## Australian Institute of Sport

Student 6: High Not Achieved

NZQA Intended for teacher use only

Purpose

Sports anemia is common in athletes, but depending on the sports they play, their levels of haemoglobin can differ. According to a sports science article, athletes can often suffer from low haemoglobin levels due to aerobic exercises, as it expands the baseline plasma volume. When this occurs, the concentration of red blood cells (which contain haemoglobin) is decreased, which can lead to sports anemia. Haemoglobin levels are considered low if they are lower than 12-13g/dL (grams per decilitre).

I believe that if athletes play a ball sport their haemoglobin levels will not be as low as those who do not play a ball sport. This is because ball sports focus more on the muscles that play with the ball, while non-ball sports often focus on most of the body rather than just certain parts.

Investigative Question

What is the difference between the median haemoglobin levels of athletes who play a ball sport and the median haemoglobin levels of those who play a non-ball sport at the Australian Institute of Sport? (1)

Analysis

**Summary of Hg by Ball.Sport**

| | *Min.* | *LQ.* | *Median.* | *Mean.* | *UQ.* | *Max.* | *Std.dev* | |
|---|---|---|---|---|---|---|---|---|
| ***Sample.Size*** | | | | | | | | |
| *Ball Sport* | 11.6 | 12.70 | 13.95 | 14.06 | 15.05 | 17.7 | 1.445 | 76 |
| *Non Ball Sport* | 12.4 | 14.02 | 14.85 | 14.87 | 15.60 | 19.2 | 1.216 | 126 |

(2)

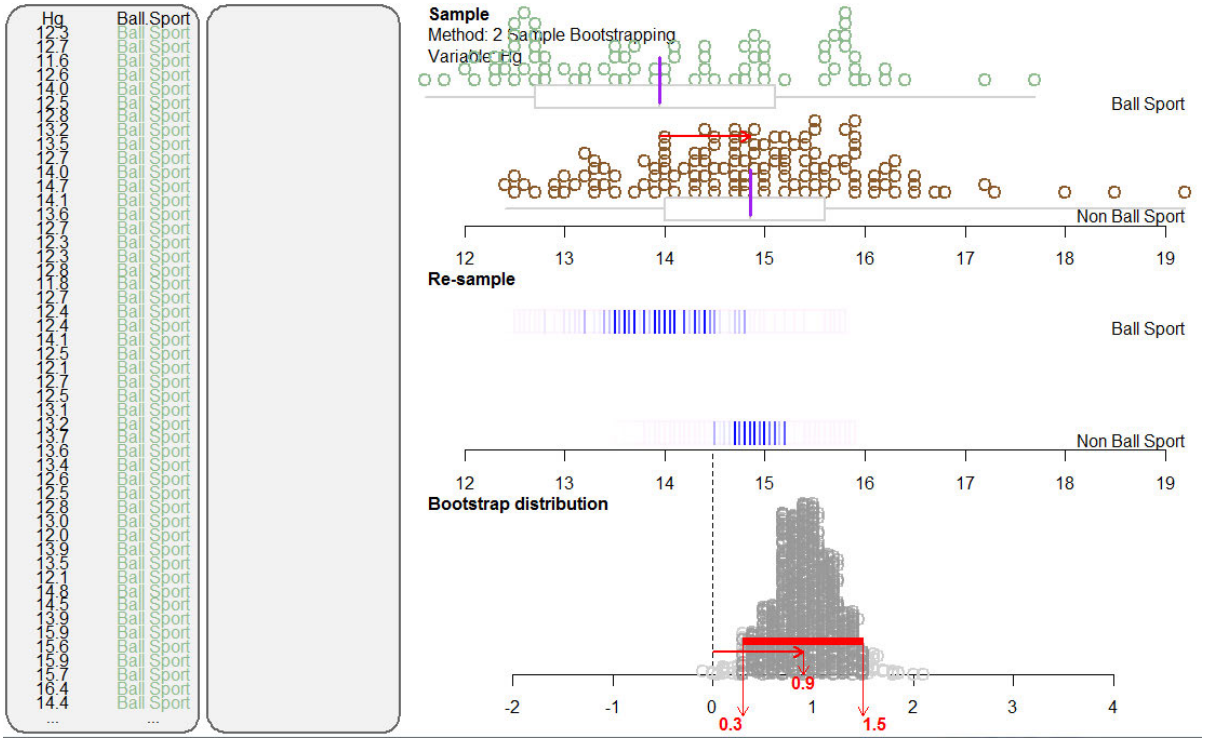
The median haemoglobin level of those who play non-ball sports is 0.93g/dL higher than those that do play ball sports. The ball sport athlete's levels range between 11.6g/dL and 17.7g/dL, so a difference of 0.93g/dL is not a huge difference but is still significant. (3)

The distribution of haemoglobin levels of those who play a non-ball sport is unimodal, with a lot of the data between 14.5 and 15.5g/dL and the distribution of haemoglobin levels of those who play ball sports is bimodal with most of the data between 12 and 13g/dL at the biggest clump and then at the next clump between 15.5 and 16g/dL. (3)

In the ball sports data, the middle 50% is mostly all together and isn't really that spread out. The middle 50% is between 14 and 16g/dL. The middle 50% of the non-ball sports data is very spread out, and the clumping is on the outskirts of the 50%. The non-ball sports middle 50% has shifted and is overlapping the right side of the middle 50% of the ball sports.The main clumps of both data plots are not overlapping each other. The main clump of he non-ball sports data has higher levels of haemoglobin. (3)

From the data we can see there is a difference between the median haemoglobin levels of athletes who play ball sports and non-ball sports. There is not a huge difference between the variables but there is still enough to show that there most likely is a difference and that back in the population athletes who play ball sports have lower levels of haemoglobin, which is the opposite of what I expected the results to be.

I am going to resample 1000 times from the data and construct a bootstrap confidence interval to see the difference between the population medians.




2

## Conclusion

My bootstrap has shown that those who play non-ball sports actually have a higher level of haemoglobin by between 0.3 and 1.5 g/dL. It is not a huge difference but this is obviously enough to make ball sport athletes haemoglobin levels lower than what is healthy. If these athletes do not ensure that they maintain a healthy haemoglobin level, then they could fall beneath the ideal level and end up suffering from sport anemia.

From my data results, I can confidently say that there is a difference in haemoglobin levels between athletes who play ball sports and those who do not play ball sports. Assuming that my sample reflects the entire Australian population, the bootstrapping does work. The probability that another sample of this will have different results and graphs is very likely but because there is a big enough difference I think that it will still to show that ball sport athletes will have different levels of haemoglobin.

4