What makes a top Olympian?

Data analysis by

Catherine Kelly

Background

➢ The modern Olympics sees athletes competing in a wide range of sports

➢ Visually, there are numerous differences between athletes such as slight jumpers and powerful weightlifters but what makes Olympians?

➢ This project aims to investigate various factors that contribute to Olympians and medal winners such as:

- Age
- Height
- Weight
- BMI
- Hosting the Olympics
- Population of country
- GDP of country

Background

- This work will focus on 5 sports:
  - Eventing – male athletes only
  - Men's 100 m
  - Men's marathon
  - Men's shot put
  - Men's high jump

Background

➢ Data was obtained from the following sources:

  ▪ Olympic and GDP data: Kaggle.com

  ▪ Population: https://www.jetpunk.com/data/population/countries-by-population/

➢ Data was analysed using Python.

➢ The data was reduced to between 2004 and 2016 as there is a large amount of missing data prior to 2004. In addition, the COVID pandemic in 2020 affected data collection

➢ The data was also reduced to male athletes only due to the large differences in male and female biometrics creating greater variability
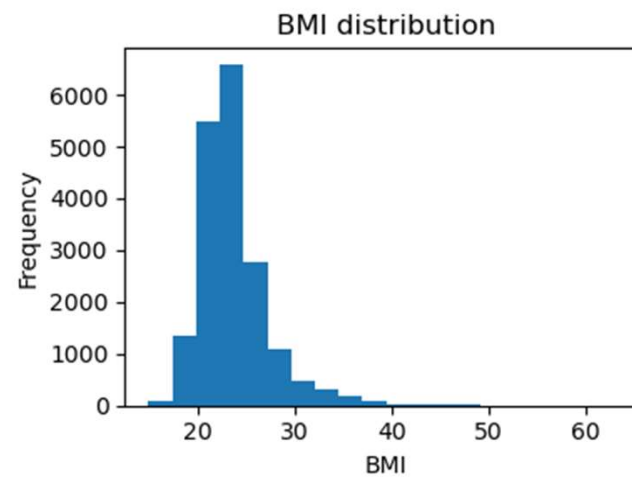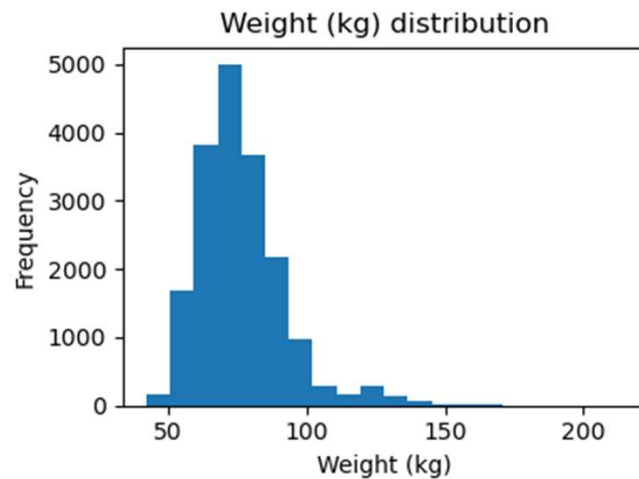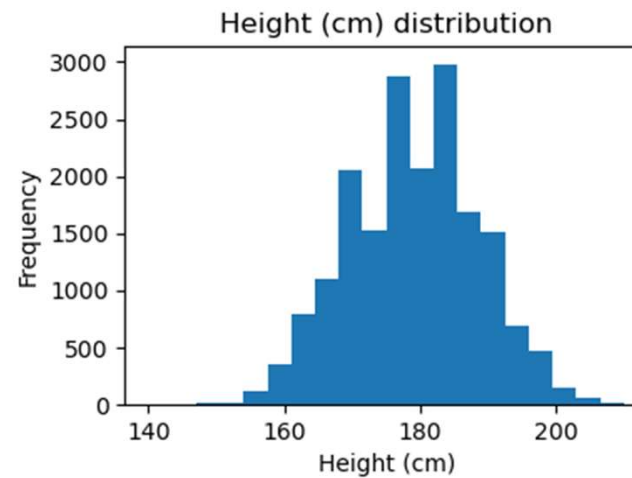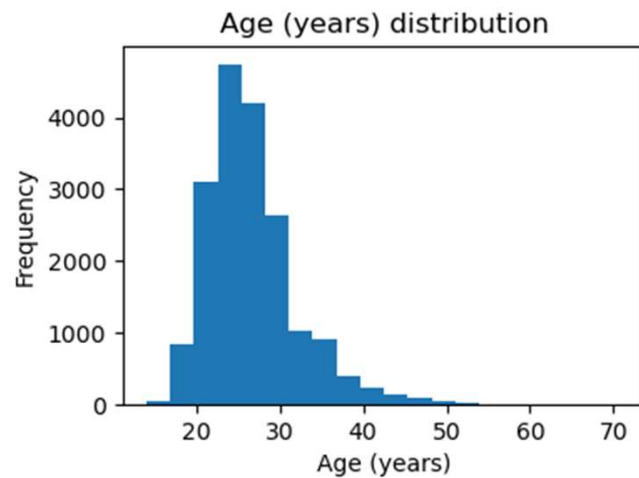
Olympians' biometrics

▶ The following table highlights the biometrics stats of the competitors

Biometric	Mean	Std	Min	Max
Age (years)	26.7	5.6	14	71
Height (cm)	178.8	9.6	140	210
Weight (kg)	76.0	15.9	42	214
BMI	23.6	3.6	14.9	63.9

▶ There is a lot a variation between athletes

- The youngest and oldest Olympians competed in Diving and Dressage

- The shortest and tallest competitors were in Weightlifting and Judo

- The lightest and heaviest Olympians competed in Diving and Judo

- The lowest BMI and highest BMI Olympians competed in Archery and Judo

# Olympians' biometrics - distribution

Eventing

Biometric	Eventing		Olympians		p_value
	Mean	std	Mean	Std	
Age (years)	36.6	8.3	26.6	5.5	<0.00
Height (cm)	178.8	7.1	178.8	9.6	0.98
Weight (kg)	72.1	6.6	76.1	15.9	<0.00
BMI	22.5	1.5	23.7	3.7	<0.00

