

# Arabian Horse Foal Information as a Bioassay for Environmental and Husbandry Changes



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## Abstract

The Arabian Horse breeding program is institutionally mandated at Cal Poly Pomona and has been since its inception. Environmental factors such as changes in weather and precipitation levels play a major role in foal development, and may be used as a bioassay to evaluate husbandry, care and climate change. Using the Cal Poly Pomona Arabian horses as a sentinel species we evaluated gestation length, animal's size at birth (height & weight), ability to stand, time until the first nursing, as well as rate of growth within the 1st two months. These were evaluated for all foals born during the 2017 (n=17) and 2018 (n=10) birthing season and this data were compared to data collected in 2012 (n=9). The average gestation length of Arabian foals born in 2018 (0.33 days +/- 6.46 days) showed lower variation and a greater prediction accuracy rate compared to Arabian foals born in 2017 and 2012 (5.86 days +/- 10.48 days and 5.44 days +/- 12.78 days respectively). There was a significantly higher birth weight in the Arabian foals born in 2018 and 2017 (56.9 kg +/- 22.2 kg and 57.95 kg +/- 16.00 kg) compared to Arabian foals born in 2012 (49.51 kg +/- 16.18 kg). No other parameters evaluated differed significantly between foal cohorts. This data will be compared to archival data to further evaluate changes in foal parameters and evaluate the factors that may be associated with shifts and trend. From the current data set we can conclude that gestation length and birthweight have an increased acuity and may be useful as early indicators of environmental change impact on horse populations.

