and community engagement. Deemed a success, it was determined that the drill should be continued in subsequent years and expanded to include other areas of California. In the following year, more than 6.9 million individuals across every county in California participated in the 2009 *Great California ShakeOut* event, which occurred on October 15, 2009 at 10:15 am. Expansion of the earthquake drill in 2009 required increased coordination, resulting in the Earthquake Country Alliance growing to a statewide effort, with partner alliances in the Bay Area and North Coast. This resulted in the division of California into 11 areas for which earthquake hazard information was organized on the ShakeOut website. In addition, the ShakeOut earthquake drill spread to areas outside the state of California for the first time in 2009. The Great West Coast ShakeOut in New Zealand was the first example of this expansion (Southern California Earthquake Center, 2011),

In the third year of implementation, the 2010 California ShakeOut was held on October 21, 2010 at 10:21 am and involved over 7.9 million participants. The event included an additional message, "secure your space", and encouraged Californians to ready their homes for an earthquake. The ShakeOut subsequently has expanded to Nevada, Guam, British Columbia, Oregon, and 11 Central U.S. states, all of which have facilitated successful

ShakeOut drills (Southern California Earthquake Center, 2011). Table 1 summarizes California ShakeOut participation to date.

An important element of the ShakeOut’s success has been efforts to maintain consistency in ShakeOut-related communications, including websites, distribution materials, and messages. This, in addition to extensive advertising and media outreach, has allowed millions of people to hear the ShakeOut message and participate in the drills. Various games and media tools have been developed to encourage public participation and interactive learning. “Dare to Prepare” is an earthquake readiness campaign created by the Earthquake Country Alliance that promoted the notion that although the earthquake threat persists (i.e., “Shift Happens”), people still have the ability to minimize potential damage (Earthquake Country Alliance, 2011). “Putting Down Roots in Earthquake Country” is a handbook about earthquake preparedness that was originally published by SCEC in 1995. In the years since it was published it has been adapted to many of the regions where ShakeOut drills have been held, including the San Francisco Bay Area, Northern California, Utah, the Central U.S., Nevada, and Alaska (ECA, 2011). Widespread collaboration between SCEC in California and stakeholders in other regions wishing to conduct large-scale ShakeOut drills has allowed the adaptation of information and resources while maintaining sufficient consistency to foster public interest and attention. The ShakeOut website, maintained by SCEC, is a key channel for delivering and receiving consistent information about the ShakeOut drill. The spread of the drill across the nation and beyond increases its visibility within the state, as well as its potential impact.

Table 1. California ShakeOut Participation

Year	Date	Region	Estimated Number of Participants	Estimated Number of Registrants
2008	11/13/08	8 Southern California Counties	5.4 million	11,746 ^a
2009	10/15/09	State of California	6.9 million	11,008
2010	10/21/10	State of California	7.9 million	11,658
2011	10/20/11	State of California	8.6 million	11,850

^a In 2008, registration for households and organizations took place in separate data systems; data for households consisted of registered participants only.

4. ShakeOut Evaluation Efforts

Overview

Formal evaluation of the ShakeOut drills is ongoing and has been limited by the lack of funding available for assessment activities. The initial 2008 drill resulted in three different types of funded evaluations: (1) a comprehensive program evaluation (Davoudi, Onuma, & Glik, 2009), (2) an evaluation of the education sector (Petal & Green, 2009), and (3) a media-focused evaluation (Blakley, Chen, & Kaplan, 2009).

The initial ShakeOut drill was praised as a success based in part on the results of these early evaluations, but also on the tremendous visibility of, media attention on, and community interest in the event. Although the ShakeOut drill continued in subsequent years, funding for ongoing evaluation was not available. In preparation for the 2009 ShakeOut, the RiskRed evaluation team offered to repeat the online survey in-kind. This survey focused on the education sector only, however. Given these constraints and in an effort to move the evaluation process forward, SCEC invited a local disaster and survey researcher to assist in the development of an online survey that built on previous work in preparation for the 2009 ShakeOut drill, also in-kind. As the two evaluation efforts advanced, concern about conducting simultaneous surveys developed, and the two evaluation efforts were merged to reduce respondent confusion and burden. To accomplish this, SCEC formed a Research and Evaluation committee to integrate and coordinate evaluation efforts across all participation categories.

Together, the committee developed a questionnaire to collect data from five different sectors: 1) households, 2) K-12 schools, 3) K-12 school districts, 4) colleges and universities, and 5) other organizations. Committee tasks included developing survey questions, programming the online survey, pretesting and pilot testing the survey, emailing invitation and reminder emails to ShakeOut registrants, analyzing quantitative and qualitative data, and preparing summary reports. The result was a more coordinated and better-integrated evaluation effort across sectors, but the lack funding severely limited data analysis and reporting.

A summary of evaluation efforts to date is presented in Table 2.

Table 2. ShakeOut Evaluation Efforts

Year	Lead	Funding	Method	Sample
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2008	<i>Comprehensive Program Evaluation:</i> Davoudi Consulting, Inc.	Contract from SCEC; part of a much larger overall SCEC program evaluation	Administrative data, secondary data, key-informant interviews, online surveys, observations	120 participant stories
	<i>Education Sector:</i> RiskRed/Western Washington University	Provided by SCEC	Pre-ShakeOut Preparedness online survey administered 11/06/08 - 12/30/08	197 K-12 schools and 9 school districts
			Post-ShakeOut Drill Evaluation online survey administered 11/13/08 - 01/31/09	378 K-12 schools and 30 school districts
	<i>Media Focus:</i> The Normal Lear Center, USC Annenberg	Grant from the Innovation Fund at the Annenberg School for Communication	Online survey in two waves (12/15/08-12/30/08, 04/01/09-04/30/09)	3,068 of 11,746 households registrants (26%)
2009	SCEC Research & Evaluation Committee	In-kind	Online Survey administered 12/17/09 - 2/1/10	N = 1,695 of 11,008 ShakeOut Registrants
2010	SCEC Research & Evaluation Committee	In-kind	Online Survey administered 11/9/10 - 12/10/10	N = 1,808 of 11,658 ShakeOut Registrants
2011	SCEC Research & Evaluation Committee	In-kind	Online Survey administered 11/10/11 - 12/21/11	N = 2,339 of 11,850 ShakeOut Registrants

5. Findings: ShakeOut 2008

Background, Methods, Findings, and Discussion for each of three funded evaluations conducted for the 2008 ShakeOut are presented.

Comprehensive Program Evaluation - 2008

Background. In 2009, an external evaluation team was hired to conduct a mixed-methods evaluation to assess selected areas and the broader impacts of the SCEC CEO (Communication, Education, and Outreach) program. The SCEC CEO program, part of the SCEC program based at University of Southern California, is actively engaged with outreach and partnership activities to improve and encourage actions to prevent, mitigate, respond to, and recover from earthquake losses among the general public as well as businesses, schools, universities, governmental, and non governmental agencies.

The evaluation team consisted of Davoudi Consulting and Deborah Glik, ScD, UCLA, assisted by SCEC CEO program affiliates. SCEC CEO is a large broad-based program that was evaluated in 2009 in anticipation of its funding renewal. Thus, the actual evaluation was broader than reported here. However, three of the six SCEC CEO program components selected for the broader evaluation directly related to the 2008 Shakeout. These were: 1) Earthquake Country Alliance and the Great Southern California ShakeOut, 2) the *Putting Down Roots in Earthquake Country* booklet, and 3) Media Communications and Relations. Evaluation components are summarized in Table 3.

Table 3. Comprehensive Program Evaluation and the 2008 ShakeOut

Component ^a	Method
Earthquake Country Alliance and the ShakeOut	Document review, key informant interview of ECA members ($N = 6$)
<i>Putting Down Roots in Earthquake Country</i> booklet	Website tracking data, online survey of individuals requesting the handbook ($N = 1,234$)
Media Communications and Relations	Media content analysis of internally produced media and news stories ($N = 92$ “earned” media stories)

^a Three of six overall SCEC program components evaluated.

The evaluation used administrative data, previously collected secondary data, newly-collected primary data from key-informant interviews, online surveys, and observations, including process and output data related to the implementation of the 2008 Great California Shakeout.

Earthquake Country Alliance. The ShakeOut is linked to and a product of the Earthquake Country Alliance (ECA). The ECA is a coalition of scientists and engineers, preparedness experts, response and recovery officials, news media representatives, community leaders, and education specialists committed to foster earthquake and tsunami readiness in California. Founded in 2004, this coalition has sponsored a number of campaigns and studies that led to the inception and development of the Shakeout campaign in 2008.

Methods. Two methods were used to evaluate the Earthquake Country Alliance—document review and key informant interviewing. Document review included perusal of the ShakeOut website and other electronic and print materials, ShakeOut participant stories, a ShakeOut “Policy Paper”, an ECA communications document, and a Debriefing Report (Dec 4, 2008). In addition, qualitative key informants interviews were held with selected ECA members. Research questions guiding data analysis included the formation of the ECA, SCEC CEO’s role, ECA coordination and impact, and benefits ECA members received as a result of their participation. Likewise, research questions guiding data analysis of feedback from ShakeOut participants included who they are and what they did, as well as what types of activities they engaged in after the event.

Findings. Beginning in 2004, SCEC convened and facilitated the ECA. Key informant interviews ($N = 6$) indicated that the ECA’s foundation and development was dependent on having a central organization (i.e., SCEC) that had both the scientific credibility and capacity to convene and lead a diverse array of engaged stakeholders. SCEC’s collaborative and science-based approach encouraged participation among ECA members and created a flexible environment, with added value for members. These benefits included: a) networking, b) coordination, c) ability to participate at different levels and in varying roles over time (fluid participation), d) opportunities to contribute to the dialogue about hazard preparedness, response and mitigation, e) ability to adapt information and materials to local contexts and for local audiences, and f) publicity.

