Statistical data type

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Source:
http://www.wisc-online.com/objects/ViewObject.aspx?ID=TMh2802
Anderson, Sweeney,wiliams, ***Statistics for Business and Economics*** , 10 e, Thomson, 2008
Sugiyono, ***Statistika untuk penelitian***, alfbeta, Bandung, 2007

Rationale

- The key understanding that what we can do with statistics, both from creator and from use point of view, is to know the characteristics the data is being examined.

Objectives

After successfully completing this learning object, you will be able to:

- Determine the word "data" is being used in a singular or plural context.
- Determine is the data is quantitative or qualitative.
- Determine is the data is nominal or ordinal.
- Determine is the data is interval or rational.
- Determine is the data is discrete or continuous.

Data - a Definition:

The information we collect about a topic or subject under investigation

May refer to individual bits of information (singular in nature) or to collections of information (plural in nature)

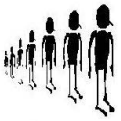
Data Singular

May refer to individual bits of information (singular in nature)

The one value that is given as a response to a question

- What color are your eyes?
- How much do you weigh?
- In which general direction—north, south, east or west—did you drive to get here?
- Where were you born?
- Why did you stop reading?

Data Plural



May refer to collections of information (plural in nature)

The set of values collected as the responses to a particular question

- 14 people said their eyes are blue, 12 said brown, 8 said gray, and 9 said green.
- 5 people said they walked North, 19 said South, 42 said East, and 1 said West.
- 12 said they finished the book, 6 said they fell asleep, and 3 replied they ran out of time.

Data

The information collected about the variable

May be a singular or a plural value

May be qualitative (categorical) or quantitative (numerical)

Categories

Numerical

Data — Qualitative (Categorical)

Data that can be placed into distinct partitions or categories according to some defining characteristic or attribute

Examples

- Hair color: blond, brunette, black, gray
- State: Wisconsin, Minnesota, Michigan, Illinois
- Astral sign: Virgo, Libra, Taurus, Scorpio
- Steak preference: Rare, Medium, Well
- Area code: 608, 312, 402, 715
- Vegetable: carrots, tomatoes, celery, cucumbers

Data — Quantitative Data

- Are numerical in nature
- Result from a process that counts or measures
- Can be ordered or ranked
- Can be used in meaningful computations

Examples

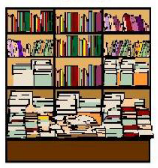
- Amount of water that passes over a dam in 1 hour
- Actual weight of a 1-pound bag of candy
- The number of people who own a particular type of automobile
- How many minutes you have lived

Qualitative Data

May be further refined into two distinct groups

- **Nominal**
- **Ordinal**

Nominal

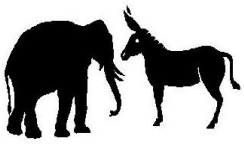


Ordinal

Qualitative Nominal Data

- Classifies data into mutually exclusive (non-overlapping), exhaustive categories in which no order or ranking (better or worse) can be imposed on the data

May be either numeric or non-numeric



Qualitative Nominal Numeric Data

- The number value indicates the category of a data element.
- Meaningful arithmetic cannot be performed upon the data.

Qualitative Nominal Numeric Data

Examples

- Area codes used with telephones
  - Area code 608 plus area code 715 is meaningless
- Street address numbers
  - 3047 divided by 1217 is not a new street address
- Social Security numbers
  - 402 - 37 - 9765 times 219 - 76 - 9602 is nonsense
- Course numbers
  - 804 - 240 minus 804 - 201 makes no numerical sense

Qualitative Nominal Non-Numeric Data

The description of the data indicates the category of an element.

- **Political Party:** Democrat, Republican, Green, Libertarian
- **Marital Status:** married, single, separated, divorced, widowed
- **College Courses:** Mathematics, English, History, Sociology

Qualitative Ordinal Data

- Classifies data into categories that can be ranked
- Provides information about relative comparisons
- Has no precise differences between the ranks
- May be either numeric or non-numeric

Numeric

Non-numeric

Qualitative Ordinal Numeric Data

- The value permits ranking or ordering of data by means of numbers.
  - **Grade in school**: first, second, third, fourth
  - **Awards in a judged contest**: first place, second place, third place
  - **Rating scales**: 1, 2, 3, 4, 5 meaning from bad to excellent

Qualitative Ordinal Non-Numeric Data

- The data description permits ranking or ordering of data.