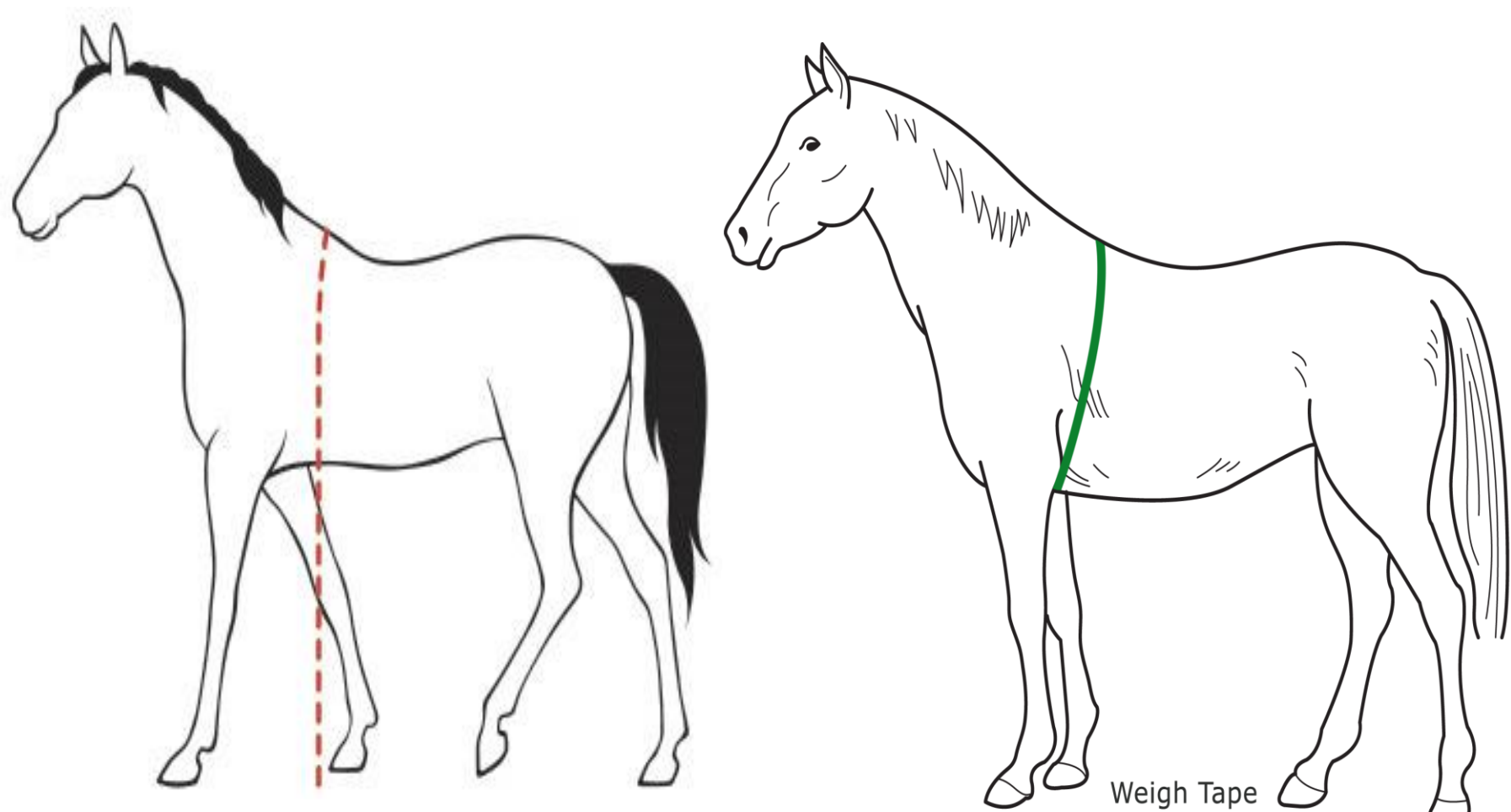
## Background and Introduction

The W.K. Kellogg Arabian Horse Center became first established in 1925 by Will Keith Kellogg. W.K. Kellogg started a breeding program around this time in 1925 of Arabian horses in Pomona, CA. His ranch, which now has become a part of Cal Poly Pomona, was a popular destination for Hollywood stars and Sunday Horse Shows were created. As part of the stipulation that W.K. Kellogg presented to the state of California, the Arabian breeding program as well as the Sunday Horse Shows have been maintained.

Cal Poly Pomona has undergone many changes in the last 5 years due to construction at the W.K. Kellogg Arabian Horse Center as well as weather and precipitation changes. These factors may have an effect on foal development. Management strategies as well as parental factors are also other factors that affect Arabian foal development. All of these various factors may induce stress in the Arabian horse causing illness, poor development, and altered gestation, which are all important variables in foal development.

## Methods

- Each foal born from each mare is recorded inside a data sheet that states: when the water broke, when the foal is delivered, time it took for the foal to stand up, time until the foal was first nursed, as well as other pertinent data. This set of data was all timed in hours using a clock and was converted to minutes.
- Foals born in the 2012 (n=9), 2017 (n=17) and 2018 (n=10) birthing season were measured at 1 week after birth and at 2 months of age.
- Height was measured using measure tape from hoof to withers.
- Weight was measured using weight tape by wrapping around body near withers.



