

1. **Gender gap.** A presidential candidate fears he has a problem with women voters. His campaign staff plans to run a poll to assess the situation. They'll randomly sample 300 men and 300 women, asking if they have a favorable impression of the candidate. Obviously, the staff can't know this, but suppose the candidate has a positive image with 59% of males but with only 53% of females.
 - a) What kind of sampling design is his staff planning to use?
 - b) What difference would you expect the poll to show?
 - c) Of course, sampling error means the poll won't reflect the difference perfectly. What's the standard error for the difference in the proportions?
 - d) Sketch a sampling model for the size difference in proportions of men and women with favorable impressions of this candidate that might appear in a poll like this.
 - e) Could the campaign be misled by the poll, concluding that there really is no gender gap? Explain.
3. **Arthritis.** The Centers for Disease Control report a survey of randomly selected Americans age 65 and older, which found that 411 of 1012 men and 535 of 1062 women suffered from some form of arthritis.
 - a) Are the assumptions and conditions necessary for inference satisfied? Explain.
 - b) Create a 95% confidence interval for the difference in the proportions of senior men and women who have this disease.
 - c) Interpret your interval in this context.
 - d) Does this confidence interval suggest that arthritis is more likely to afflict women than men? Explain.
6. **Carpal tunnel.** The painful wrist condition called carpal tunnel syndrome can be treated with surgery or less invasive wrist splints. In September 2002, *Time* magazine reported on a study of 176 patients. Among the half that had surgery, 80% showed improvement after three months, but only 54% of those who used the wrist splints improved.
 - a) What's the standard error of the difference in the two proportions?
 - b) Construct a 95% confidence interval for this difference.
 - c) State an appropriate conclusion.
12. **Depression.** A study published in the *Archives of General Psychiatry* in March 2001 examined the impact of depression on a patient's ability to survive cardiac disease. Researchers identified 450 people with cardiac disease, evaluated them for depression, and followed the group for 4 years. Of the 361 patients with no depression, 67 died. Of the 89 patients with minor or major depression, 26 died. Among people who suffer from cardiac disease, are depressed patients more likely to die than non-depressed ones?
 - a) What kind of design was used to collect these data?
 - b) Write appropriate hypotheses.
 - c) Are the assumptions and conditions necessary for inference satisfied?
 - d) Test the hypothesis and state your conclusion.
 - e) Explain in this context what your P-value means.
 - f) If your conclusion is actually incorrect, which type of error did you commit?
17. **Politics and sex.** One month before the election, a poll of 630 randomly selected voters showed 54% planning to vote for a certain candidate. A week later it became known that he had had an extramarital affair, and a new poll showed only 51% of 1010 voters supporting him. Do these results indicate a decrease in voter support for his candidacy?
 - a) Test an appropriate hypothesis and state your conclusion.
 - b) If you concluded there was a difference, estimate that difference with a confidence interval and interpret your interval in context.
20. **Ads.** A company is willing to renew its advertising contract with a local radio station only if the station can prove that more than 20% of the residents of the city have heard the ad and recognize the company's product. The radio station conducts a random phone survey of 400 people.
 - a) What are the hypotheses?
 - b) The station plans to conduct this test using a 10% level of significance, but the company wants the significance level lowered to 5%. Why?
 - c) What is meant by the power of this test?
 - d) For which level of significance will the power of this test be higher? Why?
 - e) They finally agree to use $\alpha = 0.05$, but the company proposes that the station call 600 people instead of the 400 initially proposed. Will that make the risk of Type II error higher or lower? Explain.