➤ Statistical analysis showed that the competitors in eventing were older and lighter than the average Olympian with a lower BMI
➤ This is likely due to eventing requiring a wide depth of knowledge, that comes with age and experience, rather than speed or strength
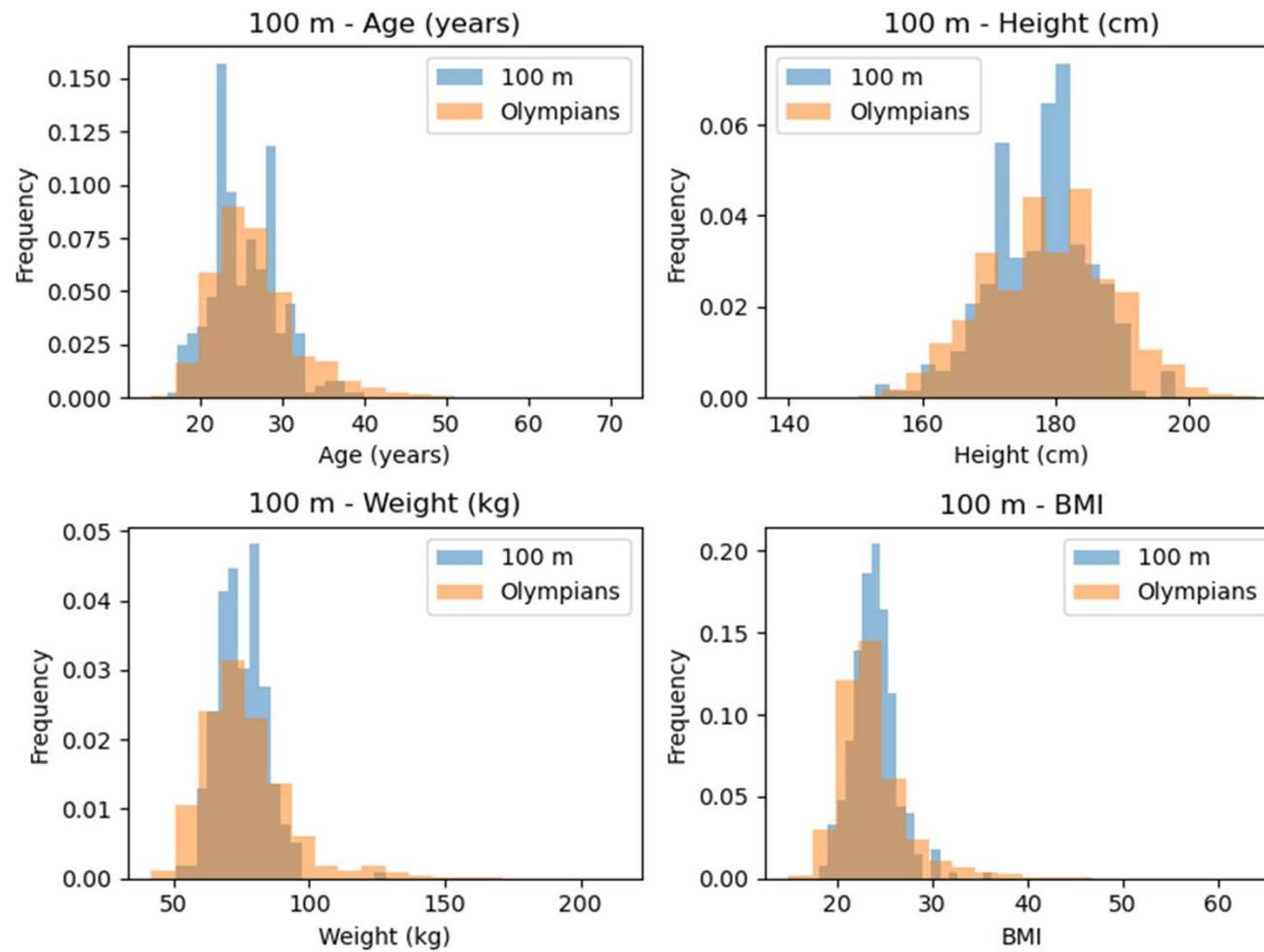
Eventing
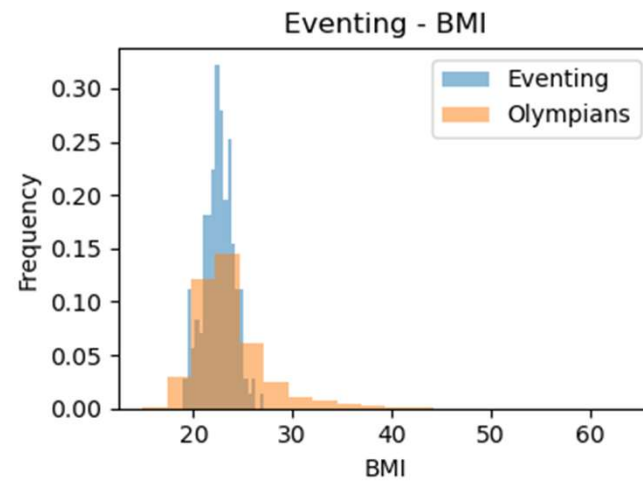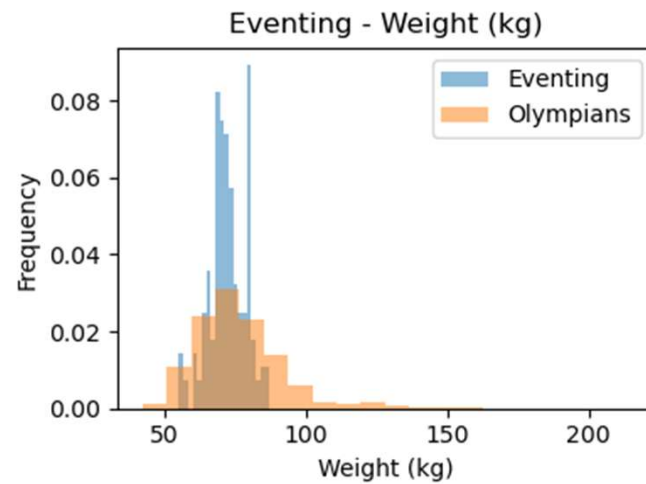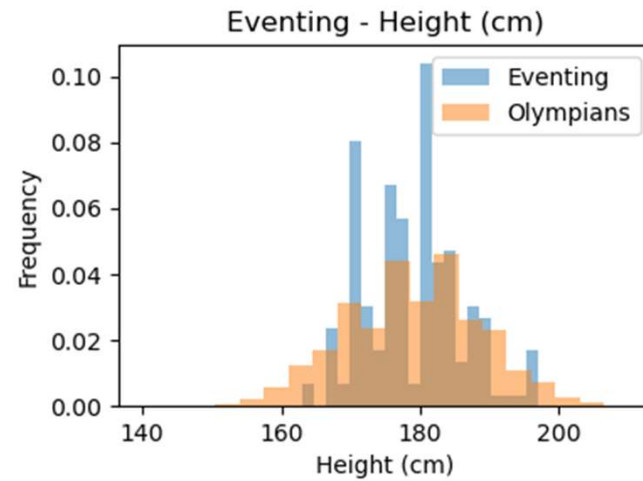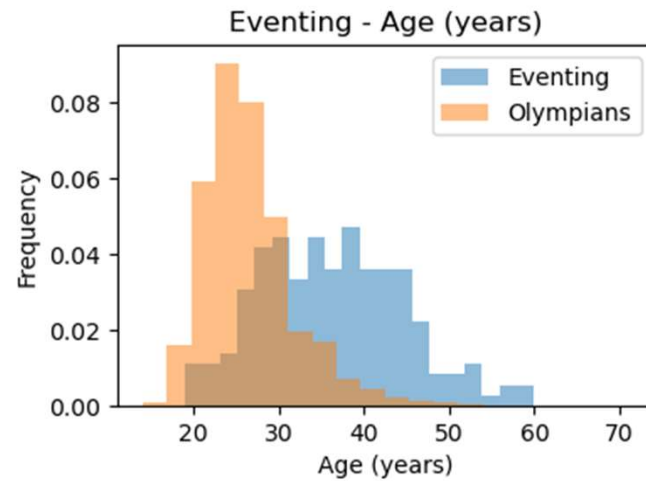
Men's 100 m