This coalition building activity can be seen as the driver for a number of linked outreach and research activities that ECA sponsored, including *DARE to Prepare* (ECA’s 2007 earthquake readiness campaign), *Policy Summits* (2007 and 2008), the *USGS Southern San Andreas Shakeout Scenario*, and a number of studies of earthquake preparedness, including a statewide survey. These activities culminated in the Great Southern California ShakeOut in November 2008. As well, ECA expanded its scope, becoming a statewide coalition. Thus, later Shakeouts became statewide events.

Key informant interviews revealed that much of the strategy of the 2008 Shakeout was based on ECA member's inputs including modeling ideal behavior, simulations of earthquake impacts, and the incorporation of social media that captured participant feedback. Moreover, months of comprehensive communication and media publicity were directly tied to SCEC involvement as well as notions of comprehensive marketing; SCEC website data showed more than 11,000 registrations on the Shakeout website, representing more than 5 million people, many of whom were affiliated with schools.

SCEC CEO also was able to collect stories of participants through its interactive website posts—120 participant stories, shared through postings on the ShakeOut website after the drill—which provide information about the value of the drill from the perspective of the participants. These stories may be viewed as demonstrations of the types of activities, challenges, prompted behaviors, and lessons learned by participants during the drill, which may help guide comprehensive studies of participant involvement and response to the drill in the future. Using an open-coding qualitative method, the stories were reviewed, and key messages (e.g. activities conducted, lessons learned, etc.) were extracted, grouped, and tabulated to understand the overarching themes.

The major findings from these stories were that the ShakeOut drill: a) increased individual and organizational awareness about earthquake hazards, b) enhanced understanding of what to expect during a high magnitude earthquake and how to respond, and c) prompted a whole range of preparedness behaviors including getting supplies, responding to “drop, cover, hold on” commands, becoming aware of evacuation and sheltering in place directives, and learning about the importance of good communication with family, friends, and neighbors. The initial “success” of the Shakeout stimulated its evolution to becoming a statewide event as well as its migration/adoption in other states and earthquake-prone regions.

Putting Down Roots in Earthquake Country. Concurrent with the Great Southern California Earthquake, a new version of the booklet, *Putting Down Roots in Earthquake Country*, geared to help homeowners in California and other earthquake prone regions to mitigate earthquake impact for their homes, was reissued and posted for download on the SCEC-CEO website. While this activity is only somewhat related to the Shakeout, its evaluation indicates how the Shakeout not only impacts immediate behaviors in response to a drill, but also more general preparedness behaviors.

Methods. Two methods were used to assess the booklet. First, the timing and number of acquisitions of the handbook via the ECA website was evaluated using Google Analytics software to determine the week-by-week order history of the publication to better understand the events prompting individuals to register and order the publication. Second, the Qualtrics online survey tool was used to invite individuals and organizations requesting the handbook online to provide additional feedback. A total of 9,002 registrants who ordered the publication between June 1, 2008 and May 30, 2009 were invited to complete the 39-item online survey during a two-week period, between July 15 and July 31, 2009.

A total of 1,234 registrants responded to the survey (14%); 1,035 completed the survey in its entirety (84%). Research questions focused on the types of events that prompted increased demand for the handbook, whether the handbook promoted preparedness, and user feedback. For registrants who ordered handbooks for their organization, a set of additional questions about organizational use was asked.

Findings. Google analytics web utilization software showed that handbook ordering spiked at two points in time during the year: 1) after a real earthquake (Chino Hills, July 29, 2008) and, 2) on the day of the Shakeout drill (November 13, 2008), suggesting that real and simulated events, alike, may foster information seeking and preparedness behavior. Online survey participants represented a distinct segment of the population—those who were over 35 years of age, homeowners, and college educated.

Media Communications and Relations. For publicizing the Shakeout 2008, SCEC CEO and its partners utilized standard “media relations” tools such as press conferences and news releases so that reporters could publicize events in “earned media”, that is, *not* paid advertising. This effort generated many news articles. Additionally, SCEC used social media sites such as YouTube to convey information about the Shakeout and consequences of earthquakes more generally. SCEC CEO was diligent about collecting and storing their own produced media (e.g., SCEC online newsletters) as well as externally generated media (i.e., news stories) in their central database.

Methods. A media content analysis of recent news stories in 2008 about the Shakeout was conducted. The emphasis was on identifying which components were well implemented, which needed improvement, and ways that SCEC’s media aspect might be further developed. SCEC online news articles pertaining to Shakeout collected in 2008 and stored in the main program database were reviewed and content analyzed for frequency, types of themes included, and mention of organizational names in the articles. An additional 92 news stories about the 2008 Shakeout were reviewed and coded for type of media that carried the story as well as themes and messages that were publicized. Themes were grouped under major message headings and tabulated. Research questions were: *What did the news media report about the Shakeout in 2008?* and *Which organizations were mentioned most frequently in news media articles about the Shakeout?*

Findings. Most of the ShakeOut articles in the news media occurred immediately before, during, and immediately after the shakeout event in November of 2008. Stories covered the event itself, preparedness, consequences of a major southern California earthquake, and the kinds of things different agencies were doing in anticipation of an actual event. Most stories occurred just prior to the Shakeout drill. Shakeout stories were represented in various outlets representing print and online articles, media advisories, blog posts, and video clips, posted by various news channels and mediums, and by different reporters. There was a lot of discussion of local earthquakes. Given that the ShakeOut Scenario is a USGS product, it is not surprising that the USGS was mentioned in the media far more than other organizations, including SCEC and the ECA. Moreover, this reflects SCEC’s explicit intention to promote the ShakeOut drill itself rather than its own organizational banner.

Discussion. This comprehensive program evaluation benefited from relatively well-defined SCEC CEO programs that collected a reasonable amount of administrative, programmatic, and participant data. The time and effort spent on this evaluation was split between organizing and analyzing pre-existing databases as well as collecting new data to supplement information that was not readily available. Data used for this analysis were derived from program documents, key informants, participant feedback collected through online surveys, observations, and media content analysis. The types of available data (inputs and activities) drive the types of data received as well as findings/indicators that could be assessed for each programmatic activity as part of this evaluation. The ECA component and “Putting Down Roots” booklet had more data available than the Media Relations component. Although this evaluation took place in a time and resource constrained context, the existing data provided by SCEC CEO and supplemented by new data collected by the evaluation team contributed toward understanding: a) what SCEC CEO does, and b) the outcomes (actual or potential) it could achieve.

Some of the limitations of this evaluation are that only some data were available, data mainly describe program implementation processes and outputs, and there was, with the exception of some Google Analytics and an online survey about those who acquired the *Putting Down Roots in Earthquake Country* materials, minimal impact data. More to the point, there was no formal research evaluation study design, and the *ad hoc* nature of data acquisition, both qualitative and quantitative, clearly had sampling or selection bias issues, with persons who were interviewed possibly different than those who were not.

Education Sector Evaluation - 2008

An evaluation focusing specifically on the education sector was undertaken by the international non-profit organization, RiskRED (Risk Reduction Education for Disasters), to determine the effectiveness of the ShakeOut in motivating school disaster preparedness. Support from the Earthquake Country Alliance and ProVention Consortium allowed the Risk RED team and their partners to conduct an analysis of the effectiveness of the ShakeOut drill in schools (Petal & Kelman, 2011). Risk RED worked with the Coalition for Global School Safety and Disaster Prevention Education and with Western Washington University’s Institute for Global and Community Resilience. Risk RED’s team assembled materials and self-evaluation checklists for schools in support of the ShakeOut, and after investigating the body of research on California school disaster management, the collaborating parties developed a *School Disaster Preparedness Survey* and *School Post-Drill Evaluation Survey*. A panel of school safety activists from around the world assembled to observe school responses to the drill.

Methods. The evaluation team consisted of 13 school safety activists, including several international members. Qualitative as well as quantitative data were collected.

Qualitative Data. Qualitative data consisted of school-site observations and debriefings. The team observed the ShakeOut drill conducted in a private elementary school, a public middle school, a public high school, and at a district emergency operations

center. In addition, assorted blog comments were reviewed, and a convenience sample of students and parents from the Los Angeles area was interviewed following the drill.

Quantitative Data. Quantitative data were collected through two online school surveys: 1) a pre-ShakeOut “School Preparedness” survey and 2) a post-ShakeOut “Drill Evaluation” survey. Schools that had registered on the ShakeOut website to participate in the drill were invited by email to also participate in the evaluation; links to both survey questionnaires were posted on the ShakeOut website. Table 4 reports participation.

The pre-ShakeOut *School Preparedness* survey focused on assessment and planning, physical and environmental risk reduction, and response capacity development. The post-ShakeOut *Drill Evaluation* survey focused on drills conducted as well as the school’s evaluation of their participation in the ShakeOut drill and the various response elements practiced. Specific topics included: 1) drill frequency, process, and evaluation, 2) “Drop, cover, hold on” and evacuation drills, 3) Incident Command Systems (ICS), 4) the National Incident Management System (NIMS), and 5) Safety and Environmental Management Systems (SEMS).

Table 4. Education Sector ShakeOut and Survey Participation

	Public Schools	Private Schools^a	School Districts
Total number in California	4,356	3,369	308
Registered to participate in ShakeOut	277/4,356 (6%)	650/3,369 (19%)	207/308 (67%)
Preparedness Survey (11/06/08 – 12/31/08)	76/277 (27%)	121/650 (19%)	12/207 (6%)
Drill Evaluation Survey (11/13/08 – 01/31/09)	187/277 (68%)	191/650 (29%)	30/207 (14%)

^a Total represents those private schools having 6 or more students.

