

Title of Project: Survey and Evaluation of Recent Hospital Evacuations Following Damaging Earthquakes in California, Mexico, and New Zealand

Principal Investigator: Judith Mitrani-Reiser, PhD

Participating Institutions: Pacific Earthquake Engineering Research Center
Johns Hopkins University, Baltimore, Md
National Science Foundation
University of Canterbury, Christchurch, NZ
Ministry of Health, New Zealand
UC Berkeley
Rutherford and Chekene

Funding Period: July 1, 2011 to December 31, 2011

Total Cost: \$50,000

Purpose: See Attached Exhibit A

Matching Contributions:

| | |
|--|----------------|
| Committed funds from NZ Ministry of Health: \$US | 20,000 |
| Proposed funds from NSF Grant for Student Participation: | \$50,000 |
| Soft Match: 4 hospitals x 2 person-hours x \$150/hr = | <u>\$1,200</u> |
| Total Matching Contribution: | \$71,200 |
| Leverage ratio: | 1.4 |
| Total Project Value: | \$121,200 |

BACKGROUND

The continued functionality of critical infrastructure, such as healthcare facilities, is necessary following a major event. The focus of this proposed study is to assess the impact of the Christchurch earthquakes of 2010 and 2011 and the Baja California earthquake of 2010 on acute-care hospitals. The study approach is multi-disciplinary involving engineers, epidemiologists and health and emergency managers. Each of these disciplines is necessary to properly analyze how structural and non-structural damage disrupts essential services provided by hospitals. Given that the building stock in New Zealand is similar to that in the US and that the building code in New Zealand is comparable to current practice in California, the results of this study will have direct applications to the state of California. In addition to similarities between the US and NZ in their existing building stock and building codes, the Coordinated Incident Management Systems (CIMS) for New Zealand is based on California's Incident Command Structure (ICS). Given the agreement of these structures, we expect our project to inform best practices in healthcare system design as well as in emergency response and management.

In order to provide adequate services to patients, hospitals rely on a wide range of internal and external functions, each of which are part of a complex network of interacting systems. The loss of a single function can severely disrupt the ability to provide care during the critical first hours. The overall goal of this project is to collect and analyze data from recent seismic events to help us better understand the consequence of losing any one or multiple functions in a hospital.

PURPOSE OF THE STUDY

The Darfield and Canterbury earthquakes that hit Christchurch over a six-month period provide a unique opportunity to assess of the exact mechanisms that disrupt regular services of hospitals, the resilience of the healthcare system provided by redundancies in resources and services of their networked facilities, the performance of this system after several successive strong ground motion events. The practical applications of the lessons learned can be used to improve the safety of hospitals in New Zealand, the US, and other countries by improving planning and better integrate response activities. Although analyzing the impacts on specific facilities, the study seeks to describe the interactions between all the acute-care hospitals.

The focus of the proposed study is to visit hospitals in New Zealand, Mexico, and the United States to collect additional information that will allow us to assess the functionality of hospitals and public health preparedness after significant seismic events, which addresses an important sector of community resilience. Our previous work in Chile lays the foundation for comparative studies on the performance of healthcare delivery systems impacted by natural disasters, and therefore we propose to adapt our survey tool to the healthcare facilities of Christchurch, El Centro and Mexicali to better understand how physical damage correlates with loss of function, damage and performance data of structures needs to be collected after many events. The survey tool was tested on one hospital in the Maule region of Chile, and completed on seven hospitals in the Biobío region of Chile. This tool has been is designed to assess hospital damage, including structural and nonstructural components, utility services, and equipment, as well as loss of supplies and personnel. We intend to collect physical damage data by interviewing the Construction and Property Manager of the Christchurch Hospital and the Facilities and Engineering Manager at the Canterbury District Health Board (CDHB). This data will include collapse risk of the building as well as damage to structural components (e.g., foundation, columns, and walls), nonstructural components (e.g., cladding, elevators, and partitions), and geotechnical hazards (e.g., apparent liquefaction). In parallel, we will survey hospital administrators on the loss of services they experienced after the event as a direct impact of earthquake damage, and on patient evacuations/transfers and hospital personnel shortage/surge that occurred in the weeks that followed.