## Results

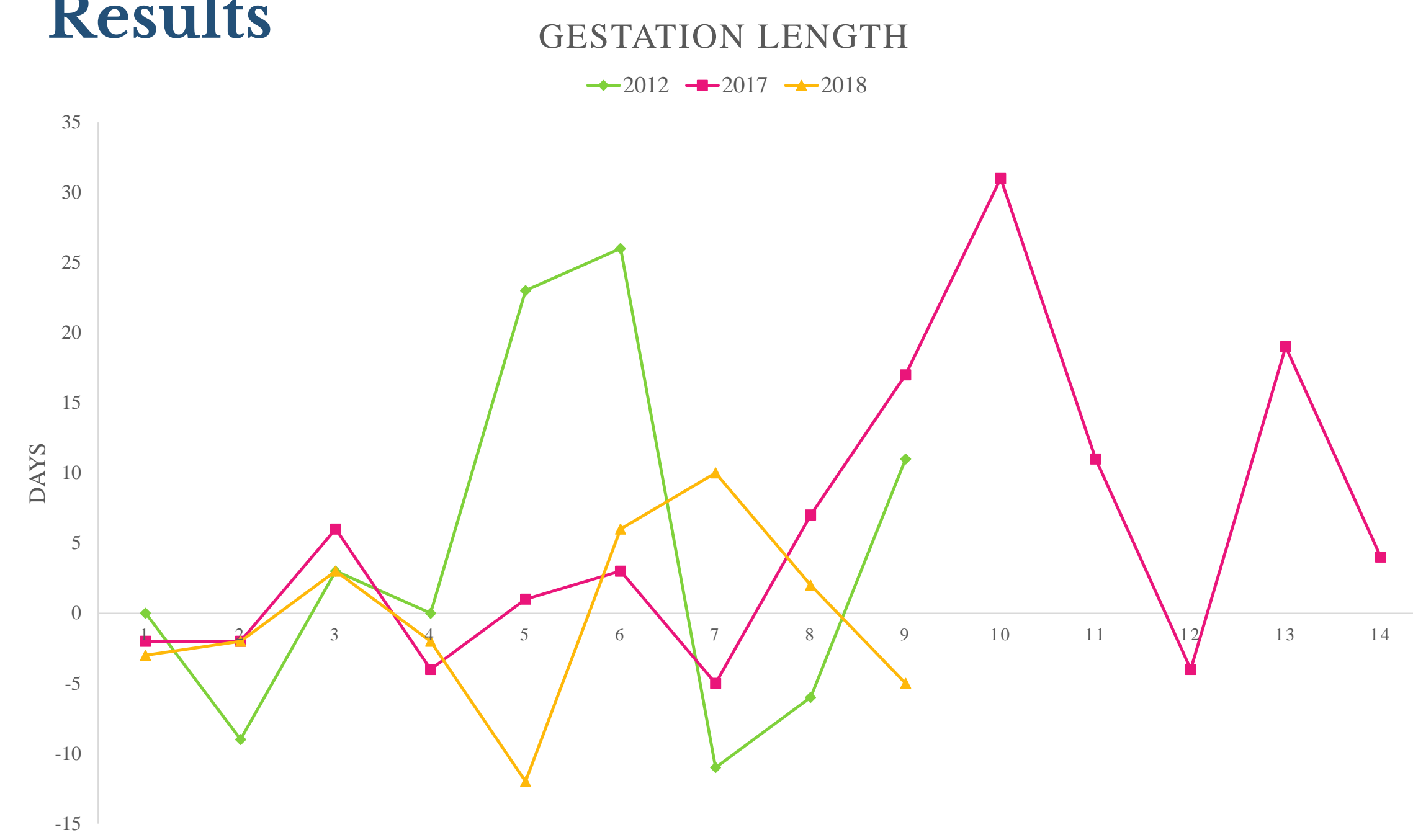


Figure 1: Compares gestation length of foals born in 2012 (n=9) to 2017 (n=17) and 2018 (n=10)