Results. Key findings from the Pre-ShakeOut Preparedness and Post-ShakeOut Drill Evaluation surveys are presented in Tables 5 and 6. Qualitative data collected through school observations and debriefings and quantitative data collected through pre- and post-ShakeOut surveys led to the following conclusions, among others:

- Broad participation is essential to successful school disaster prevention and response planning;

- Principles underlying “Drop, Cover, and Hold On” are not well understood and not well-practiced in settings without desks or tables;
- Many schools may benefit from ICS training;
- Pre-drill planning and post-drill discussion are the most important part of the drill experience;
- School emergency plans should not be static, but rather in constant revision by the people practicing them;
- Drills require realism and variety to maximize effectiveness;
- Students are neither fully engaged in disaster prevention and preparedness nor in carrying such messages home;
- Child-to-family disaster knowledge transfer holds great and untapped potential;
- Drills provide opportunities for student experiential learning before, during, and after conduct of the drill; and
- Home-based licensed child-care providers would benefit from regulations and clear guidance about disaster planning.

Discussion. Although this volunteer sample of ShakeOut registrants interviewed in the quantitative component is not representative of California schools in general, it can be said to reflect the most engaged schools and school districts that registered to participate in the ShakeOut. Thus, survey findings provide insight on issues related to preparedness and the practice of drills that are faced by the most engaged schools and school districts and can be used in the design of future evaluation and program efforts. A unique aspect of this evaluation is that quantitative data were collected separately for private schools, about which little is known in terms of disaster preparedness. Although a large portion of school districts registered to participate in the ShakeOut (67%), the number of district registrants surveyed was small (pre-ShakeOut, $n = 12$; post-ShakeOut, $n = 30$). Data collection for the pre-ShakeOut preparedness and post-ShakeOut drill evaluation surveys overlapped, which may have caused confusion or reporting errors. Ideally, these two surveys would have had separate data collection periods. Nonetheless, this evaluation provides useful insights for future planning. The qualitative case studies highlight strengths and ongoing concerns for school disaster preparedness, and the quantitative data shed light on the challenges faced by the most engaged schools.

Table 5. Pre-ShakeOut School Preparedness Survey: Frequency of Schools Reporting Preparedness Actions Taken (N=197)

Preparedness Action	(%)
Assessment and Planning Activities	
Administrative-Level Preparedness Actions:	n = 190
Have a school preparedness committee	95
Have maps and identified evacuation routes	48
Have plans for alternate school site	23
Have plans for continuing instructions following extended closure	17
Staff-Level Preparedness Actions:	n = 186
All/most staff aware expected to stay on job as disaster service worker	92
All/most staff completed own family disaster plan	14
Physical Protection Activities	
Physical Environment Risk Reduction:	n = 180
All/most school buildings meet all current earthquake safety standards	71
All/most portable classrooms are fastened to the ground/foundation	39
All/most tall and heavy furnishings are fastened	72
All/most hazardous materials have been limited, isolated, secured	70
All/most smoke detectors, fire alarms, automatic sprinkler systems, fire hoses and extinguishers are in place and maintained regularly	90
Capacity Development	
Student Response Skills:	n = 175
All/most students have practiced “Drop, Cover, Hold On” and evacuation	91
All/most science lab students know how to extinguish flames, isolate hazardous materials	20
One or more staff members have training in:	n = 174
Basic First Aid	97
Advanced First Aid	62

Crisis counseling	55
Red Cross disaster class	31
CERT	25
Fire suppression	20
Amateur radio (HAM)	13

Table 6. Post-ShakeOut Drill Evaluation: Frequency of Schools (N=378) and Districts (N=30) Practicing Key Drill Components

Drill Activity	Individual Schools (%)	School Districts (%)
General Drill Frequency, Process, & Evaluation	n = 347	n = 29
Practice fire drills at least monthly	66	83
Practice evacuation ICS/SEMS at least annually	64	79
Practice lock-down or shelter-in-place at least annually	70	86
Drills Practiced for 2008 ShakeOut Event	n = 347	
Drop, Cover, Hold On (DCH) only	13	-
DCH and Building Evacuation only	54	-
DCH, Building Evacuation, and ICS/SEMS	33	-
ShakeOut “Drop, Cover, Hold On” & Evacuation Drills	n = 352	n = 22
All students dropped, covered, held on during drill	76	82
All teachers dropped, covered, held on during drill	60	77
Following “shaking” all staff left door signs indicating status	29	23
Following “shaking” all students and staff assembled in safe area	85	91
ShakeOut ICS, NIMS, and SEMS Drills	n = 338	n = 22
Incident command center met/exceeded expectations	77	82
Communications, public information met/exceeded expectations	65	73
Emergency supplies met/exceeded expectations	59	77
First Aid/mental health team met/exceeded expectations	67	87
Simple/light search & rescue team met/exceeded expectations	64	82
Assembly area met/exceeded expectations	83	95
Security including utilities met/exceeded expectations	68	73
Sanitation and shelter met/exceeded expectations	51	55

Media-Focused Evaluation - 2008

Background. Hollywood Health & Society, a program within the University of Southern California Annenberg Norman Lear Center, received a grant from the Innovation Fund at the Annenberg School for Communication to complete an evaluation of the 2008 ShakeOut drill focusing on media effects (Blakley, Chen, & Kaplan, 2009). The survey assessed the effectiveness of the “entertainment education-based” technique, which has been used to disseminate information to the ShakeOut drill participants, and was incorporated into the *L.A. Earthquake: Get Ready* campaign. This survey, which used as its sample individuals who were registered for the 2008 Great Southern California ShakeOut, was designed to assess the preparedness knowledge, beliefs, attitudes and behaviors as well as socio-demographic characteristics of respondents who had a high likelihood of also participating in Shakeout events.

Specifically, the survey was designed to: (1) assess the degree to which individuals who were registered for the Great Shakeout online registry recognized and adhered to campaign messages, (2) investigate what factors predict participants’ attitudes and beliefs related to earthquake preparedness, response, and recovery, and (3) describe the population groups that were registered on the site, and how they received and transmitted information to others. Thus, it was intended that the sample would represent individuals who already had some level of engagement in earthquake preparedness.

Methods. A repeated cross sectional survey of adults, aged 18 years and older, who had registered to participate in the 2008 ShakeOut was conducted in two waves data collection. Participation in the second wave was not contingent on completing the first wave. The first survey was conducted one month after the ShakeOut drill; the second was conducted five months post-drill to determine the longer-term impact of ShakeOut activities. Response rates are presented in Table 7.

Table 7. 2008 ShakeOut Media-Focused Evaluation Survey Participation

Wave	N	Response	Complete	Timing
		Rate	Data	
1	3,068	26% (3,068/11,746)	80% (2,467/3,068)	1-month post-drill
2	2,390 ^a	20% (2,390/11,746)	86% (2,044/2,390)	5-months post-drill

^a Approximately 40% of Wave 2 respondents also were respondents in Wave 1.

Data were collected through online questionnaires emailed to adults, aged 18 years or older, who had registered to participate on the ShakeOut website. For both waves of data collection, invitations were emailed to the complete list of registrants. The questionnaire included items measuring socio-demographics, mass media channels of message exposure, interpersonal communication about earthquakes, knowledge, perceived salience, self-efficacy, outcome effectiveness, barriers to preparedness, preparedness, and drill participation.

Findings—Wave 1. A report summarizing Wave 1 findings was produced by the Lear Center (Blakley, Chen, & Kaplan, 2009); findings are summarized in Tables 8-10.

The sample represented a highly engaged population. Nearly all respondents (97%) said they would continue to participate if an earthquake drill was conducted annually, and knowledge of recommended protective actions was relatively high. Interestingly, a month after the drill, more than half (56%) felt “somewhat” prepared, 12% felt “very well” prepared, and a third (32%) either felt “fairly” prepared or “totally” unprepared to handle a large-scale earthquake, suggesting that the sample may represent a population with elevated concerns about earthquakes. Compared to the general population in California (U.S. Census Bureau, 2009), Wave 1 respondents included a higher percentage of women (67% v. 50%), whites (75% v. 42%), and residents of Pasadena and the area surrounding the University of Southern California, presumably because of high registration rates for USC faculty, staff, and students.

The large majority of registrants surveyed (79%) reported that they had engaged in the primary behavioral objective of the ShakeOut—a “Drop, Cover, Hold On” exercise—on the day of the drill. While knowledge about recommended protective actions was high, only 22% of respondents were able to volunteer the key ShakeOut message in exact terms (i.e., “Drop, Cover, and Hold On”). However, subsequent analysis of the data suggested that the low unprompted recall of the ShakeOut’s “key message” was largely due to measurement error associated with: 1) question structure, 2) miscategorization of correct responses, and 3) participant confusion. Moreover, the premise that “Drop, Cover, Hold On” was the primary message is faulty. Indeed, subsequent ShakeOut events have sought to narrow the focus of the wide variety of messages that were promoted in anticipation of the initial drill.

Table 8. 2008 ShakeOut Media-Focused Evaluation Findings—Media

Degree to which individuals who were registered for the Great Shakeout online registry recognized and adhered to campaign messages:

- The majority (79%) of those who registered on the ShakeOut website reported having physically participated in the “Drop, Cover, Hold On” exercise.
- Only 22% of registrants who participated in the survey were able to recall the key message: “Drop, Cover, and Hold On”, unprompted.
- Respondents reported a relatively high level of knowledge about appropriate protective actions to take during an earthquake in varied situations (in general, 87%; outside, 92%; in bed, 44%, driving, 94%).
- A month after the drill, more than half (56%) felt “somewhat” prepared, 12% felt “very well” prepared to handle a large-scale earthquake, and a third (32%) either felt “fairly” prepared or “totally” unprepared.
- Nearly all respondents (97%) said they would continue to participate in an annual earthquake drill.

