Microsoft Data Analytics Capstone Project

Nepal Earthquake Damage Analysis

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Dataset

- Data from April 2015 when a 7.8 magnitude earthquake hit Ghorka, Nepal
- Dataset contains information on structures affected by earthquake including damage, foundation, area, age, structure material.
- This data will be used to assess the damage caused to different building and provide insight on rebuilding the city to provide better resistance against future natural disasters

Primary Questions

How much damage was caused?

How did different building material survive?

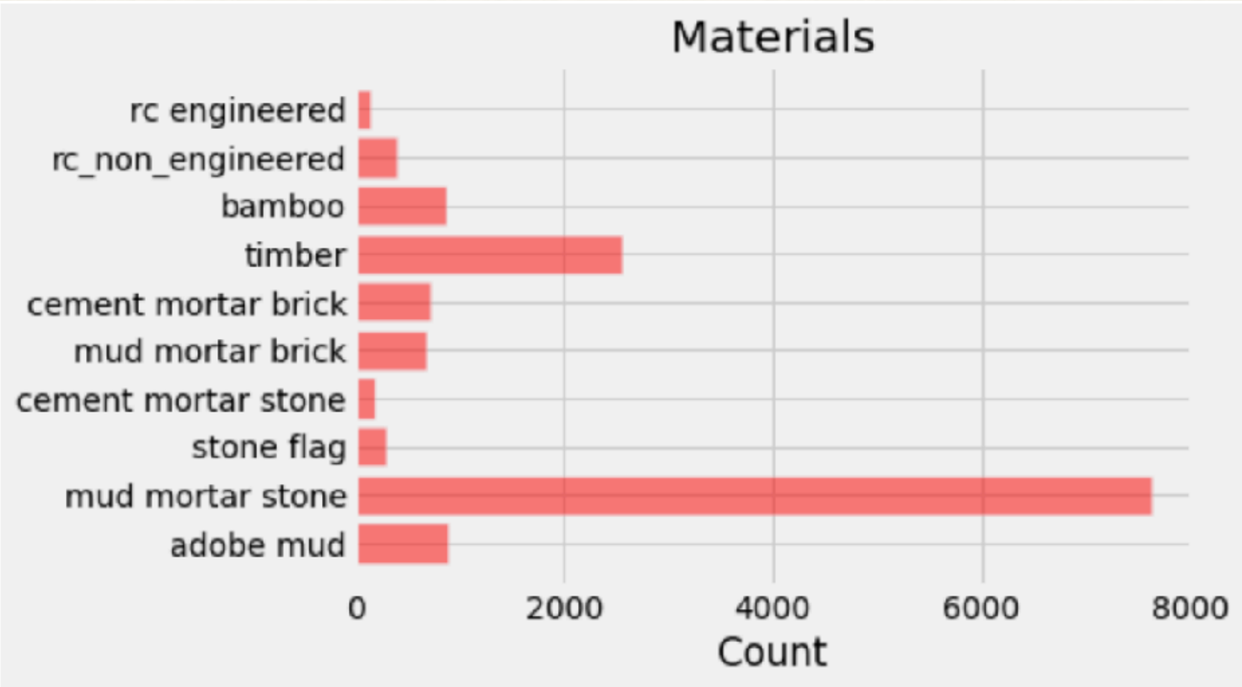
How did building age relate to damage caused?

The Dataset

Materials

- Several Buildings in the dataset contain more than 1 material
- Mud mortar stone is by far the most commonly used material as it is in 76% of buildings affected by the Earthquake