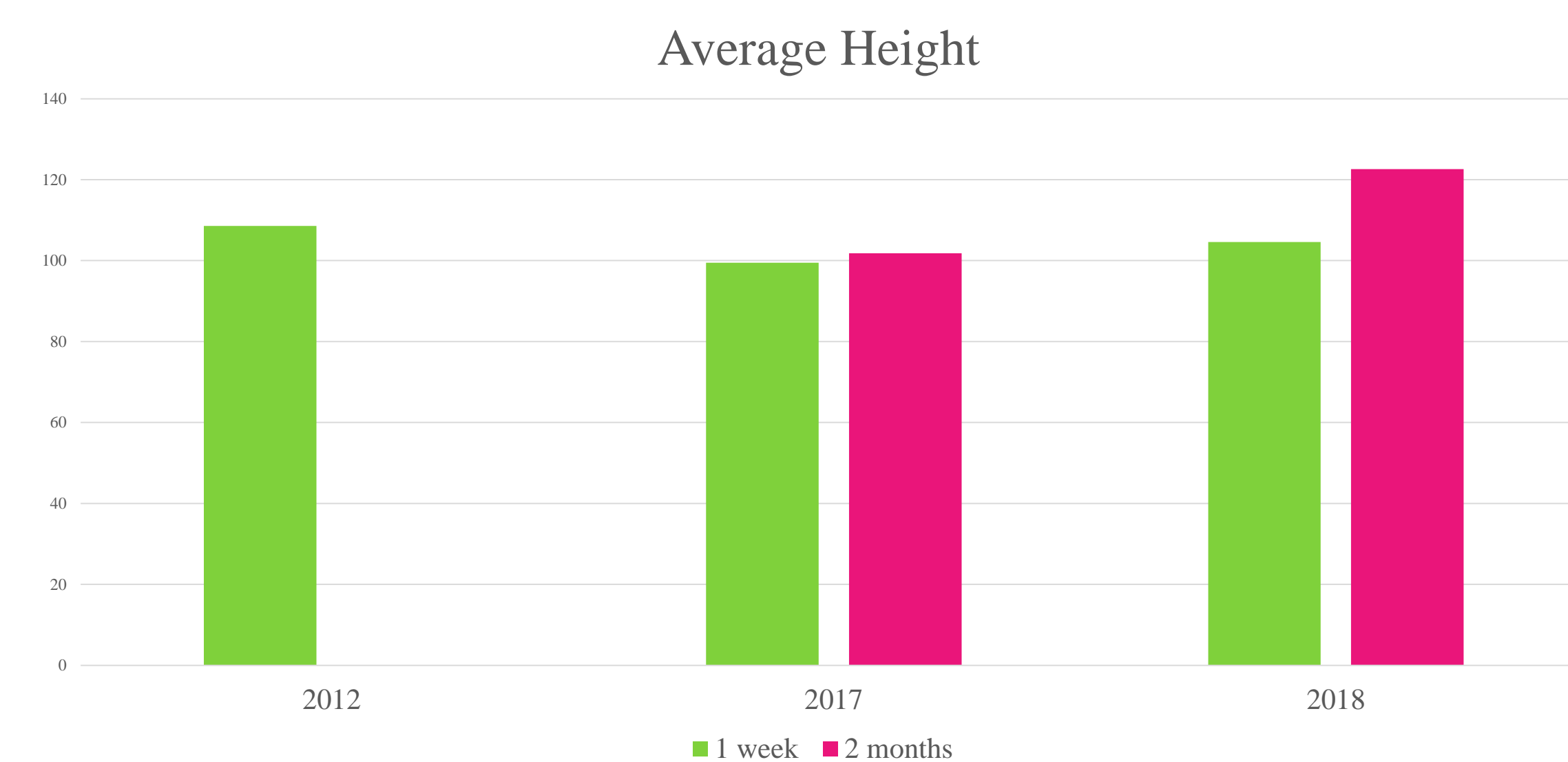


Figure 2: Average height comparison measured at 1 week and at 2 months for foals born in 2012 (n=9) to foals born in 2017 (n=17) and 2018 (n=10)