Biometric	Men's 100 m		Olympians		p_value
	Mean	std	Mean	Std	
Age (years)	25.4	4.2	26.7	5.6	<0.00
Height (cm)	177.5	7.5	178.8	9.6	<0.00
Weight (kg)	75.2	8.9	76.0	15.9	0.11
BMI	23.8	2.3	23.6	3.6	0.12

➢ Participants in the men's 100 m were found to be statistically younger and shorter than the average Olympian

Men's 100 m

Men's marathon

Biometric	Men's marathon		Olympians		p_value
	Mean	std	Mean	Std	
Age (years)	30.8	4.6	26.7	5.6	<0.00
Height (cm)	172.9	7.1	178.8	9.6	<0.00
Weight (kg)	60.0	5.9	76.0	15.9	<0.00
BMI	20.0	1.5	23.6	3.6	<0.00

➢ Marathon Olympians were older, shorter and lighter than the average Olympian which also led to a lower BMI
➢ This is likely because marathons require endurance rather than power so smaller athletes are at an advantage

Men's marathon
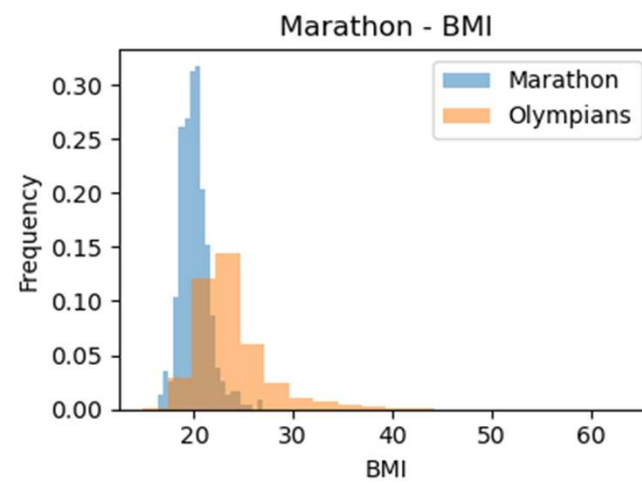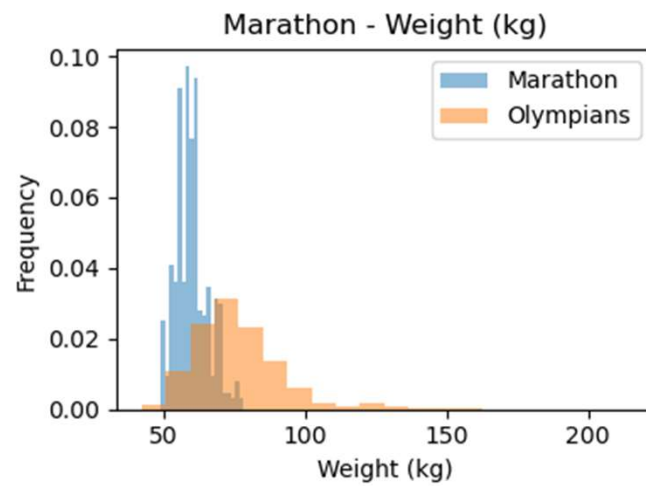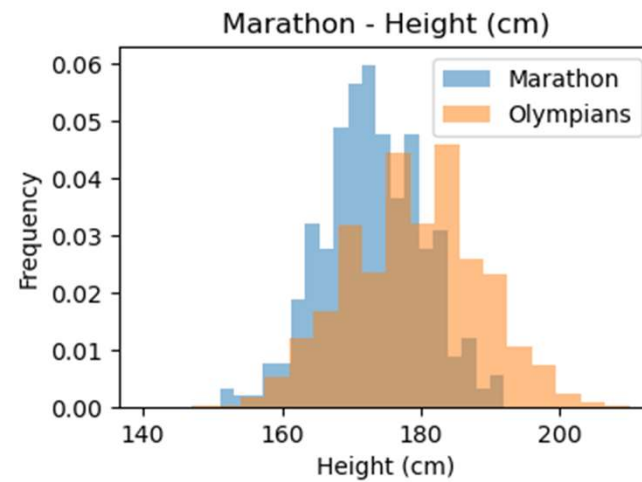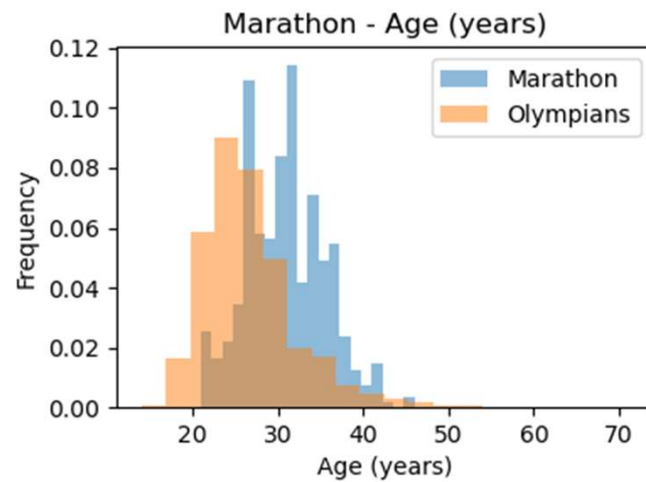
Men's shot put

