

The Language of Statistical Decision Making

Lecture 2 Section 1.3

Robb T. Koether

Hampden-Sydney College

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Outline

The Language
of Statistical
Decision
Making

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Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

- 1 Populations and Samples
- 2 Inferences
 - Example
- 3 Hypotheses
 - Example
- 4 Statistical Significance
 - Example
- 5 Assignment

Study: Low-Carb Diets

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

- Article

Study: Low-carb diet gets best results

- What is the relevant information here?
- What is known to be true and what is conjecture?
- Are there any weaknesses to this study?

Populations and Samples

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Definition (Population)

The **population** is the set of all individuals *of interest* to the study.

Definition (Sample)

A **sample** is a set of individuals in the population from which data were obtained. Their characteristics were observed or measured.

Inferences

The Language
of Statistical
Decision
Making

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Koether

Populations
and Samples

Inferences

Example

Hypotheses

Example

Statistical
Significance

Example

Assignment

Definition (Statistical inference)

A **statistical inference** is a conclusion that is drawn about the population, based on what was observed in the sample.

Samples and Inferences

The Language
of Statistical
Decision
Making

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Koether

Populations
and Samples

Inferences

Example

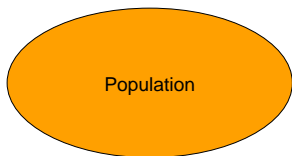
Hypotheses

Example

Statistical
Significance

Example

Assignment



Samples and Inferences

The Language
of Statistical
Decision
Making

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Koether

Populations
and Samples

Inferences

Example

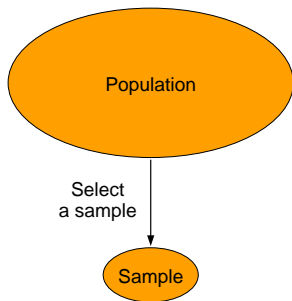
Hypotheses

Example

Statistical
Significance

Example

Assignment



Samples and Inferences

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences

Example

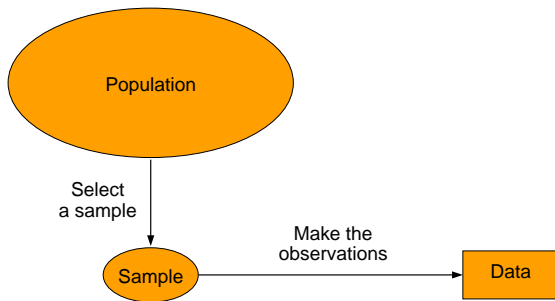
Hypotheses

Example

Statistical
Significance

Example

Assignment



Samples and Inferences

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences

Example

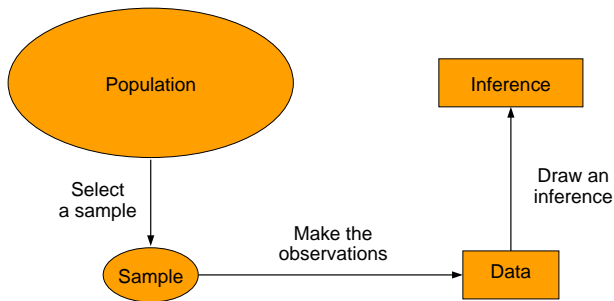
Hypotheses

Example

Statistical
Significance

Example

Assignment



Samples and Inferences

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences

Example

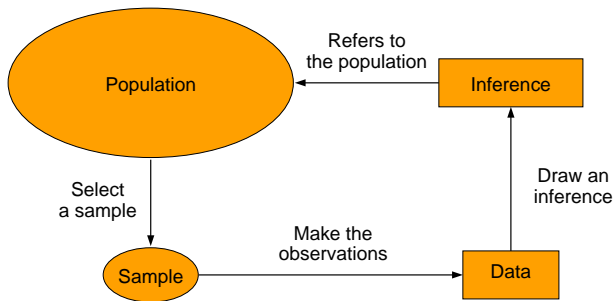
Hypotheses

Example

Statistical
Significance

Example

Assignment



Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Samples and Inferences)

- Is the earth getting warmer?
- How can we tell?

Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

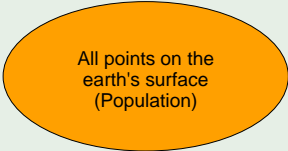
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Samples and Inferences)



All points on the
earth's surface
(Population)

Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

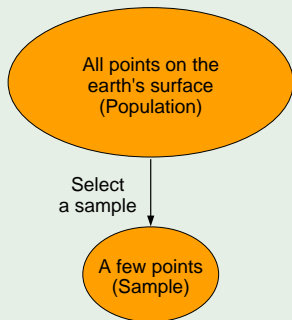
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Samples and Inferences)



Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

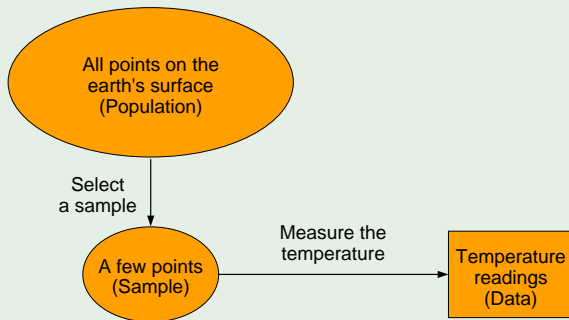
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Samples and Inferences)



Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

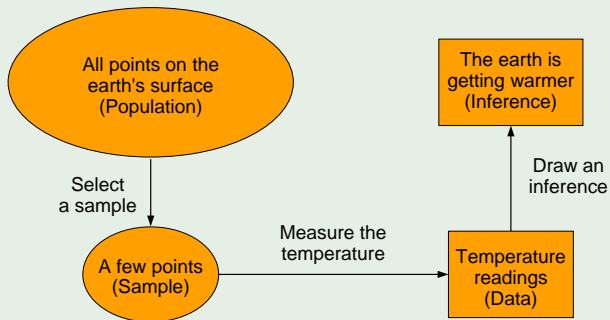
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Samples and Inferences)



Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

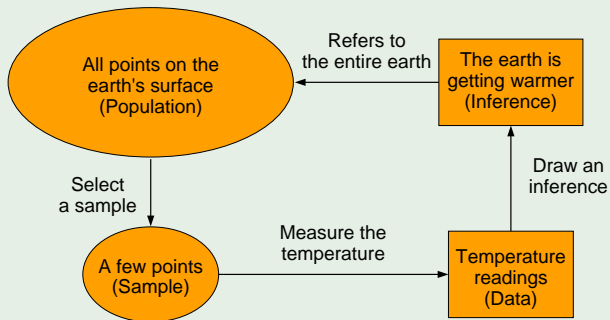
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Samples and Inferences)



Hypotheses

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Definition (Hypothesis)

A **hypothesis** is often a statement that is proposed to explain a phenomenon that is known to be true.

- In statistics the phenomenon is that which was observed in the sample.
- The hypothesis is a statement about the population that explains the phenomenon.

Hypotheses

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

- Suppose we observe that when we roll a die, the number 6 comes up unusually often.
- One hypothesis could be that the die is not properly balanced, thereby making the number 6 more likely.
- What is another plausible hypothesis?

Null Hypothesis

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Definition (Null Hypothesis)

The **null hypothesis** is the conventional belief about the population, or the status quo, or the neutral position.

- It requires no special justification.
- That is, it receives the benefit of the doubt.

Alternative Hypothesis

The Language
of Statistical
Decision
Making

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Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Definition (Alternative (Research) Hypothesis)

The **alternative hypothesis** is an alternative to the null hypothesis.

- It requires evidence for its justification.
- That is, it bears the burden of proof.

