Early insights and expectations for Earthquake Early Warning

Washington, Sep 2014 public responses to M9 paywall intercept survey fielded by Google Consumer Insights.

Preliminary findings – not yet peer-reviewed.

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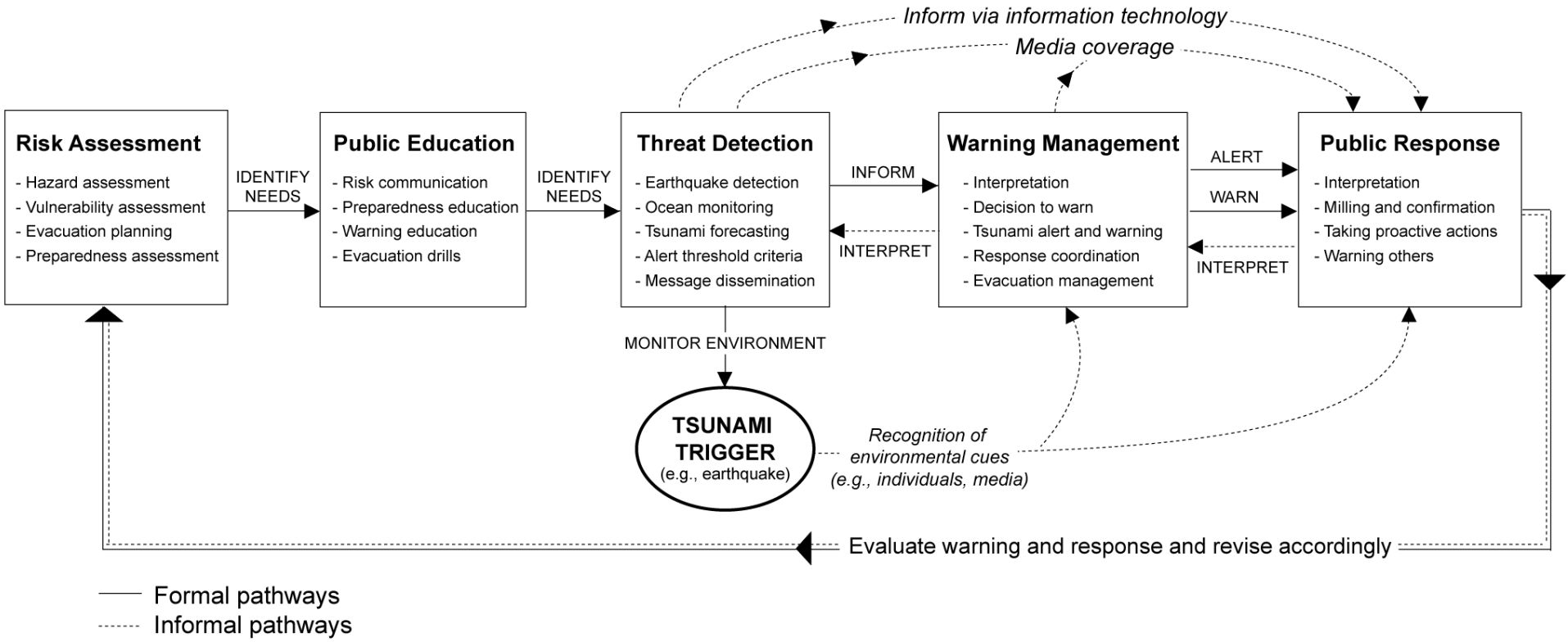
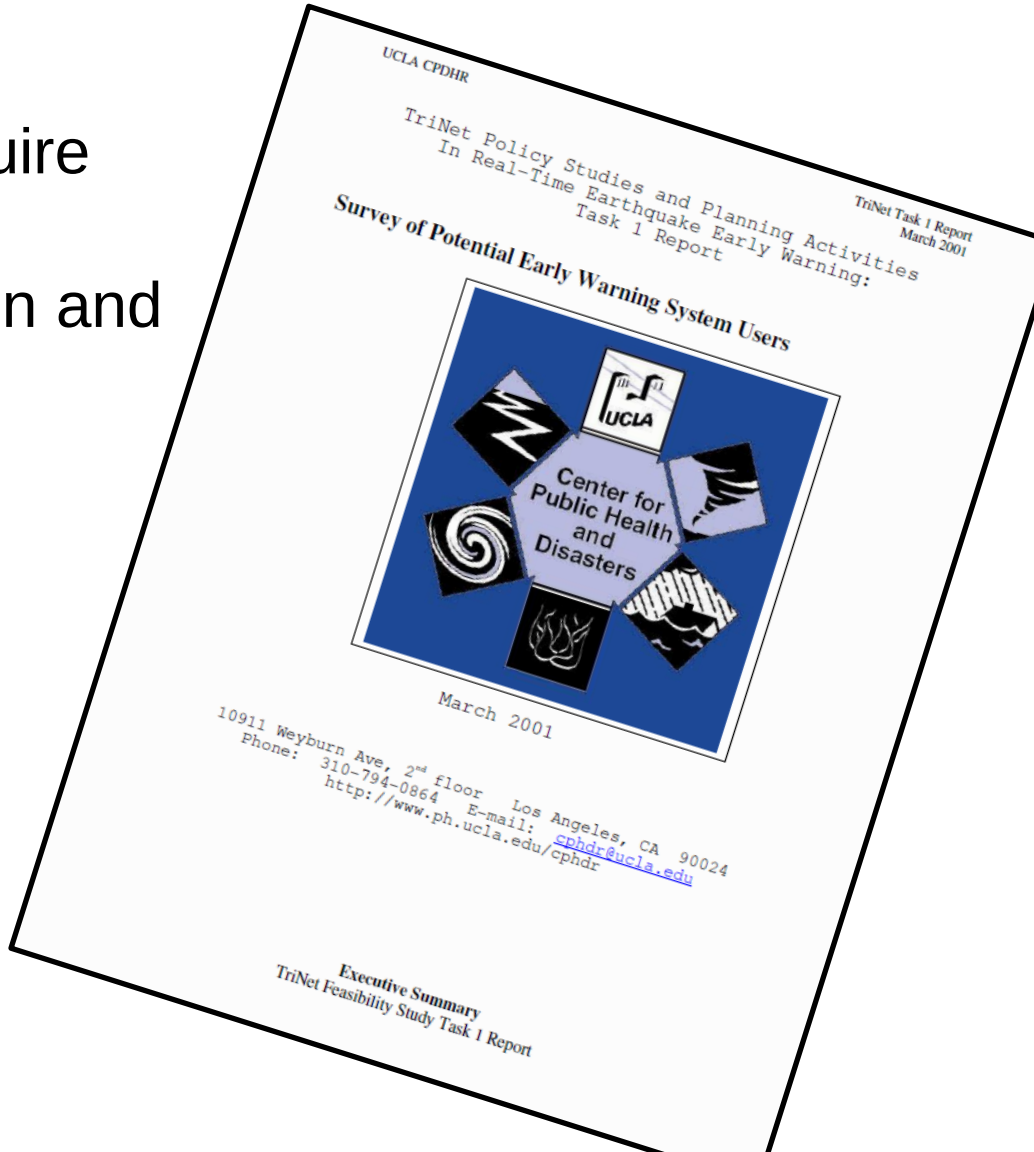
- At the March 2013 PNSN workshop, 50+ attendees (some of you) from public and private sectors met to discuss EEW system development. You were:
  - Ready to act (to varied extents) based on an EEW system,
  - Interested in learning about range of mitigation possibilities from EEW users around the world, and
  - Concerned about the kind of public education program required to have the public make "risk wise decisions" after receiving the warning.
- This talk provides:
  1) a framework for thinking about EEW, and
  2) some evidence regarding perceptions, preparations and interest in EEW, to inform your design and development of potential EEW applications.

One Framework:
Tsunami Warning and Preparedness
(NRC 2011, especially Mileti and Wood)



Earthquake Early Warning – Perceptions, Decisions and Behaviors

Short-term warnings require long-term social and organizational preparation and integration in order to be effective.


