STATISTICS

Instructor:

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Source: Kaplan, Robert M. Basic Statistics for the Behavioral Sciences, Allyn and Bacon, Inc., Boston, 1987

GRAPHS AND THEIR DISTRIBUTION

Properties of Scales

Magnitude is the property of "moreness." A scale has the property of magnitude if we can say that one attribute is more than, less than or equal to another attribute (McCall, 1980).

Properties of Scales

The concept of Equal Intervals is a property that uses uniform difference between two points along has the entire scale. For example, on a ruler the difference between 1 cm and 3 cm means the same as the difference between 9 cm and 11 cm.

Properties of Scales

An Absolute 0 is obtained when nothing at all exist of the property being measured. It means nothing to be measured. For example, if you have a scale to measure the wind velocity and if it shows “0”, it means there is no wind at all.

Types of Scales

A Nominal Scale is a scale that does not have magnitude, equal intervals or absolute 0. Nominal scales are really not scales at all. Their purposes are no more than naming the objects. For example, you may assign 1 to define males and 2 to define females.

Types of Scales

A scale with the property of magnitude but not the property of equal intervals or the property of absolute 0 is known as Ordinal Scale. An ordinal scale allows us to rank individuals or objects but not to say anything about the meaning of the difference between the ranks.

Types of Scales

When the scale has the property of magnitude and equal intervals but not the property of absolute 0, we refer to it as an Interval Scale. For example, a Celsius tempeture scale has the property of property of magnitude and equal intervals but not the property of absolute 0.

Types of Scales

A scale that has all three properties is called a Ratio Scale. For example, a Kelvin tempeture scale has the property of property of magnitude, the property of equal intervals and the property of absolute 0 (A point at which all molecular activity ceases).

Types and Properties of Scales

	Property		
Types of Scales	**Magnitude**	**Equal Intervals**	**Absolute 0**
Nominal	No	No	No
Ordinal	Yes	No	No
Interval	Yes	Yes	No
Ratio	Yes	Yes	Yes

Discrete and Continuous Variables

A continuous variable may take on any value within a defined range. Time is a good example of continuous variable.

Discrete and Continuous Variables

A discrete variable can be either names or numbers. Discrete variables have gaps between successive observable values. Number of fights a boxer has von is an example of discrete variables. You can not say that the boxer von 4.755 of 10 fights.

Distributions and Their Graphs

A single score will mean more to us if we think about it in relation to other scores. For example, if you got a score of 31 on your statistics test, you might want to know "Is that a good score? An average score? Does it pass?"

Distributions and Their Graphs

To make sense of the information, we often place the score within the distribution of scores.

Distributions and Their Graphs

A frequency distribution is a simple way of displaying and summerizing numerical information. To create a frequency distribution we need only nominal measurements. However, it can also be made for ordinal, interval and ratio data.

Distributions and Their Graphs

A frequency distribution is defined as a presentation of data showing the frequency with which each score occurs.

Distributions and Their Graphs

Student Name	Score
Hasan	60
Deniz	70
Mesut	60
Emrah	80
Derya	80
Havva	60
Cem	70
Salih	90
Sinem	70

Distributions and Their Graphs

Score	***Tally***	***f***
90	/	1
80	//	2
70	///	3
60	///	3
		N=9

Distributions and Their Graphs

A grouped frequency distribution is used in the case that it is impractical to tally every possible score. For example, think about 1000 people of different ages old. For some ages, it is possible to have 0 possibility. Then, it is impractical to draw out frequency of each age.

Distributions and Their Graphs

The class interval is a portion of a measurement scale containing more than one possible value.

Distributions and Their Graphs

Example of Grouped Frequency Distribution for A Group of People of Different Ages (Range=0-100/N=1000)

Class Intervals	*Midpoints*	*f*
1-20	10.5	100
21-30	25.5	250
31-40	35.5	100
41-50	45.5	150
51-60	55.5	250
61-70	65.5	100
71-80	75.5	50

Upper and Lower Real Limits: Midpoints

There are several technical considerations for the proper use of grouped frequency distributions. First, intervals have upper real limits and lower real limits.

Distributions and Their Graphs

LOWER AND UPPER REAL LIMITS

Class Intervals	*Lower Real Limits*	*Upper Real Limits*
1-20	0.5	20.5
21-30	20.5	30.5
31-40	30.5	40.5
41-50	40.5	50.5
51-60	50.5	60.5
61-70	60.5	70.5
71-80	70.5	80.5

Upper and Lower Real Limits: Midpoints

Second, intervals have midpoint that is exactly halfway between the lower and upper real limits. For example, for interval 21-30, lower real limit (LL) is 20.5 and upper real limit (UL) is 30.5. Thus, the size of the interval is 30.5-20.5=10. To obtain the midpoint, we divide the interval size by 2 and add this value to lower real limit. 10/2=5 and 20.5+5=25.5 is the midpoint. The formulation of midpoint (MP) is MP=LL+(UL-LL)/2

Frequency Distribution for Nominal Scales

Relative frequency distribution gives proportion rather than raw numbers.

