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# **Understanding the Z-Score Distribution in Hypothesis Testing**

The fallacy in educating people in statistics is always failing to articulate the way graphs diagrams or data are derived whilst assuming that the student already understands this. A deep dive into the complications of a Z-score distribution curve is outlined in this short paper.

Formula: How to calculate Z-Score for several sample means

# **Case Study For Visualization purposes**

Imagine one is presented with the problem of performing a hypothesis test to determine if the systolic arterial pressure from 36 patients (considered a sample) differed from the population mean of 120. A good demonstration will be done using 5 tuples.

|  |  |  |
| --- | --- | --- |
| **Systolic Pressure** | **Population Systolic Pressure** | **Technical Explanation** |
| 112 | 120 | Each pressure point is now considered a sample mean; 112 represents an unknown sample |
| 113 | 120 | Each pressure point is now considered a sample mean; 113 represents an unknown sample |
| 114 (Mean=Median) | 120 | Each pressure point is now considered a sample mean; 114 represents an unknown sample |
| 115 | 120 | Each pressure point is now considered a sample mean; 115 represents an unknown sample |
| 116 | 120 | Each pressure point is now considered a sample mean; 116 represents an unknown sample |

The Z-score distribution is derived from each data point and each data point is the mean of an assumed sample. In reality, the assumed sample means (pseudo-means) are just individual data points assumed to be group means. The 0.05 alpha level then represents 5% of the data points or pseudo-means.

This is complicated even more because the mean of the sample means or pseudo-means (114) is then used to calculate a Z-score that will be used in hypothesis decisions. This seems like an easy realization but it is not the case.

# **Conclusion**

A rather simple paper that expounds on what happens behind the scenes when performing a t-test. A t-test can be performed against 0 or against a pre-determined population mean. This paper forms the basics of hypothesis testing when comparing sample means to a population mean. In short when a hypothesis test is performed based on the scenario above, one should be able to decide whether samples (sample means) when averaged differ significantly or non-significantly from the population mean.