

## Why GAO Did This Study

Earthquakes pose a significant threat to people and infrastructure because of their capacity to cause catastrophic casualties, property damage, and economic disruption. According to the USGS, 16 states have a relatively high likelihood of experiencing damaging ground shaking in the next 50 years, and nearly half of all Americans are exposed to potentially damaging earthquakes.

GAO was asked to review efforts to mitigate against earthquake impacts in the United States. Specifically, this report address (1) actions select cities have taken to mitigate seismic risks, (2) the distribution of federal buildings relative to earthquake prone areas and actions to identify and mitigate seismic risks to these buildings, and (3) what is known about the benefits of USGS's earthquake early warning system, ShakeAlert, and the extent to which implementation challenges are being addressed. GAO reviewed key documents and federal authorities; collected federal building inventory information; conducted site visits to selected cities—Seattle, San Francisco, Los Angeles, Memphis; and interviewed, among others, federal, state, and local officials.

## What GAO Recommends

GAO recommends that DOD and GSA (1) fully identify their exceptionally high risk buildings; (2) prioritize and implement comprehensive seismic safety measures to mitigate earthquake risks; and (3) that USGS develop a program management plan to address, among other things, ShakeAlert implementation challenges. DOD, GSA, and USGS agreed with the recommendations.

View [GAO-16-680](#). For more information, contact Chris Currie at (404) 679-1875 or [curriec@gao.gov](mailto:curriec@gao.gov) or David Wise at (202) 512-5731 or [wised@gao.gov](mailto:wised@gao.gov)

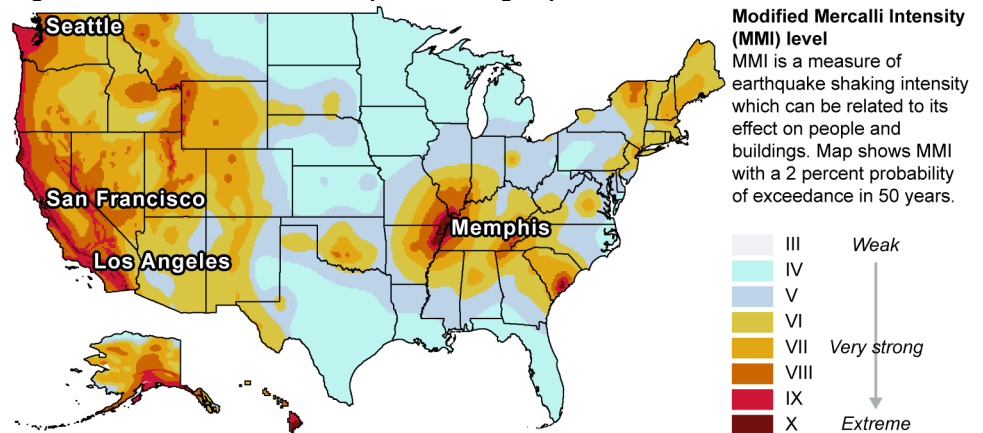
# EARTHQUAKES

## Additional Actions Needed to Identify and Mitigate Risks to Federal Buildings and Implement an Early Warning System

### What GAO Found

The four cities GAO visited (see figure) have taken various actions to assess and mitigate seismic risks, including identifying and assessing their high risk buildings, structurally retrofiting buildings, and requiring that furnishings and nonstructural components be secured, among other things.

Figure: Select Cities on 2014 Earthquake Shaking Map



Source: GAO presentation of U.S. Geological Survey mapping; MapInfo (map). | GAO-16-680

Note: A 2 percent in 50 years probability equates to an earthquake recurring and exceeding a given MMI level about every 2,475 years.

About 40 percent of federally-owned and -leased buildings in the United States are located in areas where very strong to extreme shaking from earthquakes could occur. The Department of Defense (DOD) and General Services Administration (GSA), which are responsible for the majority of these buildings, have not fully identified their exceptionally high risk (EHR) buildings or prioritized and implemented comprehensive seismic safety measures. Federal agencies identified their EHR buildings as part of a government-wide effort in the 1990's, and GSA has begun taking initial steps to identify its current EHR buildings. In addition, while DOD and GSA have taken some steps to reduce the seismic risk of their buildings through seismic retrofits, disposals, and low-cost mitigation alternatives, GAO observed gaps in the extent to which these agencies have comprehensively implemented these mitigation measures, such as securing furniture. Until they fully identify their EHR buildings and prioritize and implement comprehensive safety measures, DOD and GSA will be unable to fully understand and address the vulnerabilities of their buildings.

U.S. Geological Survey's (USGS) early warning system—ShakeAlert—is capable of broadcasting early warnings, and stakeholders, including state agencies and universities, have identified multiple benefits, such as enhanced public safety. However, implementation challenges exist that could inhibit efforts to expand the system throughout the western United States. For example, decisions on funding, public education, and user certification are needed to enable implementation of an integrated system across jurisdictions. Developing a program management plan, which helps establish management controls, could help address ShakeAlert implementation challenges.