UCLA CPDHR

TriNet Policy Studies and Planning Activities
In Real-Time Earthquake Early Warning:
Task 1 Report

TriNet Task 1 Report
March 2001

Survey of Potential Early Warning System Users

Center for Public Health and Disasters

March 2001

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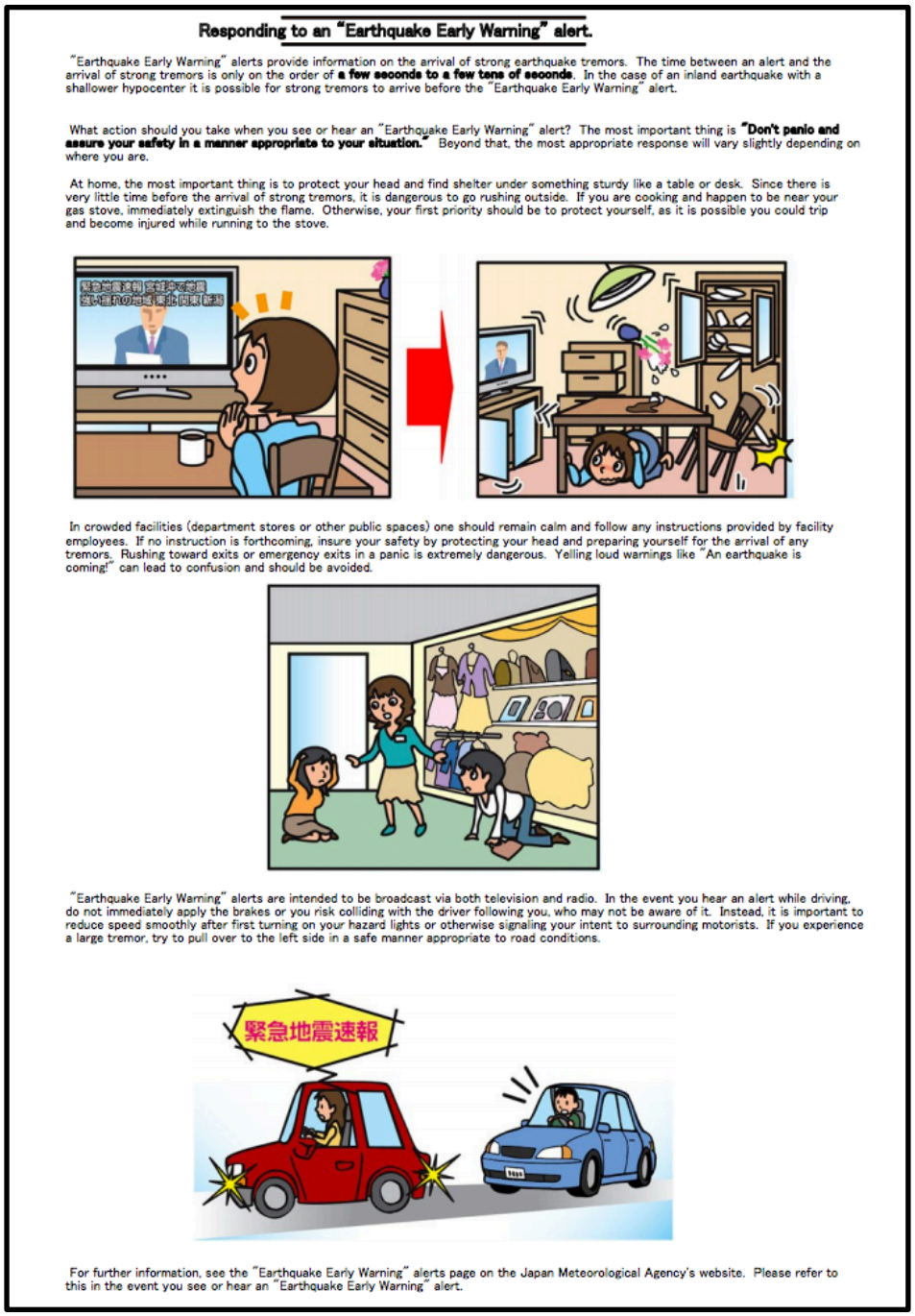
Executive Summary
TriNet Feasibility Study Task 1 Report

Anticipating Earthquake Early Warning

People need actionable information on what to do, not just that there is a threat.



Responding to an "Earthquake Early Warning" alert.

"Earthquake Early Warning" alerts provide information on the arrival of strong earthquake tremors. The time between an alert and the arrival of strong tremors is only on the order of **a few seconds to a few tens of seconds**. In the case of an inland earthquake with a shallower hypocenter it is possible for strong tremors to arrive before the "Earthquake Early Warning" alert.

What action should you take when you see or hear an "Earthquake Early Warning" alert? The most important thing is **"Don't panic and assure your safety in a manner appropriate to your situation."** Beyond that, the most appropriate response will vary slightly depending on where you are.

At home, the most important thing is to protect your head and find shelter under something sturdy like a table or desk. Since there is very little time before the arrival of strong tremors, it is dangerous to go rushing outside. If you are cooking and happen to be near your gas stove, immediately extinguish the flame. Otherwise, your first priority should be to protect yourself, as it is possible you could trip and become injured while running to the stove.

In crowded facilities (department stores or other public spaces) one should remain calm and follow any instructions provided by facility employees. If no instruction is forthcoming, insure your safety by protecting your head and preparing yourself for the arrival of any tremors. Rushing toward exits or emergency exits in a panic is extremely dangerous. Yelling loud warnings like "An earthquake is coming!" can lead to confusion and should be avoided.

"Earthquake Early Warning" alerts are intended to be broadcast via both television and radio. In the event you hear an alert while driving, do not immediately apply the brakes or you risk colliding with the driver following you, who may not be aware of it. Instead, it is important to reduce speed smoothly after first turning on your hazard lights or otherwise signaling your intent to surrounding motorists. If you experience a large tremor, try to pull over to the left side in a safe manner appropriate to road conditions.

For further information, see the "Earthquake Early Warning" alerts page on the Japan Meteorological Agency's website. Please refer to this in the event you see or hear an "Earthquake Early Warning" alert.

Japan Meteorological Agency 2007, translated by P. Haugerud

Survey results to date

- Paywall intercept surveys in CA, OR, WA (N=1203)

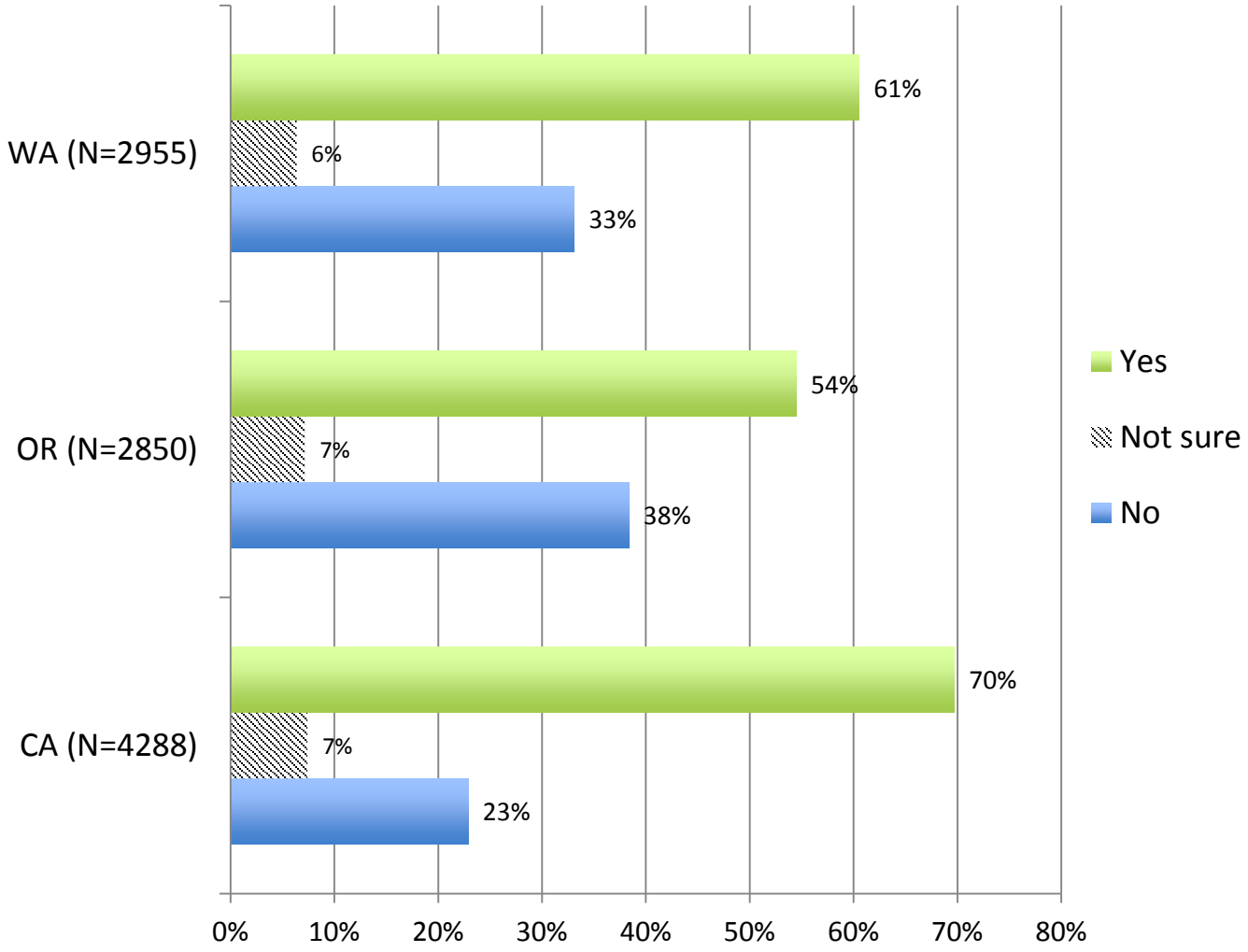
Google consumer surveys

- April 2014 National Science Foundation-funded M9 research project kick-off meeting (N=27)

