Practicum 2: Random Variables in Life

January 1, 2017

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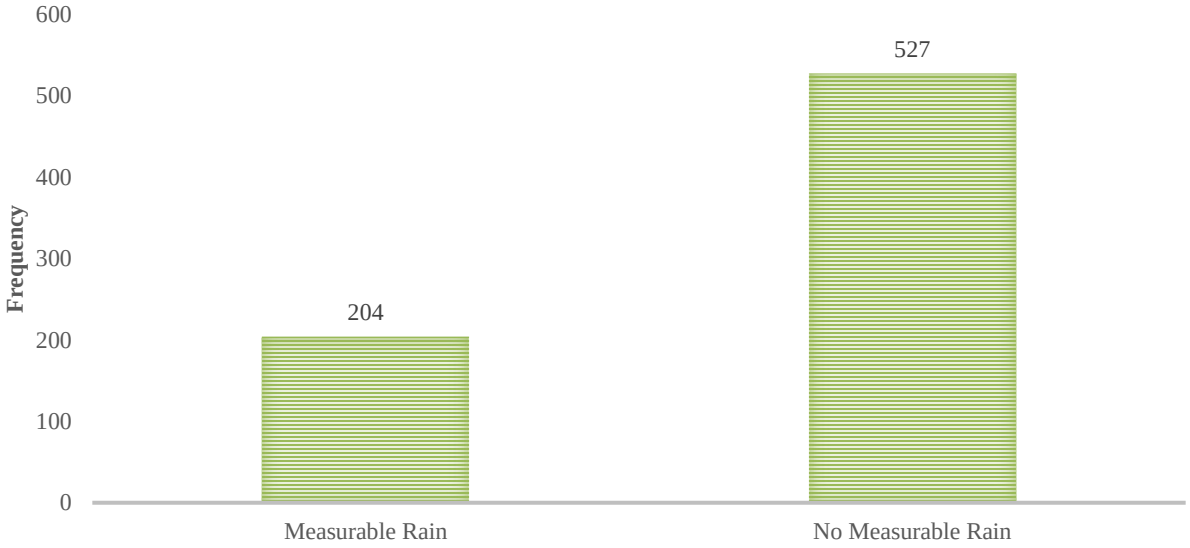
Variable 1: Rain

The rain variable has only two possible values: Measurable Rain and No Measurable Rain. As such, this will be a Binomial random variable. The following bar plot illustrates this.

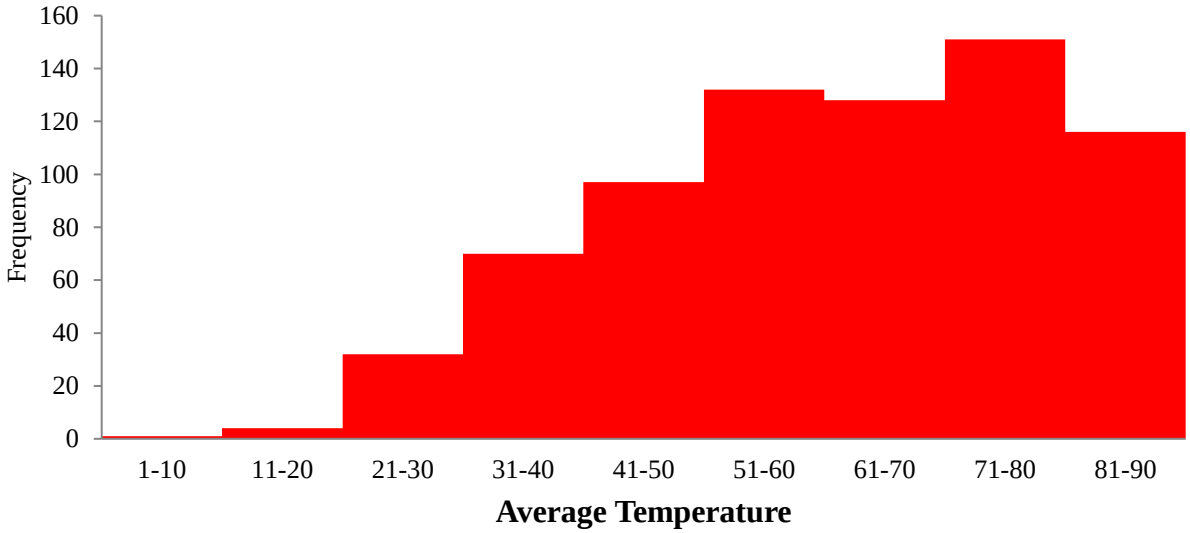


The two parameters of a Binomial distribution are n and p. Here, n=1 for each day. In general, p is the success probability. The estimate for that is the proportion of rainy days, which is 0.27907. With this information, the correct distribution is

$$\text{Bin}(n=1, p=0.27907)$$

Variable 2: Average Temperature

The average temperature variable is continuous. Thus, it could be Uniform, Exponential, or Normal. The histogram is provided here.