(Blakeley, Chen, & Kaplan, 2009)

Table 9. 2008 ShakeOut Media-Focused Evaluation Findings—Attitudes and Beliefs

Factors that predict participants’ attitudes and beliefs related to earthquake preparedness, response, and recovery:

- People who participated in the drill were less likely (20 v. 28%) to endorse the discredited “Triangle of Life” recommendation as an advisable protective action.
- Drill participants were significantly less likely (12% v. 17%) to endorse “getting under a doorway” (only recommended in adobe structures) as an advisable protective action during an earthquake.

(Blakeley, Chen, & Kaplan, 2009)

Findings—Wave 2. Analysis of Wave 2 data (not included in the original report) was conducted for this report by Deborah Glik, PhD, one of the researchers involved in the original media-focused evaluation. See Appendix A for data from Waves 1 and 2.

Participation. There were no significant differences in socio-demographic factors between survey waves. (See Appendix A, Table A-1.) About three-quarters of respondents

(77% of Wave 1 respondents and 71% of Wave 2 respondents) reported that that they had “dropped, covered, and held on” during the drill (Table A-2). About half (49%) had practiced their plans, 43% had helped others, and 35% had participated in a meeting about these issues. Many fewer reported using games or social media applications. By Wave 2 adherence to these activities had dropped slightly (Table A-2).

Information Sources and Communication. The majority of respondents reported that they received their information about the ShakeOut and earthquake preparedness through conventional news media such as TV news, newspapers, radio, the Internet, and interpersonal conversations. A majority of respondents discussed earthquake preparedness with family, friends, and colleagues, suggesting that respondents were engaged in disaster preparedness. (See Tables A-3 and A-4.)

Table 10. 2008 ShakeOut Media-Focused Evaluation Findings—Information

Population groups who were registered on the site, and how they both received and transmitted information to others:

- Compared to the general population in California (U.S. Census Bureau, 2009), Wave 1 respondents included a higher percentage of women (67% v. 50%), whites (66% v. 43%), individuals aged 50 years and older (42% v. 37%), and individuals with higher annual incomes (\$66,000 v. \$29,000).
- Most who participated were either at work (47%) or home (35%) at the time of the drill.
- People who physically participated in drill were nearly three times as likely (14% v. 5%) to participate in online earthquake-related games.
- Two-thirds (66%) received earthquake information from television, and just over half (55%) from print newspaper.
- The ShakeOut website was the most frequent source of online information (86%).
- Three-quarters (75%) reported having heard or seen something about the ShakeOut four or more times in the past 30 days.
- Drill participants were more likely to have found information on online news sites than those who registered, but did not participate (36% v. 20%).
- Not quite half (44%) had received print materials related to the drill.
- People who talked to others about earthquake preparedness in the month following the drill were more likely to have participated in the drill (79% v. 55%) than those who did not.
- Those who physically participated were more likely to recruit others to participate (84% v. 70%) practice other aspects of their disaster plan (49% v. 27%) and to assist others in their earthquake preparations (46% v. 18%) than those who did not participate.

(Blakeley, Chen, & Kaplan, 2009)

Knowledge. There was wide variation in understanding of what protective actions to take during and after an earthquake. Although a large majority knew to drop, cover, and hold on (86% in Wave 1, 83% in Wave 2) as well as to pull over if they were in a car (92% in Wave 1, 91% in Wave 2), there was still some confusion about what to do in other settings. Moreover, nearly a quarter (22%) endorsed the discredited “Triangle of Life” strategy. Interestingly, knowledge level remained consistent in the months following the drill. (See Table A-5.)

Self-Assessed Preparedness. Among this self-selected, engaged sample with relatively high levels of knowledge, 82% considered themselves only “fairly prepared” or “somewhat unprepared.” A very small percentage, 12% in both Waves, felt they were “very prepared”, and 6% at both times considered themselves to be “totally unprepared” (see Table A-6). Those who reported that they were totally unprepared (6%) appeared more likely to be minorities, women, younger adults, and people with lower incomes; those who said they were *more* prepared tended to be white, older adults with higher incomes. Women, those who identified as white/Caucasian, and those who reported higher incomes were more likely to participate in the “Drop, Cover, and Hold On” drill. There was no clear age gradient related to drill participation. There was little attenuation in responses over time suggesting relative stability of salience and behavior. (See Tables A-7 and A-8.)

Discussion. The sample was not representative of the state as a whole, but rather of California residents who registered for the ShakeOut and also volunteered to take the survey. It can be assumed that this self-selected group was more engaged and motivated than the overall population. Generally, the sample was highly knowledgeable with positive attitudes and skills about preparedness. The lack of attenuation of knowledge, beliefs, attitudes, and practices from Wave 1 to Wave 2 suggests that for motivated participants, such factors are reinforced by activities such as the ShakeOut drill. At the same time, high rates of participation in the drill as well as critical self-assessments of level of preparedness suggest that the ShakeOut reinforced awareness about earthquake preparedness even among an already engaged population.

An issue for this evaluation is that the sample represents a special population that, unlike the general population, is highly engaged in earthquake safety. Among this group, the response rate was relatively high, and the sample can be considered representative of registrants. This bears on the generalizeability of findings, which shed light on how motivated individuals responded to the ShakeOut drill.

In terms of the primary drill objective, a substantial portion of the sample (roughly three-quarters) reported that they had participated in the “Drop, Cover, Hold On” drill exercise, and a larger proportion knew what self-protective actions to take during an earthquake. Preparedness actions taken were measured as self-perceived preparedness (“*How prepared to you feel you are to handle a large-scale earthquake?*”), which may be inaccurate because respondents do not know how prepared they are, and may inadvertently collect data about fear of earthquakes, rather than level of preparedness or participation in preparedness behaviors.

The fact that only 12% of this population felt they were totally prepared, and the large majority—over 80%—said they were only partially prepared, is anomalous, as these assessments are much lower than that findings from population-based surveys. For example, in a Los Angeles survey conducted in 2004, 48% reported having adequate disaster supplies and 40% reported having a family communication plan, and rates of preparedness were lower among ethnic minority groups, persons with lower income, and persons with chronic illnesses (Eisenman, Glik, Ong et al., 2009). However, even these types of overall statistics can be misleading, as people may have some but not all needed supplies,

and having a disaster communication plan is even less likely than having supplies (Murphy, Cody, Frank et al., 2009). Furthermore, this is a subjective assessment of preparedness among a somewhat motivated and engaged group, and self-assessments may reflect a more idealized standard than the norm.

One of the conclusions drawn was that too many earthquake-related events (e.g., the “Drop, Cover, Hold On” drill, the Golden Guardian event, the International Earthquake Conference, the ShakeOut Scenario and associated visualizations, the Get Ready Ride, etc.) took place in a relatively short time period, promoting too many simultaneous messages.

Because there was no true baseline, with both surveys taking place after the drill, this evaluation cannot definitively assess impact of the Shakeout on subsequent preparedness behavior. On the other hand, those who did participate were more knowledgeable and had stronger and more positive attitudes and beliefs about preparedness. The degree to which this is a ceiling effect—a population who already scores high on selected indicators and hence is unlikely to change—is a real possibility. For these reasons it is not possible to use these data to assess impact. The usefulness of these data, however, is to describe the types of audiences that the ShakeOut Drill is attracting. Clearly, by implication, the audiences not well represented are those who are younger and poorer and more ethnically diverse. Thus, changing who participates in the ShakeOut over time is quite relevant.

6. Findings: ShakeOut, 2009 – 2010

Although interest in continuing annual drills increased following the success of the first ShakeOut, funding for evaluating these efforts was not readily available, and initial attempts to secure independent funding were unsuccessful. To facilitate an integrated evaluation approach that would provide consistency of method across participation categories, SCEC formed a Research and Evaluation Committee¹ consisting of local earthquake preparedness researchers to develop and implement evaluation activities for future ShakeOut drills.

Methods

The ECA Research and Evaluation committee developed a questionnaire to collect process and outcome data from five ShakeOut participation categories: 1) households, 2) K-12 schools, 3) school districts, 4) colleges/universities, and 5) other organizations. Individuals began the questionnaire answering items for the participation category under which they registered, and then were invited to complete other relevant sections of the questionnaire. Topics included current and prior participation in the ShakeOut, experience

¹ Committee members were Mark Benthien, SCEC, Rebekah Green, PhD and Marla Petal, PhD, RiskRed, Michele Wood, PhD, CSU Fullerton.

practicing drills, disaster planning and preparedness and mitigation efforts, individual and organizational demographics, and for individuals, additional data were collected about information sources and channels, information seeking, and communication. In addition, open-ended items were included to collect information about lessons learned and suggestions for future ShakeOuts.

The questionnaire was administered online using SurveyMonkey software. In 2009, the questionnaire was available 8-16 weeks following the ShakeOut; in 2010, 2-6 weeks following the ShakeOut, and in 2011, 2-8 weeks following the ShakeOut (see Tables 1 and 2). Invitations with personalized survey links were emailed to those who provided a valid address when they registered on the ShakeOut website. Reminders were emailed to those who did not complete the survey. Correspondence was sent under cover of the ShakeOut (info@shakeout.org) via SCEC Director of Communication, Education, and Outreach and ECA Executive Director (Mark Benthien). The questionnaire was pretested by a group of ECA Associates prior to launch. See Table 11 for information about survey sampling and administration.