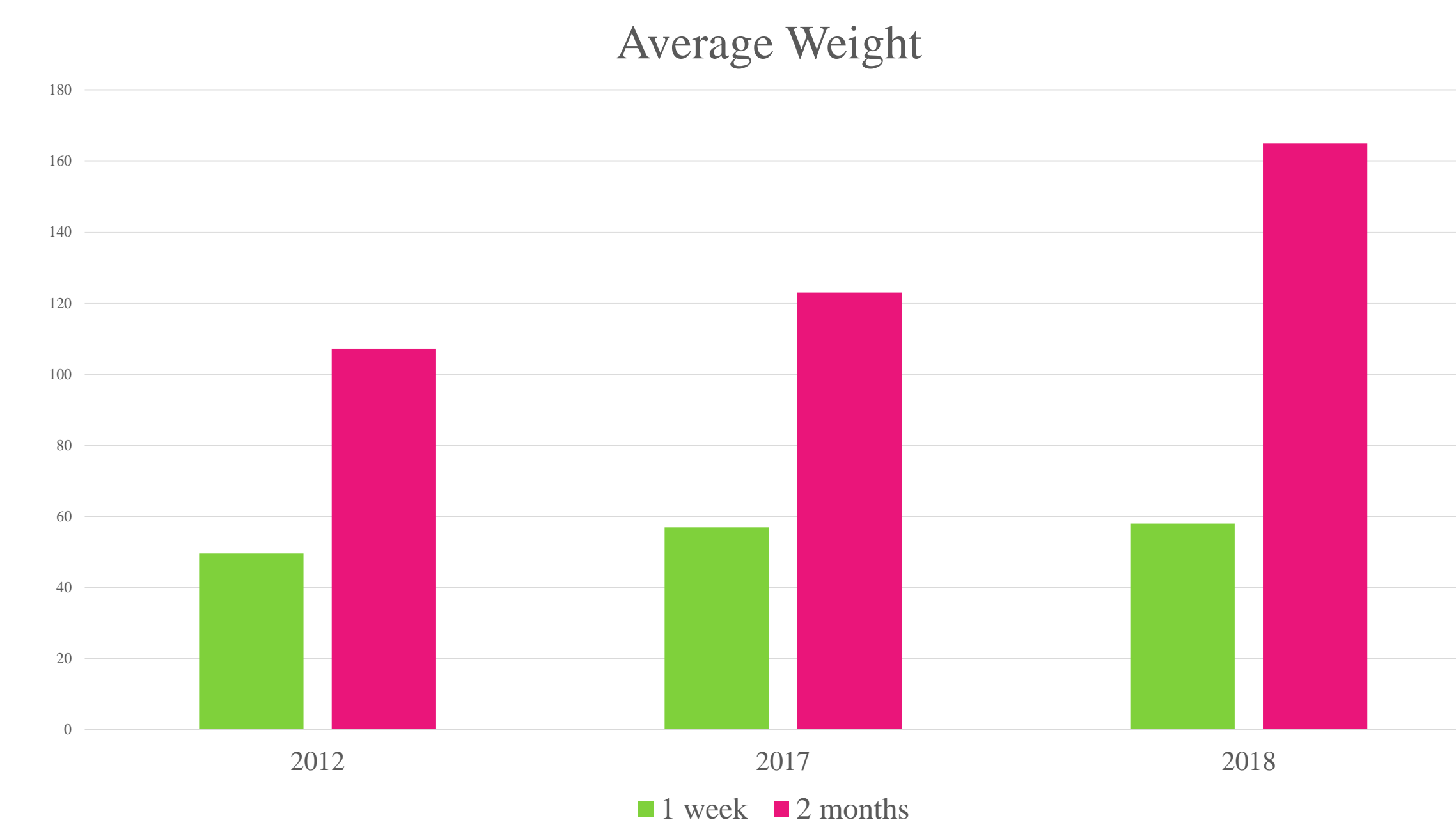


Figure 3: Average weight comparison measured at 1 week and at 2 months for foals born in 2012 (n=9) to foals born in 2017 (n=17) and 2018 (n=10)

