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A Statistical Analysis Investigating the Phenomenon Known as "Kitten Season" and Its Correlation to Climate

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Abstract

Open intake animal shelters that take in stray and feral cats have long had to cope with a phenomenon known as "Kitten Season", a period of time when there is a large uptick of intakes of young kittens aged 0-6 months old. This typically occurs from April to October in the United States. While evidence in some other species suggests that conceptions could be related to temperature, little research has examined how conception may be related to climate conditions in cats.

To determine whether cat conception is related to climate, I examine data from January 2012 and December 2020 on all cat intakes acquired from the Idaho Humane Society. Conception date is estimated and analyses are conducted to determine whether temperature correlates with daily kitten conceptions. Results from this study will help provide insights into how a changing climate will influence the number of kitten conceptions.

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Abstract

Open intake animal shelters that take in stray and feral cats have long had to cope with a phenomenon known as "Kitten Season", a period of time when there is a large uptick of intakes of young kittens aged 0-6 months old[1]. This typically occurs from April to October in the United States.
While evidence in some other species suggests that conceptions could be related to temperature[2], little research has examined how conception may be related to climate conditions in cats.

To determine whether cat conception is related to climate, I examine data from January 2012 and December 2020 on all cat intakes acquired from the Idaho Humane Society. Conception date is estimated and analyses are conducted to determine whether temperature correlates with daily kitten conceptions. Results from this study will help provide insights into how a changing climate will influence the number of kitten conceptions.

Methods

Eight years of cat intake data spanning January 2012 to June 2021 from the Idaho Humane Society was used for this project. This data was sorted to only include cats under the age of 3 months old and aggregated into a dataset containing variables including sex of the cat, date of intake, estimated age, and type of intake. This results in a sample size of n=13,573 out of the original dataset. Then, I merged this data with weather data for Ada county from the National Weather Service for each date of conception.

Conception date was calculated as day of intake minus estimated age at intake minus the average conception duration in days for feral cats (~67 days). The age of kittens was estimated by shelter staff upon intake with observation of both the stage of development of their teeth[2], and their weight[3], which gives a somewhat accurate age on the kitten up to ~4 months old.

Data is analyzed using a multiple regression model where day of year (0-365) its square term, average daily temperature, and its squared term are used to predict number of daily kitten conceptions. Square terms are included so that curvilinear effects can be modeled.

Results

Figure 1 displays the number of estimated cat conceptions by day of the year (Jan.1=1, Dec.31=361) with color representing temperature. The maximum number of conceptions in a day was 32,(which occurred twice) at average daily temperatures of 44.5 and 38 degrees fahrenheit on both days.

Table 1 presents the results of the multiple regression analysis. Results show curvilinear effect of both day of the year and average temperature. Day of the year controlled for temperature was found to be more of a predictive factor than temperature controlled for day of the year, which has a negative correlation with number of conceptions per day

Table 1

Variable	Regression coefficient	Standard error	P-value
Intercept	7.017	0.556	<0.001
Day of Year	0.004	0.005	0.388
Day of Year squared	-0.000067	0.000013	<0.001
Average temperature	0.0134	0.0236	0.569
Avg temperature squared	-0.00044	0.0002	0.0251