Results

A substantial amount of data has been collected over the past three years, but without funding, analysis and documentation has been slow. A draft report has been prepared for the 2009 Education sector, but it is still under revision. The following tables report selected findings based. Frequencies for key variables are presented below for 2009 and 2010. These represent a small fraction of the total data available. (Data for 2011 are currently being cleaned.)

Table 11. 2009-2011 ShakeOut Evaluation: Respondents and Registrants by Participation Category ^{a, b}

	2009	2010	2011
	<i>N</i>	<i>N</i>	<i>N</i>
Participation Category			
Households	631	566	801
K-12 Schools	215	274	304
School Districts	69	85	124
Colleges/Universities	52	47	64
Other Organizations	728	836	1,046
Total ^c	1,695/11,008	1,808/11,658	2,339/11,850
	(15%)	(16%)	(20%)

^a Includes individuals who did not receive a survey invitation because their email address was invalid or they had previously opted out of SurveyMonkey.

^b Some individuals completed multiple sections of the survey; primary participation category is reported.

^c Total includes people who: 1) indicated that they were at least 18 years of age, 2) responded “yes” when asked whether they wanted to complete the survey, 3) reported being a California resident, and 4) provided their ShakeOut participation category; some stopped answering questions before they completed the entire survey.

Households/Individuals. In 2009, 631 respondents initiated the questionnaire as individuals (566 in 2010). Of those who also indicated their gender, 35% (175/500) were men (2010: 43%, 219/505) and 65% (325/500) were women (2010: 56%, 282/505; 1% preferred not to say, 4/505).

Of those who indicated their race/ethnicity, 80% (375/472) were white (2010: 71%, 350/494), 11% (50/472) were Hispanic/Latino (2010: 11%, 56/494), 2% (10/472) were black or African American (2010: 3%, 16/494), 6% (26/472) were Asian (2010: 6%, 29/494), and 1% (6/472) was American Indian or Alaskan Native (2010: 1%, 3/494). (In 2010, 4% were “Mixed”, 19/494, <1% were Native Hawaiian or other Pacific Islander 1/494; and 1%, 20/494, preferred not to say.

In terms of age, in 2009, 10% were 18-29, 32% were in their 30s or 40s, 32% were in their 50s, 21% were in their 60s, and 5% were in their 70s or older ($n=485$). This compares to 6%, 18-29; 32%, 30s or 40s; 32%, 50s; 22%, 60s; and 8%, 70s or older in 2010 ($n=477$).

In 2009, respondents were asked if they had received print materials about the ShakeOut prior to the drill, and 34% reported that they had. When asked about sources of information about earthquake safety and preparedness, the most common responses in 2010 were governmental agencies (48%) and ECA (47%), with relatively fewer receiving information from employers (21%) and schools (11%). (See Table 12.) In 2010, respondents were asked about their preferred ways of receiving information about earthquake safety and preparedness; 68% indicated email (382/566), 56% the internet (316/566), 41% television (231/566), 28% newspapers (160/566), 26% face-to-face (150/566), 23% radio (131/566), and 11% cell phone voice or text messages (61/566). The large proportion preferring email and the Internet suggests a technology savvy sample.

When respondents were asked what they did to get ready for the ShakeOut in 2009, 84% (486/580) said that they encouraged others to participate (69%, 392/566 in 2010), 71% (414/580) said that they reviewed drill manuals from the ShakeOut website to plan their drill (53%, 305/566 in 2010), 43% (250/580) said that they helped others prepare for their ShakeOut drill (24%, 138/566 in 2010), 40% (233/580) said they developed new earthquake response plans (23%, 132/566 in 2010), 34% (195/580) said they distributed information to other people in their organization (37%, 210/566 in 2010), 28% (160/580) said they participated in a meeting in their workplace or school about preparing for earthquakes (18%, 101/566 in 2010), and 25% (145/580) said they played the “Beat the Quake” game on the ShakeOut website (12%, 65/566 in 2010). A relatively smaller proportion (<10%) indicated that they joined the ShakeOut Facebook group or followed the ShakeOut Twitter feed.

Nearly three-quarters (2009: 75%, 419/564; 2010: 82%, 443/542) said that they practiced “Drop, Cover, and Hold on” on the day of the ShakeOut. Most practiced the drill at home (2009: 52%, 293/564; 2010: 57%, 284/502). About a third were at work (2009: 33%, 187/564; 2010: 31%, 157/502). Nearly all said that they plan to participate in the next year’s ShakeOut (2009: 87%, 442/509; 2010: 90%, 457/509).

Table 12. 2009-2010 ShakeOut Evaluation: Usual Sources of Information about Earthquake Safety and Preparedness – Households

Activity	2009		2010	
	<i>(N=631)^a</i>		<i>(N=566)</i>	
	%	<i>N</i>	%	<i>N</i>
Where do you usually get information about earthquake safety and preparedness?				
City or State Government agencies	--b	48	271/566	
Earthquake Country Alliance (ECA) / ShakeOut	--b	47	266/566	
Television anchors/reporters	64	372/580	43	242/566
Friends or relatives	47	270/580	28	159/566
U.S. Geological Survey	46	268/580	39	222/566
Federal Emergency Management Agency (FEMA) or Department of Homeland Security (DHS)	--b	29	162/566	
American Red Cross	40	235/580	27	155/566
Emergency Management Agencies	35	203/580		--b
Southern California Earthquake Center (SCEC)	34	196/580	22	22/566
“Putting Down Roots in Earthquake Country” handbook	34	196/580		--b
Employers	27	159/580	21	120/566
Homeowner’s Guide to Earthquake Safety	27	157/580		--b
Insurance representatives	12	69/580	6	31/566
Received no earthquake information before the 2009 ShakeOut	13	74/580	12	2/566

^a 580/631 completed this section.

^b These item was revised in 2010.

Table 13 shows different preparedness actions that respondents may have taken by their reasons for taking action. A third (32%) learned what to do to stay safe during an earthquake because of the ShakeOut.

Table 13. 2010 ShakeOut Evaluation: Preparedness Actions Taken Because of the ShakeOut – Households (N=525)

What things have you/your household done...?	Because of ShakeOut %	Done NOT because of ShakeOut %	Started but not Finished %	Planning to Do It %	Not Planning to Do It %
Secure heavy furniture to the wall	13	36	21	21	9
Move heavier items to lower shelves	20	38	19	13	10
Complete or update a family plan	21	33	23	16	7
Identify an out-of-state contact person	22	47	8	18	5
Keep shoes and flashlights by the bed	21	53	8	13	5
Complete First Aid training	11	51	8	18	12
Keep fire extinguisher nearby	13	58	5	16	8
Have occasional earthquake drills	20	17	8	30	25
Copy important documents	11	38	18	27	6
Have a First Aid kit	16	67	7	8	2
Store at least 3 days of food at home	20	58	10	10	2

Store at least 3 days of water at home	18	57	11	11	3
Have an evacuation bag ready	15	37	18	23	7
Have portable radio and batteries	16	56	7	16	5
Talk to an expert to evaluate building and earthquake risks	7	21	6	17	49
Strengthen or repair home for earthquake safety	8	25	8	17	42
Purchase earthquake insurance	7	27	4	12	50
Identify safe spots in every room	26	30	15	23	6
Learn what to do to stay safe <i>during</i> an earthquake	32	45	10	10	3
Learn when/how to shut off the main gas valve	19	57	4	15	5

K-12 Schools. Of the 215 K-12 school representatives that initiated the questionnaire in 2009, 200 completed one or more sections. Of these, 122 represented public schools (61%), and 78, private schools (39%). In 2010, 90 of the 274 initial respondents completed one or more sections. Of these, 180 (66%) represented public schools, and 94 (34%) represented private schools. Table 14 presents frequencies for selected items for public schools.

While the majority of schools practiced a “drop, cover, hold on” drill with the ShakeOut with the 2009 and 2010 ShakeOuts (87%, 99%), only about a quarter used the opportunity to practice a full simulation exercise (26%, 27%). Areas of concern include the relatively low proportion of schools with all or most heavy furnishings and equipment secured (78%, 71%), limited knowledge about the school’s role serving as an emergency shelter (50%, 57%), and the relatively low proportion of schools in which all or most teachers and staff know or have received training in how to use fire extinguishers (72%, 35%).² When asked about specific improvements that resulted from their participation in

² The wording for this question changed; in 2009 the wording included “teachers/staff know how to use”, and in 2010 the language was changed to “are instructed on how to use,” possibly accounting for the difference between the two years.

the ShakeOut, most (71%, 66%) reported improvements to their school's disaster plan, policies, or procedures. A substantial portion also reported that the ShakeOut led to improvements in educating students about disaster prevention (71%, 60%). This finding, along with the number of school representatives who indicated that their school encourages staff and students to prepare for disasters at home and provides support materials for doing so (67%, 76%) suggests that this may be a viable and not yet fully realized approach to disseminating ShakeOut preparedness messages.

Table 14. 2009-2010 ShakeOut Evaluation: Frequencies for Selected Variables – K-12 Schools

Activity	2009		2010	
	<i>(N=122)^a</i>		<i>(N=180)^b</i>	
	%	<i>N</i>	%	<i>N</i>
Participated in current ShakeOut	96	111/115	89	160/180
Practiced “drop, cover, hold on” with ShakeOut	87	96/111	99	158/160
Practiced full simulation exercise with ShakeOut	26	25/111	27	43/160
Have disaster/emergency management committee	85	39/46	88	141/160
School buildings meet standards for earthquake safety	67	31/46	74	119/160
Encourage staff/students to prepare for disasters at home, provide support materials	67	31/46	76	121/160
Know whether expected to provide emergency shelter w/ local Red Cross chapter/government	50	23/46	57	91/160
All/most tall/heavy furnishings that could slide or fall and kill or injure people are secured to wall studs	78	36/46	71	113/160
All/most teachers/staff are taught/know how to use fire extinguishers	72	33/46	35	56/160
This year’s ShakeOut led to improvements in: ^c				
Disaster plan/policies/procedures	71	15/21	66	104/157
Seeking needed training	43	9/21	36	57/157
Educating students for disaster prevention	71	15/21	60	95/157
No improvements	5	1/21	3	5/157

Table 14. 2009-2010 ShakeOut Evaluation: Frequencies for Selected Variables – K-12 Schools

^a Data represent 122 public school respondents that completed at least one section of the questionnaire.

