Jan. 24 Statistic for the day:
% of the world’s population estimated to be drunk at any one time: 0.7%

Assignment: Read Chapter 4
Exercises: pp. 73-77 #1, 4, 5, 7, 9, 17

From Gallup website: “Despite some controversy this past week over whether it was appropriate to have such a gala while the country is at war, 60% of Americans said the festivities were appropriate; 32% disagreed.”

Do you think the result would have been the same if the war had been mentioned in the question?

A perplexing polling paradox
- People generally believe the results of polls.
- People do not believe in the scientific principles on which polls are based

According to Gallup, most Americans said that a survey of 1500 to 2000 respondents (a larger-than-average sample size for national polls) CANNOT represent the views of all Americans.

How are Gallup Opinion Polls Taken?
- Telephone interviews: Random digit dialing
  - At random pick
    - Exchange (area code + first three digits; e.g., 814 865)
    - Next two digits (e.g., 22)
    - Last two digits (e.g., 11)
  - Up to three callbacks (why callbacks?)
  - Evenings and weekends
  - This catches unlisted numbers

Designed to be a random sample from the POPULATION of people with telephones.

All members of the population are equally likely to be in the sample.

Called a SIMPLE RANDOM SAMPLE.

Polls typically take roughly 1500 or 1600 people.
Repeated sampling produces a HISTOGRAM for the percentage of people in the sample who believed the inaugural festivities were appropriate.

Recall that the percentage for the Gallup poll was 60% (or .60 as a decimal).

WHAT MIGHT THE HISTOGRAM LOOK LIKE? (Let’s suppose the sample contained 1600 likely voters.)

We generally will NOT have the benefit of .025

We define the MARGIN OF ERROR to be two standard deviations.

Report: Percentage ± 2 standard deviations

So the margin of error is 2 standard deviations.

In our example:
Standard deviation = .0125 or 1.25%
2 standard deviations = .0250 or 2.5%

Report:
60% ± 2.5% or .60 ± .025

We generally will NOT have the benefit of a histogram to get the standard deviation or the margin of error of the sample percentage.

SECRET FORMULA FOR THE MARGIN OF ERROR OF A SAMPLE PERCENTAGE:

\[
\frac{1}{\sqrt{n}}
\]

Square root of sample size

So in our example, if the sample size were 1600, then the square root is 40 and so the MARGIN OF ERROR is:

\[
\frac{1}{40} = 0.025
\]

Or 2.5%
And we report 60% ± 2.5%

The 2.5% margin of error is a measure of the uncertainty in our estimate of 60%.

The estimate of 60% is a guess at the population percent. It’s based on a sample of 1600 from a huge population.

It would be better to say that our best guess of the population percentage who say yes is 57.5% to 62.5%
Summary:
- We have a simple random sample from the population of telephone owners.
- We find the percentage from our sample.
- The MARGIN OF ERROR is 1 divided by the square root of the sample size.
- For 1600 the MARGIN OF ERROR is .025.
  - Hence we report: PERCENTAGE ± .025
- The margin of error does not depend on the population size, only on the sample size!

The morning after pill
Do you think that the ‘morning-after’ contraceptive pill should be available over the counter?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>Not sure</th>
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<tbody>
<tr>
<td>USA</td>
<td>59.1%</td>
<td>37.1%</td>
<td>3.8%</td>
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USA Today call-in poll, 2004

What Is Wrong With the Poll?

- The responding group is not representative of any larger group!
- Opinions reflect only those of the people who decide to respond.
- These polls are unscientific and worthless.

READ P. 71 OF THE TEXT BOOK.

What is the margin of error for the different percentages?

What should you report?

Example: men who answer yes 15%

N = 100

Margin of error = .10 or 10%

Report: 15% ± 10%

So there is a huge margin of error and the 15% is fairly uncertain.

Pie Chart for Contraceptive Poll

Do you have a tattoo?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Women</td>
<td>23%</td>
<td>77%</td>
</tr>
</tbody>
</table>

Based on:
- 100 men
- 136 women
- Stat100 SP 04
What Is Wrong With the tattoo Survey?

What is the target population?

What sort of sample do we have?