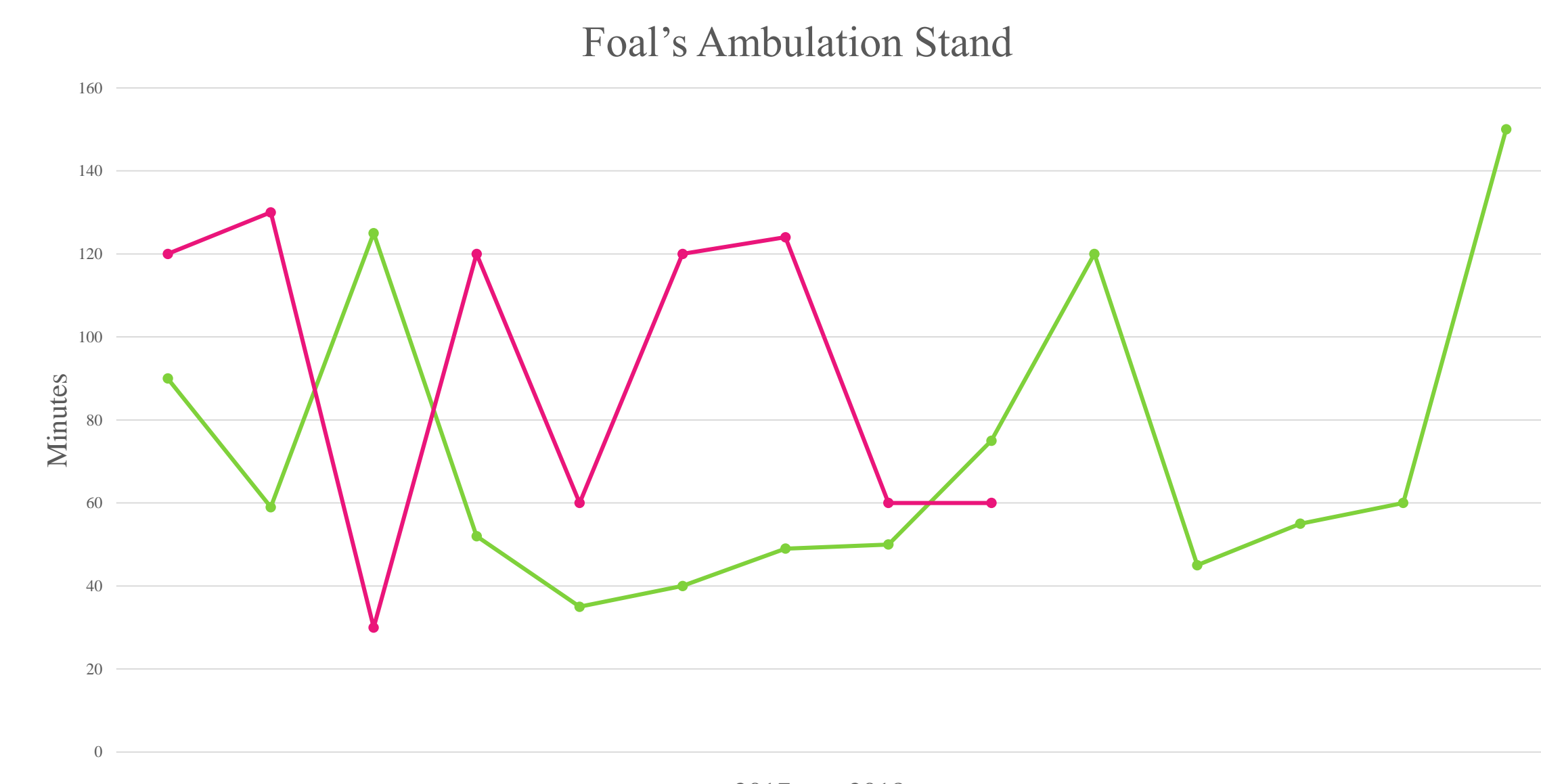


Figure 4: Graph shows comparison of foal's time it takes to stand when first born in 2017 (n=17) and 2018 (n=10). No data was taken for 2012 (n=9).