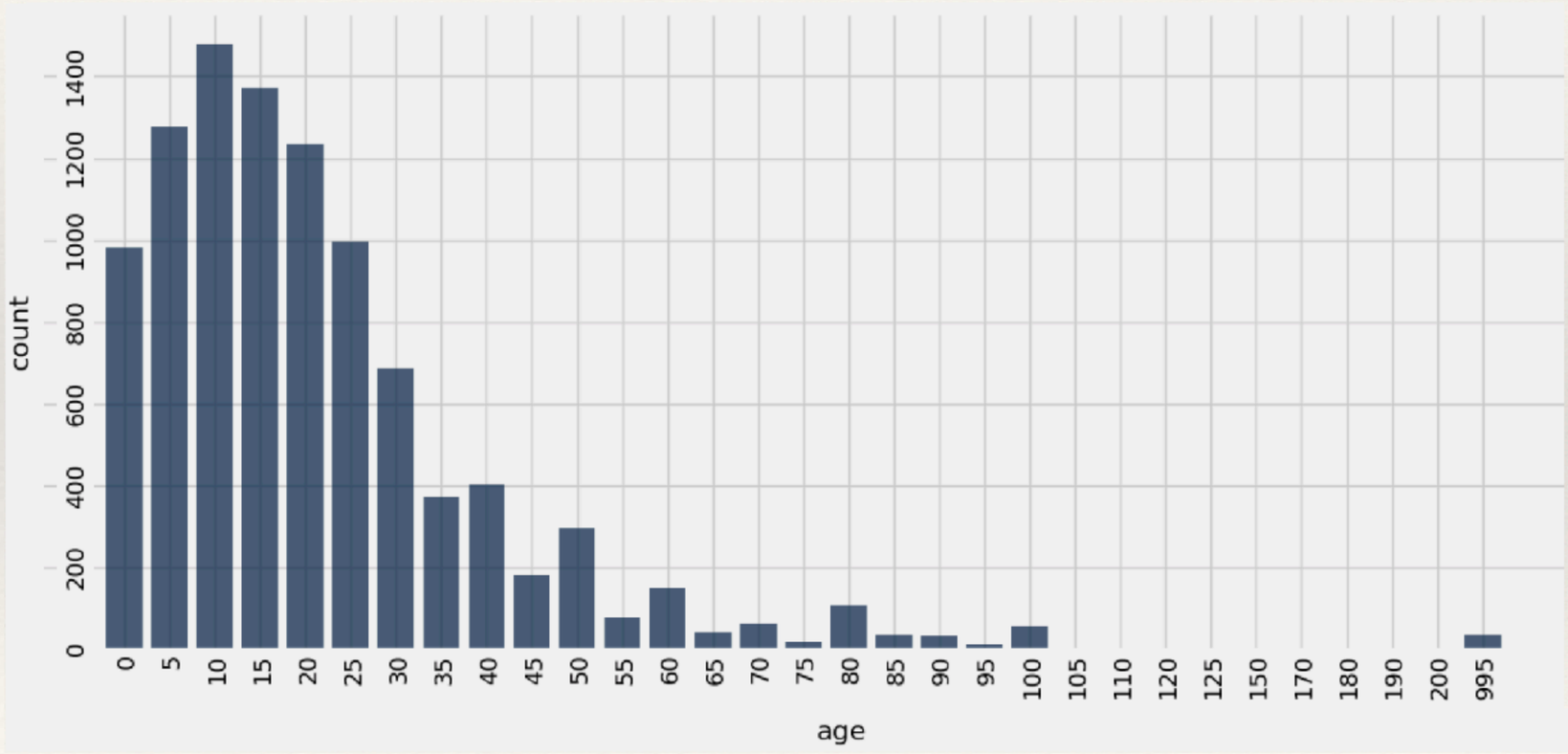
Material	Count	Percent (%)
mud mortar stone	7626	76.26
timber	2561	25.61
adobe mud	897	8.97
bamboo	877	8.77
cement mortar brick	725	7.25
mud mortar brick	688	6.88
rc_non_engineered	400	4
stone flag	299	2.99
cement mortar stone	190	1.9
rc engineered	138	1.38



Building Age

- 73.5% of the buildings are in their first 25 years of existence,
- 51% in their first 15 years.

