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## P4\_7 It's a Man Eat Man World

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### Abstract

In this paper we calculated how long the human race would last if it resorted to cannibalism and only cannibalism. We took into account how many calories a human is comprised of, using the value for an average human male, and that each human will consume exactly 2500 calories a day in accordance with the recommended calorie intake for men. Using a decay model, we found that 1 person would be left alive after 1149 days.

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### Introduction

There are currently 7.6 billion people on Earth [1]. In this paper we present a hypothetical situation in which all food has been removed from the surface of the Earth, and humans have resorted to cannibalism in an attempt to survive. We will calculate how long the human race could survive if it had to resort to cannibalism and eat only human flesh.

### Theory

The total amount of calories in the edible parts of an adult male human body sum to 125822.25 calories, assuming only the body parts asterisked in table 1 of reference [2] can be consumed. For simplicity, we shall assume that this is the same calorie amount for every one of the 7.6 billion people on Earth irrespective of height, sex or weight as there is no data on the calorific content of other body types. A second assumption is that the population of Earth does not change for any reason other than people being eaten. We shall also assume that the average number of calories consumed per person per day is that of an average adult male: 2500 calories, mean-

ing that 1 human body feeds 50 people a day. Each day, therefore, the population of the world will decrease to  $50/51^{th}$  of its size compared to the day before. We can calculate the function that models this scenario as follows, given it will follow an exponential decay:

$$e^c = \frac{50}{51} \quad (1)$$

Therefore,

$$c = \ln\left(\frac{50}{51}\right) \quad (2)$$

Hence,

$$e^{xc} = \frac{y}{N} \quad (3)$$

Where  $x$  is the number of days passed;  $c$  is the decay constant;  $y$  is the number of people remaining after each day; and  $N$  is the initial world population. We can rearrange equation (3) to give the number of days it takes to reach a certain population count:

$$x = \frac{\ln\left(\frac{y}{N}\right)}{c} \quad (4)$$

In this model we have not taken into account the logistics of the situation and have assumed

that the edible body parts have been shared equally amongst everyone left on Earth, and that people will be grouped together in one place when the population is low in numbers.

## Results

To calculate how many days it would take for the population to reach just one remaining person, we set  $y$  equal to 1. The corresponding value of  $x$  is therefore 1148.9 days, or in other words, the 1149<sup>th</sup> day is when the food supply would run out. This means it would take 3.1 years for there to be 1 person remaining with no food left.

We plotted the exponential decay function onto a graph to show how the number of people still alive varies with time over the 1148.9 days.

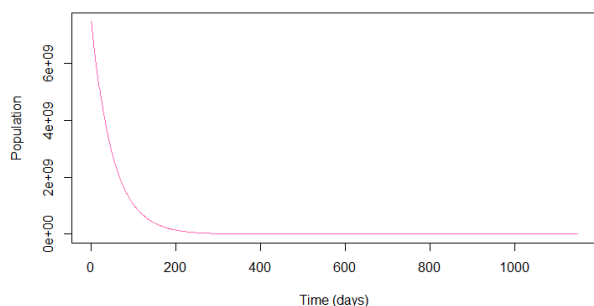


Figure 1: Graph showing the population decrease due to cannibalism over time.

Using equation (4), we calculate that it would take 35 days for humanity's population to decrease by half, and by the 451<sup>st</sup> day only 1 million would remain. As the population approaches 1, the number of people being eaten dramatically slows, as shown in figure 1. It would take 116 days to go from 10 people left alive to just 1, which is found by substituting  $y = 10$  and  $y = 1$  into equation (4).

## Discussion

In reality, there would be other factors to take into account when calculating how many days it would take for the human race to eat itself to death. To make the model more accurate, you

would need to account for the different calorie outputs of women and children, and the lower calorie intake they require. This would not be the same as the values given above (125822.25 and 2500 calories respectively) which are for an average human man. However, it is reasonable to expect the ratio between the calorific content of a person's body and the required calorie intake is similar between all persons, regardless of sex. For this reason we can expect the model to be reasonably accurate in this respect. Rationing would increase the amount of time humanity could survive, however, people getting less than their required food intake would eventually impact their bodies nutritional value.

We have also assumed that all of the food is being shared equally. If instead, a small number of people gathered and stored all of the others, they could potentially last decades.

## Conclusion

Constructing an exponential decay model for the amount of time it would take for the human race to eat itself, we found that the last human would be left alive after 1148.9 days, which corresponds to just over 3 years. Having an all-meat diet would have no adverse affect on your health provided you ate a variety of components from the food source, e.g. liver or kidneys [3]. However, you would be at risk from contracting Prion diseases, which you get from eating human brains [4].

## References

- [1] <http://www.worldometers.info/world-population/> [Accessed 5/11/17]
- [2] <https://www.nature.com/articles/srep44707> [Accessed on 5/11/17]
- [3] Walter S. McClellan, Eugene F. Du Bois. (1930) Prolonged Meat Diets with a Study of Kidney Function and Ketosis <http://www.jbc.org/content/87/3/651.full.pdf+html>
- [4] <https://www.cdc.gov/prions/index.html>[Accessed on 5/11/17]