^b Data represent 180 public school respondents that completed at least one section of the questionnaire.

^c The 2009 survey referred to improvements as a result of the previous (2008) ShakeOut, thus for 2009, *N* reflects organizations that responded to the question and also participated in 2008.

School Districts. In 2009, a total of 69 school districts responded. These represented public school districts or county offices of education. In 2010, 85 school districts responded. Of these, 59 (70%) represented public school districts, and 8, county offices of education (9%); the remainder (18) represented a group of private schools (21%). Table 15 presents selected findings for public school districts and county offices of education.

The pattern reflects a similar, but perhaps slightly more positive, representation compared to individual schools. When asked about improvements resulting from ShakeOut participation, very few school district representatives (5%, 3%) indicated that participating in the ShakeOut resulted in no improvements. (Only three of nine improvements asked about are presented here.)

Table 15. 2009-2010 ShakeOut Evaluation: Frequencies for Selected Variables – School Districts

Activity	2009		2010	
	(N=69) ^a		(N=67) ^b	
	%	N	%	N
Able to report on district’s participation in the current ShakeOut ^c	91	63/69	76	49/67
All/most classrooms practiced drop, cover, hold on with ShakeOut	92	58/63	98	48/49
All/most schools practiced full simulation exercise with ShakeOut	16	9/58	31	15/49
Has disaster/emergency management committee	78	21/27	76	41/54
All/most school buildings meet standards for earthquake safety	82	22/27	85	45/53
All/most staff/students encouraged to prepare for disasters at home, provided support materials	67	18/27	69	35/51
All/most schools know whether expected to provide emergency shelter w/ local Red Cross chapter/government	70	19/27	76	39/51
All/most furnishings/equipment that could kill or injure people are secured to wall studs	89	24/27	74	40/54
This year’s ShakeOut led to improvements in: ^d				
Disaster plan/policies/procedures	53	8/15	69	34/49
Seeking needed training	33	5/15	45	22/49
Educating staff/students for disaster prevention	80	12/15	35	17/49
No improvements		-	6	3/49

^a Data represent 69 (of 69) public school districts that completed at least one section of the questionnaire.

^b Data represent 67 (of 67) public school districts that completed at least one section of the questionnaire.

^c For 2009, this item asked respondents whether their district participated in the current ShakeOut drill.

^d The 2009 survey referred to improvements as a result of the previous (2008) ShakeOut, thus *N* reflects organizations that responded to the question and also participated in 2008.

Colleges/Universities. In 2009, 52 college/university representatives initiated the survey. Of these, 28 (54%) were public colleges/universities, 15 (29%) were private, and 9 (17%) did not state. In 2010, 47 respondents initiated the survey. Of these, 37 (79%) were public; 10 (21%) were private. Table 16 reports data for the public colleges and universities.

Nearly all respondents at the college/university level (96%, 88%) indicated that their institution encourages staff and students to prepare their households for earthquakes and other disasters, and provides support materials. Among this small volunteer sample that registered to participate in the ShakeOut and also agreed to participate in an evaluation of the ShakeOut, engagement seems particularly high. This may indicate opportunities to help provide colleges and universities with the tools they need in order to implement the preparedness outreach and education they are already performing in the best, most effective way possible. Sharing state of the art, science- and theory-based methods for motivating preparedness would seem an effective approach for this group, in particular.

Table 15. 2009-2010 ShakeOut Evaluation: Frequencies for Selected Variables – Colleges/Univ.

Activity	2009		2010	
	(N=23) ^a		(N=33) ^b	
	%	N	%	N
Practiced “drop, cover, hold on” with ShakeOut ^c	86	18/21	94	29/31
Practiced a full simulation exercise with ShakeOut ^c	19	4/21	27	9/31
Have disaster/emergency management committee	91	21/23	82	27/33
All/most school buildings meet standards for earthquake safety	74	17/23	64	20/31
Encourage staff to prepare for disasters at home, provide support materials	96	22/23	88	29/33
Know whether expected to provide emergency shelter w/ local Red Cross chapter/government	70	16/23	73	24/33
All/most furnishings/equipment that could kill or injure people are secured to wall studs	70	16/23	47	14/30
All/most teachers/staff are taught/know how to use fire extinguishers	61	14/23	20	6/30

^aData represent 23 (of 28) public colleges/universities that completed at least one section.

^bData represent 33 (of 37) public colleges/universities that completed at least one section.

^c For 2009, data include only those colleges/universities that reported that they participated in the ShakeOut (21/23).

Organizations. In 2009, 728 respondents initiated the survey representing organizations. The majority were businesses (210/693, 30%), government organizations (189/693, 27%), non-profit organizations (101/693, 15%), and health organizations (49/696, 7%). In 2010, 836 respondents initiated the survey. The pattern of organizational representation was similar to the previous year, with the majority representing businesses (229/836, 27%), government organizations (251/836, 30%), non-profit organizations (134/836, 16%), and health organizations (65/836, 8%). (See Table 17.)

A majority of respondents representing organizations (87%, 91%) reported that their organization encouraged staff to prepare for disasters at home, providing support materials for doing so. Organizations may benefit even more than colleges and universities from receiving guidance about, and tools to support, motivating employees to take earthquake preparedness actions. Interestingly, a smaller proportion (65%, 56%) indicated that their organization's participation in the ShakeOut led to improvements in their encouraging staff to prepare for earthquakes and other disasters at home, suggesting that this may be an area in which the ShakeOut can make further contributions to statewide household readiness.

Table 17. 2009-2010 ShakeOut Evaluation: Frequencies for Selected Variables – Organizations

Activity	2009		2010	
	<i>N</i> =611 ^a		<i>N</i> =794 ^b	
	%	<i>N</i>	%	<i>N</i>
Participated in the ShakeOut drill	97	591/611	98	774/794
Practiced “drop, cover, hold on” with ShakeOut	83	489/591	94	678/718
Practiced full simulation exercise with ShakeOut	19	116/591	37	266/718
Have disaster/emergency management committee	70	428/611	71	566/794
Encourage staff to prepare for disasters at home, provide support materials	87	532/611	91	725/794
All/most furnishings/equipment that could kill or injure people are secured to wall studs	70	430/611	55	408/746
All/most teachers/staff are taught/know how to use fire extinguishers	69	339/611	50	387/772
This year’s ShakeOut led to improvements in: ^c				
Disaster plan/policies/procedures	62	251/408	51	360/705
Seeking needed training	34	137/408	35	245/705

Educating staff for disaster prevention	72	294/408	58	406/705
Encouraging disaster planning at home	65	264/408	56	391/705
No improvements	4	16/408	13	92/705

^a Data represent 611 (of 728) organizations that completed at least one section.

^b Data represent 794 (of 836) organizations that completed at least one section.

^c The 2009 survey referred to improvements as a result of the previous (2008) ShakeOut, thus *N* reflects organizations that responded to the question and also participated in 2008.

Discussion

These data reflect a motivated volunteer sample of ShakeOut registrants. The ways in which ShakeOut registrants may differ from non-registrants are unclear, however, it is certainly the case that registrants represent an engaged population. Other limitations include the cross-sectional nature of the data, inconsistent data collection windows, the number of skipped items, and sampling bias associated with the internet. These data cannot be used to generalize to the state as a whole, nor can they be used to assess impact.

Nonetheless, the data can be useful in providing insights about program direction and future evaluation needs. It is clear that the ShakeOut drill has provided schools, school districts, and colleges/universities with an assortment of opportunities to prepare for and mitigate against earthquakes and other disasters. Businesses, in particular, represent an important and yet untapped resource for increasing the state's overall earthquake preparedness and mitigation efforts.

Like the ShakeOut drill, itself, this survey has improved over time, becoming a simpler and more straightforward process, and feedback about the survey has become increasingly positive. It seems likely that the survey process itself serves as an "intervention", having the effect of prompting additional earthquake preparedness and mitigation actions.

Future Directions. In the past year, the ECA ShakeOut Research and Evaluation committee has planned for changes in future data collection efforts. These include: 1) developing a protocol for sharing data with other researchers, 2) changing from confidential to anonymous data collection so that individuals can be followed over time, 3) sharing data and ideas with other ECA committees more formally, and 4) plotting geographically businesses that have registered for the ShakeOut and that represent local "champions" throughout the state. In addition, the committee is considering a greater emphasis on client satisfaction and programmatic feedback.

7. Challenges and Opportunities

Review of existing reports and data led to the identification of several challenges and opportunities in terms of program as well as evaluation.

Program

Because ShakeOut registrant evaluation samples represent the very most engaged, this group can play a key role as local community champions for earthquake preparedness. Theory-based causal modeling has established that 1) observing others take action to prepare for and mitigate against earthquakes, and 2) talking to others about earthquake readiness actions are effective tools for motivating others to act (Wood, Mileti, Kano et al., 2012). Thus, measuring “talking” that has occurred because of the ShakeOut may be a reasonable endpoint in this light. The fact that the ShakeOut seems to be effective at encouraging very engaged individuals to talk to others about earthquake safety and preparedness suggests that perhaps the ShakeOut may impact knowledge and action in this very way. In any case, it makes sense to incorporate the principles of social modeling to encourage people to talk with others, and to measure the extent to which the most engaged do so.