	Age (yrs)
mean	25.3935
std	64.4797
min	0
25%	10
median	15
75%	30
max	995



Other Features

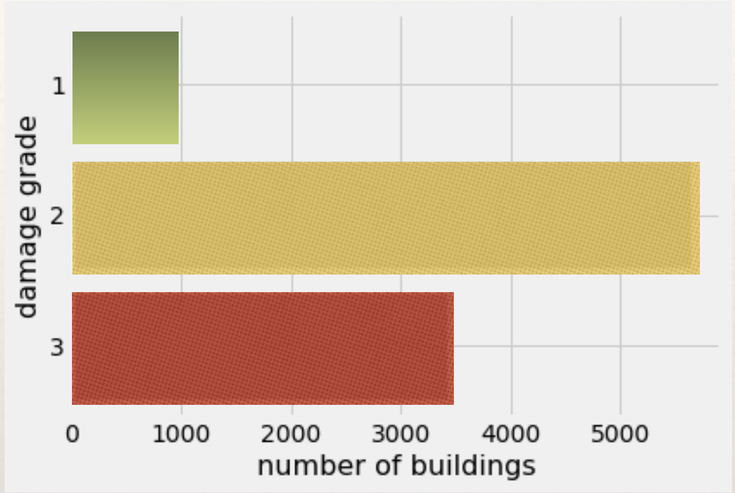
- Data over all 10,000 buildings
- 85% of buildings were multi storied (2 or more stories).

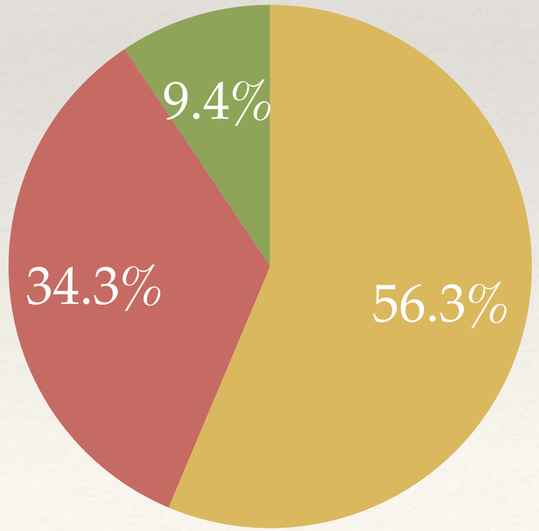
	Area (m^2)	Height (m)	Num Floors Pre Eearthquake	Num Families in Buildings
mean	38.4381	4.6531	2.1467	0.9846
std	21.2648	1.79275	0.736328	0.423276
min	6	1	1	0
25%	26	4	2	1
median	34	5	2	1
75%	44	5	3	1
max	425	30	9	7

How Much Damage Was Caused?

How Much Damage Was Caused?

- Damage grade:
  - 1: Light damage
  - 2: Moderate damage
  - 3: Severe damage
- Distribution of damage grades:
  - 1: 938 buildings (9.4%)
  - 2: 5636 buildings (56.3%)
  - 3 : 3426 buildings (34.3%)
  - Mean: 2.2488





How Did Different Building Material Survive?