Examples

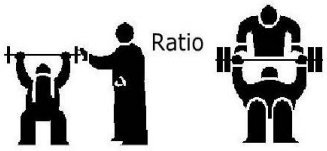
- **Grades that are earned in a course**: A, B, C, D, F
- **Size of a automobile**: sub-compact, compact, mid-size, full-size, limousine, stretch limousine
- **Household income**: low, middle, high

Quantitative Data

- Is numerical in nature
- May be further refined into two distinct groups
  - Interval
  - Ratio

Interval

Ratio



Quantitative Interval Data

- Is ranked.
- Has precise differences between units of measure.
- Defines values in such a way that the interval between two data values is meaningful.
- Does not have a meaningful zero.

Examples

- The scores received on a standardized test (ACT, SAT, IQ)
- Temperature comparisons (a zero may exist, but it is not meaningful because it is arbitrary in selection)
- Measurement of time

Quantitative Ratio Data

- The data possesses the characteristics of the interval measure, except that a meaningful zero exists.
- True ratios exist when the same information is collected from two or more subjects.
- The ratio of the data values is meaningful.

Examples

- Physical measurements
  - Area
  - Height
  - Weight
- Money or monetary value
- Counts related to the number of occurrences.

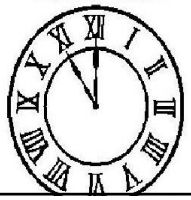
Data

The information collected about the variable

- May be a singular value or a plural value
- May be qualitative (categorical) or quantitative
- **May be discrete or continuous**

Discrete

Continuous



Discrete Data

- Applies only to numerical data
- Is finite in nature
- Is countable
- Has spaces between given values
- Is exact

Examples

- The number of eggs a chicken lays in 24 hours
- The amount of money currently in your possession
- The number of points scored by a football team
- The number of students who have visited this learning object
- The number of Skittles in a 1-pound bag

Continuous Data

- Applies only to numerical data
- Has an infinite number of choices
- Cannot be counted
- Has no spaces over a range of values
- Cannot be exactly measured

Examples

- The quantity of milk that a cow produces in 24 hours
- The weight of a red Skittle
- The height of a basketball player
- The time it takes a student to complete this learning object
- The current temperature outside

Continuous Data - Problems

- Data that is continuous is difficult to comprehend.
- People tend to round continuous data to some fixed number of decimal places.
- Rounding makes continuous data behave as if it were discrete data.

Examples

- How much do you weigh?
  - Usually rounded to the nearest pound
- How tall are you?
  - Usually rounded to the nearest inch
- What is the temperature?
  - Usually rounded to the nearest degree
- How much does a Skittle weigh?
  - Usually rounded to the nearest thousandth gram

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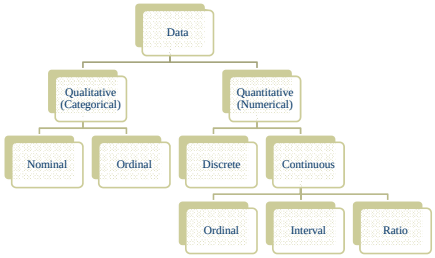
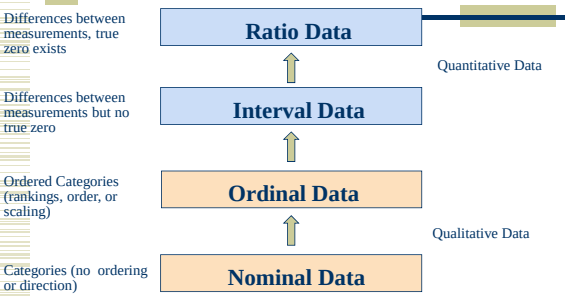
Other Categorization



Measurement Levels



Summary

- Data may be either singular or plural.
- Data may be either qualitative or quantitative.
- Qualitative data may be nominal, ordinal, interval or rational.
- Quantitative data may be either discrete or continuous.

Thank you