Weapons Used in Murders	Relative Frequency
Handgun	50 %
Rifle	5 %
Shotgun	8 %
Cutting or stabbing	19 %
Other Weapons	12 %
Personal Weapons	6 %

Frequency Distribution for Nominal Scales

Sometimes we want to find the number of cases that fall below a particular score in a frequency distribution. To obtain this information easily we use a cumulative frequency distribution.

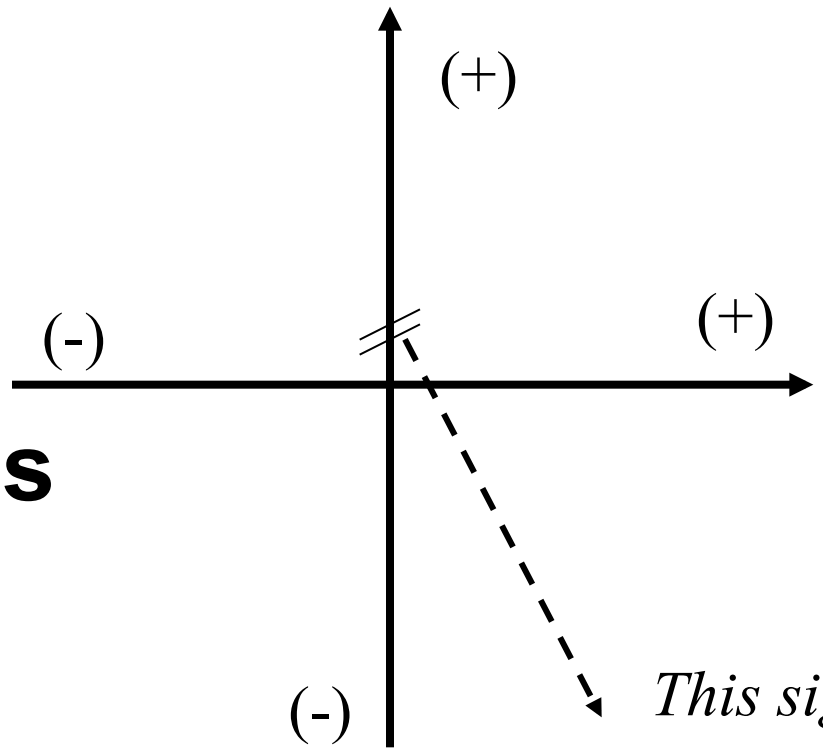
Distributions and Their Graphs

(Range=0-100/N=1000)

Class Intervals	*Absolute f*	*Cumulative f*	*Relative f*	*Cumulative Relative f*
71-80	50	1000	0.05	1.00
61-70	100	950	0.10	0.95
51-60	250	850	0.25	0.85
41-50	150	600	0.15	0.60
31-40	100	450	0.10	0.45
21-30	250	350	0.25	0.35
11-20	100	100	0.10	0.10

