Inferences About Proportions

- A study in France examined the effectiveness of the drug RU 486 for terminating early pregnancies
- 488 women were given the drug(s)
- In 473 of these, the pregnancy was terminated

Based on this sample what can we say about the probability of termination of early pregnancies in populations similar to the individuals in the French study?
Confidence Intervals

• Estimate population proportion with the sample proportion

$$\hat{p} = \frac{473}{488} = 0.969$$

• Use a range of values to reflect uncertainty: a confidence interval

• General Form for a 95% CI?
Why?

• The proportion is really a sample mean
  – $n$ Bernoulli outcomes (either 0 or 1)
  – expected value
  – variance

• What does the CLT say?

• $n$ is large enough if $np > 5$ and $n(1-p) > 5$
Confidence Interval

- Check if normal approximation is OK...

- 95 % Confidence Interval
Interpretation

• If 100 random samples of size 488 were drawn from this population, and 100 different confidence intervals were constructed, approximately 95 of the intervals would contain the true population proportion and 5 would not.

• Based on the study, we are 95% confident that RU 486 will result in termination of early pregnancy 95.4 to 98.4 percent of the time.
Comparing Two Groups

Can physicians's advise change smoking behaviour?

• In one group of current smokers (n = 114), doctor discussed hazards of smoking and encouraged patients to quit.

• In the other group (n = 96), no advice was given.

• In a follow up visit, 11 of the 114 given advice, had quit.

• Of the 96 who had not received advice, 7 had quit.

Is the advice given by physicians an effective way to get patients to quit smoking? 0.10 vs 0.07
Confidence Interval
Hypothesis Test

- Test Ho: \( p_1 = p_2 \)
- Test Statistic: Z score for the difference under Ho
- Sampling distribution
- p-value
- Conclusion?
Sample Size and Power

- Similar to Normal Mean results
  - modification for SE
- Formula in text
- Expressions - work through based on principles of probability
- S-Plus Calculations
Exact Calculations

If $n$ is not large enough for Normal approximation

• For one proportion:
  – number of successes has a Binomial Distribution
  – Can work out exact CI/p-value
  – Computer - S-plus

• For two proportions, more complicated....