



# The Earthquake Fatality Potency and Load by Country

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# Earthquakes affect human health on multiple time scales

Immediate health impacts include:

- trauma-related deaths and injuries from **building collapse**;
- trauma-related deaths and injuries from the secondary effects of the earthquake, like drowning from tsunamis or burns from fires.

Medium-term health impacts include (WHO):

- secondary infection of untreated wounds;
- increased morbidity and risk of complications due to disrupted medical services;
- potential risk of communicable diseases, esp. in overcrowded areas;
- increased psychosocial needs;
- potential environmental contamination by chemical/radiological agents following destruction of industrial infrastructure.





# World seismicity during 2019 - 2024







# World seismicity during 2005 - 2010







# World seismicity during 1993 - 1998







#### DATA

Our new catalog of fatal earthquakes for the world (nearly 3000) from 856 BCE to May 2022 (excluding tsunami deaths)







#### Fatalities reported for each earthquake as a function of time







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# Cumulative sum of reported fatalities as a function of time







#### Total numbers of earthquake fatalities reported by country

Rank	Country	Fatalities	Neq	-550	Nyears	2024	Mmin		Mmax
1	China	2,374,124	416		2211		3.4		8.6
2	Turkey	1,649,445	250		2385		3.8		8.0
3	Iran	807,321	210		1 <mark>363</mark>		4.0		7.7
4	Syria	445,238	16		118 <mark>1</mark>		7.3		7.8
5	Italy	422,356	242		1974		3.7		7.2
6	Azerbaijan	337,314	11		886		4.2		7.7
7	Haiti	323,280	8		183		5.0		8.1
8	Japan	271,173	146		119 <mark>5</mark>		5.2		9.1
9	Greece	172,152	172		2575		5.4		8.3
10	Egypt	163,671	12		2058		4.5		7.3
11	Pakistan	145,286	35		198		4.5		8.0
12	Ecuador	135,053	33		385		4.4		8.6
14	Peru	90,375	89		439		4.5		8.5
15	Portugal	50,649	11		411		5.3		8.5
55	California	1,141	32		168		4.5		7.9

Peru has the highest and Egypt the lowest frequency of fatal earthquakes





## Two new parameters to measure earthquake losses

## A. Earthquake potency

Defined as the average earthquake disaster size in a given country, in units of fatalities per event.

(Derived from the sum of recorded fatalities divided by the number of earthquakes that it took to accumulate them.)





#### Countries ranked by potency using all available data







## Second new parameter to measure earthquake losses

### **B. Earthquake fatality load**

Defined as the ratio of fatalities to population size per year, a key measure of the earthquake problem in a country

The earthquake load is a measure of a country's suffering due to earthquakes

















# On 6 February 2023, a devastating earthquake doublet consisting of Mw 7.8 KAHRAMANMARAŞ and Mw 7.6 ELBISTAN events (separated by about 9 hr) struck the southeastern part of Turkey. 59,500 fatalities were recorded (53,500 in Turkey, 6000 in Syria)



































































#### Growth of population







#### EQFL as a function of time







# We suggest that the impact of all natural disasters should be measured in

### potency (average fatalities per event) and load (ratio of fatalities to population size per year)

For more info, see *https://fatal-earthquakes.icesfoundation.org* 

## Thank you for your attention





**References:** 

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