ECA’s 5-year strategic plan currently includes engaging the already prepared. This effort should be continued and expanded. The ECA should actively recruit and encourage individuals to talk to others about preparedness. That is, in addition to developing messages and program activities to motivate people to take preparedness action, ECA efforts also should develop messages and activities specifically designed to motivate people to motivate others. This applies to businesses and other organizations, as well.

As part of further expansion of the ShakeOut’s “whole” community effort, businesses and other organizations should play a larger role in conducting ShakeOut drills, distributing earthquake safety and preparedness information, and modeling preparedness efforts. If workers and their households are better prepared for a major earthquake, they will be able to return to work more quickly, thereby increasing community resilience and speeding recovery. Expanding the role of businesses, in particular, may help strengthen community resilience and the rate of recovery, not only for the businesses affected, but for the larger community as well. Disaster preparedness, having an emergency response plan in place, and having the equipment and supplies necessary to enable business continuity, increase the likelihood that businesses will recover following disaster (Tierney, Lindell, & Perry, 2001). A study conducted in Santa Cruz County, CA found that prior to the Loma Prieta earthquake, only 10% of respondents had a businesses recovery plan, and only 23% had an emergency plan (Wasileski, Rodriguez, & Diaz, 2011). The 2004 National Small Business poll found that at least 30% of small businesses have been closed for 24 hours or longer in the past three years following a natural disaster, and that 38% of small employers have an emergency preparedness plan (National Federation of Independent Businesses, 2004). The

field of business and disaster research is currently quite limited, but it is widely held that disaster preparedness contributes to how businesses react to and recover from disasters.

Schools represent a strategic opportunity for transmitting messages to the general public in that gaining the support of one school can potentially affect hundreds, and perhaps, thousands, of individuals. Schools can and should play a larger role in motivating household preparedness through the transmission of information, support materials, and engagement from students to their families. The ShakeOut already provides materials to schools to facilitate this effort, and this activity should be expanded. Recognition that can be posted on school websites can help school's publicize their efforts, and can help motivate families, as well as other schools, to also take action.

Any and all evaluation activities can be used to reinforce preparedness messages. Evaluation activities can act as potent motivators, themselves. For this reason, respondents who reach the end of a ShakeOut questionnaire should receive a brief program message encouraging them to talk to others about earthquake safety and preparedness and to enlist others to become better prepared.

The advent of social media is changing the way people communicate. Although these tools allow for information sharing among large numbers of people, they also require planning, ongoing monitoring, and evaluation. Costs associated with social media development and oversight can be prohibitive and can divert resources from the main focus of a program without a well-developed social media plan. The ShakeOut cautiously has made use of social media to support and enhance its program message and activities. This should be pursued within the context of a carefully designed social media plan to minimize resources expended and maximize results gained. New guidelines have been developed by the Center's for Disease Control and Prevention that provide a framework for designing and implementing a social media presence to promote public health and preparedness programs. These tools help insure that social media activities are efficient and aligned with program goals and objectives.

Finally, the ShakeOut provides an ideal opportunity to test and provide public education about new alert and warning systems. The Earthquake Early Warning system (EEW) currently is being tested in California and can provide up to a minute warning before strong shaking is felt. Messages can be passed through Twitter and other forms of social media. The Commercial Mobile Alert System (CMAS), an "opt-out" system that enables the delivery of alerts and warnings to handheld mobile devices through commercial providers, is currently being tested in selected communities for nationwide release. This technology may be used to provide post-event alerts and warnings. The ShakeOut drill provides an ideal opportunity to acquaint the public with these systems and to provide public education about what they are and how they work. Using the ShakeOut as a vehicle for introducing these mobile alert systems to the public and providing needed education can help people learn what to do when they receive earthquake related alert messages in the future.

Evaluation

One issue that has emerged is the importance of consensus about what to measure. This involves having a clear understanding of primary and secondary goals of the ShakeOut on any given year, and on the purpose of the evaluation. The ShakeOut has become a large event, with multiple goals, objectives, and stakeholders. Because the drill is implemented at the local level, there is risk of potential divergence of message. Periodic review, update, and distribution of a simple schema or “logic model” can help communicate program goals, resources, inputs, outputs, and desired outcomes to the many individuals and groups that implement the ShakeOut across the state. This can help increase coordination and consistency of message at multiple levels.

Another issue is the use of proxy measures for actual preparedness actions taken. Measuring perceptions of earthquake preparedness is less accurate and less informative than asking about specific behaviors given that people are not always aware of what it means to be prepared. Moreover, those who are more knowledgeable about earthquake preparedness and who have taken more steps to prepare may rate their level of preparedness lower than those who have done less because of their greater awareness of ways in which it is possible to prepare. Because of the large number of actions involved, level of earthquake preparedness can only be teased apart in a more rigorous study.

Generalizability has been an ongoing problem for ShakeOut evaluations. Only population-based representative samples can be used to generalize to the state as a whole. Respondents for the ShakeOut evaluations to date can only represent ShakeOut registrants, and in some cases, ShakeOut registrants who participated in the given evaluation. The state conducted a population based household survey nearly five years ago, which can serve as a baseline for any future efforts to assess impact of the ShakeOut on the state as a whole, and to monitor levels of household preparedness. For the purpose of cost efficiency, it makes sense to refocus the scope of the current ShakeOut evaluation activity that is implemented through the existing SCEC committee structure to primarily inputs (resources invested) and outputs (process measures of implementation and program quality/participant satisfaction). In addition, these efforts may also be useful in describing the effects of the ShakeOut on the very most engaged. This narrowed scope can help ensure that data collected are streamlined and can be used to monitor and improve program implementation. Any future effort to evaluate the impact of the ShakeOut should involve a statewide household survey that largely replicates the baseline state survey to minimize cost.

Given time and resources, more formalized types of program evaluation might be considered. Conducting a theory-based evaluation can help to identify how conceptual models are driven by theories and evidence-based best practices. True population-based surveys can be more apt in describing the populations who do and do not respond to the Shakeout annual events, campaigns, and auxiliary materials. Whether prospective, which greatly increases cost, or cross sectional, which are informative when multiple cross-sections are assessed over time, such surveys could be used to monitor the impact of participation on household participants as well as monitor how participation changes over

time within different populations. As well, cost effectiveness evaluations can help to identify how SCEC CEO resources are spent and assist program planning efforts with decisions on where to allocate (as well as detract) future resources. However, such evaluations take time and resources. Such an allocation of resources might be worth the expenditure given the ongoing need for Shakeout activities.

The ShakeOut structure facilitates a communitywide approach to communicating preparedness messages through multiple sources, channels, and sectors to increase message engagement, consistency, and synergy. While the ShakeOut's "whole community" approach is commonly believed to be effective, evaluation efforts to date have not formally examined the effect of disseminating ShakeOut preparedness and earthquake safety messages to households through schools, businesses, and other organizations. Establishing whether or not messages that arrive through multiple community institutions increases their effect would be a worthwhile endeavor.

Data collection for the statewide household preparedness survey concluded roughly four years ago, and much has happened since that time. The survey should be repeated at regular intervals to provide ongoing monitoring. The Commission should, with state partners, help identify resources to fund a follow up cross-sectional survey to assess change over time. The questionnaire that was used in the baseline survey should be re-administered with minimal change to facilitate baseline comparison and to maintain cost-efficiency. Follow up data should be collected at a fraction of the initial baseline cost. Data can be used to assess the impact of the ShakeOut throughout the state, guide future program activities, and help first responders and emergency managers anticipate community needs following a major earthquake.

8. Key Findings

Although a vast amount of data has been collected, analysis has been limited because of the in-kind nature of evaluation activities following the initial year the drill was implemented, in 2008. Key findings that have emerged include:

- **SCEC and the ECA have been successful in their efforts to promote the ShakeOut rather than their own organizations.** This explicit effort on the part of SCEC and ECA to take a "back seat" to the drill activities and the message of earthquake safety and preparedness is likely responsible for the rapid adoption of the drill throughout the state and beyond as well as the amount of publicity it has received across news and other media. The fact that the media was more likely to mention USGS, the origin and author of the Scenario, rather than SCEC or ECA reflects this.

- **Just as real earthquake events prompt behavior, simulated events such as the ShakeOut drill also can prompt information seeking and preparedness action.** The fact that there were two peaks in downloading of the “Putting Down Roots” handbook—immediately following a real earthquake (Chino Hills, July 29, 2008) and on the day of the ShakeOut drill—demonstrates that the ShakeOut drill, while only a simulation, can affect actual behavior.
- **California schools remain an underutilized resource for promoting household earthquake preparedness.** Schools can do more to encourage staff and student families to prepare for disasters at home and provide support materials for doing so. Assuming that ShakeOut registrants and evaluation participants represent the very most engaged, in 2009, only 67% of responders indicated that their schools encourage staff and students to prepare for disasters at home and provide related materials. This number rose to 76% in 2010. Among individual or household respondents, only 11% indicated that they received information about earthquake safety and preparedness from schools. Because schools have the ability to influence hundreds or thousands of households, the actions of a single school can have a tremendous impact on the level of preparedness in local communities.
- **Businesses and other organizations also remain underutilized in efforts to promote household preparedness and community resilience.** Again, assuming that ShakeOut registrants and evaluation participants represent the very most engaged, in 2009, only 70% of responders indicated that their business or organization has a disaster/emergency management committee. This number was nearly identical in 2010. Moreover, only 69% reported that all or most staff know or are taught or know how to use fire extinguishers. Among individual or household responders, only 21% indicated that they received information about earthquake safety and preparedness from their employers. As is the case with schools, the actions of the business community as well as organizations can have a tremendous impact on the level of preparedness in local communities, and subsequent rate of recovery.
- **The ShakeOut drill has encouraged individuals to talk to others about the drill itself and about earthquake safety and preparedness.** More than two-thirds (69%) in 2010 said that they encouraged others to participate in the drill, and 71% said they reviewed drill manuals posted on the ShakeOut website. The research record has demonstrated that social cues such as ordinary people talking to others about preparing for earthquakes is an effective strategy for motivating action. Although respondents represent the very most engaged, this group is exactly who should be targeted as community role models and the initiators of such social cues to taking preparedness action.

