A120 Statistical Methods for Determination of Sample Sizes: The Binomial Distribution

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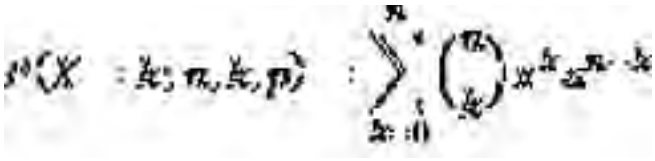
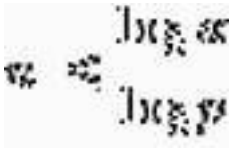
After attending this presentation, attendees will be able to explain each of the variables in the binomial distribution, calculate the sample size required for a given confidence level and percent of samples positive, and relate the sample size calculated with the binomial distribution to that calculated with the hypergeometric distribution.

This presentation will impact the forensic science community by presenting an explanation of the binomial distribution at a level appropriate for expert witness testimony in court, providing an understanding that will make it more easily accessible for use in laboratories.

Statistical methods for choosing sample sizes from large populations of items currently are rarely used in forensic laboratories, largely because they are difficult to explain to juries. One such method, the binomial distribution, is explained from the derivation of the basic form through its use in contexts where the sample size is the unknown. The equation for the binomial distribution is presented below.



This equation reduces down to:



Where n is the is the sample size, α is the confidence, and *p* is the fraction of positives in the population. When calculating the sample size with the binomial distribution, the sample size is not a factor in the calculation.

Unlike the commonly used statistical examples such as a jar of marbles containing known proportions of red and blue marbles, the proportion of drugs (say, cocaine) in a seizure is not known for certain. However, it is possible to make guesses as to the proportion of cocaine in the seizure and confirm or deny that guess with a previously-decided degree of certainty. For example, common choices when the binomial method is used are being 95% certain that 90% of the seizure is cocaine.

The binomial distribution method is also compared with another statistical method, the hypergeometric distribution. The sample sizes are plotted for the two methods. The binomial distribution is found to sometimes result in larger sample sizes, but to have other advantages that may counterbalance this difference, depending on laboratory needs. **Sampling, Statistics, Binomial**

 ** Presenting Author*