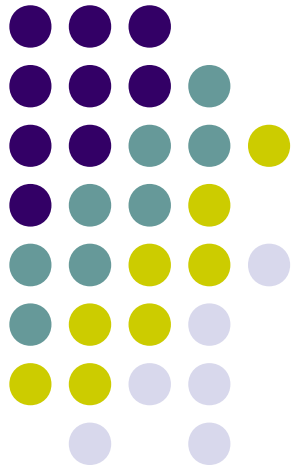
Statistics 115

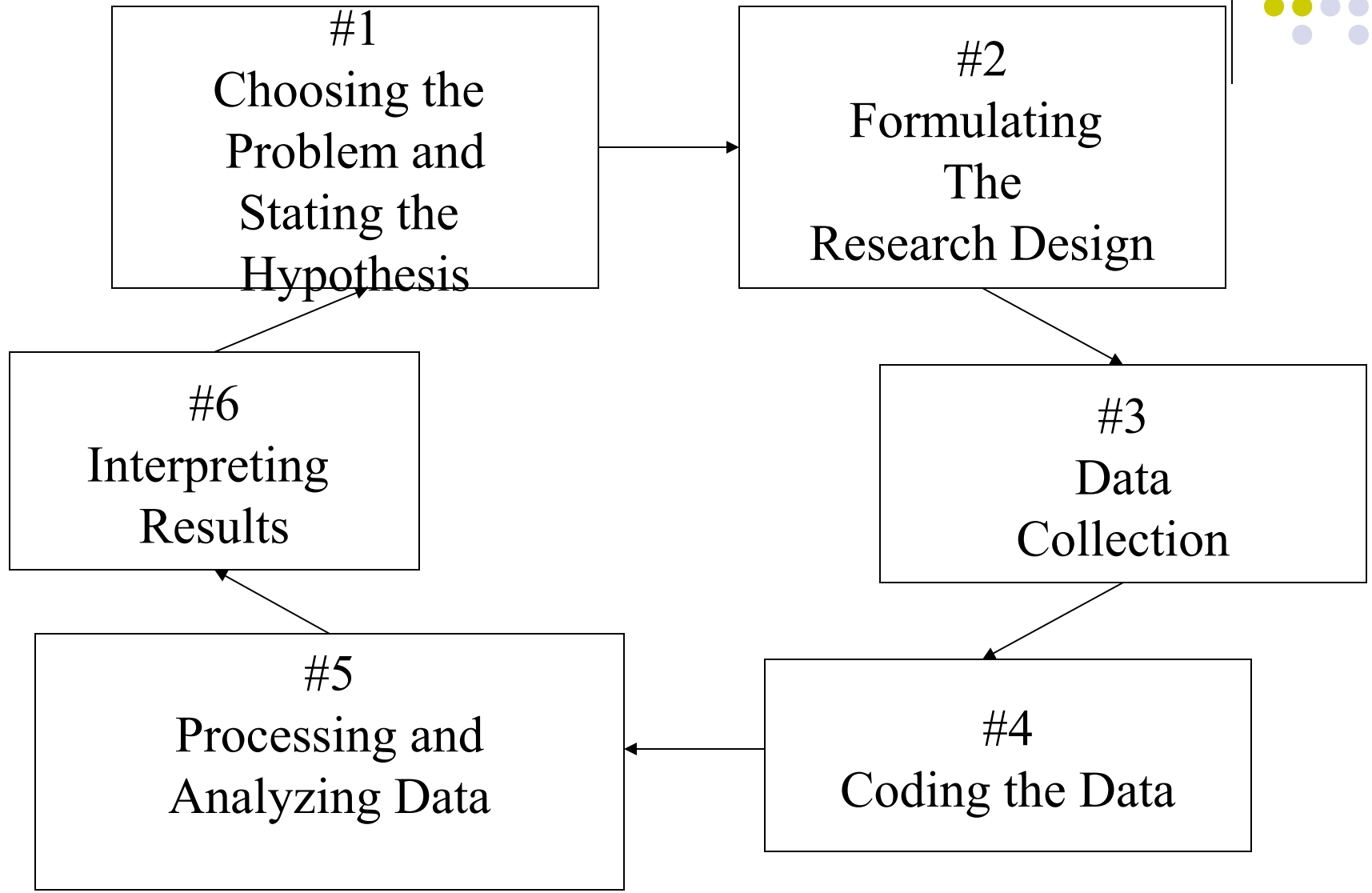


The Statistical Science

- The phrase scientific inquiry refers to a systematic process of learning.

