

# WISE Sampling Distribution of the Mean Tutorial

## Exercise 1: How accurate is a sample mean?

**Q1. What is the probability that a randomly selected American adult has a Life Satisfaction score within 30 points of the population mean (i.e., in the range 470 and 530)?**

Estimate of answer

Exact answer

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### Sampling distribution of the mean: $N=100$

Draw 10 samples of size  $N=100$ , and record their sample means below.

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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How many of your 10 sample means fell outside of the range 470 to 530?

Now in terms of their means and variability, describe in the box below how this sampling distribution of the mean for  $N=100$  compares to the distribution of scores in the population (click **Show population**).

**Q2. What is the probability that a randomly selected sample of  $N=100$  American adults has a mean Life Satisfaction score within 30 points of the population mean (i.e., between 470 and 530)?**

Estimate of the answer.

Exact answer

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### Sampling distribution of the mean: $N=25$

Draw 10 samples of size  $N=25$ , and record their sample means below.

<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
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How many of your 10 sample means fell outside of the range 470 to 530?

In the box below describe how this sampling distribution of the mean (for  $N=25$ ) compares to the sampling distribution of the mean for  $N=100$ . Be sure to consider the variability of sample means (i.e., the standard error of the sampling distribution of the means).

**Q3. What is the probability that a randomly selected sample of  $N=25$  American adults has a mean Life Satisfaction score within 30 points of the population mean?**

Estimate of the answer

Exact answer.

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### Sampling distribution of the mean: $N=5$

Draw 10 samples of size  $N=5$ , and record their sample means below.

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How many of your 10 sample means fell outside of the range 470 to 530?

In the box below describe how this sampling distribution of the mean (for  $N=5$ ) compares to the sampling distribution of the mean for  $N=100$ .

**Q4. What is the probability that a randomly selected sample of  $N=5$  American adults has a mean Life Satisfaction score within 30 points of the population mean?**

Estimate of the answer?

Exact answer?

## In Conclusion

**Q5. Complete the following table and then comment on the relationship between sample size and the expected accuracy of a sample mean:**

Sample size	Probability that a sample mean differs from the population mean by more than 30 points
100	0.2%*
25	<input type="text"/> %
5	<input type="text"/> %

**\*In Q2 we determined that there is a 99.8% chance that the mean of a sample of  $N=100$  will be within 30 points of the population mean. Thus, the probability that a mean for a sample with  $N=100$  will differ from the population mean by more than 30 points is  $100\% - 99.8\%$ , or  $0.2\%$ . You can use your findings in Q3 and Q4 to calculate the values for samples of  $N=25$  and  $N=5$ .**

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Your researcher friend says "we know that for any population, the best estimate of the mean is the sample mean -- therefore, it shouldn't matter what size sample I use, right? Since that is the case, I'll use a sample of  $N=5$  as this will save a good deal of time and money." What do you tell your friend? In your answer in the box below, include information from the questions you have just completed.