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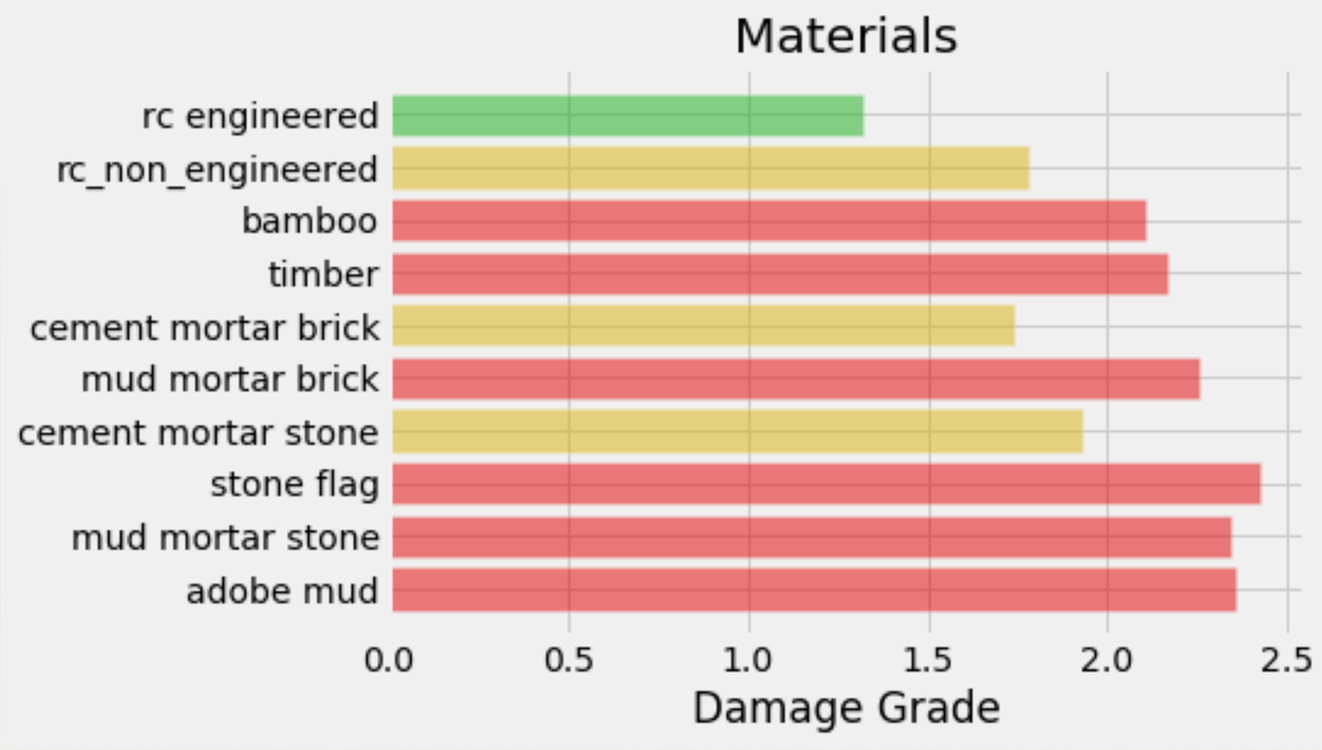
- Rc engineered incurred the **lowest** average damage grade of **1.32** ,
- Building with stone flags incurred the **highest** average damage grade of **2.42**

