

# Measurement of variations

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# Objectives

- Understand the concept of variation in biology.
- Learn methods to estimate variation in people.
- Analyze factors influencing variation in people.

# What is variation?

- Variation refers to the differences observed among individuals within a population.
- Examples: height, weight, eye color, blood type, etc.
- Variation is influenced by **genetic** and **environmental factors**.



# Types of variation

## Genetic Variation:

**Genetic variation** refers to **differences in DNA sequences** among individuals.

Genetic variation is **inherited from parents** through the transmission of genetic material.

**Example:** Variations in **eye color**, **hair texture**, and **susceptibility to certain diseases** are influenced by genetic factors.

## Environmental Variation:

**Environmental variation** arises from differences in environmental factors experienced by individuals.

Environmental factors such as **nutrition**, **climate**, **lifestyle choices**, **exposure to pollutants**, and **access to healthcare** can contribute to variation.

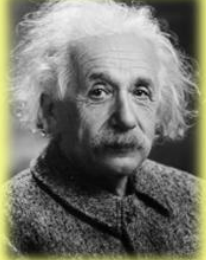


**Example:** Variation in height due to differences in nutrition during childhood.

## Combined Influence:

**Both genetic and environmental factors interact to shape the overall variation** observed in individuals.

**Example:** Individuals may inherit a genetic predisposition for a certain trait (e.g., height), but environmental factors like diet and exercise can also influence the expression of that trait.

### Genetic and Environmental Variation




Hair colour

Skin colour

Intelligence

The characteristics above are inherited (genetic), but how can the environment affect them?



# Factors influencing variation

## Genetic factors:

Traits passed down from parents to offspring through genetic material such as DNA.

Changes in DNA sequences can lead to new traits or variations within a population.

## Environmental factors:

**Nutrition:** Adequate or inadequate nutrition during crucial developmental stages can influence physical and physiological traits.

**Exercise:** Physical activity levels can impact factors like muscle mass, metabolism, and overall health.

**Socio-economic Status:** Access to resources, education, and healthcare services can affect health outcomes and contribute to variations in traits.

**Access to Healthcare:** Availability and quality of healthcare services can influence the management of health conditions and overall well-being.



# Importance of Understanding Variations

## **1.Evolutionary Studies:**

Variation provides the raw material for natural selection, driving the evolutionary process.  
Studying variation helps scientists understand how species adapt and evolve over time.

## **2.Medical Research:**

Variations in genes and traits contribute to susceptibility to diseases and response to treatments.  
Understanding variation aids in identifying genetic markers for diseases, improving diagnosis, and developing targeted therapies.

## **3.Developing Personalized Treatments:**

Recognizing individual differences allows for tailored medical interventions.  
Personalized medicine aims to optimize treatment efficacy and minimize adverse effects by considering variations in genetics, lifestyle, and environment.

## **4.Understanding Diversity in Populations:**

Variation highlights the richness and complexity of human populations.  
Appreciating diversity promotes inclusivity and informs policies addressing healthcare disparities and social equity.