

Where Have We Been?

Unit One (Chap 1-5)...exploring and understanding data, making displays, describing displays, learning about Standard Deviation

Unit Two (Chap 6-9)...exploring relationships between variables, scatterplots, correlation, linear regression, re-expressing on the Ladder of Powers

Unit Three (Chap 10-12)...gathering data, understanding randomness, sample surveys, designing experiments and studies

Unit Four (Chap 13-16)...randomness and probability, probability rules and models

Where Are We Going?

Units Five – Seven (Chap 17-26)...making confidence inferences for proportions and means, testing hypotheses, comparing two proportions

We have talked about samples and created descriptive statistics like the sample proportion (for categorical variables) and the sample mean (for quantitative variables). We understand that these statistics vary from sample to sample, and that each is an estimate of that corresponding parameter for the population.

We have discussed sampling error and understand that it is unavoidable. The remarkable thing is that sampling error is **understandable** and **predictable**. We *hope* it's small, but actually *can* know how large it will be.

Once we compute that, we can look at the data from a specific sample and see if the results are within what we expected, or were these results so unlikely (unusual) that we don't believe that they could have just happened by sampling error (happened by chance, by bad luck).

Those are the outcomes we call “statistically significant.” We are about to learn how to make that distinction! 😊

AP Stats – Chap 17

Sampling Distribution Models

When we draw a sample from a population, our sample will not (probably) reflect the entire population perfectly.

But we can use our sample to make statements (statistical inferences) about the entire population.

Before using the Normal to model the distribution of sample proportions, check these conditions:

- Randomization **Condition** (sampling method not biased and representative of the population)
- 10% **Condition** (sample is less than 10% of population)
- Success / Failure **Condition** (at least 10 successes and at least 10 failures)
- Independence **Assumption**

Categorical Data

$\hat{p}$ = the probability of success you observed

p = the true probability of success

the Normal model has...

$$\text{mean} = p \quad \text{and} \quad \text{SD} = \sqrt{\frac{pq}{n}}$$

There's an example in the text with left- and right-handed desks. This is **CATEGORICAL** because "handedness" is categorical.

Also...you are given a probability!

The example said, "suppose that about 13% of the population is left-handed."

Quantitative Data

$\bar{y} = \mu$ = the mean of the sample you observed

σ = the SD of the sample you observed

the Normal model has...

$$\text{mean} = \bar{y} = \mu \quad \text{and} \quad \text{SD} = \frac{\sigma}{\sqrt{n}}$$

There is an example in the text with elevator passengers. This is **QUANTITATIVE** because weight is a quantity (a number).

Also...you are given a mean and a SD!

The example said, “the mean adult weight is 175 pounds with a SD of 25 pounds.”

The Central Limit Theorem

“The Fundamental Theorem of Statistics”

The mean of a random sample has a sampling distribution whose shape can be approximated by a Normal model.

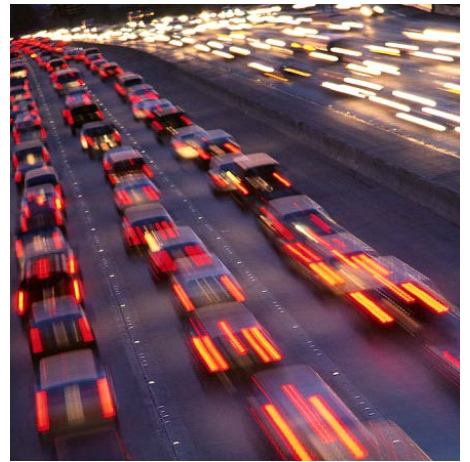
No matter what the shape of the population is!



The larger the sample, the better the approximation will be. (think of the example of getting the average roll of one die, two dice, three dice, five dice, twenty dice.)

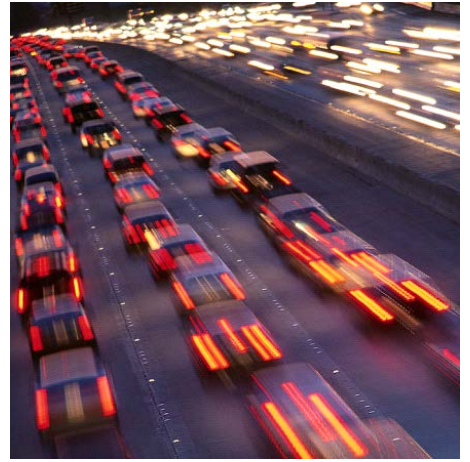
Speeding Cars

**Of all cars on the beltway,
80 % exceed the speed limit.
What proportion of speeders
might we see among the next
50 cars?**



More Cars

Speeds of cars on the beltway have a mean 52 mph and SD 6 mph, and are likely to be skewed to the right (a few very fast drivers). Describe what we might see in random samples of 50 cars.



Birthweight

At birth, babies average 7.8 pounds, with a SD of 2.1 pounds. A random sample of 34 babies born to mothers living near a large factory that might be polluting the air and water shows a mean birthweight of only 7.2 pounds. Is this unusually low?