Biometric	Men's shot put		Olympians		p_value
	Mean	std	Mean	Std	
Age (years)	27.6	3.9	26.7	5.6	<0.00
Height (cm)	191.7	6.5	178.8	9.6	<0.00
Weight (kg)	127.0	14.3	76.0	15.9	<0.00
BMI	34.6	4.0	23.6	3.6	<0.00

➢ Shot put athletes were found to be older, taller and heavier than the average Olympian with a higher BMI

➢ This is because shot put requires a lot of strength and power and therefore a more muscular body. In addition, a greater height enables a longer flight time.

Men's shot put
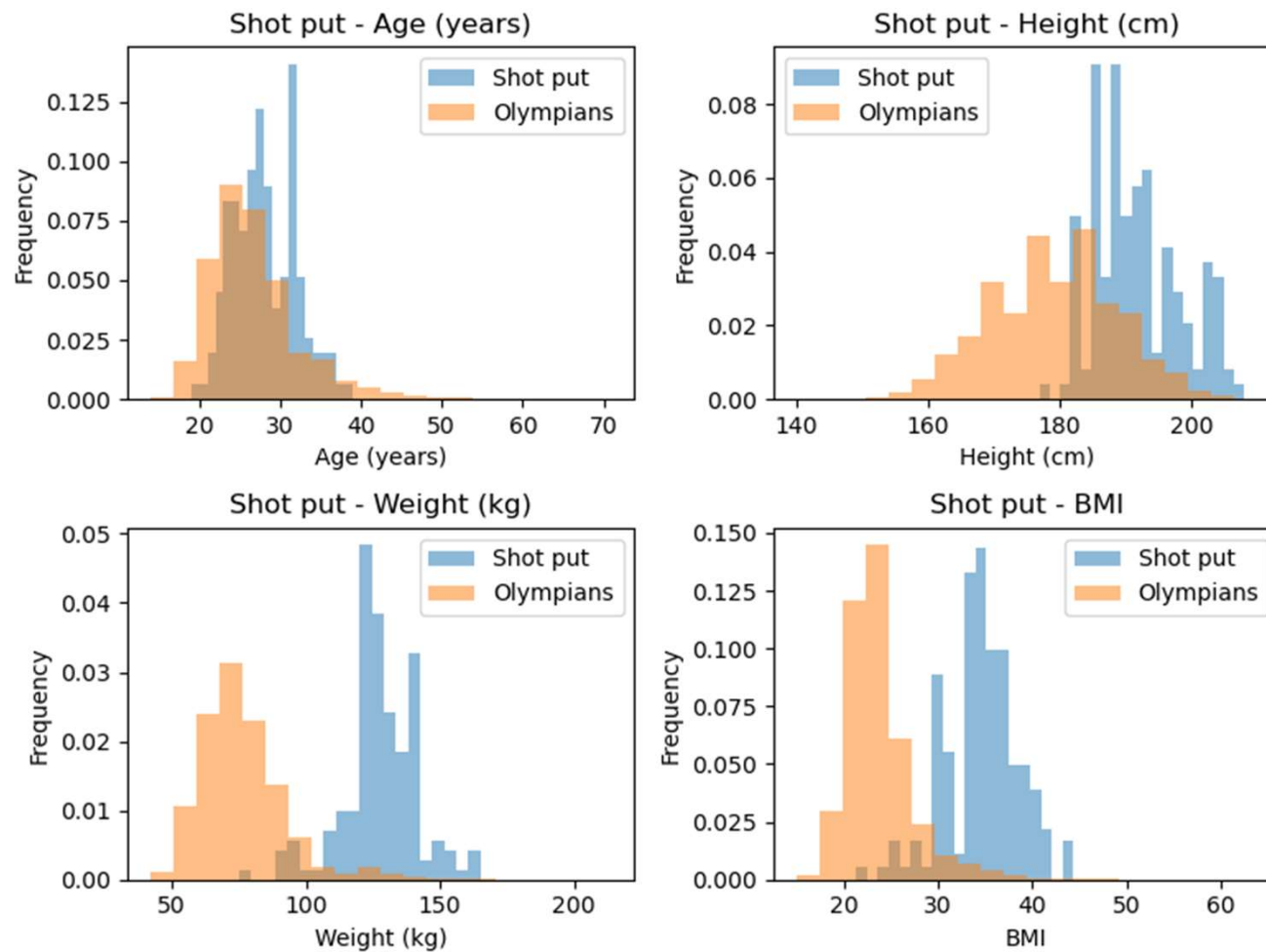
Men's high jump

| Biometric	Men's high jump		Olympians		p_value
	Mean	std	Mean	Std	
Age (years)	25.6	3.6	26.7	5.6	<0.00
Height (cm)	192.3	5.8	178.8	9.2	<0.00
Weight (kg)	76.6	6.4	76.0	15.9	0.30
BMI	20.7	1.5	23.6	3.6	<0.00