Graphs

The Basics



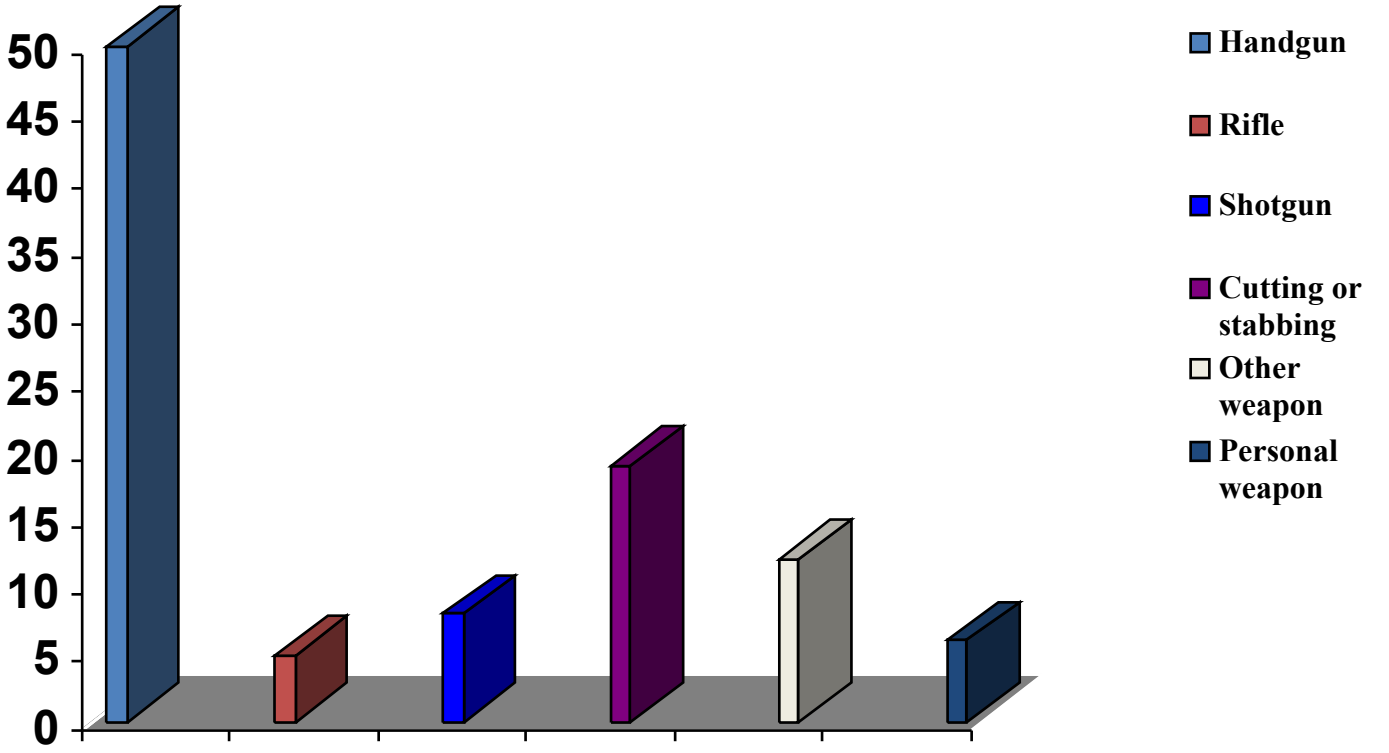
y-axis
Vertical axis
Ordinate
Dependent variable