9. Recommendations

This project yielded the following recommendations.

1. ***Target businesses and other organizations for an increased role in motivating household preparedness.*** The Commission should identify and recognize businesses and other organizations that can serve as role models because of their participation in the ShakeOut drill and evaluation, and their efforts to foster preparedness within the workforce and broader community. The Commission also should seek ways to motivate businesses to provide their employees with earthquake kits and information, and encourage increased preparedness within households.
2. ***Target schools for an increased role in motivating household preparedness.*** The Commission should identify and recognize schools that can serve as role models because of their participation in the ShakeOut drill and evaluation, and the efforts they have made to motivate students and families. The Commission also should seek ways to motivate schools to encourage increased preparedness within employee and student households.
3. ***Use the ShakeOut as an opportunity to test and provide public education about new alert and warning systems.*** The Commission should organize pilot testing of the Earthquake Early Warning system (EEW) and the Commercial Mobile Alert and System (CMAS) in connection with the ShakeOut drill to test the systems and to help educate the public about them.
4. ***Support program evaluation.*** The Commission should identify ways to provide support for cost-efficient evaluation efforts so that the effects of the ShakeOut can be assessed and the program can be improved. This may include identifying ways to provide incentives to businesses that make financial contributions to ShakeOut evaluation efforts.
5. ***Facilitate a follow-up statewide household preparedness survey.*** The Commission should, with state partners, help identify resources to fund a follow up cross-sectional survey to assess change over time.

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Appendix A

Table A-1. 2008 ShakeOut Media-Focused Evaluation: Sample Description

Demographic Characteristic	Wave 1 (N = 2,475)		Wave 2 (N = 2,052)		California Population
	n	%	n	%	
Gender					
Female	1613	67	1357	68	50%
Male	799	33	642	32	50%
Ethnicity					
White	1643	66	1349	80	43%
African-American	75	3	69	3	6%
Latino	321	13	260	13	36%
Asian	154	6	135	7	12%
Missing	282	11	239	12	--
Age					
18-29	224	9	180	9	24%
30-39	346	14	275	13	19%
40-49	560	23	492	24	20%
50-59	587	24	583	28	16%
> 60	448	18	455	22	21%
Missing	310	13	67	3	--
Personal Income					
Average	\$65,965		\$65,309		\$29,405
< \$25,000	231	9	214	10	--

\$25,000-\$49,999	425	17	324	16	--
\$50,000-\$74,999	468	19	389	19	--
\$75,000 or more	766	31	617	30	--
Missing	585	24	508	25	--

Table A-2. 2008 ShakeOut Media-Focused Evaluation: Drill Participation

“Did you participate in any of the following activities related to the Great Southern California Shake Out?”

Activities	Wave 1		Wave 2	
	(N = 2,475)		(N = 2,052)	
	n	%	n	%
<u>Primary Objective</u>				
Dropped, covered, held on	1899	77	1457	71
<u>Secondary Objectives</u>				
Practiced disaster plan	1218	49	807	39
Helped others prepare	1067	43	808	39
Participated in a meeting	868	35	683	33
Played "Beat the Quake" game	322	13	241	12
Played "After Shock" game	189	8	171	8
Joined Facebook group	73	3	54	3
Attended ShakeOut rally	27	1	23	1
Joined MySpace group	13	0.5	7	0

Table A-3. 2008 ShakeOut Media-Focused Evaluation: Information Sources

“In the past month, have you heard or seen anything about earthquakes from any of the following sources?”^a

Sources	Wave 1		Wave 2	
	(N = 2,475)		(N = 2,052)	

	<i>n</i>	%	<i>n</i>	%
TV News	1599	65	1470	72
Internet	1485	60	1275	62
Newspapers	1349	55	1208	59
Conversations	1236	50	1076	52
Radio	986	40	816	40
Primetime TV	611	25	640	31
Daytime TV	498	20	470	23
PSA	394	16	280	14
Magazines	252	10	307	15
Outdoor Ads	141	6	118	6

^aTime 2 used a 5-month recall period.

Table A-4. 2008 ShakeOut Media-Focused Evaluation: Communication with Others

"In the past month, have you talked with family or friends about the following things?"^a

Topic	Wave 1		Wave 2	
	(N = 2,475)		(N = 2,052)	
	n	%	n	%
Earthquakes in general	2281	92	1933	94
Earthquake kits	2141	87	1817	89
Disaster communication plan	1792	72	1510	74
Preparing your home for an earthquake	1746	71	1504	73
Having extra cash on hand	1445	58	1289	63
Community disaster plan	756	31	709	35

^aTime 2 used a 5-month recall period.

Table A-5. 2008 ShakeOut Media-Focused Evaluation: Knowledge

Protective Action	Wave 1		Wave 2	
	(N = 2,475)		(N = 2,052)	
	n	%	n	%
<i>"If you are inside during an earthquake, you should..."</i>				
Drop, cover, and hold on	2133	86	1706	83
Find the "Triangle of Life"	534	22	452	22
Get under a doorway	317	13	273	13
<i>"If you are outside during an earthquake, you should..."</i>				
Drop, cover, and hold on	2200	89	1835	89
Get close to a large object	140	6	127	6
Run inside a building	68	3	74	4
<i>"If you are in bed during an earthquake, you should..."</i>				
Stay in bed and cover your head with a pillow	1081	44	872	43
Quickly move to another location where you can drop, cover and hold on	1011	41	842	41
Roll to the floor	456	18	396	19
<i>"If you are driving during an earthquake, you should..."</i>				
Pull off the road and set your emergency brake	2275	92	1865	91
Stop and get out of the vehicle	148	6	146	7
Continue driving	58	2	53	3

“What should you do after an earthquake?”

Check injuries	2413	97	1981	97
Prepare for aftershocks	2343	95	1902	93
Check gas, fire, & electric hazards	2249	91	1889	92
Check for safety warnings	1928	78	1584	77
Call out-of-area contact	1642	66	1357	66
Call family	555	22	445	22
Move injured people	468	19	430	21
Search for survivors in damaged buildings	117	5	91	4
Call 911	25	1	23	1
Get in your car	9	0	10	0

Table A-6. 2008 ShakeOut Media-Focused Evaluation: Self-Assessed Preparedness

“How prepared do you feel you are to handle a large scale earthquake?”

	Wave 1		Wave 2	
	(N = 2,475)		(N = 2,052)	
	n	%	n	%
Totally unprepared	152	6	123	6
Fairly unprepared	645	26	499	24
Somewhat unprepared	1390	56	1176	57
Very well prepared	288	12	254	12

Table A-7. 2008 ShakeOut Media-Focused Evaluation: Self-Assessed Preparedness by Demographic Characteristics

Characteristic	“Totally Unprepared” (6%)				“Very Well Prepared” (12%)			
	Wave 1		Wave 2		Wave 1		Wave 2	
	n	%	n	%	n	%	n	%
Race								
White/Caucasian	68	45	59	48	219	76	190	75
African American	8	5	5	4	4	1	10	4
Hispanic/Latino	37	24	37	30	19	7	16	6
Asian Am./Pac. Islldr.	15	10	12	10	9	3	10	4
Missing	24	16	10	8	37	13	28	11
Gender								
Female	114	75	100	81	155	54	125	49
Male	31	20	19	15	130	45	124	49
Missing	7	5	4	3	3	1	5	2

Age								
18-29	26	17	21	17	13	5	5	2
30-39	32	21	25	20	18	6	17	7
40-49	35	23	34	28	54	19	54	21
50-59	19	13	25	20	89	31	91	36
60 or older	15	10	13	11	75	26	81	32
Missing	25	16	5	4	39	14	6	2
Income								
Less than \$25,000	23	15	22	18	26	9	24	9
\$25,000 - \$49,999	32	21	18	15	47	16	43	17
\$50,000 - \$74,999	31	20	27	22	39	14	48	19
\$75,000 or more	33	22	31	25	104	36	79	31
Missing	33	22	25	-	72	25	60	24

Table A-8. 2008 ShakeOut Media-Focused Evaluation: Drill Participation by Demographic Characteristics

Characteristic	Wave 1 (N = 2,475)		Wave 2 (N = 2,052)	
	n	%	n	%
Race				
White/Caucasian	1239	65	933	64
African American	60	3	56	4
Hispanic/Latino	269	14	213	15
Asian Am./Pac. Islldr.	121	6	95	7
Missing	210	11	160	11
Gender				
Female	1283	68	993	68
Male	570	30	431	30
Missing	46	2	33	2
Age				
18-29	186	10	137	9
30-39	277	15	201	14
40-49	436	23	373	26
50-59	455	24	419	29
60 or older	313	16	290	20
Missing	232	12	37	3
Income				
Less than \$25,000	171	9	149	10
\$25,000 - \$49,999	325	17	240	16
\$50,000 - \$74,999	367	19	273	19
\$75,000 or more	598	31	443	30

Missing

438

23

352

24