- A scientist sets the goal of an investigation, collects relevant factual information (or data), analyzes the data, draws conclusions, and decides further courses of action.

Steps in Statistical Inquiry



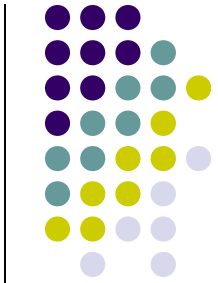
Examples:

1. **Training programs**

- Training or teaching programs in many fields, designed for a specific type of clientele (college students, industrial workers, minority groups, physically handicapped people, retarded children, etc.) are continually monitored, evaluated, and modified to improve their usefulness to society.

- To learn about the comparative effectiveness of different programs, it is essential to collect data on the achievement or growth of skill of subjects at the completion of each program.

Examples



2. **Monitoring advertising claims**

- The public is constantly bombarded with commercials that claim the superiority of one product brand in comparison to others.

- When such comparisons are founded on sound experimental evidence, they serve to educate the consumer.

- Not infrequently, however, misleading advertising claims are made due to insufficient experimentation, faulty analysis of data, or even blatant manipulation of experimental results.

- Government agencies and consumer groups must be prepared to verify the comparative quality of products by using adequate data collection to verify the comparative quality of products by using adequate data collection procedures and proper methods of statistical analysis.

Examples

3. **Plant breeding**

- To increase food production, agricultural scientists develop new hybrids by cross-fertilizing different plant species.
- Promising new strains need to be compared with the current best ones.
- Their relative productivity is assessed by planting some of each variety at a number of sites.
- Yields are recorded and then analyzed for apparent differences.
- The strains may also be compared on the basis on disease resistance or fertilizer requirements.

Examples

4. **Building beams**

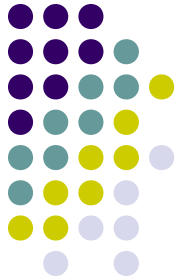
- Wooden beams that support roofs on houses and public buildings must be strong.

- Most beams are constructed by laminating several boards together.

- Wood scientists have collected data that show stiffer boards are generally stronger.

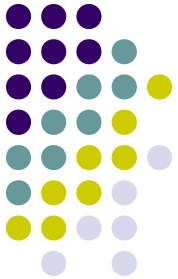
- This relation can be used to predict the strength of candidates for laminating on the basis of their stiffness measurements.

Some Statistical Tools in Data Analysis



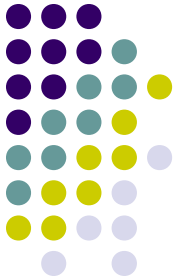
- Descriptive Statistics
- Inferential Statistics
- Experimental Design
- Regression Analysis
- Time Series Analysis

Some Notes:



- It must be realized that a scientific investigation is typically a process of trial and error.
- Rarely, if even, can a phenomenon be completely understood or a theory perfected by means of a single, definitive experiment. It is too much to expect to get it all right in one shot.
- Even after his first success with the electric light bulb, Thomas Edison had to continue to experiment with numerous materials for the filament before it was perfected.
- Data obtained from an experiment provide new knowledge. This knowledge often suggests a revision of an existing theory, and this itself may require further investigation through more experiments and analysis of data.

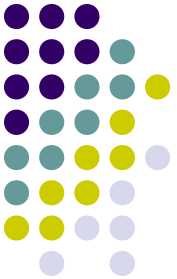
The following excerpt from a Woody Allen writing captures the vital point that a scientific process of learning is essentially iterative in nature.



Invention of the Sandwich by the Earl of Sandwich
(According to Woody Allen, humorist*)

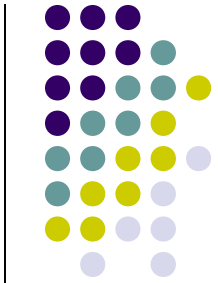
	Experiment	**Analysis**
First completed work:	a slice of bread, a slice of bread and a slice of turkey on top of both.	------> fails miserably.
	two slices of turkey with a slice of bread in the middle.	------> rejected.
	three consecutive slices of ham stacked on one another	some interest, ---------->mostly in intellectual circles.
	three slices of bread	----------> improved reputation.
	several strips of ham, enclosed top and bottom, by two slices of bread	----------> immediate success.

Application of Statistics in the Different Fields



- Marketing
- Banking
- Financing
- Politics
- Social Sciences
- Engineering
- Medicine
- Environment
- Economics

Review of Levels of Measurement



- Nominal
- Ordinal
- Interval
- Ratio