HYPOTHESIS

What is a hypothesis?A hypothesis:

- consists of a prediction that can be tested by the data collected from fieldwork.
- is expressed as a statement and can be rejected or accepted.

What makes a GOOD hypothesis?

There are a number of considerations that must be taken into account in order to make a hypothesis as strong as possible:

- **It must be plausible.**

  ➢ This means that the hypothesis should be a possible answer for your query and you would like to find out if it's true. If you already know from the start that it is or it is not possible, then it would not be considered plausible and would not stand as a good hypothesis as it defeats the testing process.

- **It must be a proposition about relationships that exist in the real world.**

  ➢ This means that the hypothesis must propose a relationship that is real and thus able to be tested. That is, it should not be contrived (forced/ artificial/ unnatural).

  ➢ E.g. "*Temperature* in areas nearer to *special rooms* is higher."

  This would not be a good hypothesis as there is no real relationship between types of classrooms and temperature. Although the types of surface or material used for the building will have an impact on the temperature, there is no real connection to the usage of the rooms or type of classroom. Unless, students' intention is to study the type of material used or type of surface, then the hypothesis must be phrased to capture the focus on type of surface or material used. As such, this hypothesis would not stand as a good hypothesis, as it would not be testable if the relationship is not real.

- **It must have clearly defined conclusions** and **specifies the relationship between the variables.**

  - This means that it must be clear of how one variable would affect another so that we will be clear in what data to collect and what we want to study or test.
  - E.g. "*Areas nearer to concrete buildings experience higher temperature*."

  Here, the hypothesis states clearly that the nearer the distance from concrete buildings, the higher will be the temperature.

- **It is must be falsifiable.**

  - This means it is able to be empirically tested (can collect data to prove)
  - and the data collected can either prove or disprove the hypothesis (can prove your statement true or untrue).

- **It must be internally consistent.**

  - This means that it must be proving what it claims to be proving and must not contain any logical or analytical contradiction.
  - E.g. "*Higher temperature causes more concrete surfaces*."

  Here, there is a relationship between the two variables – type of surface and temperature. However, this hypothesis is not logical as it should be the type of surface causing temperature to vary and not the other way round. As such, you will not be able to test it.

Example: Aliso Canyon Methane Leak of 2015-2016

Objectives: I will study the areas affected by the Porter Ranch gas leak to determine whether effects are influenced by biophysical and social phenomena

Research questions: What were the short and medium term effects of the gas leak? Why did people decide to move out, and why did people decide to stay?

Hypotheses: The number of people who moved out of Porter Ranch will decrease as distance from the gas leak increases. Methane concentrations in soil will be higher in Porter Ranch than in Northridge.

Bad and Good Examples

Bad RQ: Why does everyone want to leave Porter Ranch after the gas leak?

Good RQ: What are Porter Ranch residents' opinions towards remaining long term?

Bad hypothesis: Nobody wants to live in Porter Ranch anymore because of the gas leak

Good hypothesis: Home prices decreased more than comparable areas after the gas leak

HYPOTHESIS (IN ENGLISH)

https://labs.geog.uvic.ca/geog226/frLab5.html

https://theqgeo.com/hypothesis-testing-in-statistics-geography/

https://www.slideshare.net/aniArindam/research-hypothesis-238669229

https://www.formpl.us/blog/hypothesis-testing

Hypothesis (in Tamil)

https://www.youtube.com/watch?v=fKz3Vqven0c&list=PLKABpL9YDuJ5fh_NjetBAbTRVnSWOpO7E

https://www.youtube.com/watch?v=09cJBzXwZqk

https://www.youtube.com/results?search_query=hypothesis+in+tamil

https://www.youtube.com/watch?v=S-Zm8URENvk

A hypothesis can be defined as a tentative assumption that is made for the purpose of empirical scientific testing. A hypothesis becomes a theory of science when repeated testing produces the same conclusion.

In most cases, hypothesis testing involves the following structured sequence of steps.
The first step is the formulation of a **null hypothesis**. The null hypothesis is the assumption that will be maintained by the researcher unless the analysis of data provides significant evidence to disprove it. The null hypothesis is denoted symbolically as $\mathbf{H_0}$. For example, here is a formulated null hypothesis related to the investigation of precipitation patterns over adjacent rural and urban land-use types:
$\mathbf{H_0}$: There is no difference in precipitation levels between urban and adjacent rural areas.

The second step of hypothesis testing is to state the **alternative hypothesis** ($\mathbf{H_1}$). Researchers should structure their tests so that all outcomes are anticipated before the tests and that results can be clearly interpreted. Some tests may require the formulation of multiple alternative hypotheses. However, interpretation is most clear cut when the hypothesis is set up with only one alternative outcome. For the example dealing with precipitation patterns over adjacent rural and urban land-use types, the alternative might be:
$\mathbf{H_1}$: There is an increase in precipitation levels in urban areas relative to adjacent rural areas because of the heating differences of the two surface types (the urban area heats up more and has increased convective uplift).

Step three involves the collection of data for hypothesis testing. It is assumed that this data is gathered in an unbiased manner. For some forms of analysis that use **inferential** statistical tests the data must be collected randomly, data observations should be independent of each other, and the variables should be normally distributed.

The fourth step involves testing the null hypothesis through predictive analysis or via experiments. The results of the test are then interpreted (acceptance or rejection of the null hypothesis) and a decision may be made about future investigations to better understand the system under study. In the example used here, future investigations may involve trying to determine the mechanism responsible for differences in precipitation between rural and urban land-use types.

Inferential Statistics and Significance Levels

Statisticians have developed a number of mathematical procedures for the purpose of testing hypotheses. This group of techniques is commonly known as **inferential statistics**.

Inferential statistics are available both for predictive and experimental hypothesis testing. This group of statistical procedures allows researchers to test assumptions about collected data based on the laws of probability. Tests are carried out by comparing calculated values of the test statistic to assigned critical values.

For a given null hypothesis, the calculated value of the test statistic is compared with tables of critical values at specified significance levels based on probability. For example, if a calculated test statistic exceeds the critical value for a significance level of 0.05 then this means that values of the test statistic as large as, or larger than calculated from the data would occur by chance less than 5 times in 100 if the null hypothesis was indeed correct. In other words, if we were to reject the null hypothesis based on this probability value of the test statistic, we would run a risk of less than 5% of acting falsely.

One-tailed and Two-tailed Tests

When using some types of inferential statistics the alternative hypothesis may be directional or non-directional. A directional hypothesis (or one-sided hypothesis) is used when either only positive or negative differences are of interest in an experimental study. For example, when an alternative hypothesis predicts that the mean of one sample would be greater (but not less) than another, then a directional alternative would be used. This type of statistical procedure is known as a **one-tailed test**. A non-directional (or two-sided) hypothesis would be used when both positive and negative differences are of equal importance in providing evidence with which to test the null hypothesis. We call this type of test **two-tailed**.