Figure 1

Estimated conceptions per day faceted by year and average temperature
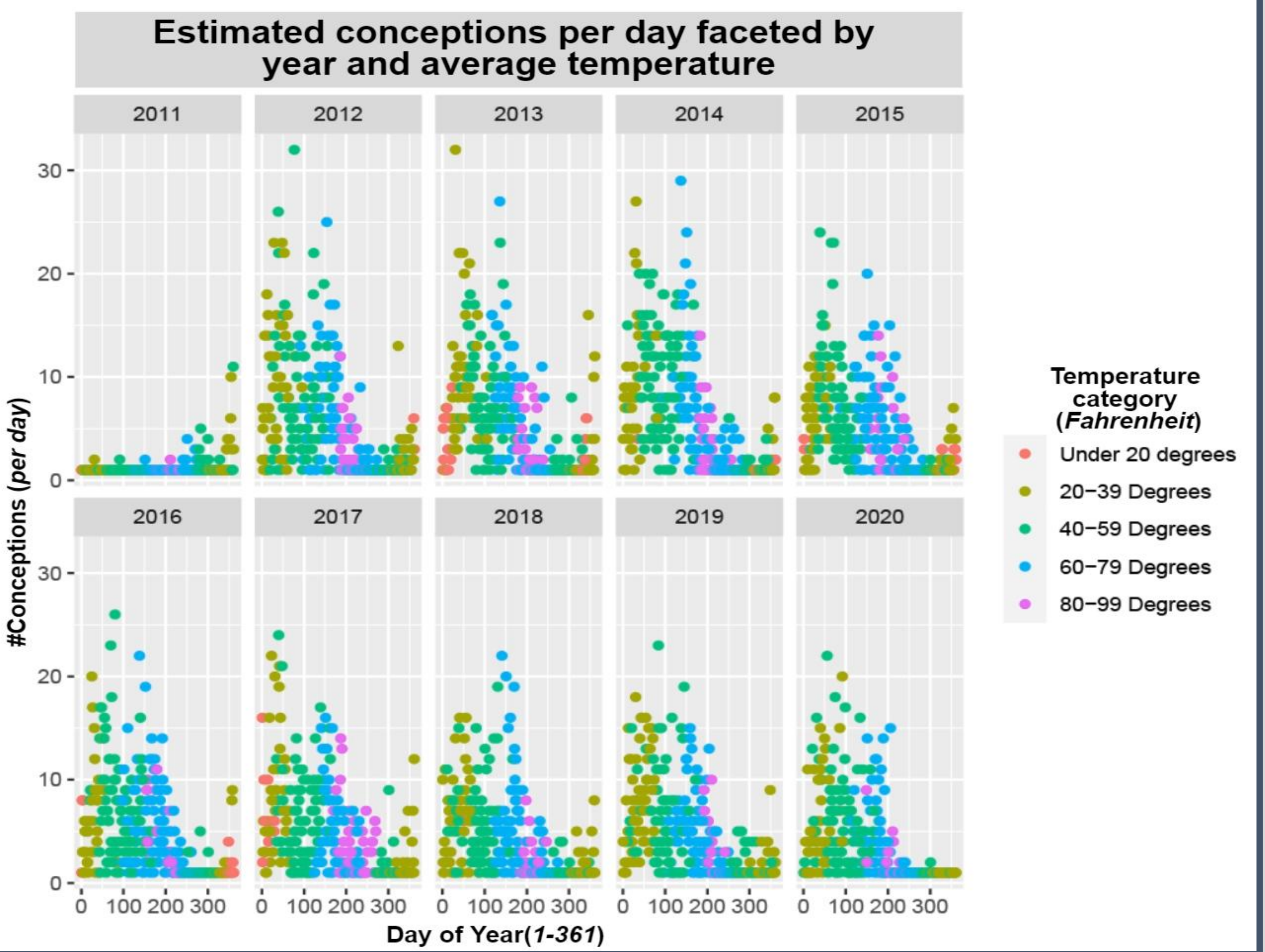
Conclusion

In Figure 1, it can be seen that the most kittens are conceived from roughly late December to early July.
The original hypothesis for this project was that increasing temperature would increase the amount of kittens conceived, and thus, born.
Data analysis showed that increasing temperature instead causes less kittens to be conceived, and that day of the year was more of a predictive factor in this data.

Discussion

The implications from this analysis mean that future temperature rise could cause less feral cats to be born, not more, and that there is an underlying process for why day of the year is a predictive factor which could be a possible route of future research on this topic.

References

1. Arlington, K. (2016, February 8). *Longer breeding seasons, more kittens: Are cats reacting to climate change?.* The Sydney Morning Herald. https://www.smh.com.au/national/nsw/longer-breeding-seasons-more-cats-are-cats-reacting-to-climate-change-20160208-gmo5bl.html#:~:text=When%20Kristina%20Vesk%20started%20working,from%20strays%20and%20feral%20cats
2. Bronson, F. H. (2009, November 27). *Climate change and seasonal reproduction in mammals.* Philosophical transactions of the Royal Society of London. Series B, Biological sciences. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2781850/
3. Digangi, B. (2019). Aging kittens - aspcapro. https://www.aspcapro.org/sites/default/files/aspcapro-aging-kittens-2019.pdf
4. DiGangi BA;Graves J;Budke CM;Levy JK;Tucker S;Isaza N; (n.d.). *Assessment of body weight for age determination in Kittens.* Journal of feline medicine and surgery. https://pubmed.ncbi.nlm.nih.gov/30982390/