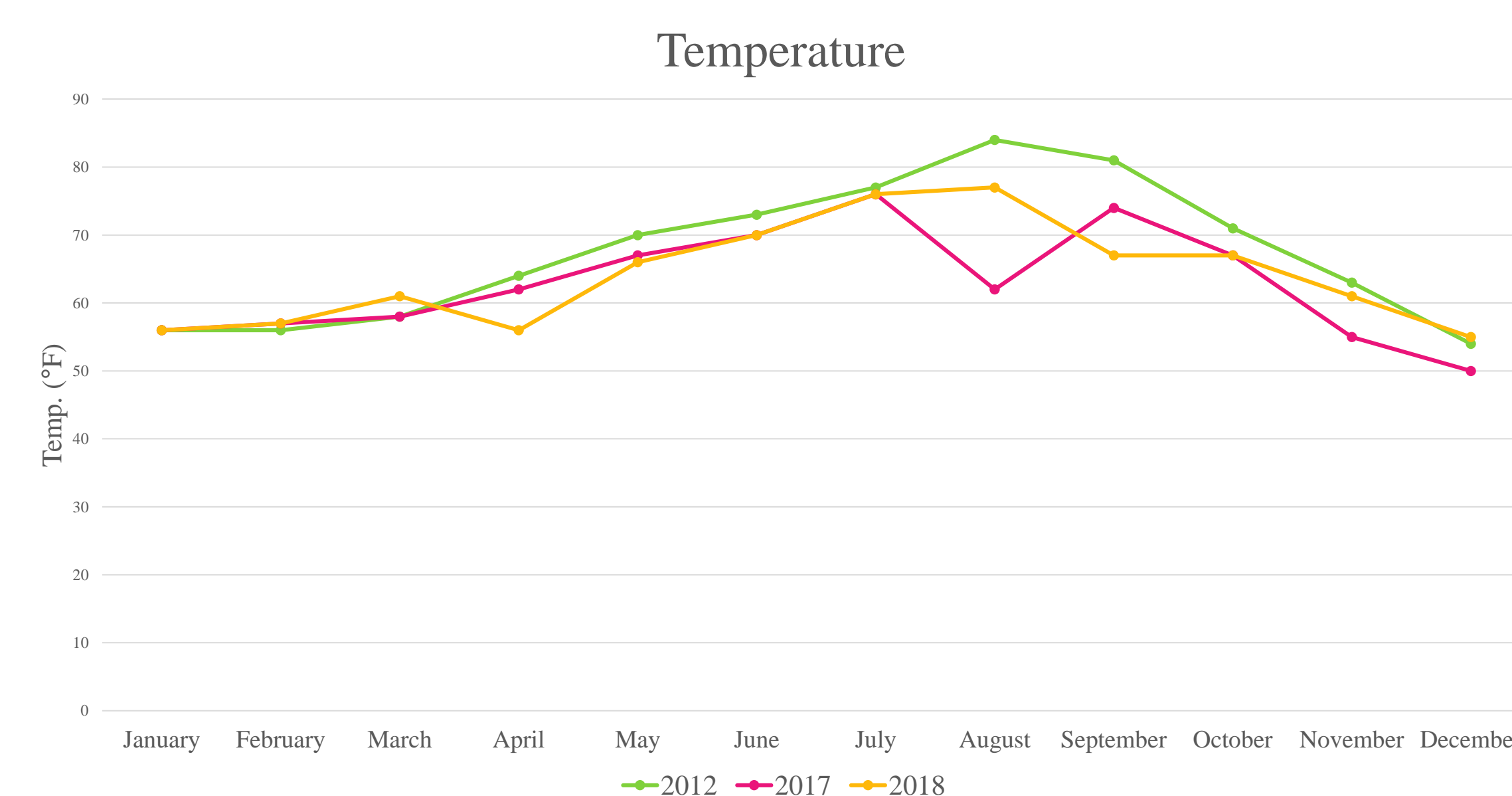


Figure 5: Comparison of annual average temperature in year 2012 vs 2017 and 2018

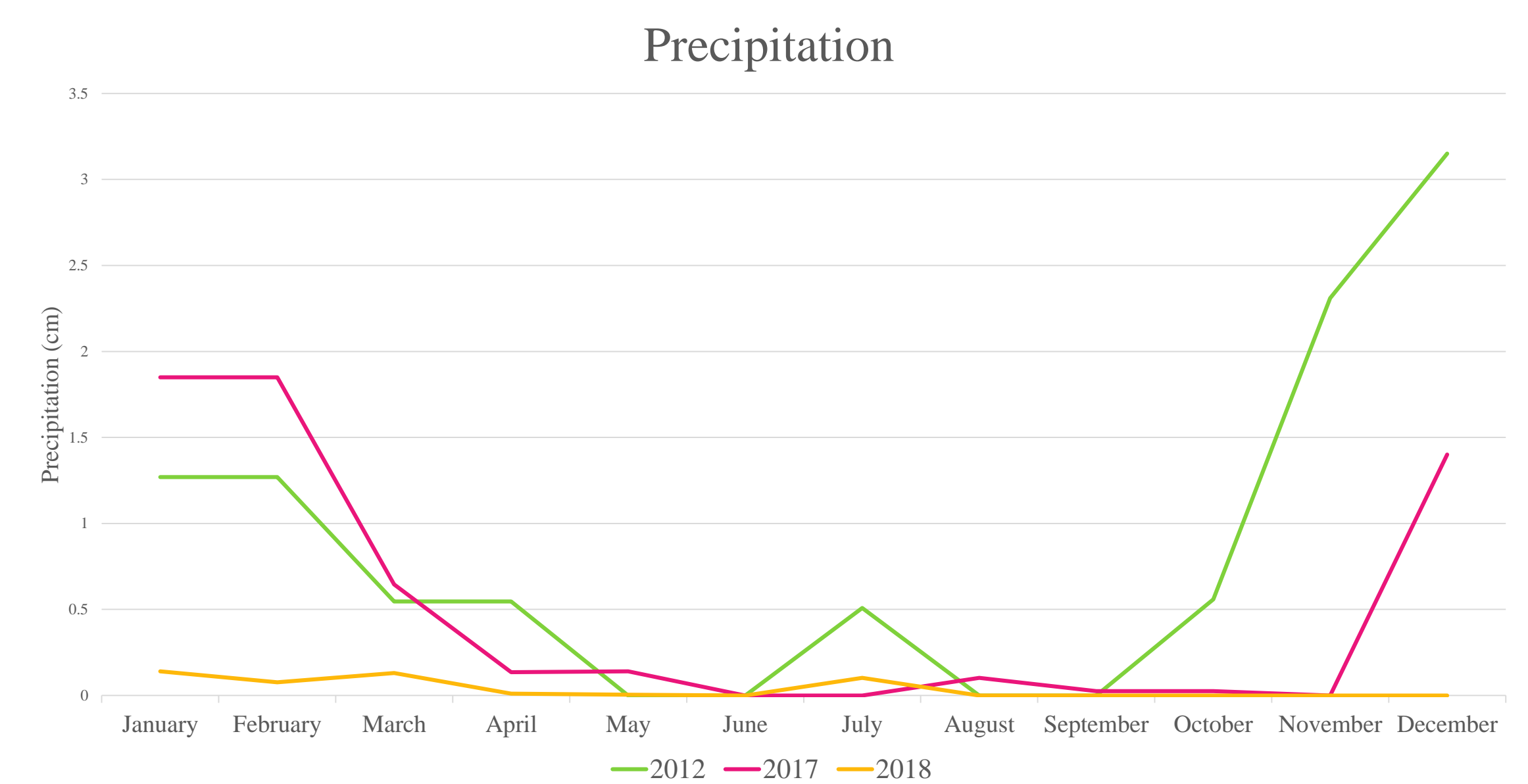


Figure 5: Comparison of annual average temperature in year 2012 vs 2017 and 2018

## Conclusion

- This data suggests that temperature and precipitation play a major role in gestation length, height, weight, and the foal's ability to stand.
- In comparison to 2012, temperature in 2017 and 2018 was relatively cooler, with 2018 being the coolest year.
- Precipitation in 2017 was relatively higher in the earlier months (January-March) than in 2012 and 2018.
- Precipitation in 2012 was higher in the later months (September-December) compared to 2017 and 2018.
- The gestation length showed lower variation in 2018 (n=10) cohort of foals compared to foals in 2017 (n=17) and 2012 (n=9). There was a significant increase in variation in gestation length for cohort of foals in 2017 (n=17), which may be the result of an increase in precipitation in earlier months of that year as well as cooler temperatures.
- There was a significant increase in height and weight of foals born in 2018 (n=10) in comparison to foals born in 2012 (n=9) and 2017 (n=17).
- The foal's trend in ambulation time is higher in 2018 (n=10) compared 2017 (n=17).
- There were some limitations to the data such as the fact that the methods used to measure the cohort of foals in 2012 may have differed in the methods used to measure the 2017 and 2018 cohort of foals.
- The 2012 (n=9) foals that were measured did not use all of the same parameters that was used for 2017 (n=17) and 2018 (n=10) cohort of foals. Ex: Ambulation

## Future Studies

We will be conducting future research studies using the W.K. Kellogg Arabian Horse Library to determine when the first breeding program started. Furthermore, we will use the same parameters used in this study to compare the impacts that weather and precipitation had on foal development and graph it on a historical timeline. We will continue collecting data on the 2019 foaling cycle and see if environmental factors and changes in weather have improved 2019's cohort of foals in comparison to 2018 cohort of foals.



## Acknowledgements

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