x-axis
Horizontal axis
Abscissa
Independent variable

This sign means that some numbers are left out

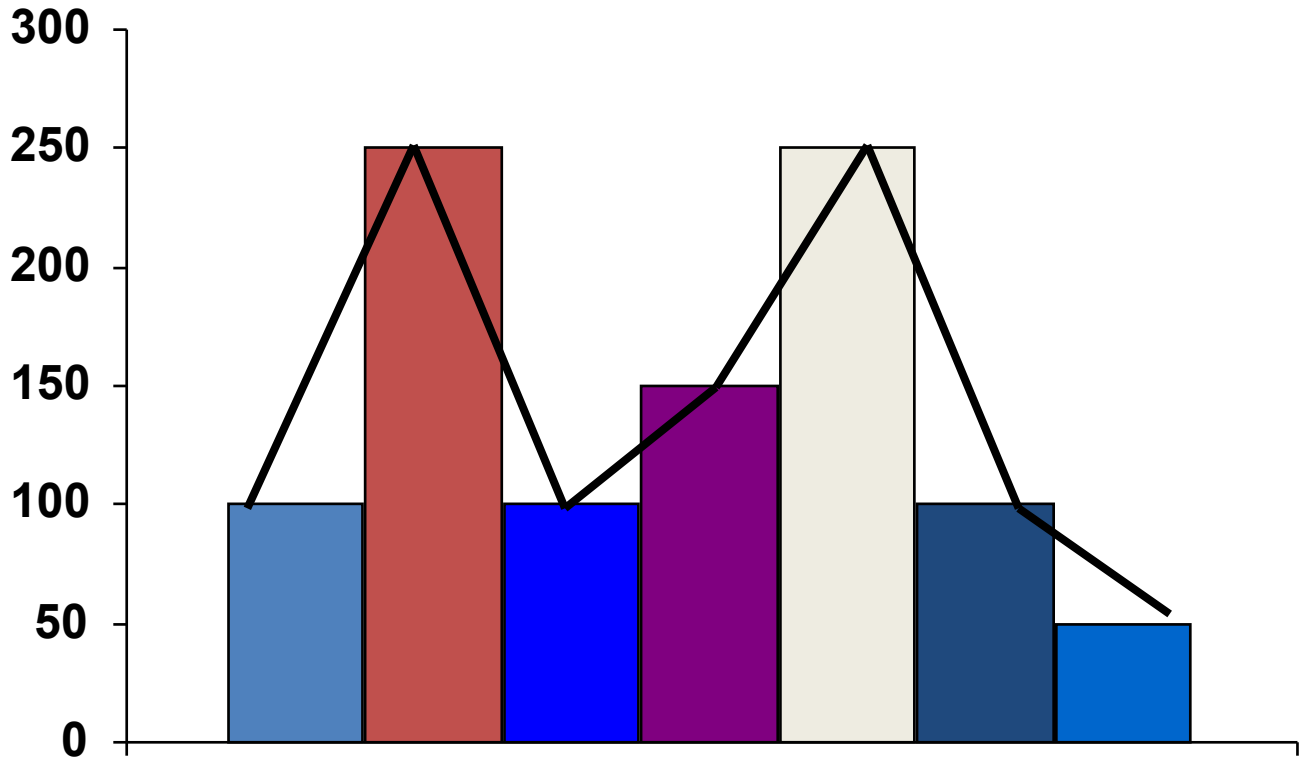
Graphs

The Histogram – Frequency data for type of weapon used in 1979 murders



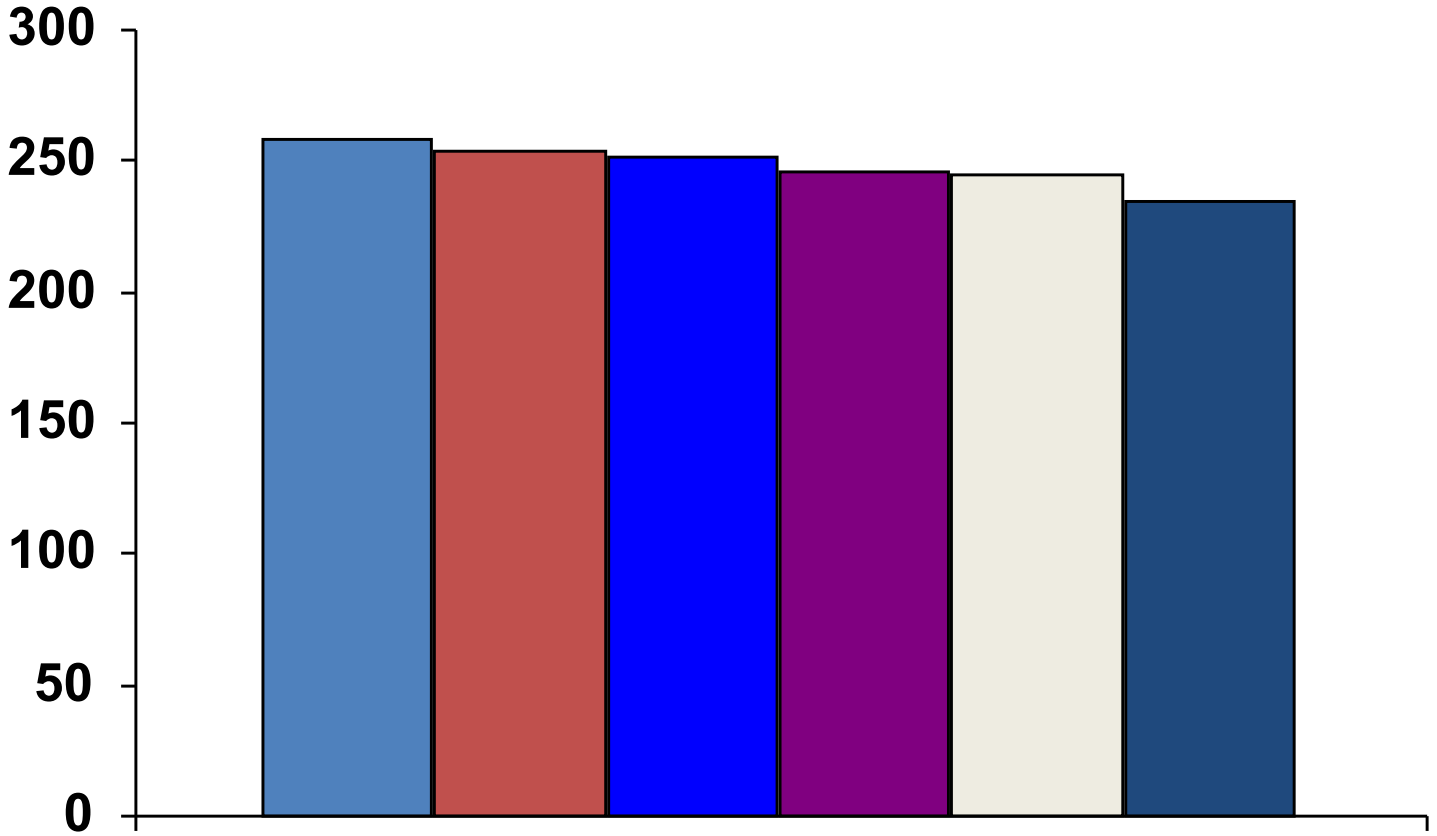
Graphs

Frequency Polygon



Graphs

Misleading with graphs



Graphs

Misleading with graphs