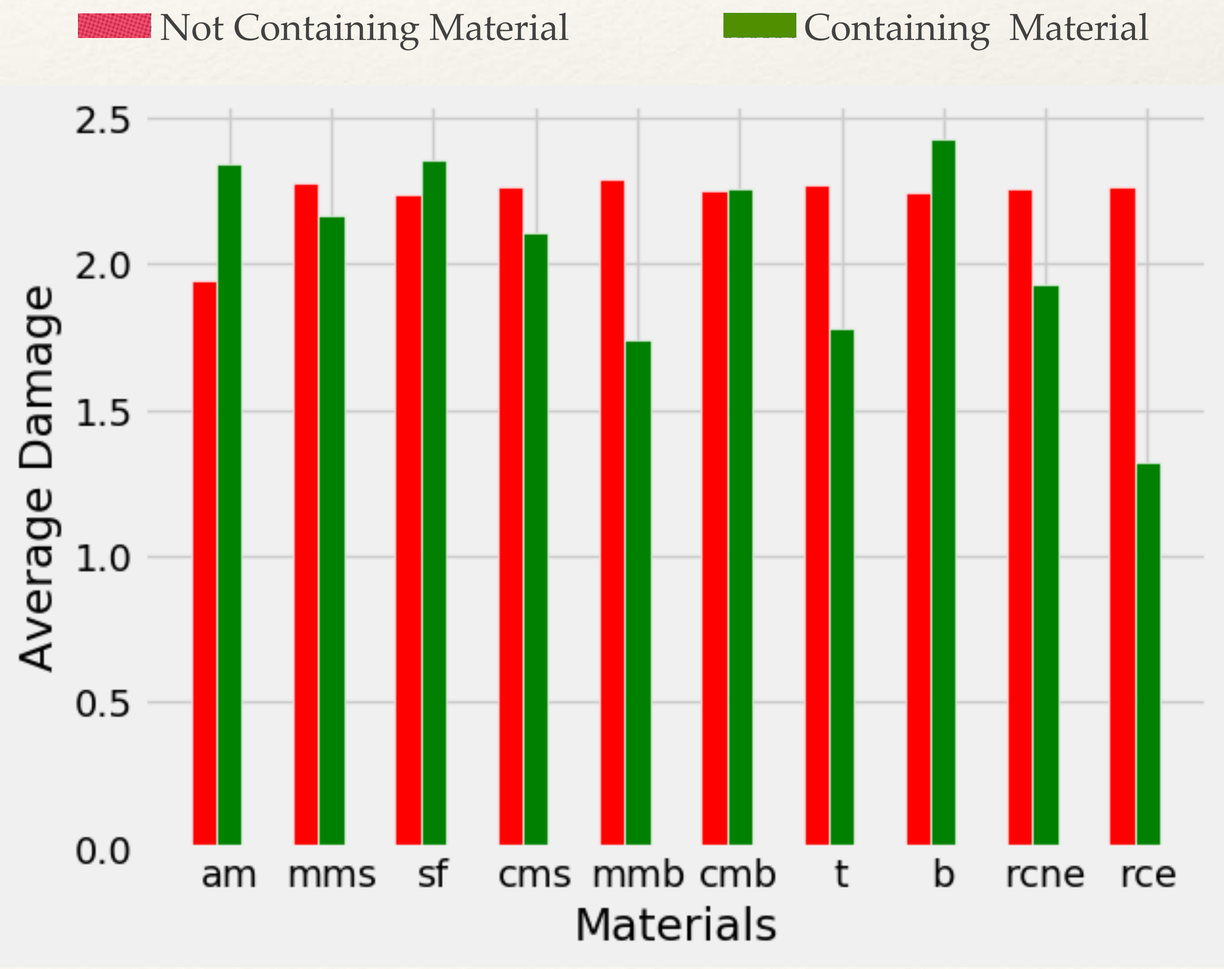


How Did Different Building Material Survive?

- Buildings with bamboo or adobe mud incurred greater damage than those without.
- Buildings with RC Engineered Material suffered significantly less damage than those without.