- Building Owners and Managers Association (N=193, some missing data on later questions)

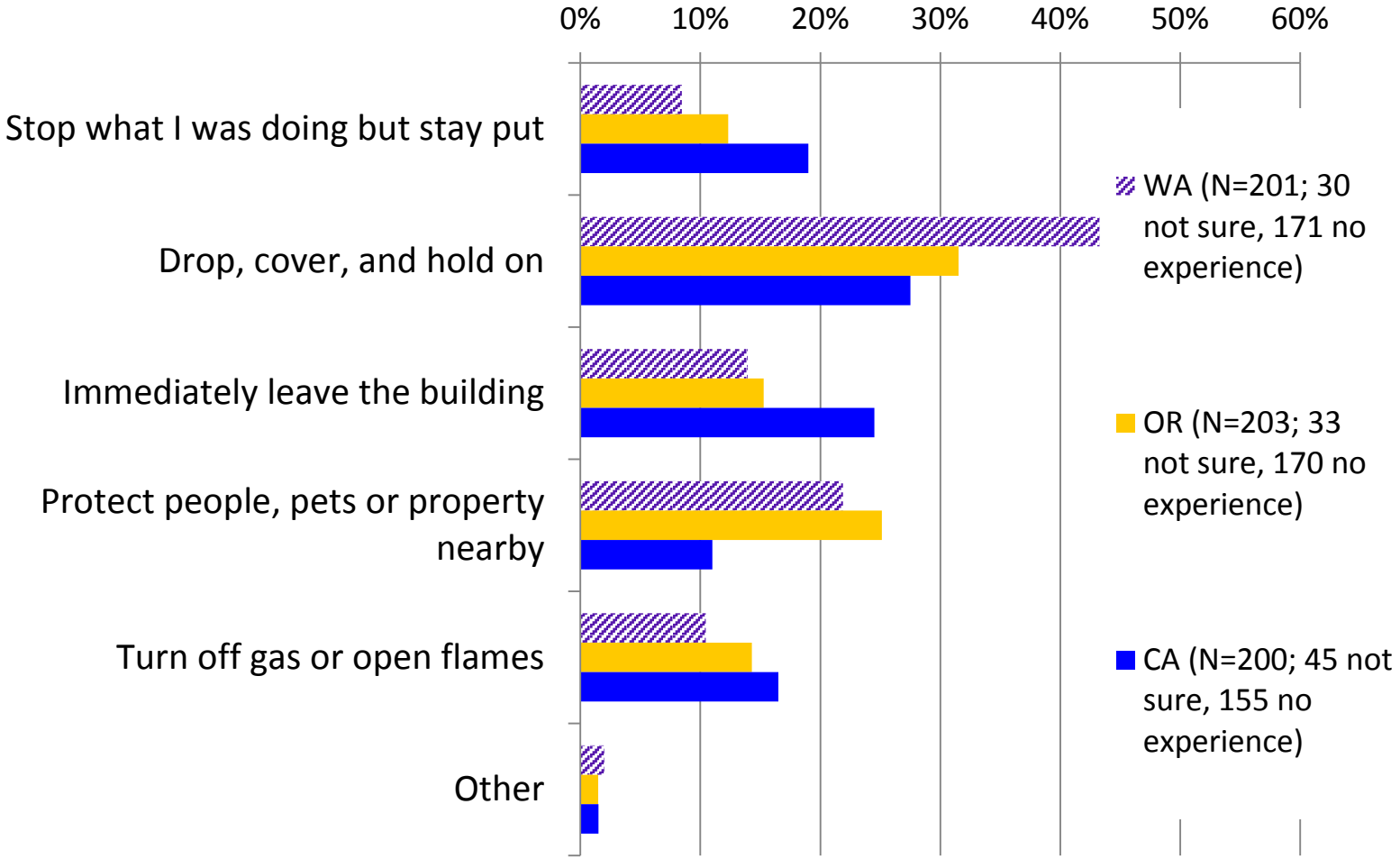
BOMA Seattle King County
Where Value is Built.

Have you personally experienced an earthquake?

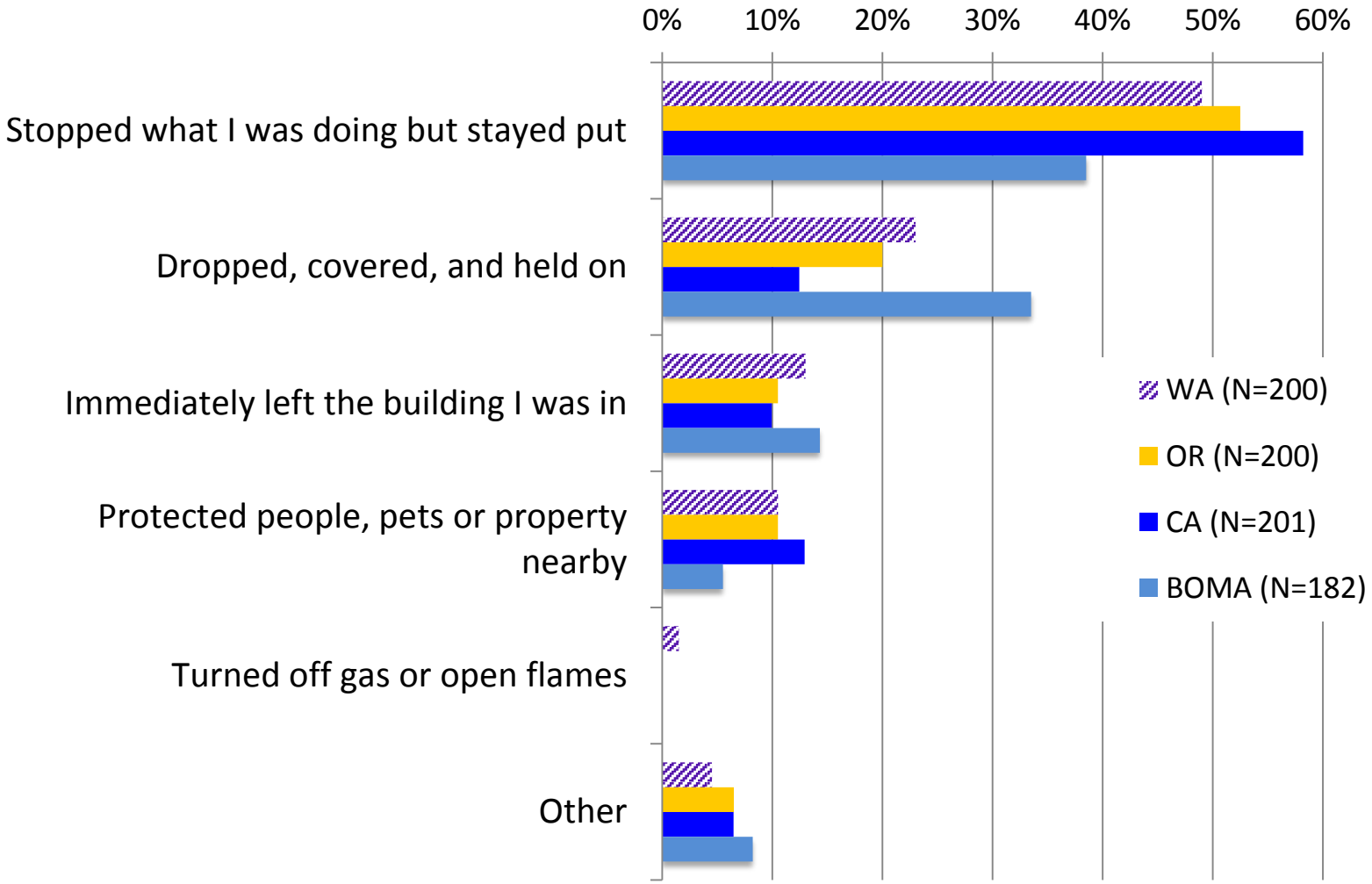


If you were to experience an earthquake when you were indoors, what do you think your first response would be during the shaking?

