



Predicting Tsunamis Triggered by Earthquake Magnitude Across Alert Levels

Team Freaky Friday



Topic and Motivation

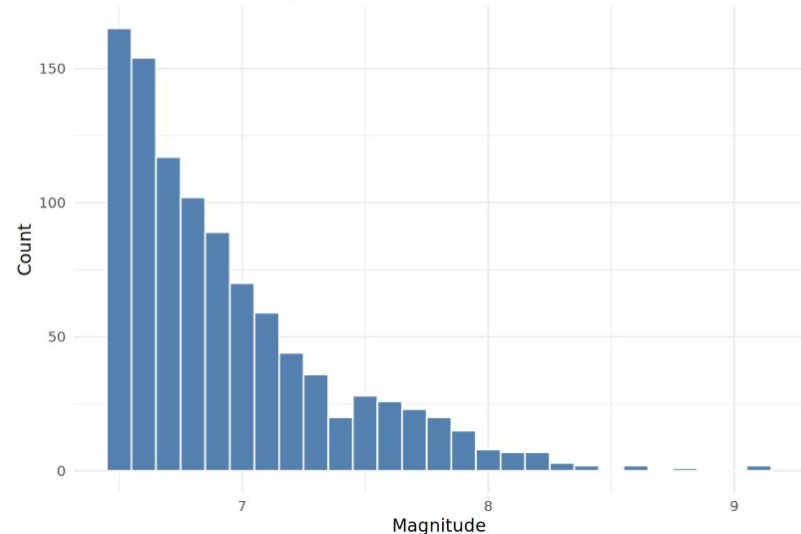
- This project examines whether earthquake magnitude significantly predicts the likelihood of triggering a tsunami.
- We aim to clarify how tsunami risk scales with earthquake strength and whether alert categories reflect meaningful differences in that risk.
- Furthermore, we want to provide insight into how magnitude translates in real-world hazard risk.

Introduce the Data

- Source: ANSS Comprehensive Earthquake Catalog (ComCat) in the U.S. Geological Survey (USGS). User warcoder on Kaggle published the data set
- The data was collected using a global seismographic network that measure ground movements
- Variables include magnitude, depth, geographic coordinates, tsunami indicator, etc
- Wealthier areas have more accurate data, potentially skewing the results of this data and analysis.

Magnitude Distribution

Distribution of Earthquake Magnitudes



Introduce the Data

Sample Data [↗](#)

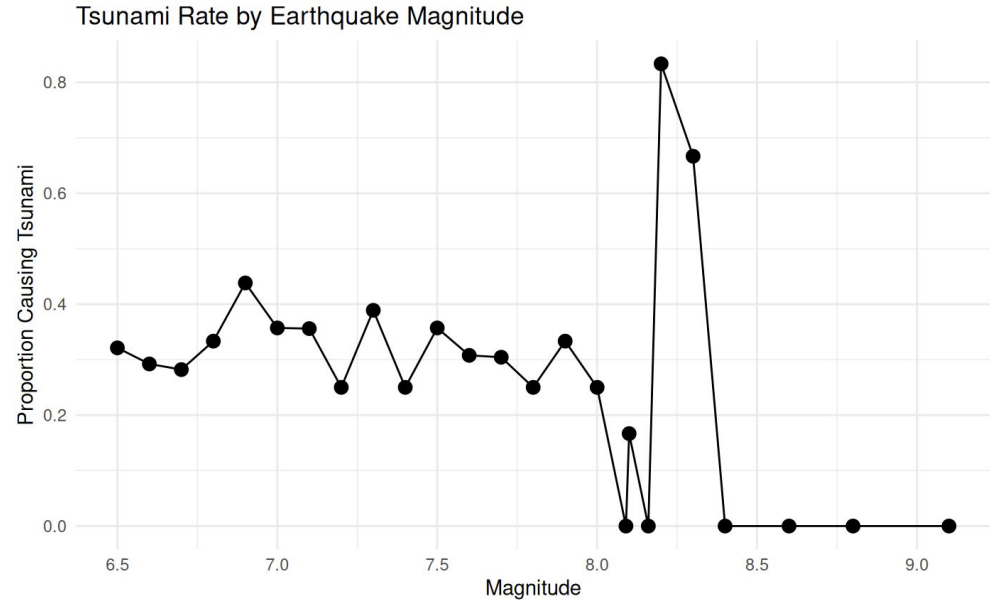
```
# A tibble: 10 × 7
```

```
  title                magnitude date_time alert tsunami depth location
  <chr>                <dbl> <chr>    <chr>   <dbl> <dbl> <chr>
1 M 6.5 - 42 km W of Sola, Va... 6.5 16-08-20... green     0 193. Sola, V...
2 M 6.5 - 43 km S of Intipucá... 6.5 19-07-20... yell...   0 69.7 Intipuc...
3 M 6.6 - 25 km ESE of Loncop... 6.6 17-07-20... green     0 171. Loncopu...
4 M 7.2 - 98 km S of Sand Poi... 7.2 16-07-20... green     1 32.6 Sand Po...
5 M 7.3 - Alaska Peninsula      7.3 16-07-20... <NA>      1 21  Alaska ...
6 M 6.6 - 277 km NNE of Codri... 6.6 10-07-20... green     1 10  Codring...
7 M 6.9 - Tonga                 6.9 02-07-20... green     1 229 Tonga
8 M 7.2 - south of the Fiji I... 7.2 15-06-20... green     1 167. the Fij...
9 M 6.6 - Panama-Colombia bor... 6.6 25-05-20... green     1 10  Panama-...
10 M 7.1 - southeast of the Lo... 7.1 20-05-20... green     1 36.0 the Loy...
```

