

**10.2 Sampling sleep** The 2009 Sleep in America poll of a random sample of 1000 adults reported that respondents slept an average of 6.7 hours on weekdays and 7.1 hours on weekends, and that 28% of respondents got eight or more hours of sleep on weekdays whereas 44% got eight or more hours of sleep on weekends (www.sleepfoundation.org).

**TRY**

- To compare the means or the percentages using inferential methods, should you treat the samples on weekdays and weekends as independent samples, or as dependent samples? Explain.
- To compare these results to polls of other people taken in previous years, should you treat the samples in the two years as independent samples, or as dependent samples? Explain.

**10.4 Less smoking now?** The National Health Interview Survey conducted of 27,603 adults by the U.S. National Center for Health Statistics in 2009 indicated that 20.6% of adults were current smokers. A similar study conducted in 1991 of 42,000 adults indicated that 25.6% were current smokers.

- Find and interpret a point estimate of the difference between the proportion of current smokers in 1991 and the proportion of current smokers in 2009.
- A 99% confidence interval for the true difference is (0.042, 0.058). Interpret.
- What assumptions must you make for the interval in part b to be valid?

**10.6 Aspirin and heart attacks in Sweden** A Swedish study used 1360 patients who had suffered a stroke. The study randomly assigned each subject to an aspirin treatment or a placebo treatment.<sup>4</sup> The table shows MINITAB output, where X is the number of deaths due to heart attack during a follow-up period of about 3 years. Sample 1 received the placebo and sample 2 received aspirin.

**TRY**

- Explain how to obtain the values labeled “Sample p.”
- Explain how to interpret the value given for “estimate for difference.”
- Explain how to interpret the confidence interval, indicating the relevance of 0 falling in the interval.
- If we instead let sample 1 refer to the aspirin treatment and sample 2 the placebo treatment, explain how the estimate of the difference and the 95% confidence interval would change. Explain how then to interpret the confidence interval. (Note that the output below would change for the analysis of this difference.)

sample p is obtained by taking proportion of ppl w  
estimate = subtract sample p for second sample from

**Deaths due to heart attacks in Swedish study**

Sample	X	N	Sample p
1	28	684	0.040936
2	18	676	0.026627

Difference =  $p(1) - p(2)$   
 Estimate for difference: 0.0143085  
 95% CI for difference: (-0.00486898, 0.0334859)  
 Test for difference = 0 (vs not = 0):  
 Z = 1.46 P - Value = 0.144

$$\hat{p} = 347 + 327 / (11535 + 140355) = 0.026$$

### 10.8 Significance test for aspirin and cancer deaths study



In the study for cancer death rates, consider the null hypothesis that the population proportion of cancer deaths  $p_1$  for placebo is the same as the population proportion  $p_2$  for aspirin. The sample proportions were  $\hat{p}_1 = 347/11,535 = 0.030$  and  $\hat{p}_2 = 327/14,035 = 0.023$ .

$$z = 0.03 - 0.023 / 0.002 = 3.5$$

- For testing  $H_0: p_1 = p_2$  against  $H_a: p_1 \neq p_2$ , show that the pooled estimate of the common value  $p$  under  $H_0$  is  $\hat{p} = 0.027$  and the standard error is 0.002.
- Show that the test statistic is  $z = 3.5$ .
- Find and interpret the P-value in context.

### 10.12 TV watching

A researcher predicts that the percentage of people who do not watch TV is higher now than before the advent of the Internet. Let  $p_1$  denote the population proportion of American adults in 1975 who reported watching no TV. Let  $p_2$  denote the corresponding population proportion in 2008.

$$\hat{p}_1 = 0.0384, 0.0657$$

- Set up null and alternative hypotheses to test the researcher's prediction.
- According to General Social Surveys, 57 of the 1483 subjects sampled in 1975 and 87 of the 1324 subjects sampled in 2008 reported watching no TV. Find the sample estimates of  $p_1$  and  $p_2$ .
- Show steps of a significance test. Explain whether the results support the researcher's claim.

### 10.10 Comparing marketing commercials



Two TV commercials are developed for marketing a new product. A volunteer test sample of 200 people is randomly split into two groups of 100 each. In a controlled setting, Group A watches commercial A and Group B watches commercial B. In Group A, 25 say they would buy the product. In group B, 20 say they would buy the product. The marketing manager who devised this experiment concludes that commercial A is better. Is this conclusion justified?

- Show all steps of your analysis, including assumptions.
- Comment on the manager's conclusion, and indicate limitations of the experiment.