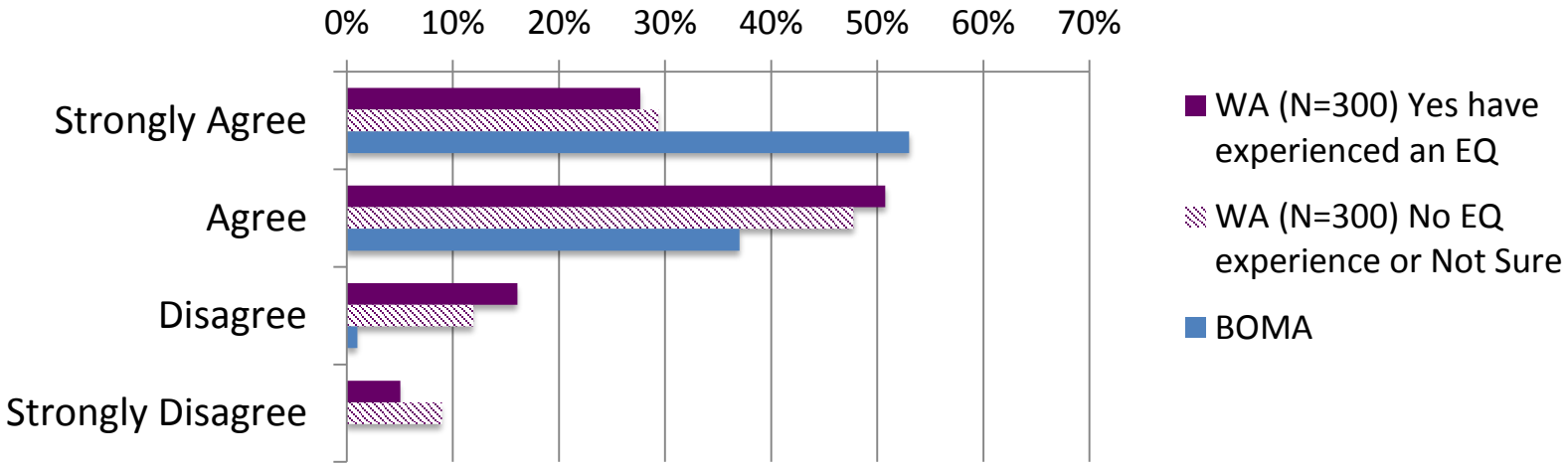
*[respondents have **not** experienced an earthquake or are unsure]*



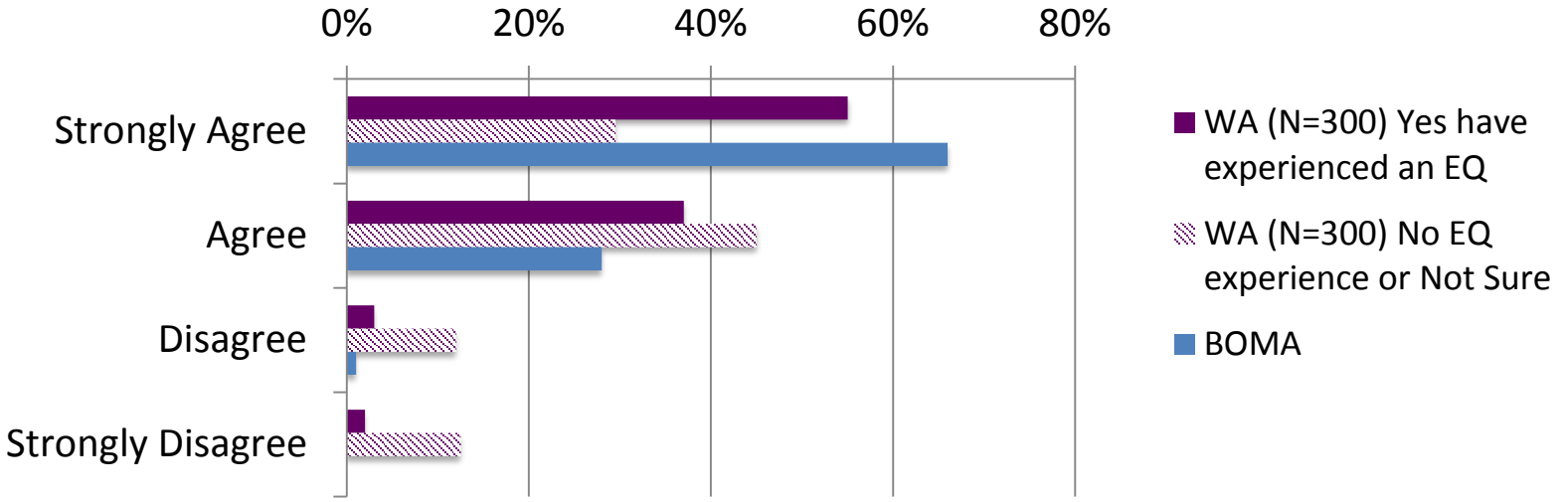
What was your first response while the earthquake was shaking? (for the most recent earthquake you have experienced)



I would be better able to protect myself from earthquake risks, including death, with an earthquake early alert (a few seconds to minutes of warning).



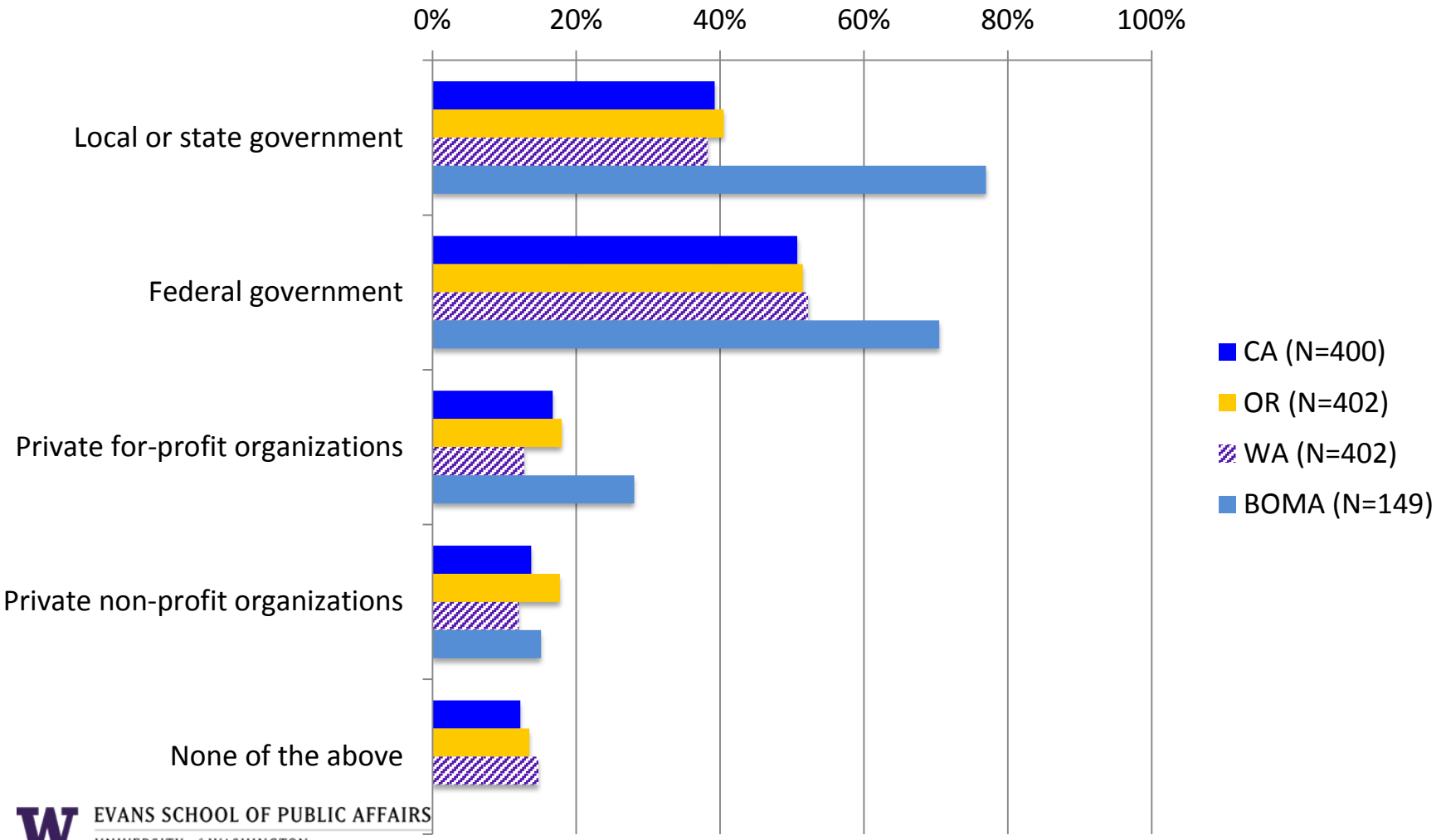
Earthquake hazard mitigation, such as reinforcing buildings, reduces the risk of death from earthquakes.



Earthquake early warning for the U.S. West Coast would cost $17 million a year and could save lives and hundreds of millions of dollars in a big quake. Who should fund it?