➢ High jumpers are younger, taller and have a lower BMI that the average Olympian
➢ Taller athletes have an advantage in the high jump as their centre of gravity is higher.
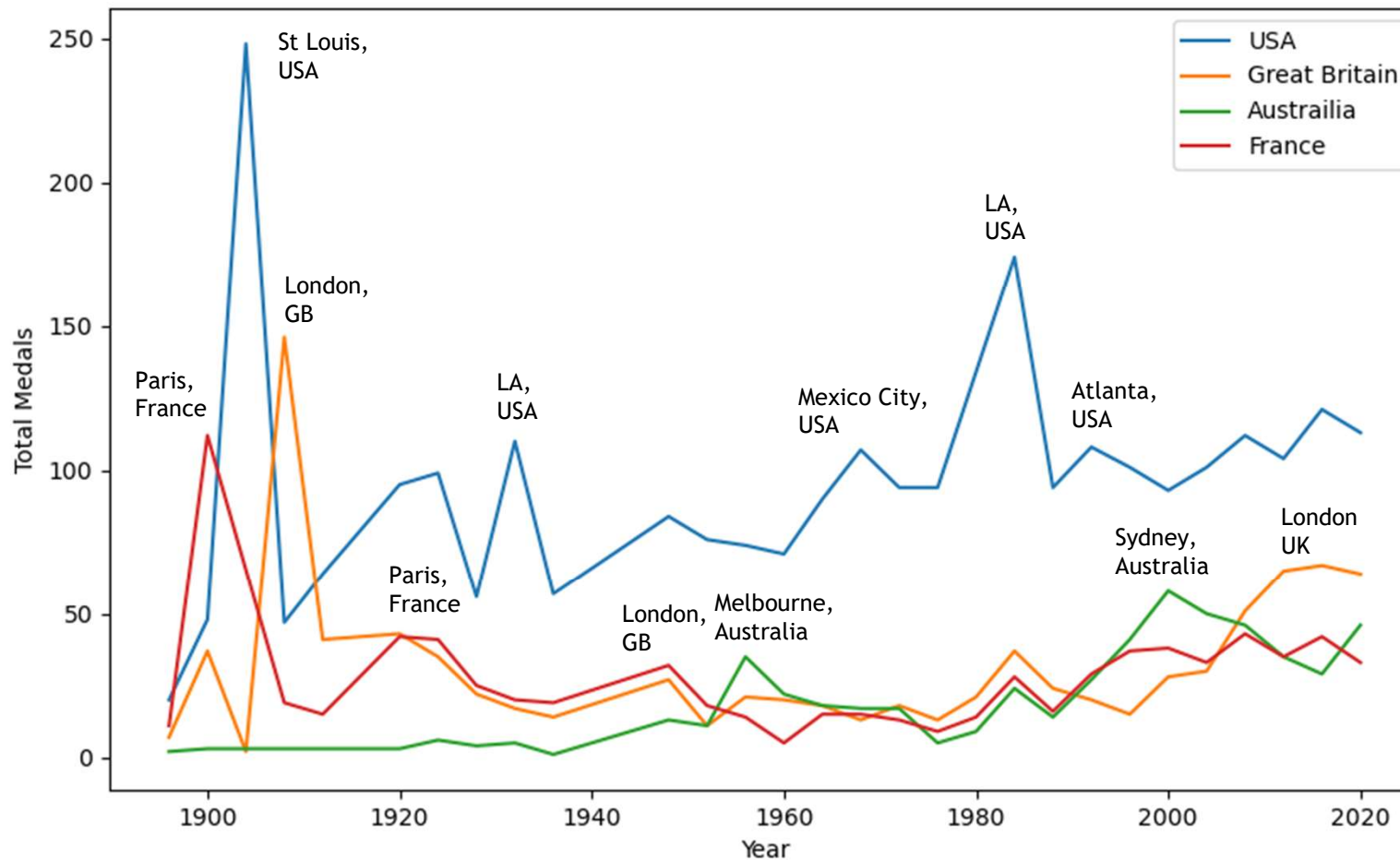