

# Statistics I: An Introduction to Statistical Reasoning

## Course Description

Recognizing that data and variability impact our daily decisions, *Statistics I: An Introduction to Statistical Reasoning* focuses on developing statistical literacy through an investigative process of problem-solving and decision-making. Students participate in the statistical process by formulating questions, analyzing data, and interpreting results, learning to become critical consumers of statistical information. The course introduces students to descriptive and inferential statistics. Topics include statistical distributions, linear regression and correlation, surveys and experiments, sampling distributions, probability, confidence intervals and hypothesis testing. A variety of statistical tools and software are used to explore concepts and deepen students' conceptual understanding of the topics. Social-emotional learning (SEL) strategies are integrated to foster a supportive and collaborative classroom environment, helping students build resilience, confidence, and effective communication and academic skills while mastering mathematical concepts. This course is offered for high school and college credit through the Early College program at the Community College System of New Hampshire. This course can be taken through all 3 CCSNH Early College modalities, including Early College At Your School, Early College On a College Campus, and Early College Online.

## Course Learning Outcomes

By the end of the course, students will be able to:

- ✚ (Technology) Select and use available technology to perform routine computations and to explore, simulate, analyze, and illustrate abstract statistical processes and solve statistical problems.
- ✚ (Statistical Process) Formulate statistical questions that anticipate variability, investigate data collection methods that acknowledge variability, use distributions to analyze data, allow for variability when interpreting results, and quantify variability.
- ✚ (Statistical Process) Interpret and critique statistical results in context from a variety of publications, distinguish between observational and experimental studies, identify and determine sources of bias and confounding, and determine when results can be generalized to a population and when the results of a study can be used to establish causal relationships.

- ✿ **(Descriptive Statistics)** Identify, interpret, and construct a variety of numerical and statistical distributions from real data to convey meaning and answer statistical questions.
- ✿ **(Descriptive Statistics)** Calculate and interpret measures of central tendency and dispersion, determine which measures of center and spread are appropriate by analyzing the shape of a distribution, and evaluate the influence of outliers on these measures.
- ✿ **(Probability)** Apply basic probability theory and rules to describe variation, to solve problems involving the Normal Distribution and various probability distributions, and to determine statistical significance.
- ✿ **(Sampling Distributions and CLT)** Generate sampling distributions for a variety of summary statistics to make inferences and illustrate, explain, and apply the Central Limit Theorem.
- ✿ **(Confidence Intervals and Hypothesis Testing)** Calculate and interpret confidence intervals for proportions and means and conduct and perform hypothesis testing to determine the statistical significance of results and to make appropriate statistical inferences.
- ✿ **(Regression and Correlation)** Create, interpret, and analyze scatter plots and produce a linear regression model to identify the strength of association of a linear trend and make predictions, if appropriate, and identify situations where correlation does not imply causation.