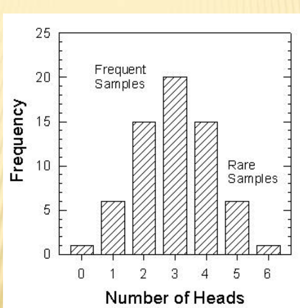
Chapter 17

SAMPLING DISTRIBUTION MODELS

SAMPLING DISTRIBUTION

- This is the distribution of probabilities we would obtain from every possible combination of samples
  - This distribution is theoretical whereas the distributions we looked at before were distributions of *data*

EXAMPLE DISTRIBUTION FOR A COIN



Retrieved from http://www.sdecnet.com/psychology/stathelp.htm, February 16, 2010.

PROPORTIONS

- The actual proportion for the population is *p*
- Our observed proportion for our sample is $\hat{p}$
- We define $q = 1 - p$ and $\hat{q} = 1 - \hat{p}$
- The sampling distribution follows a normal model with mean *p* and standard deviation $\sqrt{\frac{pq}{n}}$
- That is, the model that describes the distribution of sample proportions is

$$N\left(p, \sqrt{\frac{pq}{n}}\right)$$

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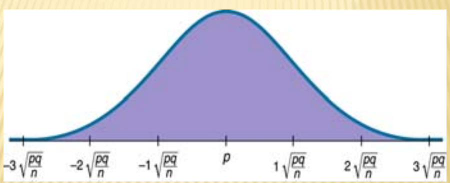
SAMPLING DISTRIBUTION FOR A PROPORTION



From *Stats Modeling the World* by Bock, Velleman, & De Veaux, 2010, p. 414.

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ASSUMPTIONS AND CONDITIONS

- There are two assumptions in the case of the model for the distribution of sample proportions:
  1. The sampled values must be independent of each other.
  2. The sample size, *n*, must be large enough.
- Conditions we can check (p. 449)
  - Randomization, 10% condition, Success/Failure

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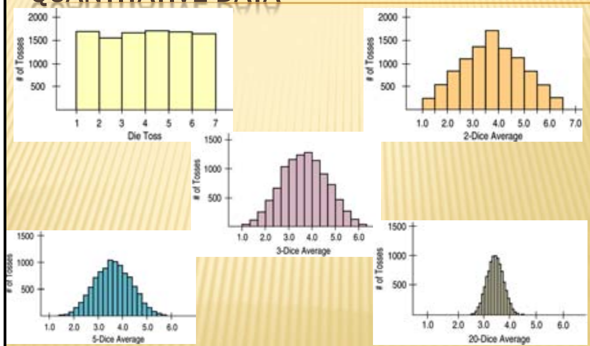
QUANTITATIVE DATA



From *Stats Modeling the World* by Bock, Velleman, & De Veaux, 2015, p. 453-54.

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CENTRAL LIMIT THEOREM

- If n is sufficiently large, the sample means of random samples from a population with mean μ and finite standard deviation σ are approximately normally distributed and modeled by

$$N\left(\mu, \frac{\sigma}{\sqrt{n}}\right)$$

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ASSUMPTIONS AND CONDITIONS

- Independence of observations
- Sufficiently large sample size
- We can check:
  - Randomization
  - 10% condition
  - Large enough sample size

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CAUTION

- Read "What can go wrong?" on p. 462
  - Don't confuse the sampling distribution with the distribution of the sample
  - Beware of observations that are not independent
  - Watch out for small samples from skewed populations

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