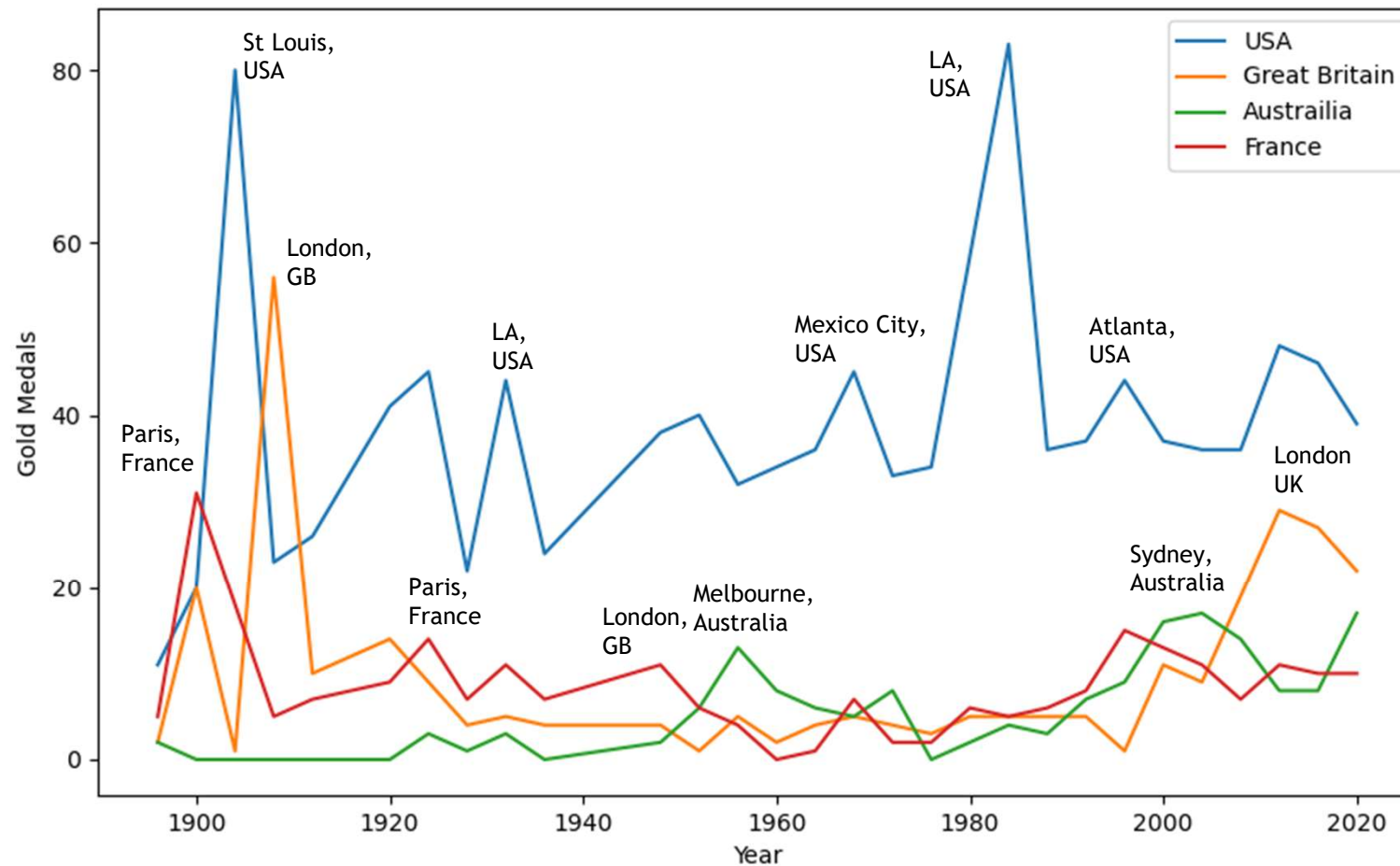
Men's high jump
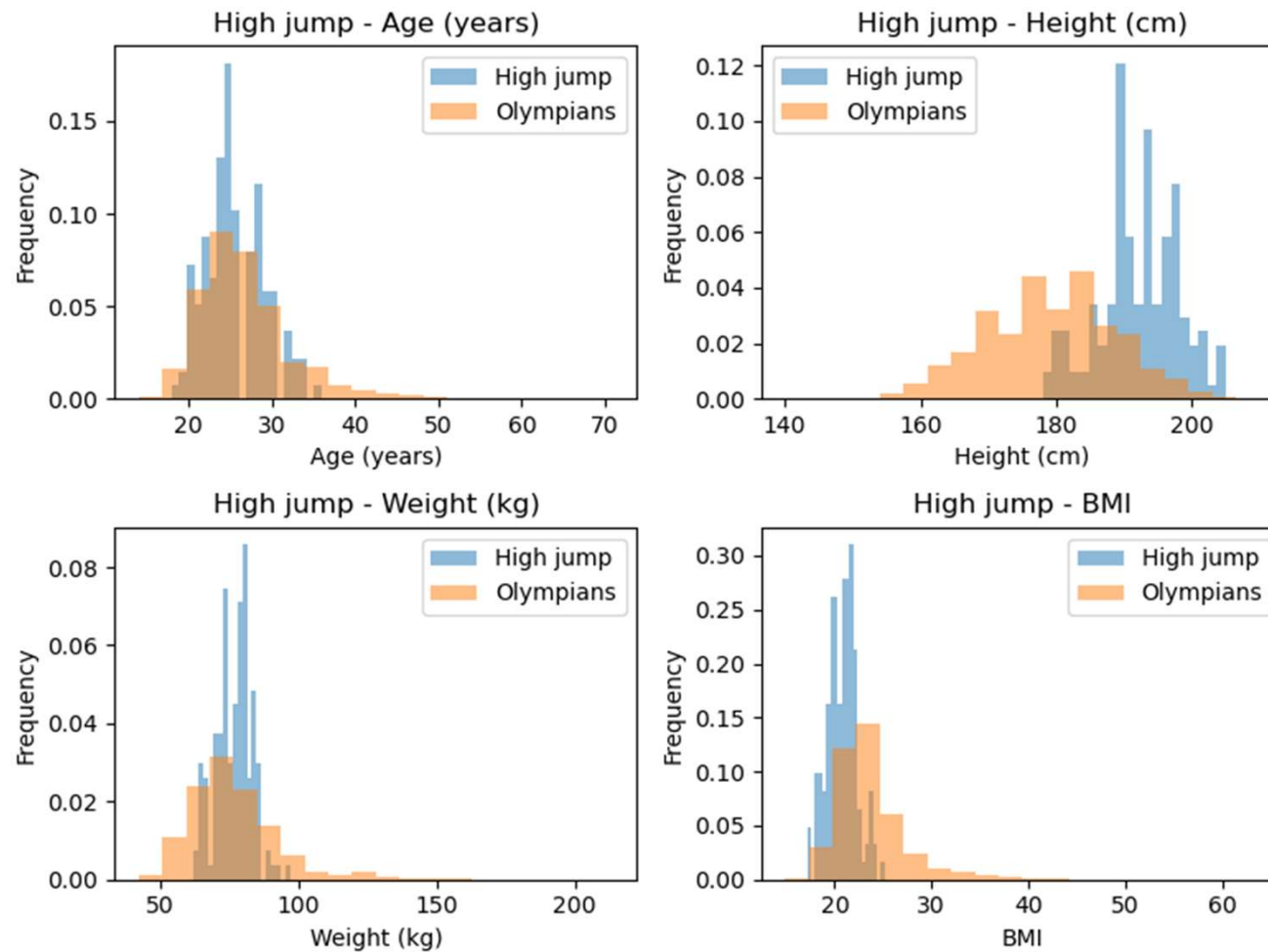
Comparison across selected sports
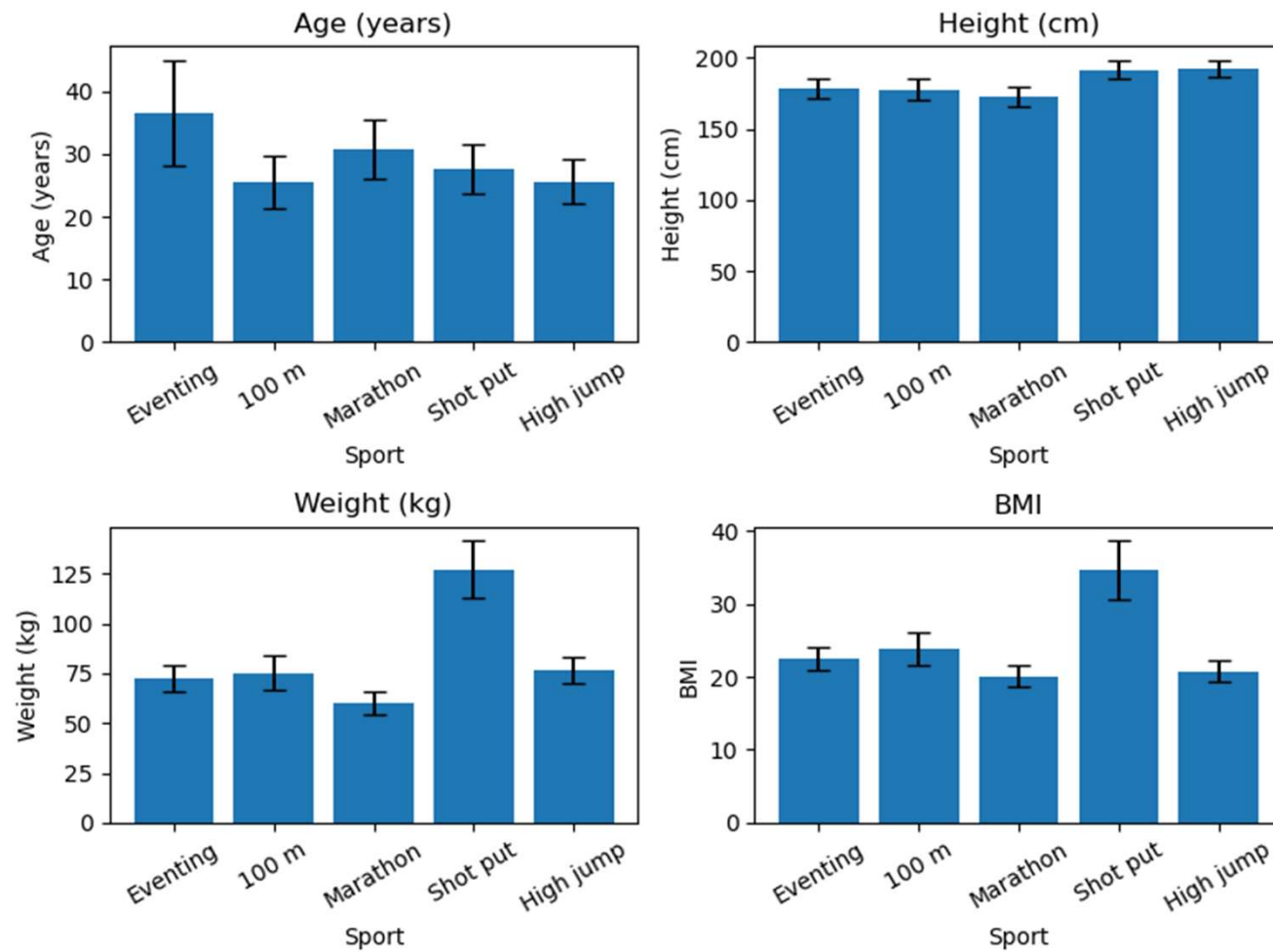
Effect of hosting country – Total medals