Cleaning the Data

```
# A tibble: 25 × 3
```

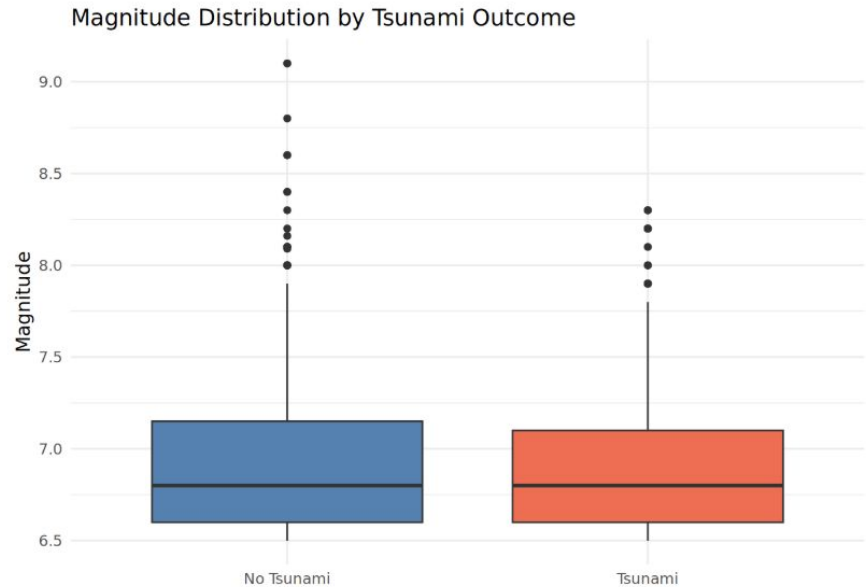
```
  magnitude tsunامي_rate    n
  <dbl>      <dbl> <int>
1     6.5     0.321   165
2     6.6     0.292   154
3     6.7     0.282   117
4     6.8     0.333   102
5     6.9     0.438    89
6     7.0     0.357    70
7     7.1     0.356    59
8     7.2     0.25    44
9     7.3     0.389    36
10    7.4     0.25    20
# i 15 more rows
```



Highlights from Exploratory Data Analysis

- There is no strong or consistent relationship between magnitude and tsunami rate
- When using grouped data, the relationship between earthquake magnitude and tsunami occurrence is weak and unstable.
- The relationship appears more “random” rather than consistent

Magnitude by Tsunami Outcome



Discussion

- The results do not reveal a clear, consistent relationship between earthquake magnitude and tsunami occurrence.
- The inconsistencies are largely driven by small sample sizes at specific magnitude levels
- Earthquake magnitude alone is not a strong or stable predictor of tsunami occurrence.
- Additional factors play a role in tsunami generation and should be researched in more comprehensive models