Check all answers that apply

(% of respondents by category)



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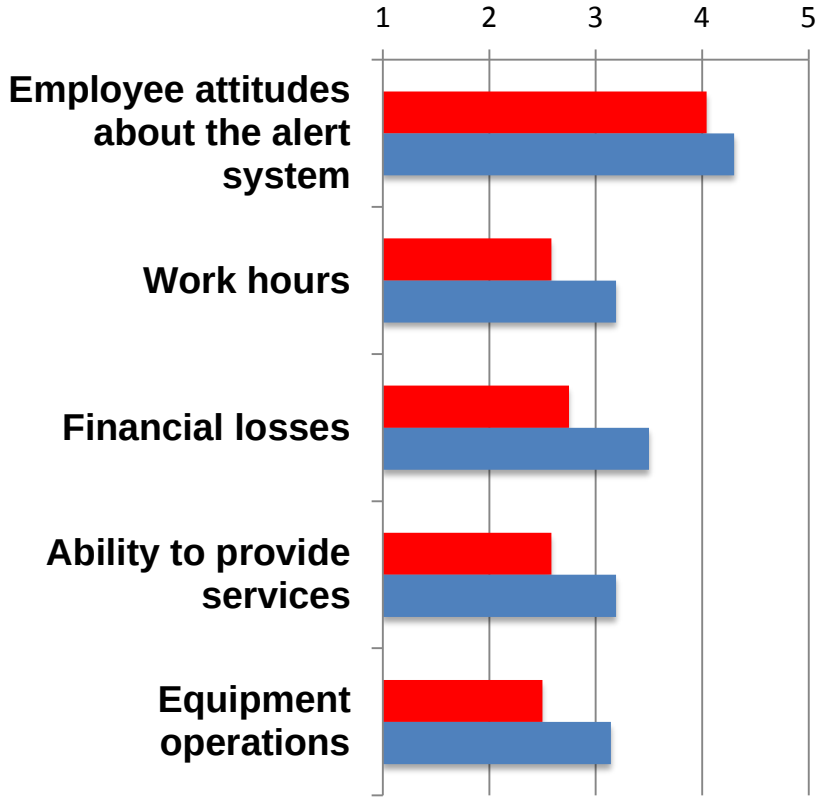
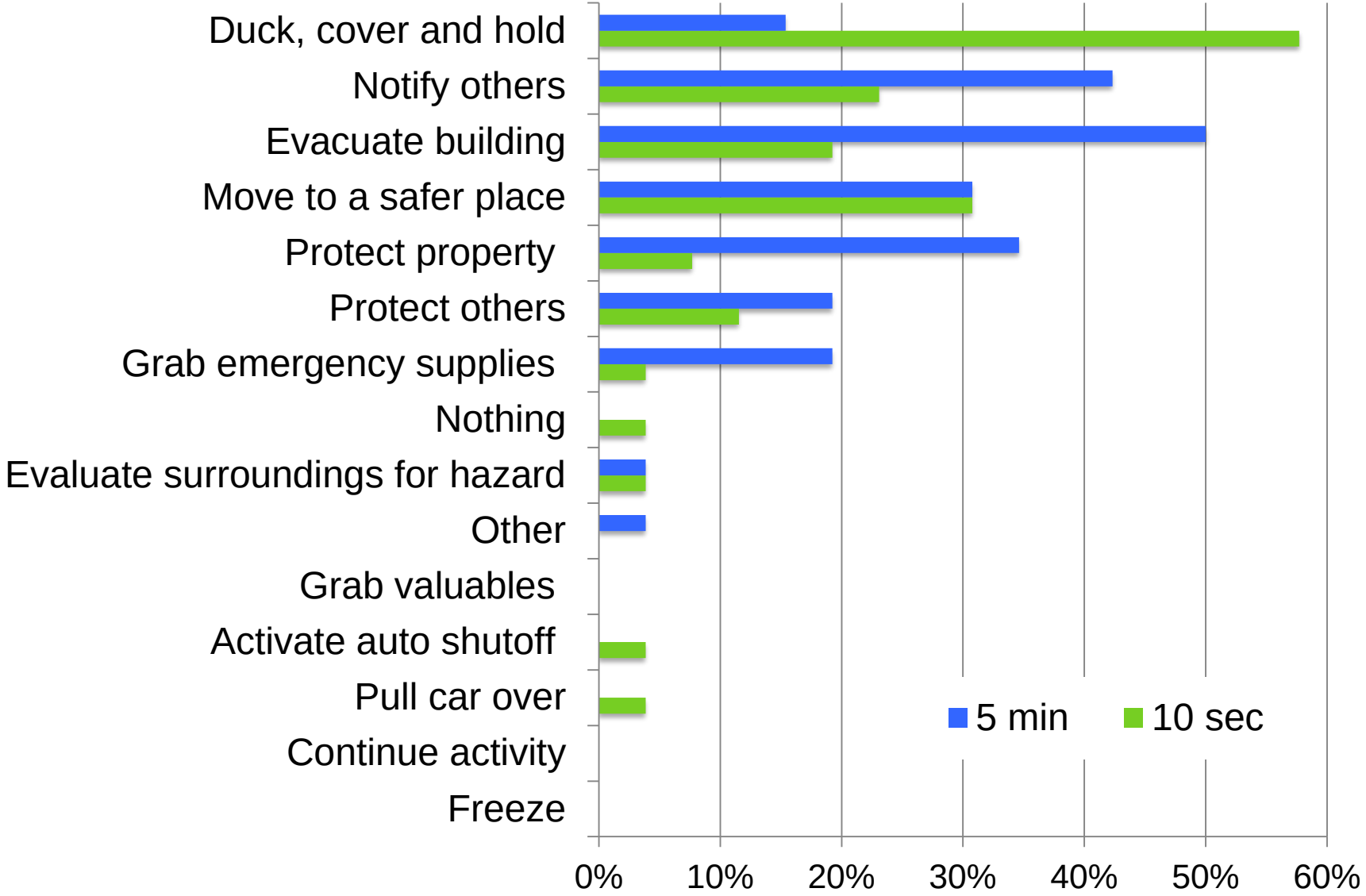
How much impact would false/missed alerts from an earthquake early warning system have on the following at your organization? *[From 1=No Impact, to 5=A Major Impact]*

[M9 stakeholders, N=27)

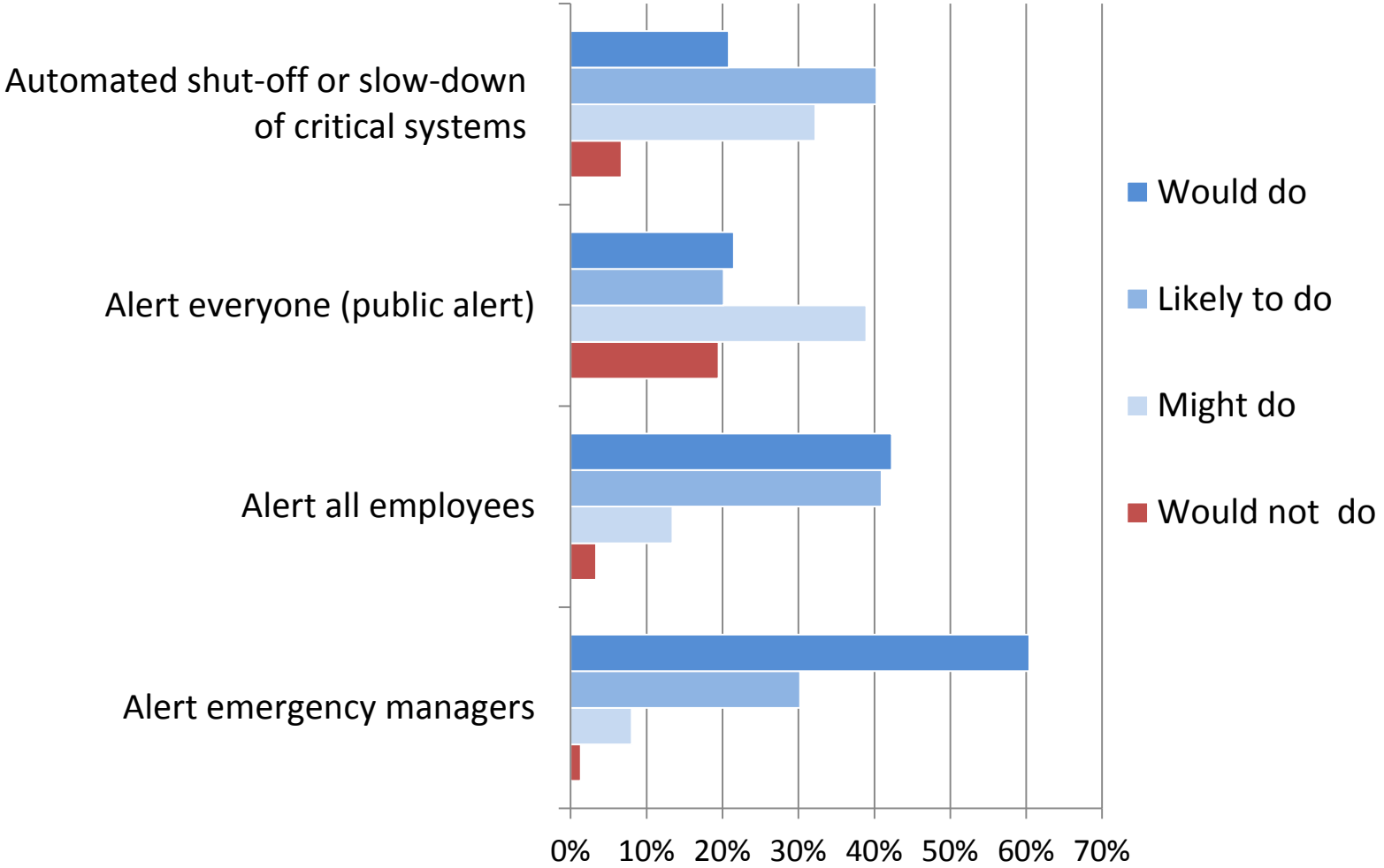


[BOMA, N=157]