➤ A peak in medal count was observed for the hosting country

Effect of hosting country – Gold medals

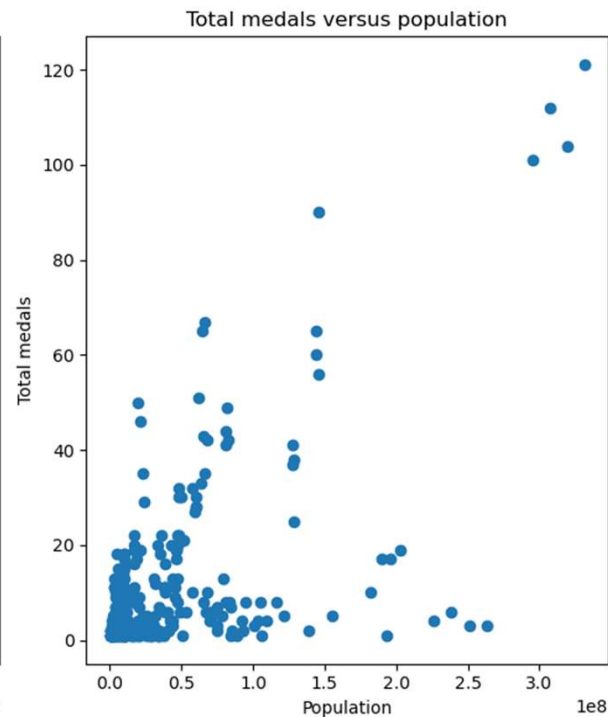➤ A peak in gold medal count was observed for the hosting country

Does population affect total medals?

