BOX 9.2 How to Calculate Chi-Square

1. Set up a work table with eight columns where each cell from the contingency table gets its own row. Identify each cell in the first column.
2. Copy the observed cell frequencies into the second column of your work table. Copy the marginal row proportion into the third column and the column n into the fourth.
3. In the fifth column, calculate the expected value by multiplying the row proportion (column 3) by the column n (column 4): E(X) = (row proportion) × (column n).
4. In the sixth column, subtract the expected value (column 5) from the observed frequency (column 2): $f_x - E(X)$.
5. In the seventh column, square the difference between the observed and expected values (column 6): $[f_x - E(X)]^2$.
6. In the last column, divide the squared difference (column 7) by the expected value (column 5): $[f_x - E(X)]^2 / E(X)$.
7. Calculate the chi-square by adding up the values in the final column: $\chi^2 = \Sigma[f_x - E(X)]^2 / E(X)$.
8. Find the statistical significance by looking this up on a chi-square table. Find the row for the correct degrees of freedom: d.f. = (c − 1)(r − 1). If your chi-square is larger than the value in the table, the relationship between the two variables is statistically significant and you can reject the null hypothesis.