Briefly describe what you and/or others in your organization could do with: 10 seconds (5 minutes) of earthquake early warning. (M9 stakeholders, N=27)

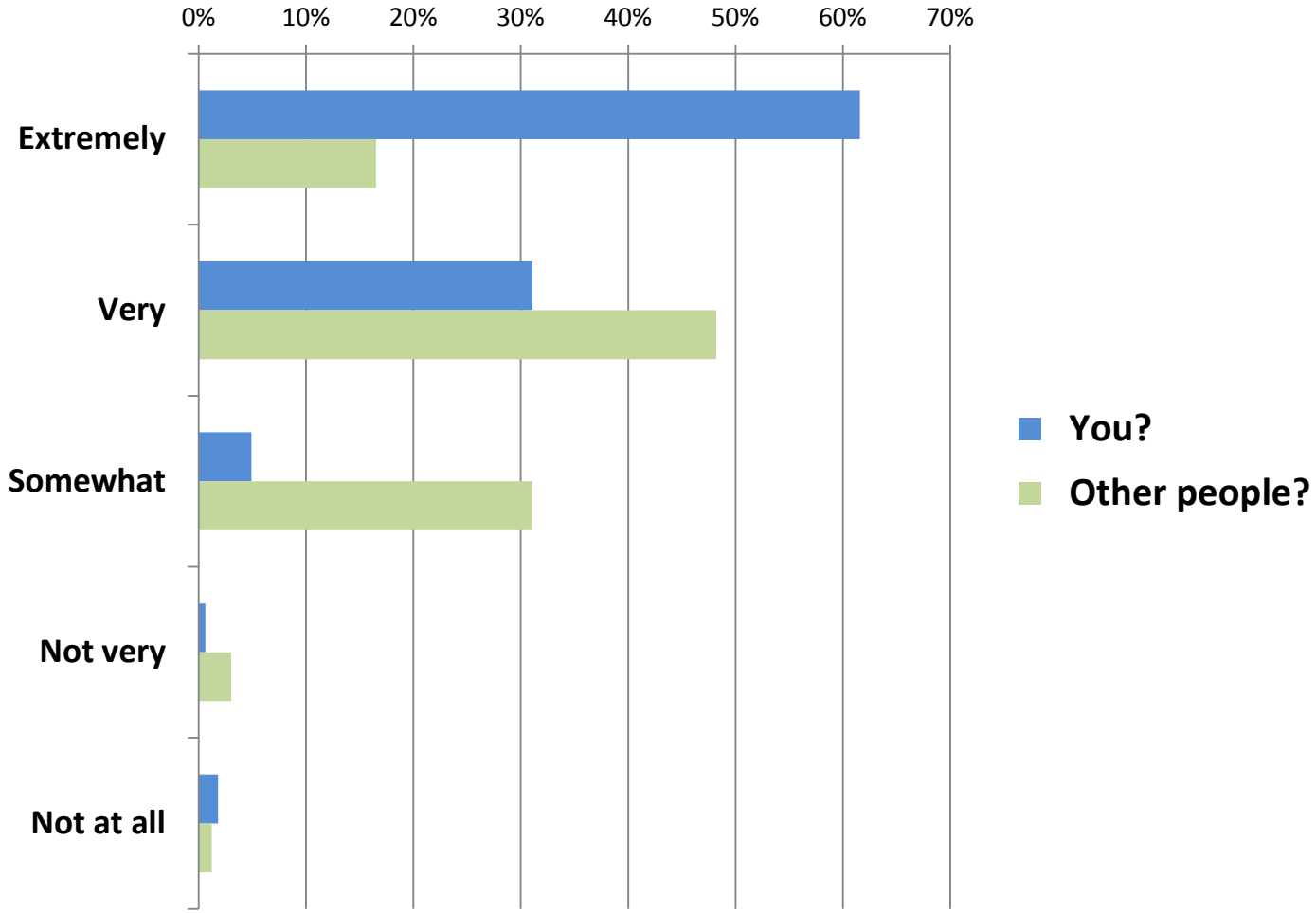


How would your organization use an earthquake early warning system if it were available now? (BOMA, N=149)



In general, in responding to alerts (including drills) at your place of work or study, how compliant are..

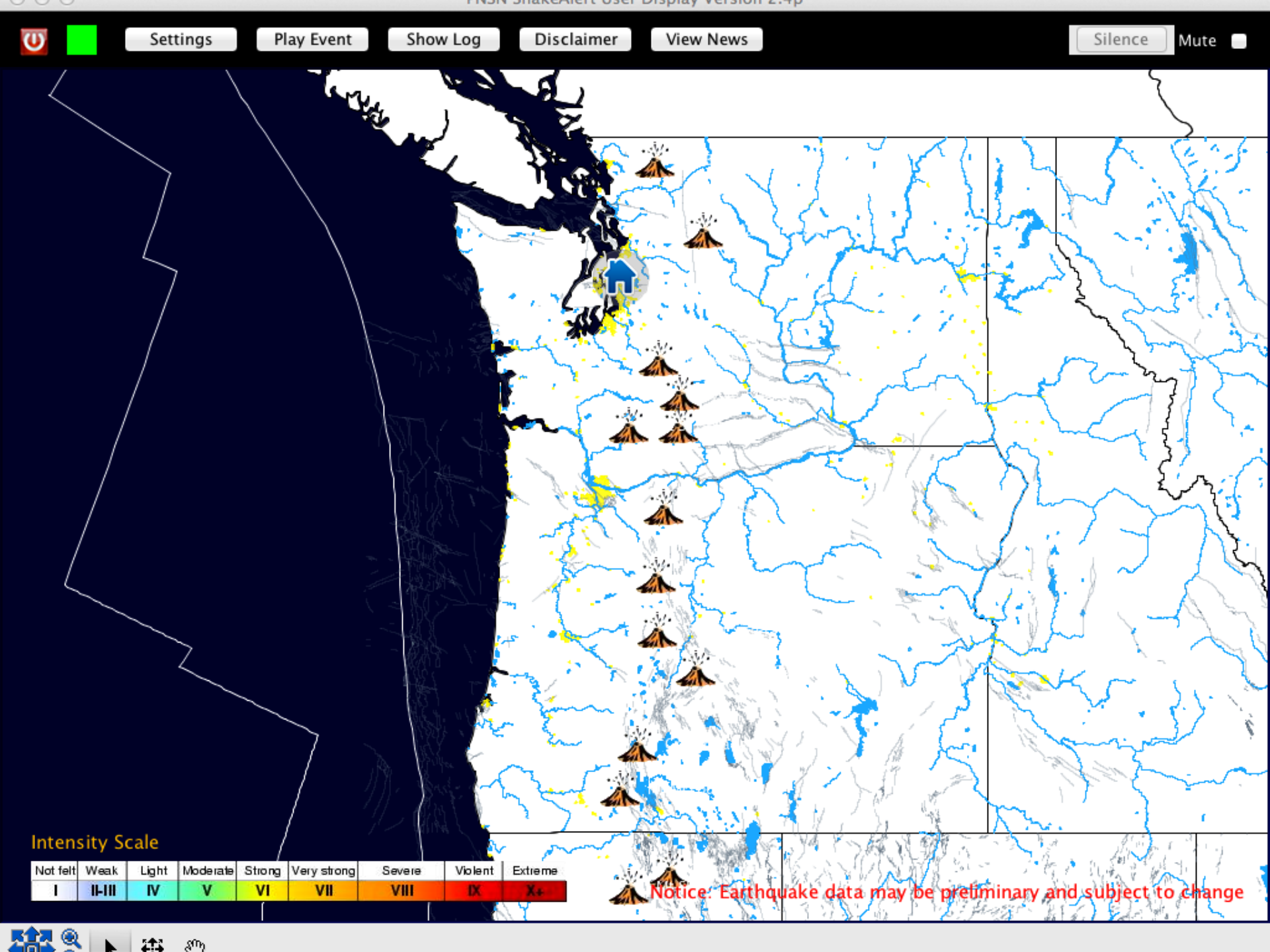
(BOMA respondents, N=164)



How can we make EEW most useful for you?

