Hypothesis in Statistics

Definition, Types, Variables, and Examples

Definition

- A hypothesis is a testable statement or assumption about a population parameter (such as mean, proportion, or relationship between variables). It is tested using sample data through statistical methods. In short: A hypothesis is a prediction we check with evidence.

Simple Hypothesis

- Definition: States a relationship between only two variables.

- Variables:
- - Independent: Gender (male/female)
- - Dependent: Height (cm)

- Example:
- - H0: Average height of male students = 170 cm
- - H1: Average height of male students ≠ 170 cm

Complex Hypothesis

- Definition: States a relationship between more than two variables.

- Variables:

- - Independent: Study Hours/day, Sleep Hours/night

- - Dependent: Exam Score (%)

- Example:

- - H0: Exam scores are not affected by study hours and sleep hours

- - H1: Students who study >3 hours and sleep 7–8 hours score >80%

Null Hypothesis (H0)

- Definition: Assumes no relationship or no effect between variables.

- Variables:

- - Independent: Teaching Method (traditional vs. digital)

- - Dependent: Test Score

- Example:

- - H0: Mean test score of traditional method = Mean test score of digital method ($\mu1 = \mu2$)

Alternative Hypothesis (H1)

- Definition: Contradicts the null; states that a relationship or effect exists.

- Variables:

- - Independent: Teaching Method (traditional vs. digital)

- - Dependent: Test Score

- Example:

- - H1: Mean test score of traditional method ≠ Mean test score of digital method ($\mu1 \neq \mu2$)

Statistical Hypothesis

- Definition: Any hypothesis that can be tested statistically (includes both H0 and H1).

- Variables:

- - Parameter: Population mean weight of apples (μ)

- Example:

- - H0: $\mu = 150$ g (average apple weight is 150 g)

- - H1: $\mu > 150$ g (average apple weight is greater than 150 g)

Summary Table

- Simple Hypothesis: 2 variables | Example: H0: Mean male height = 170 cm

- Complex Hypothesis: >2 variables | Example: Study >3 hrs & Sleep 7–8 hrs → Score >80%

- Null Hypothesis: No effect | Example: $\mu 1 = \mu 2$

- Alternative Hypothesis: Effect exists | Example: $\mu 1 \neq \mu 2$

- Statistical Hypothesis: Testable with statistics | Example: H0: $\mu = 150$ g, H1: $\mu > 150$ g