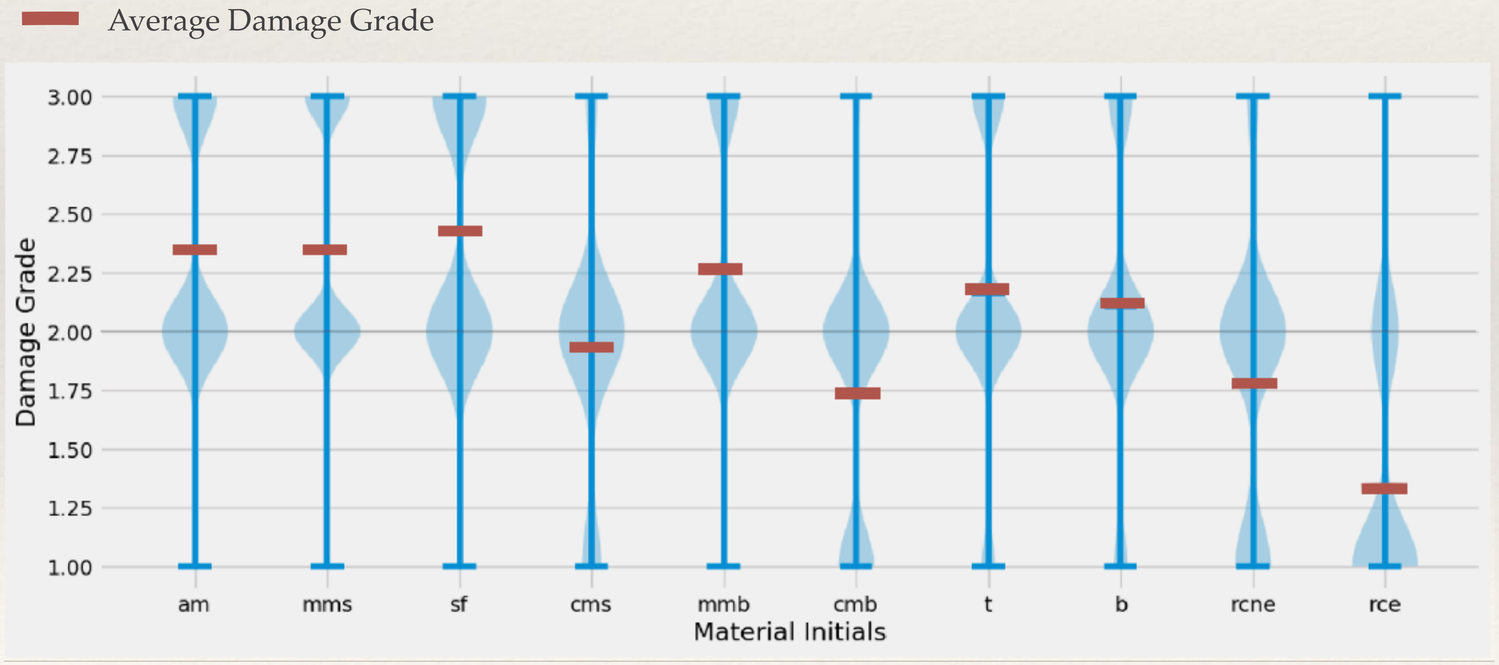
* Difference = Without - With

Material	Material Initials	Difference (Ave Damage)
adobe mud	am	-0.399164
mud mortar stone	mms	0.112946
stone flag	sf	-0.118581
cement mortar stone	cms	0.15648
mud mortar brick	mmb	0.550802
cement mortar brick	cmb	-0.00753217
timber	t	0.488333
bamboo	b	-0.181372
rc_non_engineered	rcne	0.32873
rc engineered	rce	0.942972



How Did Different Building Material Survive?

- Violinplot shows frequency distribution of the various damage grades for buildings containing each material
- Cement Mortar Stone, Cement Mortar Brick, RC Non Engineered, and RC Engineered material show more frequent distribution around the lowest damage grade



Material	damage grade = 1	damage grade = 2	damage grade = 3
adobe mud	26	525	346
mud mortar stone	332	4342	2952
stone flag	5	162	132
cement mortar stone	37	130	23
mud mortar brick	29	454	205
cement mortar brick	237	441	47
timber	306	1527	728
bamboo	111	562	204
rc_non_engineered	127	234	39
rc engineered	96	40	2

How Did Building Age Relate To Damage Caused?

