



## Misleading Uses of Data





#### WOULD YOU BUY THIS PRODUCT?



#### WHY MIGHT SOMEONE BUY IT?

#### FACT:

Cocoa Krispies are over 40% sugar by weight AND contain trans-fat!

How does that contribute to immunity?

Health claims are an unfortunate extension of product marketing efforts that overlap scientific information provided to consumers on the nutrition facts panel and ingredient list of packaged foods. Fuzzy at best, they create a false sense of hope and add value to products that in some cases may merit it, but in many cases don't.

May we suggest ignoring the large font writing on food products, and sticking to the facts in the nutrition label itself.

http://www.fooducate.com/blog/2010/06/04/kelloggs-slapped-by-ftc-twice-for-misleading-advertising/

## We Are Learning To...

- Identify whether graphs are misleading.
- Identify the factors that can make bar graphs, line graphs, and scatter plots misleading.
- Interpret whose interests are favored by misleading graphs.

# Think About It:

• What is misleading about the graph?

• How could the graph be changed to reflect the data more accurately?

• Why would someone make a graph that is misleading in this way?

## Is this graph misleading?

#### CNN.com

#### CNN/USA TODAY/GALLUP POLL

## Results by party



+ PREVIOUS

HEXT -

SAMPLE: Interviews conducted by telephone March 18-20, 2005, with 909 adults in the United States. SAMPLING ERROR: +/- 7% pts

## Better?

#### RESULTS BY PARTY: CNN/USA Today/Gallup Poll Margin of error: +/- 7%

Question 2: Based on what you have heard or read about the case, do you agree with the court's decision to have the feeding tube removed?



www.mediamatters.org/items/200503220005

## Why might this graph be misleading?



Factors that can make a graph misleading:

- X or Y-axis scale is too big or too small
- X or Y-axis skips numbers, or does not start at zero
- Axes are not labeled
- Data is left out
- What else?

#### BP Truthfully Misrepresents How Much Oil they are Recovering

by Lisa Wade, Jun 4, 2010, at 10:30 am

Nathan Yau, at Flowing Data, calls BP out on a piece of data representation trickery. In a video on the BP website explaining the progress they were making in cleaning up the oil, Kent Wells offered the following graph:

Kent Wells Tech Update - 24 May 2010



This graph is misleading because the bars represent the <u>total</u> amount of oil collected over a period of time.

They are not necessarily collecting a higher amount of oil than they did the previous day.

Instead, each day they have just collected more oil *overall*.

## If they keep collecting oil, we should expect nothing less!

Instead of showing the data cumulatively, they could have presented how much oil they collected each individual day. But the data, in that case, doesn't look as good. Take a look:



http://thesocietypages.org/socimages/2010/06/04/bp-truthfully-misrepresents-how-much-oil-they-are-recovering/

# Think About It:

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## **Comparison of Class Averages**



What is misleading about this graph?

Task: Create a more accurate representation of the data.

## Students Participating in School Play

Year	1	2	3	4
# of students participating in play	120	116	114	110

The play director argues that the number of students participating in the play has dropped sharply over the past few years because the school has slashed their budget. The school principal argues that the difference in the number of students in the play has been roughly the same from year to year.

<u>Task A:</u> Create a graph that supports the director's argument <u>Task B:</u> Create a graph that supports the principal's argument

#### **Randomized Experiment vs. Observational Study**



Observe data that observe data that already exists without changing conditions

#### Randomized Experiment vs. Observational Study

Determine whether each scenario is a *randomized* experiment or observational study. Explain why.

a. A scientist wants to observe how plants grow. She randomly assigns plans to be in two groups; one group is placed under a lamp and the other is left alone. She measures the heights of the plants in each group every other day.

b. A farmer wants to determine how many apples to plant on several acres of land he bought. To determine this, he counts the number of apple trees on the north side and the south side of the property and records the number of apples each tree yields. He then uses the data to decide how many apples to plant in each region.

## SOLUTION

- a. Randomized experiment the scientist has two groups that were randomly assigned. One group is simply observed while the other group has a treatment placed on it.
- b. Observational Study Although the farmer has two groups, he is simply observing the existing trees without controlling any variables.

### **Surveys & Biases**

A <u>survey</u> is a study of one or more characteristics of a group.

It is often difficult to survey an entire population. Instead, you can survey a part of the population or a <u>sample</u>.

A <u>randomly-selected sample</u> gives the best chance of representative data.

In a sample, some parts of the population may be over or under-represented. We call this a <u>biased sample</u>.

A survey question that encourages a particular response is a <u>biased question</u>.

#### Identify potentially biased questions

Tell whether the question is potentially biased. Explain your answer. If the question is potentially biased, rewrite it so that it is not.

- a. Don't you agree that the voting age should be lowered to 16 because many 16-year-olds are responsible and informed?
- b. Do you think the city should risk an increase in pollution by allowing expansion of the Northern Industrial Park?

### SOLUTION

- a. This question is biased because it suggests that lowering the voting age is a good thing to do. An unbiased question is "Do you think the voting age should be lowered to 16?"
- b. This question is biased because it suggests that the proposed expansion will be bad for the environment. An unbiased question is "Do you think the city should allow expansion of the Northern Industrial Park?"