SCOPE OF WORK

1. Brief review of hospital damage following the earthquakes in New Zealand and Baja California.
2. Evaluate our survey tool together with our research collaborators and make any necessary modifications.
3. Train research collaborators on how to effectively use the survey tool.
4. Contact the four hospitals in the study regions and organize the schedule for interviews.
5. Collect data in the field.
6. Analyze and process the data.
7. Compile results and produce a summary report.
8. The project representatives during the term of this agreement will be:

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|---|--|
| Requesting Agency: Alfred E. Alquist Seismic Safety Commission | Providing Agency: Regents of the University of California, Berkeley (PEER) |
| Name: Fred Turner | Name: Judith Mitrani-Reiser |
| Phone: 916-263-5506 Ext 227 | Phone: 410-516-7763 |
| Fax: 916-263-0594 | Cell: 202-552-9271 |
| Email: turner@stateseismic.com | Email: jmitrani@jhu.edu |

Direct all inquiries to:

| | |
|---|--|
| Requesting Agency: Alfred E. Alquist Seismic Safety Commission | Providing Agency: Regents of the University of California, Berkeley (PEER) |
| Attention: Fred Turner | Attention: Judith Mitrani-Reiser |
| Address: 1755 Creekside Oaks Drive, Suite 100, Sacramento, CA 95833 | Address: Dept. of Civil Engineering, Latrobe 210 3400 N Charles St., Baltimore, MD 21218 |
| Phone: 916-263-5506 | Phone: 410-516-7763 |
| Email: turner@stateseismic.com | Email: jmitrani@jhu.edu |

BUDGET DETAIL

1. Invoicing

- A. For services satisfactorily rendered and upon receipt and approval of the invoices, the Commission agrees to compensate the Pacific Earthquake Engineering Research Center (PEER) for actual expenditures incurred in accordance with the rates specified herein or attached hereto.
- B. Invoices shall include the Agreement Number and shall be submitted in triplicate not more frequently than monthly in arrears to:

Sue Celli
1755 Creekside Oaks Drive, Suite 100
Sacramento CA 95833

2. Budget Contingency Clause

- A. It is mutually agreed that if the Budget Act of the current year and/or any subsequent years covered under this Agreement does not appropriate sufficient funds for the program, this Agreement shall be of no further force and effect. In this event, the State shall have no liability to pay any funds whatsoever to Contractor or to furnish any other considerations under this Agreement and Contractor shall not be obligated to perform any provisions of this Agreement.
- B. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, the State shall have the option to either cancel this Agreement with no liability occurring to the State, or offer an agreement amendment to Contractor to reflect the reduced amount.

3. Payment

- A. Costs for this Agreement shall be computed in accordance with State Administrative Manual Sections 8752 and 8752.1.
- B. Nothing herein contained shall preclude advance payments pursuant to Article 1, Chapter 3, Part 1, Division 3, Title 2 of the Government Code of the State of California.

Principal Institution: Pacific Earthquake Engineering Research Center
PI: Judith Mitrani-Reiser
Project Dates: July 1, 2011 - December 31, 2012
Budget Dates: July 1, 2011 - December 31, 2012
Title: Survey and Evaluation of Recent Hospital Evacuations Following
 Damaging Earthquakes in California, Mexico, and New Zealand

| NAME | ROLE IN PROJECT | TYPE APPT mo | INST BASE SAL | 01 % EFF | Jul-11 | Dec-11 |
|---|------------------|--------------------|---------------------|-------------|--------|-----------|
| | | | | | 01 | 01 |
| | | | | | BUDGET | BUDGET |
| Judith Mitrani-Reiser | PI | 0.49 | 113,300 | 100.0% | \$ | 4,626 |
| Thomas Kirsch | co-PI | 0.30 | 186,000 | 100.0% | \$ | 4,650 |
| Senior Personnel | Senior Personnel | 0.35 | 150,000 | 100.0% | \$ | 4,375 |
| Bill Holmes | Senior Personnel | | | | \$ | 2,400 |
| Mary Comerio | Senior Personnel | | | | \$ | 1,200 |
| PERS. SUB TOTAL | | | | | | \$ 17,251 |
| FRINGE BENEFITS | PI | | 35.5% | | \$ | 4,846 |
| TOTAL PERSONNEL | | | | | | \$ 22,097 |
| EQUIPMENT - Computer | | | | | | \$ - |
| CONSULTANTS | | | | | | \$ - |
| SUPPLIES | | | | | | \$ - |
| DOMESTIC TRAVEL | | | | | | \$ 4,500 |
| FOREIGN TRAVEL | | | | | | \$ 8,125 |
| PUBLICATION COSTS | | | | | | \$ - |
| COMPUTER SEVICES | | | | | | \$ - |
| SUBAWARDS | | | | | | \$ - |
| SUBTOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD | | | | | | \$ 34,722 |
| CONSORTIUM/CONTRACTUAL COSTS | | | | | | \$ - |
| DIRECT COSTS | | | | | | 0 |
| INDIRECT COSTS | | | | | @ | 0 |
| TOTAL DIRECT COSTS FOR INITIAL BUDGET PERIOD | | | | | | \$ 34,722 |
| BASE FOR INDIRECT COSTS | | | | | | \$ 34,722 |
| IDC | | | | | 26.00% | \$ 9,028 |
| Total to subgrantee | | | | | | \$ 43,750 |
| PEER Overhead | | | | | | \$ 6,250 |
| Total Project | | | | | | \$ 50,000 |

Rates
 IDC - 26%
 FB - 35.5%