The Language
of Statistical
Decision
Making

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Koether

Populations
and Samples

Inferences

Example

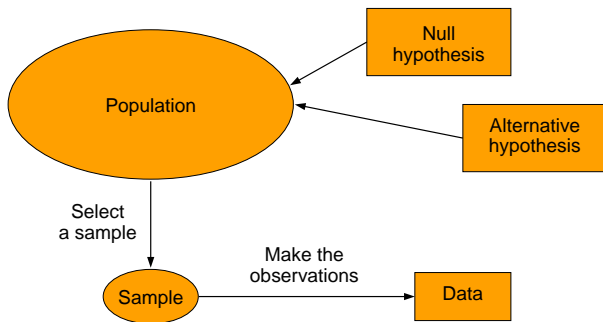
Hypotheses

Example

Statistical
Significance

Example

Assignment



The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences

Example

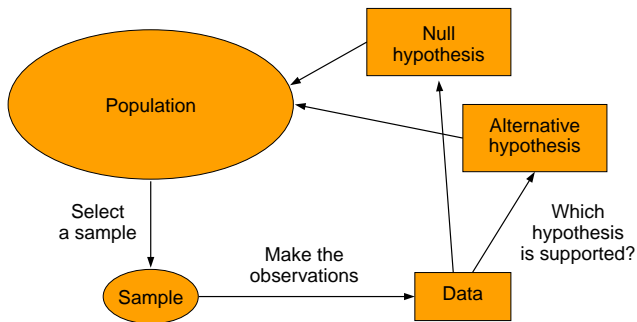
Hypotheses

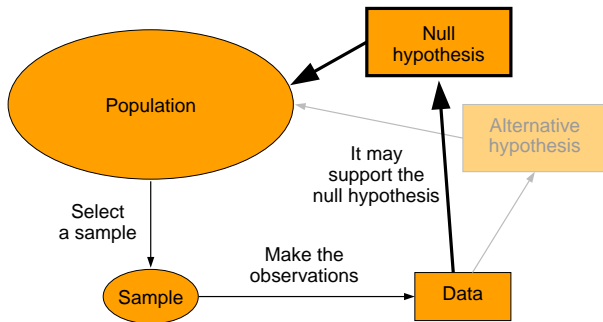
Example

Statistical
Significance

Example

Assignment





The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences

Example

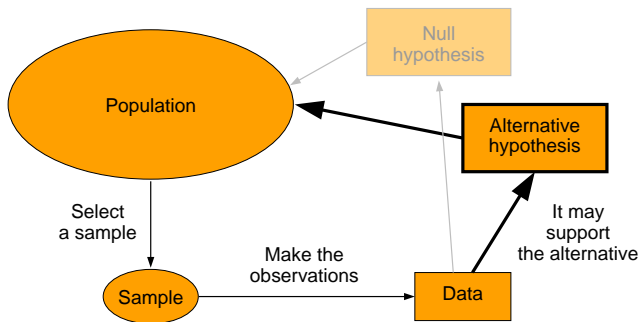
Hypotheses

Example

Statistical
Significance

Example

Assignment



Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

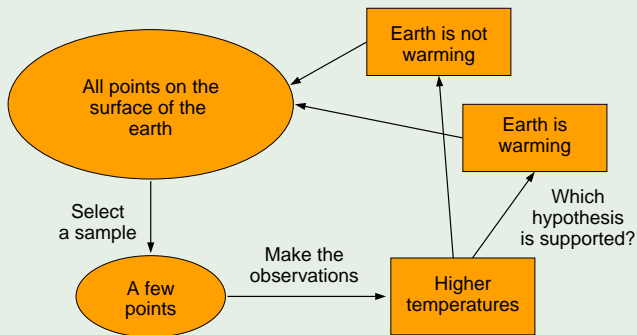
Assignment

Example (Null and Alternative Hypotheses)

- In the case of global warming, what are the null and alternative hypotheses?
- What evidence would support the alternative hypothesis?
- What evidence would be *consistent with* the null hypothesis?

Example

Example (Null and Alternative Hypotheses)



The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

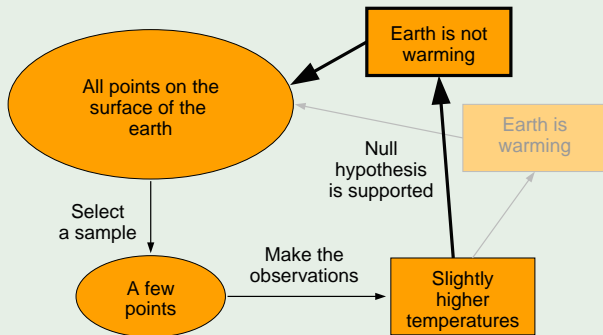
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Null and Alternative Hypotheses)



Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

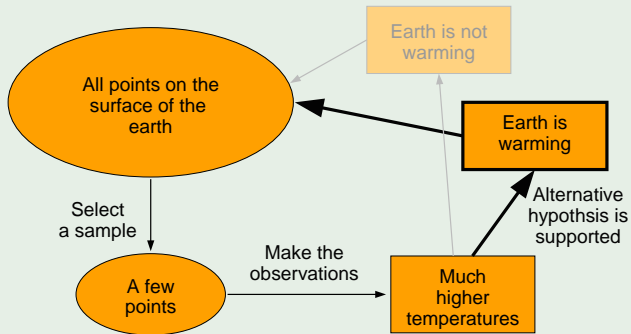
Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Null and Alternative Hypotheses)



Statistical Significance

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Definition

The data are called **statistically significant** if their deviation from what would be expected under the null hypothesis is too great to be attributed to sampling error.

Example

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Example (Statistical Significance)

- In the global warming example, an increase in the sample of 0.1°F may not be statistically significant if it could be attributed to sampling error.
- An increase of 5°F most likely would be statistically significant as it could not be attributed to sampling error.

Assignment

The Language
of Statistical
Decision
Making

Robb T.
Koether

Populations
and Samples

Inferences
Example

Hypotheses
Example

Statistical
Significance
Example

Assignment

Homework

- Read Section 1.3 - 1.3.2, pages 4 - 11.
- Let's Do It! 1.1, 1.2, 1.3, 1.4.
- Page 67, exercises 1 - 3.