

# Unlocking Statistics:

## *From hypothesis to outcome*

### Online course learning objectives

This course will introduce learners to the principles behind the many statistical practices, including sampling, variables and inference and showing how these concepts fit into the research design process. It helps to build a mental map to enable students to work their way through tests and procedures.

#### **This course will help learners to:**

- Identify and recognize the different types of variables and the factors involved in choosing types of variables
- Interpret and summarize a set of values of a variable
- Identify relationships between variables in graphs
- Ask the right questions about relationships and describe them between variables, their existence, their sign and their strength
- Identify how the process of sampling determines the degree of uncertainty they will have in their result
- Choose a suitable form of sampling for their own projects, evaluating the degree of uncertainty in their chosen form of sampling
- Describe what happens to uncertainty in statistical analysis
- Apply a null hypothesis test, evaluate the results and recognize the limitations of null hypothesis testing
- Select the appropriate statistics test for their research, explain the logical structure of a statistics test and results and report these results

**Language:** English

**Time to complete:** 6 hours

**Level:** Beginner

**Instructor:** Professor Roger Watt

### Online course full syllabus

#### **MODULE ONE: VARIABLES**

In this module we will cover what variables are, different types of variables, and how to choose them.

Topics:

1. What are Variables?
2. Types of Variables
3. Choosing Variables
4. The Big Picture

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### **MODULE TWO: VALUES AND SUMMARIES OF VARIABLES**

In this module, the key concept concerns the values that a variable can take. Sometimes they are just labels for different categories or situations, sometimes they can be numbers for variables that can be quantified.

Topics:

1. Values for Variables
2. Values and Variable Type
3. Distributions of Values
4. Summarizing Distributions
5. The Big Picture

### **MODULE THREE: RELATIONSHIPS BETWEEN VARIABLES**

In this module we will identify and describe relationships between variables in graphs and ask the right questions about relationships.

Topics:

1. What is a Relationship Between Variables?
2. Using Graphs to Show Relationships
3. Variable Types and Relationships
4. Describing Relationships
5. The Big Picture

### **MODULE FOUR: SAMPLING**

In this module we will look at how we can use samples in statistics. The sample stands in for the population—in other words it represents it—and so we will learn how to choose a suitable sample that represents the whole population.

Topics:

1. Samples vs Populations
2. Types of Sampling
3. Uncertainty in Sampling
4. Errors in Sampling
5. The Big Picture

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## **MODULE FIVE: INFERENCE AND THE NULL HYPOTHESIS**

In this module we look at one very common form of inference that is designed specifically to provide an (uncertain) answer to the question of whether a relationship exists between two variables.

Topics:

1. Hypothesis Testing
2. Null Hypothesis Testing
3. Understanding the Null Hypothesis Test
4. Possible Outcomes of Null Hypothesis Testing
5. Inferential Errors: Warning
6. A New Logic
7. The Big Picture

## **MODULE SIX: DOING TESTS AND REPORTING RESULTS**

In this final module, we provide you with a guide to the practicalities of which statistics test you should use and how to report the result. The two types of variables involved are what determines the appropriate test to do.

Topics:

1. The Practical Process of Statistical Testing
2. Getting the Result
3. The Specific Statistical Tests
4. The Big Picture: Reporting the Result