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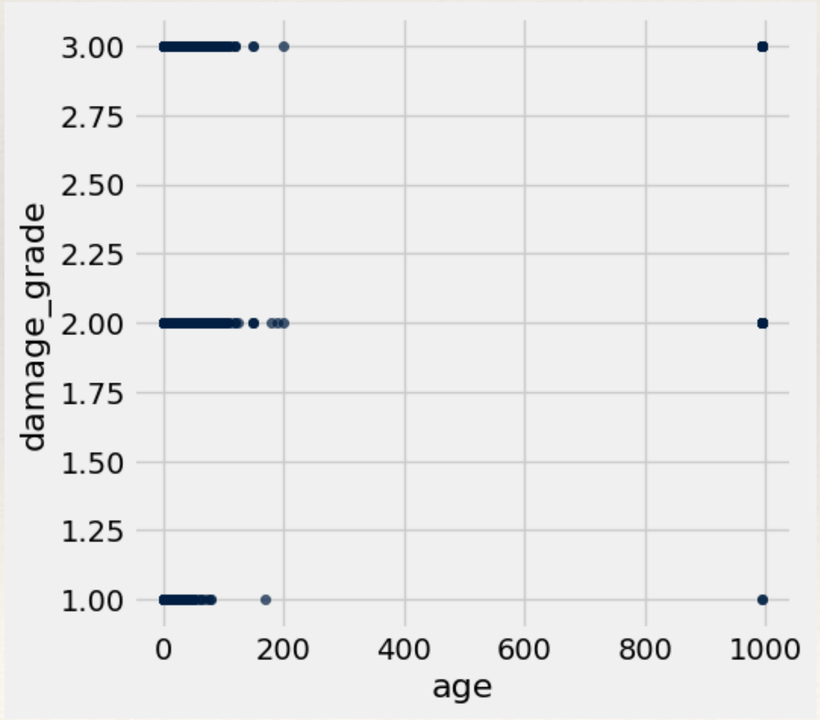
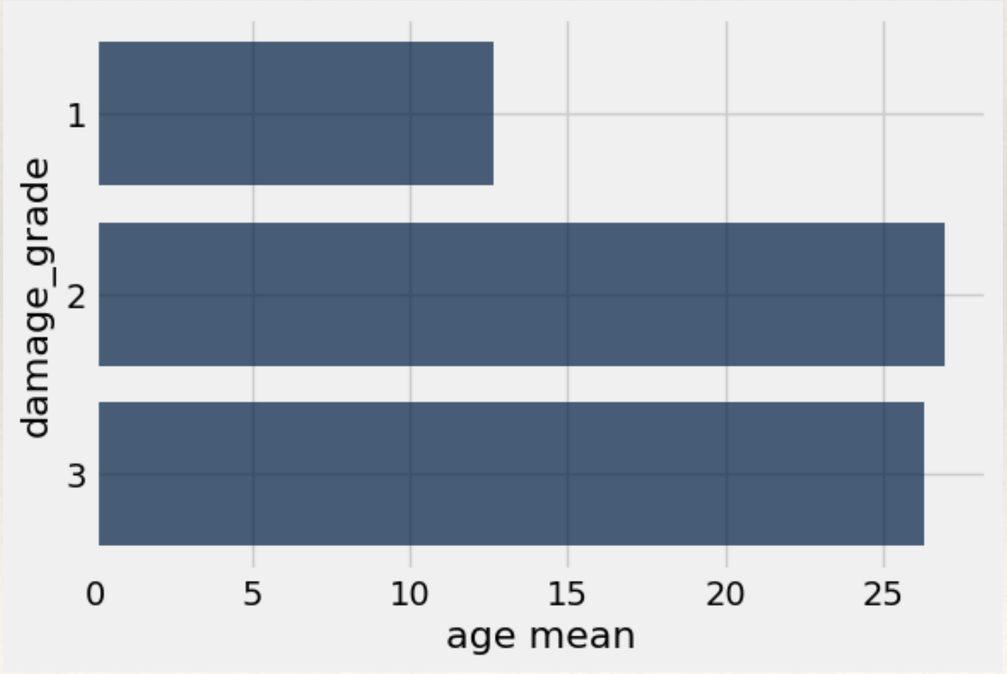
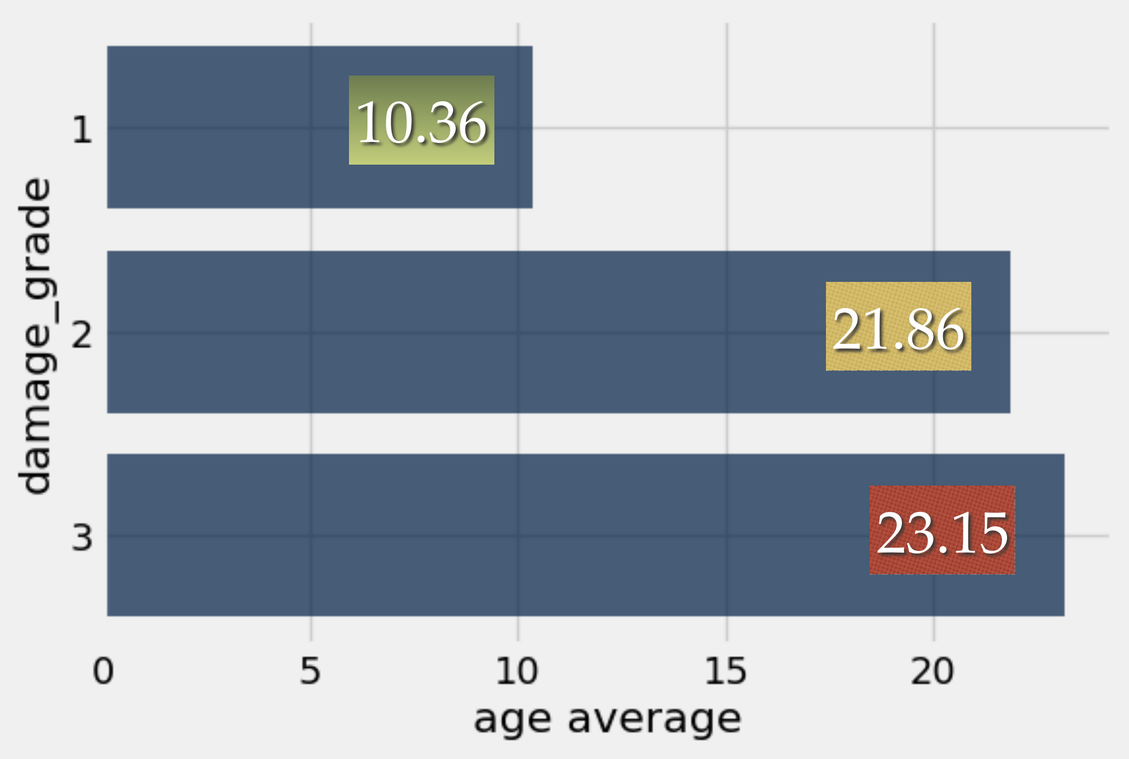
- The scatter plot below shows thats ages above 100 are outliers, therefore we will focus on buildings with ages less than or equal to 100 years.
- The average age for each damage grade does not exceed 26.9 not excluding the outliers in the dataset