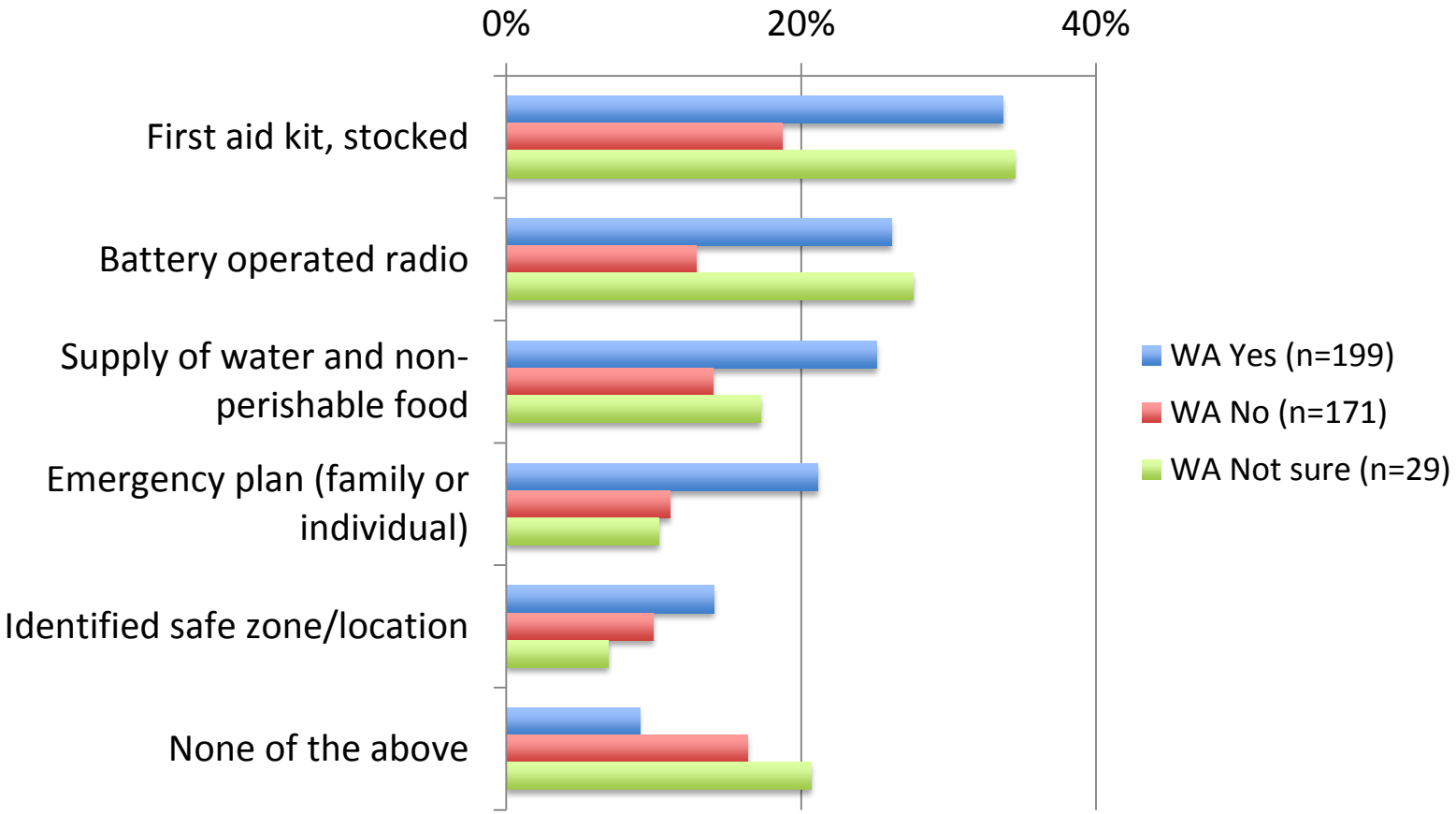
- System hardware, software and operations: practice, problem-solving
- Interface: design and usability

- Applications development:
  - Trigger trains to slow down, elevators to stop, or hospitals to suspend surgical operations, transfer important data from computers to disks immediately, shut down electronics automatically.
  - Take emergency precautions: take shelter under a desk, or keep away from glass windows.
  - Quicken the dissemination of tsunami warnings.
  - Other?


Settings
Play Event
Show Log
Disclaimer
View News
Silence
Mute
Intensity Scale
Not felt
Weak
Light
Moderate
Strong
Very strong
Severe
Violent
Extreme
I
II-III
IV
V
VI
VII
VIII
IX
X+
Notice: Earthquake data may be preliminary and subject to change

