

4.3

Lesson 4.3 – The Use and Misuse of Statistics

Goal: Assess the validity of conclusions presented in the media

A **valid conclusion** is one that is supported by unbiased data that has been interpreted appropriately

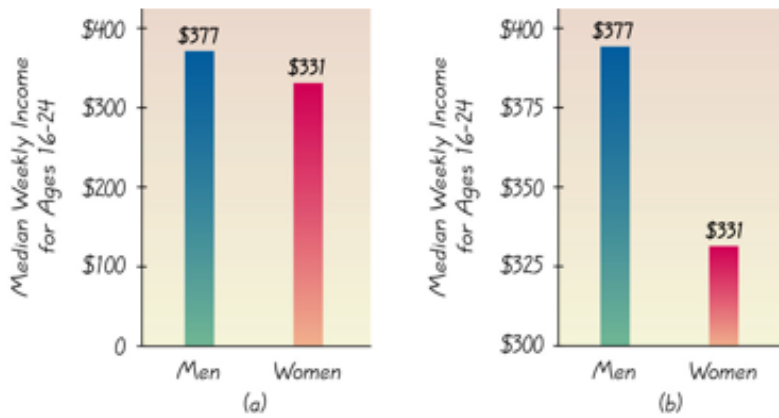
When you read a conclusion someone has made based on statistics, you must decide whether the conclusion is valid or not. To do this, ask yourself:

- Is there any bias in the data collection, in the way the
 - sample was selected (random sampling or not)
 - questions were phrased, or (leading questions)
 - survey was conducted? (anonymous vs. not)
- If the data involved measurements, were they accurate?
- Are any graphs drawn accurate, or do they mislead the viewer?

Assessing Graphs

The graphs in each pair show the SAME DATA. Choose the graph that displays the data MORE accurately. Justify your choice.

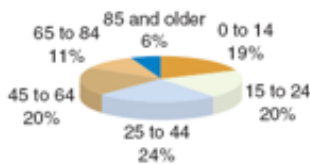
1. Graphs comparing men and women’s weekly income



a is more accurate because the graph starts at zero. Graph b looks like men make 3 times more than women.

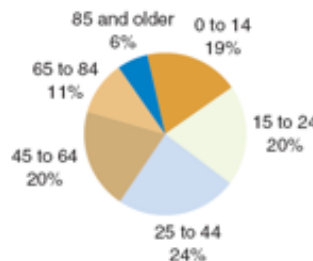
2. Canada’s population by age, according to the 2001 census

i) Ages of Canadians, 2001 Census



OR

ii) Ages of Canadians, 2001 Census



Graph (ii) is displayed more accurately. Since the graph in (i) is 3 dimensional it is less accurate. Using 3D makes pieces appear larger than they are compared to other pieces.

Assessing How Data was Collected & Graphed

Four Grade 9 students collected data on school lunch preferences. Is their conclusion valid? *To assess the validity, ask yourself:*

Was the sample size appropriate?

50 students were sampled.
Depending on school size, this may not be enough data.

Was the sample representative?

We can't tell because we don't know how they chose their sample. Need more information.

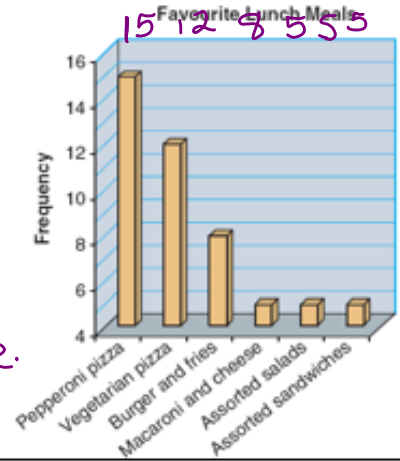
Were the survey questions biased?

Question is unbiased. Students

How was the survey conducted? could choose which ever lunch they wanted.
The survey was conducted orally. Students might be

Is the graph constructed accurately? Self-conscious about their choices

No. 3 dimensions skews the results.



Conclusion: We asked students to tell us their favourite lunch meals and displayed the results in a bar graph. We conclude that the school cafeteria should serve more pizza since it is clearly the favourite lunch of students.

Graph doesn't start at zero (distorts the relative quantities)

Assessing Assumptions About Cause & Effect

A group of grade 12 students performed a linear regression on data they collected from Statistics Canada about the number of seniors and the number of weapons crimes in Canada. Is their conclusion valid? *To assess the validity of the conclusion, ask yourself these questions:*

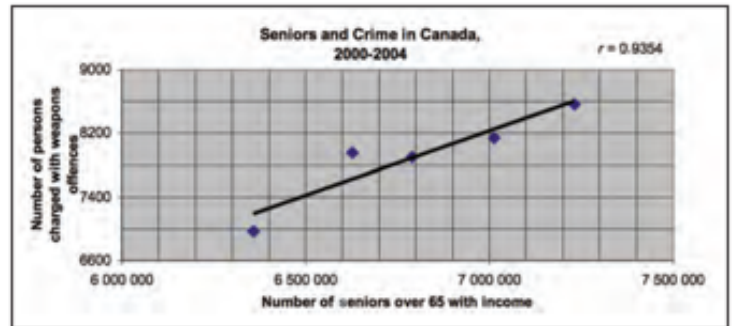
1) Was there bias in the data collection?

Source is good, but we need more data points.

2) Is the graph constructed accurately?

No, doesn't start at zero. (otherwise ok)

3) Is the correlation strong? yes (r = 0.9354)



Conclusion: There is a strong positive correlation between the two variables. As the number of seniors increases, weapons charges increase. Therefore, criminals in Canada are becoming older because of our ageing population.

4) Does the analysis support a cause-and-effect relationship

No. They are likely both caused by population increase.

The conclusion drawn here is not valid.