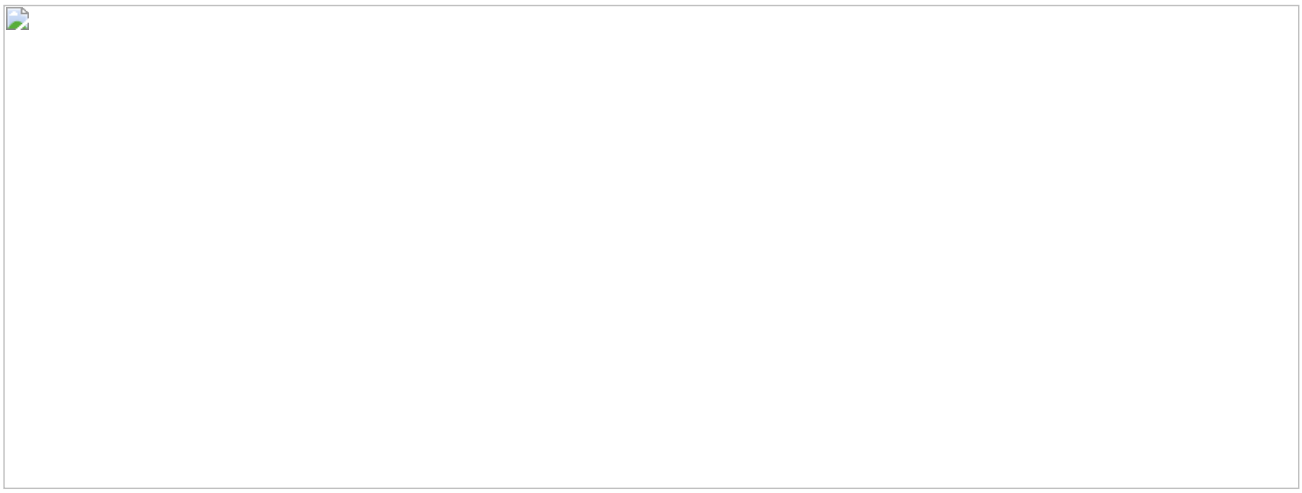
Scientific Method in Research Concept YouTube Lecture Handouts

Scientific Method in Research

Statistical methods occupy a central role in the scientific method because they allow us to suggest and test hypotheses using models *scientific method* initial attempts is to organize ideas about a subject, to the building of a theory.



- Concept: interested in describing and explaining the spatial pattern of cancer cases in a metropolitan area
- Description: begin by plotting recent incidences on a map
- Surprise: surprising results lead us to the next step on the route to explanation by forcing us to generate hypotheses
- **Hypothesis is a proposition whose truth or falsity is capable of being tested**.
- Hypothesis: Pattern of cancer cases is related to the distance from local power plants.
- **Model is more detailed, in the sense that it suggests the nature of the relationship between the variables**.
- Model: we might speculate that the likelihood of cancer declines as the distance from a power plant increases.
- Validation: we could plot cancer rates for a subarea versus the distance the subarea centroid was from a power plant. If we observe a downward sloping curve, we have gathered some support for our hypothesis
- **Models are validated by comparing observed data with what is expected**
- **Laws -** *laws* are defined as universal statements of unrestricted range. If we were to repeat our analysis **in many locations throughout a country**, and if our findings were similar in all cases, we would have uncovered an empirical generalization
- Einstein called theories 'free creations of the human mind' . Theories as collections of generalizations or laws

- If, for example, we generate other empirical laws that relate cancer rates to other factors, such as diet, we begin to build a theory of the spatial variation in cancer rates

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