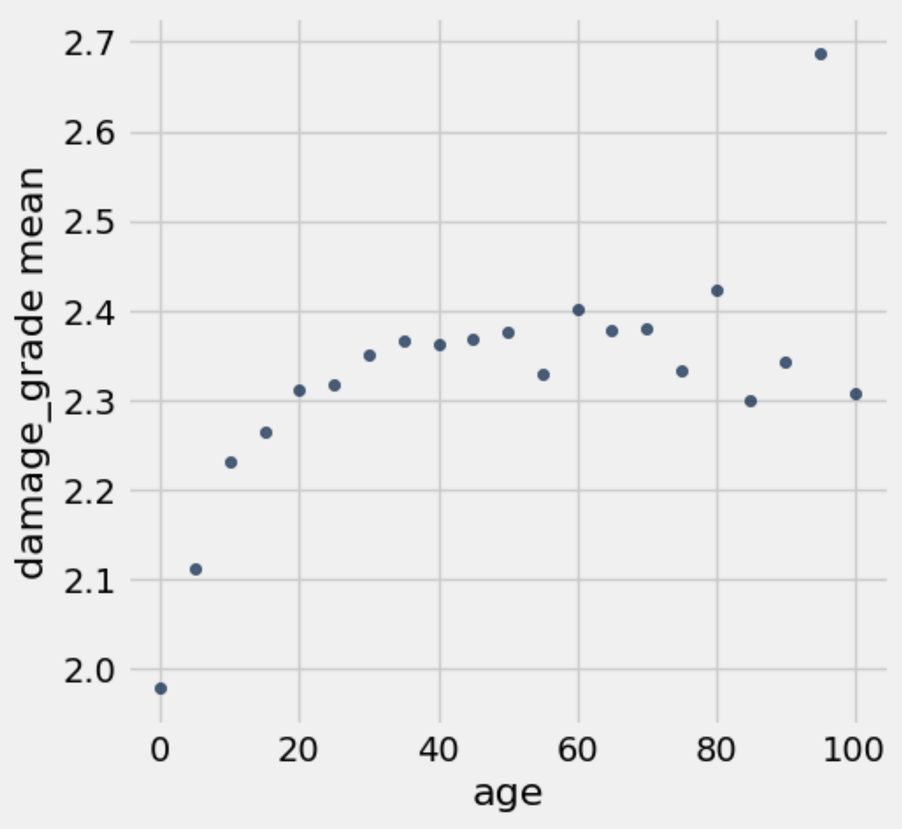




How Did Building Age Relate To Damage Caused?

- The dataset (not including age values above 100) represents a loose positive relationship between age and damage grade with correlation constant $r = 0.15$





Summary

- About 90% of buildings suffered moderate to severe damage, with 34% falling under the highest damage grade
- Buildings with Rc engineered materials withstood the earthquake better than any other material. Buildings not containing this material suffered an average of 0.94 on the damage grade scale higher than those that contained it.
- Building age was somewhat positively correlated to damage.