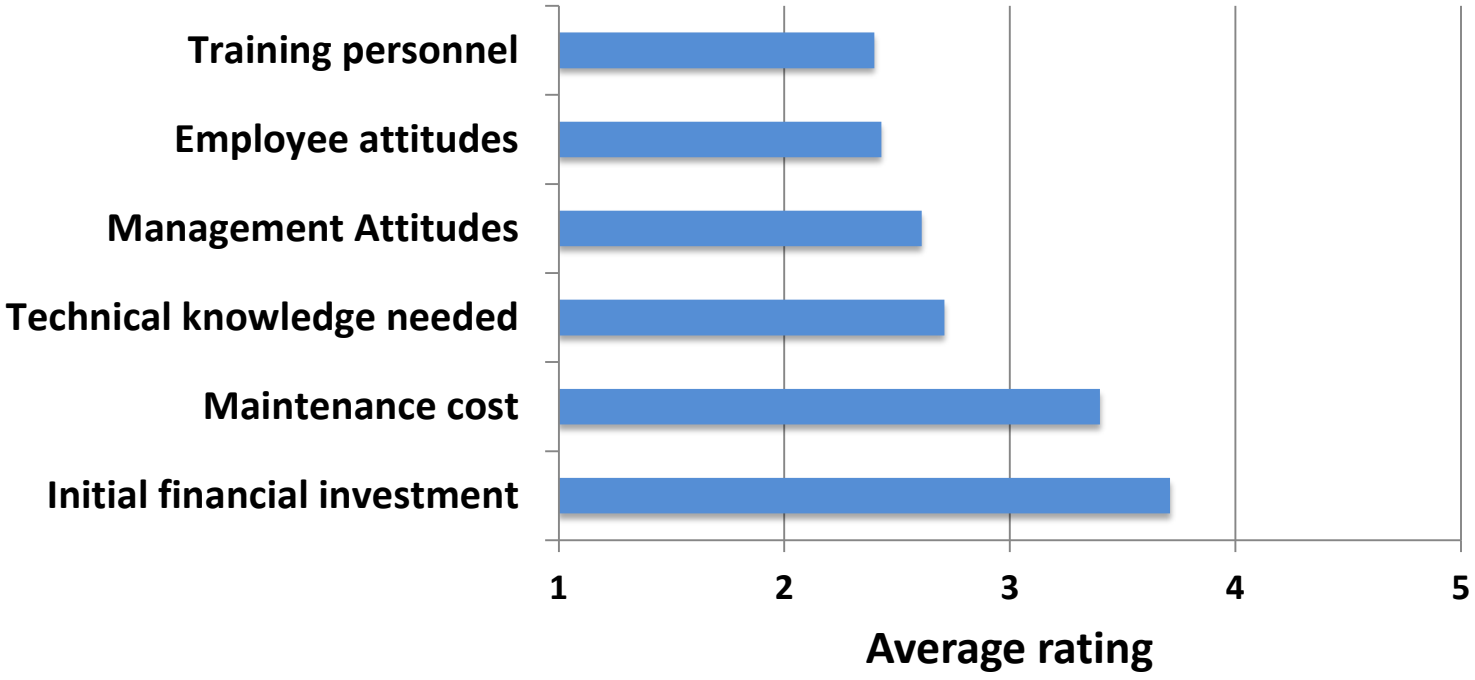
EXTRA SLIDES

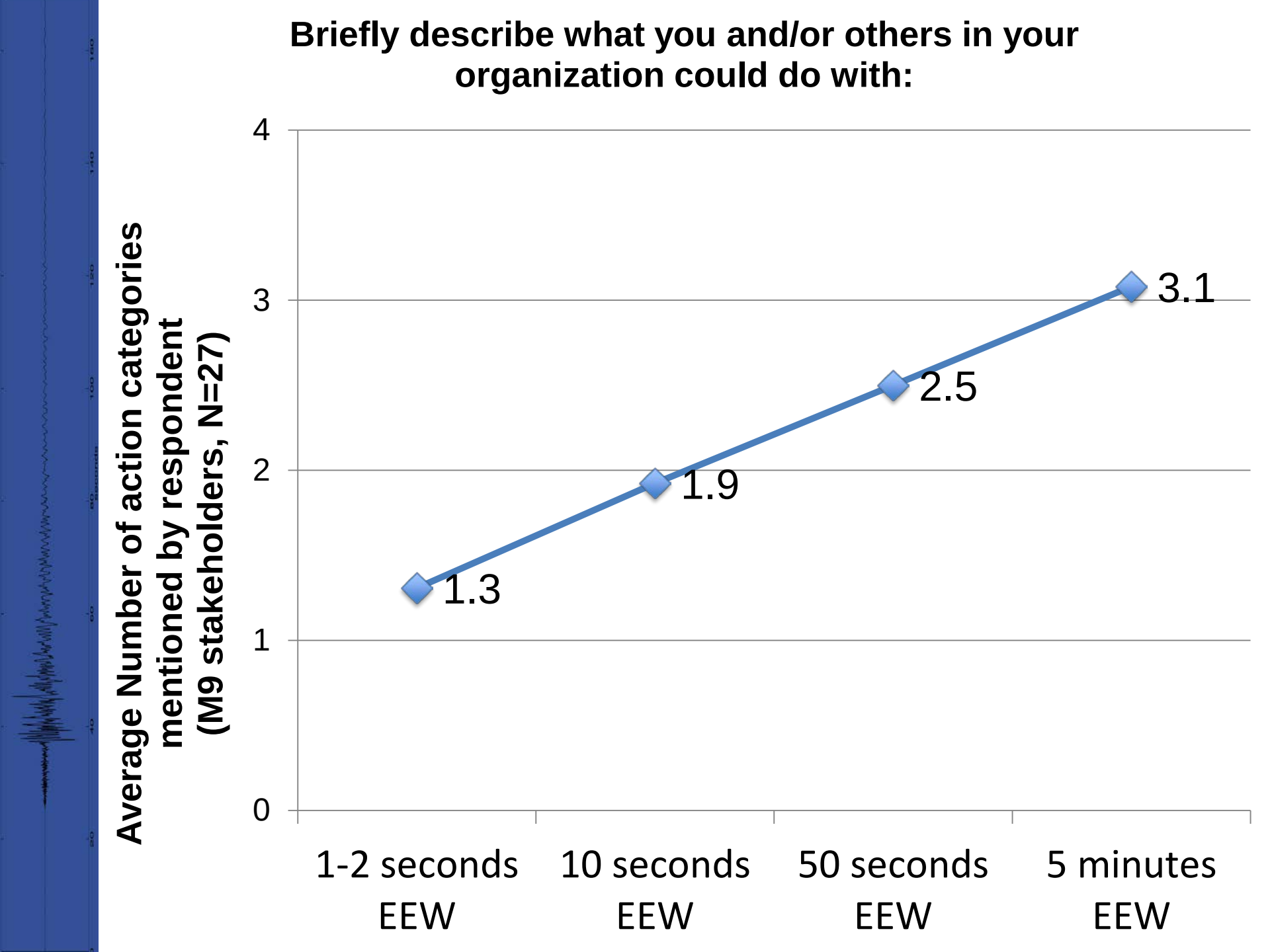
Which of these preparations for an emergency do you have at your home? (check all that apply) By State and by response to "Have you personally experienced an earthquake?"



EXTRA SLIDES

What barriers to implementation of an earthquake early warning service do you see?
Please rate the impact of each potential barrier, on a scale from 1 (not at all a barrier) to 5 (a major barrier). [BOMA, N=157]




Briefly describe what you and/or others in your organization could do with:
Average Number of action categories mentioned by respondent (M9 stakeholders, N=27)
4
3
2
1
0
1.3
1.9
2.5
3.1
1-2 seconds EEW
10 seconds EEW
50 seconds EEW
5 minutes EEW

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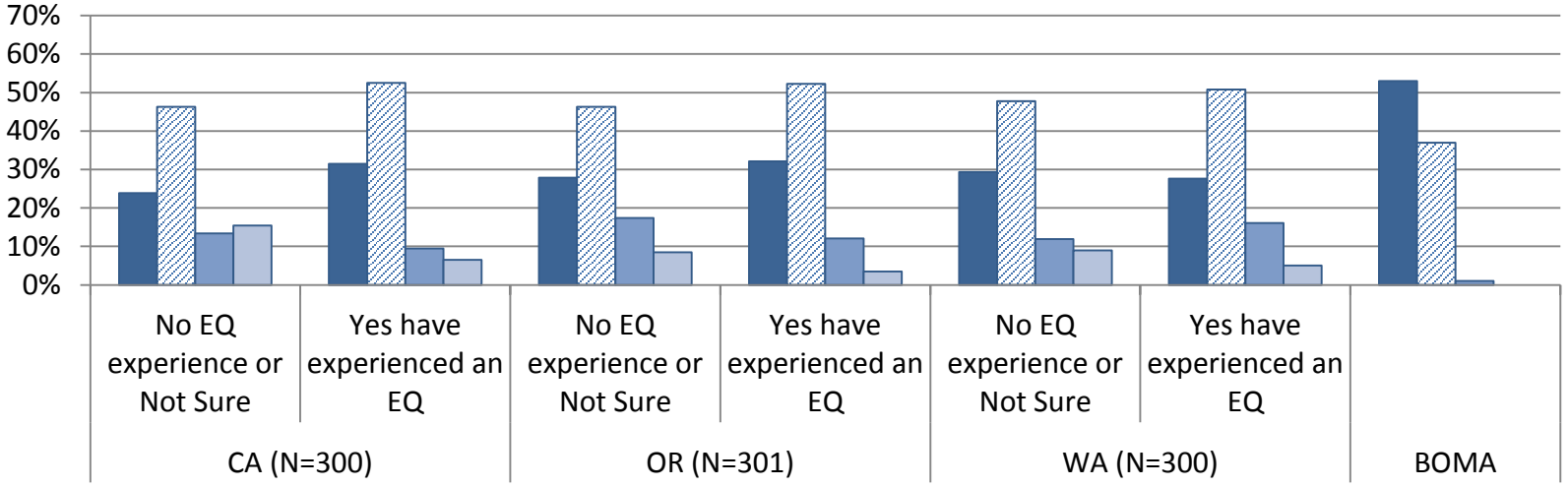

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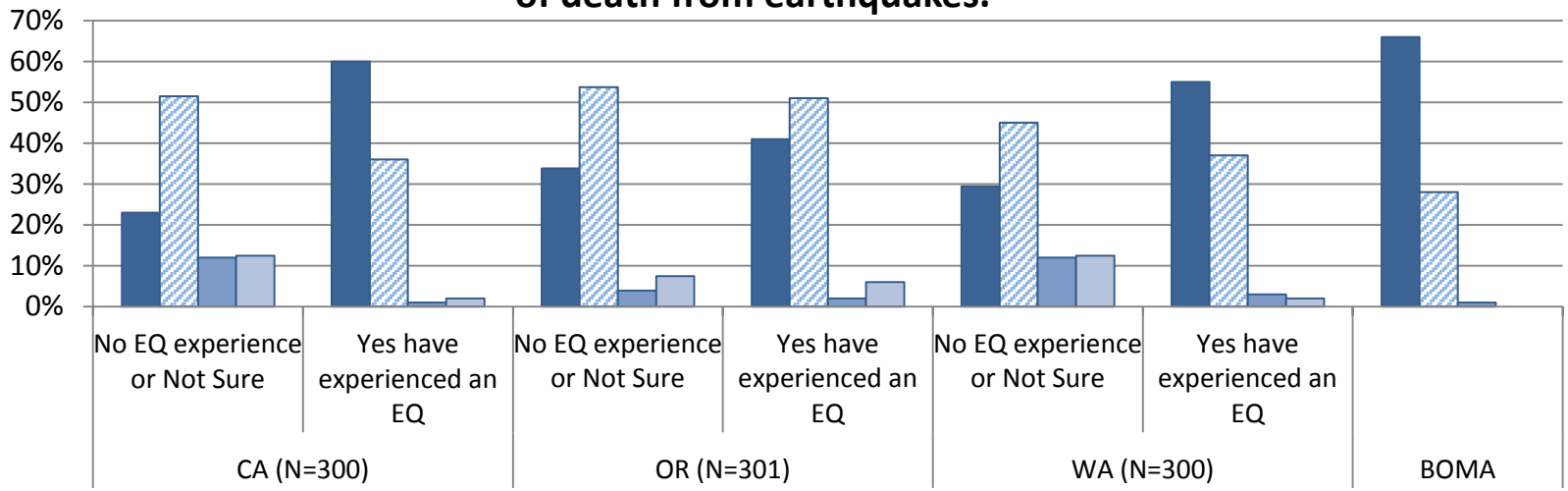

By State and BOMA, and by personal earthquake experience)