**Key points**

* If the sums of the rows and the sums of the columns in the two-by-two table are fixed, then the hypergeometric distribution and  Fisher's exact test can be used. Otherwise, we must use the chi-squared test.
* The *chi-squared test*compares the observed two-by-two table to the two-by-two table expected by the null hypothesis and asks how likely it is that we see a deviation as large as observed or larger by chance.
* The function chisq.test() takes a two-by-two table and returns the p-value from the chi-squared test.
* The *odds ratio* states how many times larger the odds of an outcome are for one group relative to another group.
* A small p-value does not imply a large odds ratio. If a finding has a small p-value but also a small odds ratio, it may not be a practically significant or scientifically significant finding.
* Because the odds ratio is a ratio of ratios, there is no simple way to use the Central Limit Theorem to compute confidence intervals. There are advanced methods for computing confidence intervals for odds ratios that we do not discuss here.