➤ A positive correlation was found between the total number of medals and population
➤ Outliers are the People's Republic of China and India
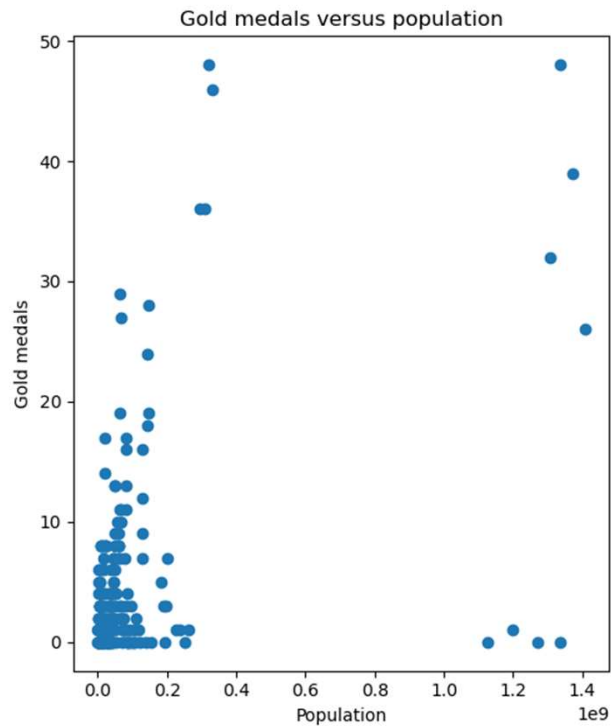➤ Removal of these improved the correlation
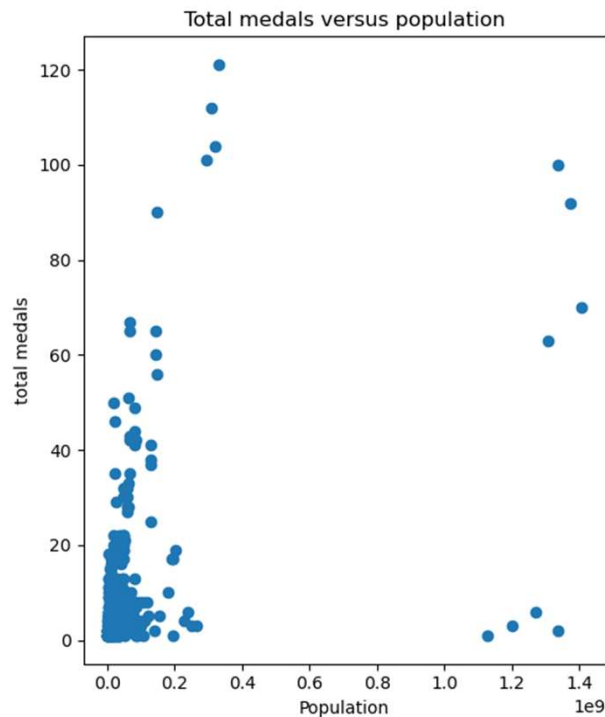
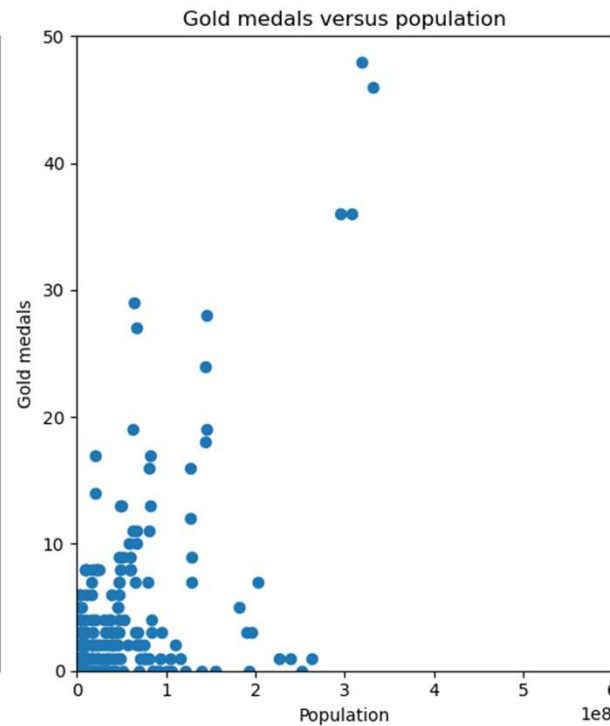Pearson correlation = 0.41   Pearson correlation = 0.59

Does population affect gold medals?

- A positive correlation was found between the total number of gold medals and population
- Outliers are the People's Republic of China and India
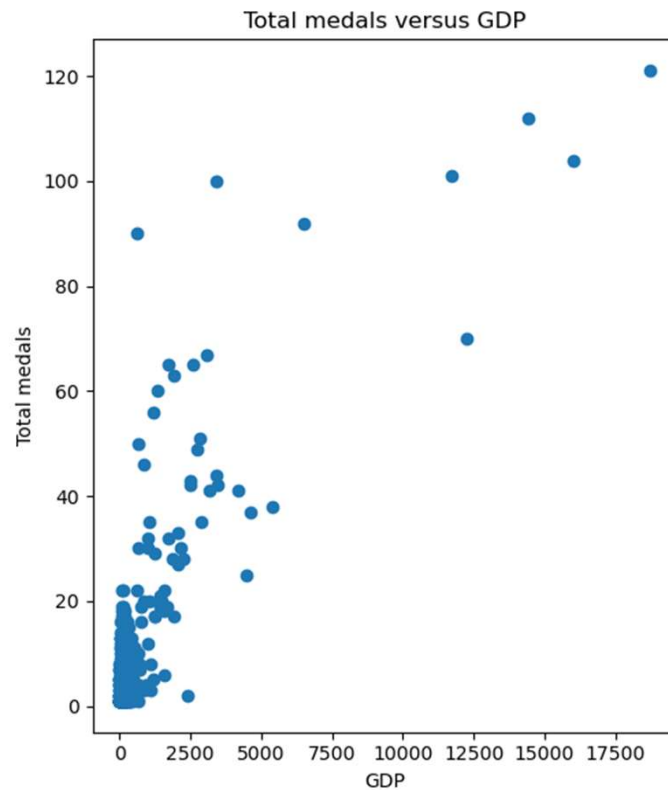- Removal of these improved the correlation
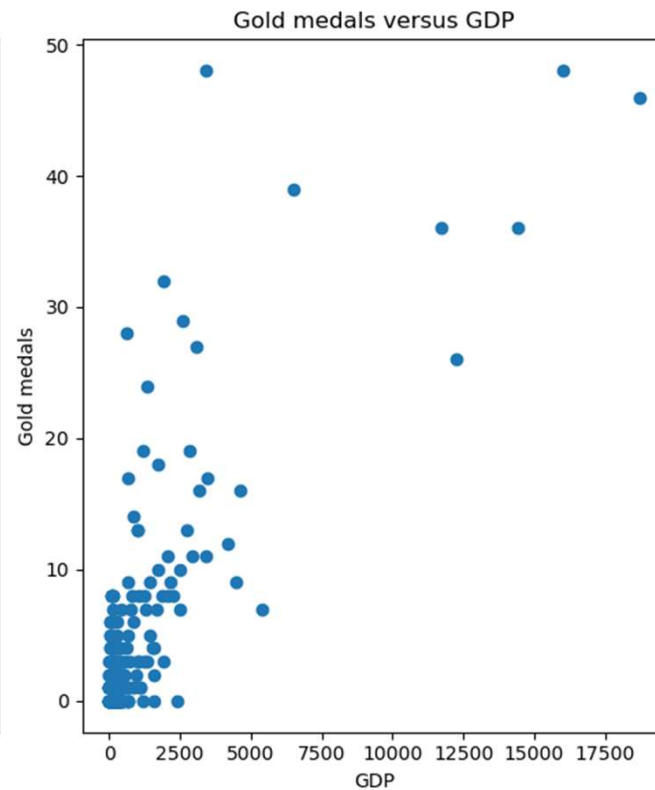

Pearson correlation = 0.46   Pearson correlation = 0.58

Does GDP affect total and gold medals?

➢ A positive correlation was found between the total number of medals and gold medals and GDP

Pearson correlation = 0.80

Pearson correlation = 0.79

Conclusions

- Different sports require different athlete biometrics

- The chance of winning a medal is increased if the Olympics is being held in your Country

- Countries with larger populations and / or GDP are more successful at winning medals.