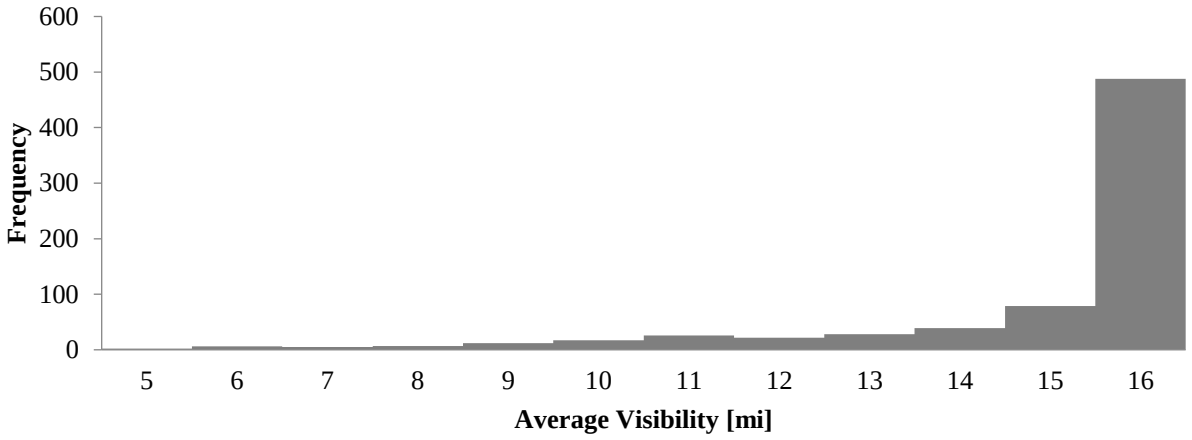


Note that it is definitely not Uniform or Exponential. There is a mound shape to it, even if it is not symmetrical. Thus, while it is not exactly Normal, it is approximately so. The Normal distribution has two parameters, μ and σ. From the data, the mean is 61.46 and the standard deviation is 17.48. Thus, the *closest* distribution available for the average temperature is

$$\text{Normal}(\mu=61.46;\ \sigma=17.48)$$

Variable 3: Average Visibility

The average visibility variable is continuous. Thus, it could be Uniform, Exponential, or Normal. The histogram is provided here.



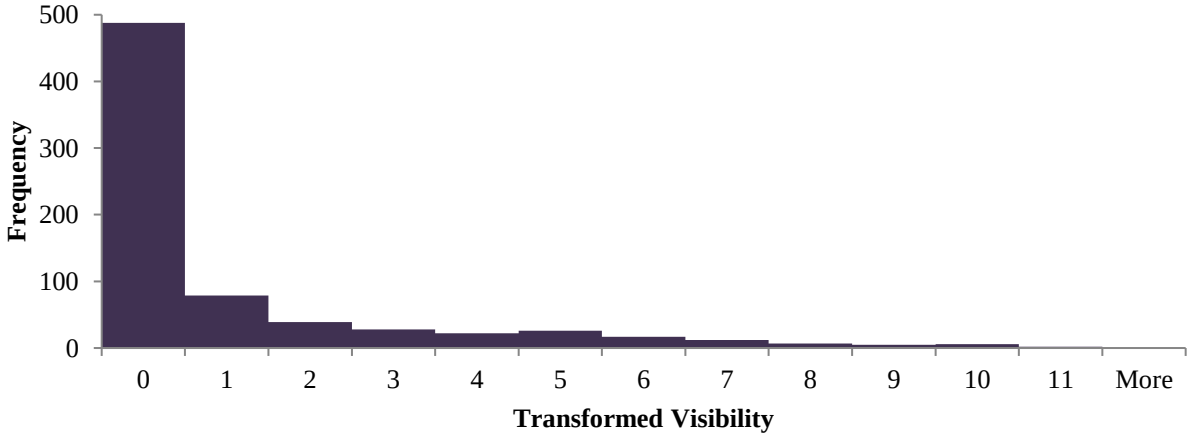
It definitely does not appear to match any of the three continuous variables provided. It is not Uniform. It is not Normal, as there is no hump to it. It looks a little Exponential, but the tail is in the wrong direction. Here are these three distributions applied to this data:

$$\text{Unif}(5, 16)$$

$$\text{Exp}(\lambda=1/14.87)$$

$$\text{Normal}(\mu=14.87;\ \sigma=2.17)$$

Perhaps we could transform the data to get one of the three distributions. If V is the average visibility measured, then 16 – V has this histogram:



This definitely looks like an Exponential distribution. Thus, $16 - V \sim \text{Exp}(\lambda=1/1.13)$ or

$$V \sim 16 - \text{Exp}(\lambda = 0.883)$$