# Practical 2.5: Categorical data

#### ADS2

Semester 2, 2023/24

### Learning Objectives

- Describing and visualising categorical data
- Chi-square test of categorical data

#### 1. Simulation of the probability of goodness-of-fit test

In the lecture you learned how to use the chi-square value to measure the discrepancy between observed data and expected data. Based on Season preferences data, use a simulation to get the distribution of  $\chi^2$  and calculate the p-value (the probability that the discrepancy is larger than the observed data).

```
Poll_seasons <- data.frame(Spring = 40, Summer = 30, Autumn = 18, Winter = 28)
```

Hint: If there is no preference for a particular season, the frequencies should follow a 0.25 in each category. Generate a (large) population with the expected proportions, sample 116 values (same as the values in the poll) and calculate the  $\chi^2$ , replicate this a large number of times to get an approximate  $\chi^2$  distribution.

```
equal_preferences <- sum(Poll_seasons) * 0.25
```

Use plot(density(...)) to visualise the distribution of simulated  $\chi^2$  values. What is the curve like? Do you get the similar probability as in the lecture material?

How the curve changes when considering a higher population size? How about a larger sample size?

Compare the probability with the result from *chisq.test()*.

## 2. Chi-square distribution and degree of freedom

Generate random chi-square values with different degrees of freedom. Use it as your simulation tool to get the curves as in the lecture. Hint: use rchisq() to directly obtain  $\chi^2$  values for each degree of freedom.

## 3. Chi-square test of homogeneity

Input the data from the two categories (season preference and reported allergy) into a data frame. Visualise the data as bar, balloons and mosaics. Hint: Try mosaicplot()

Perform chi-square test on the data.

## 4. Chi-square test and Fisher's exact test

Input the data from the survival after geneX KO into a matrix.

Perform a chi-square test on the data.	Turn off the Yates's continuity correct assigning the <i>correct</i> argument
to FALSE. What warning message do	you get? If you turn on the correction, what changes?

Perform a Fisher's exact test of	on the data. Hint	use $fisher.test()$	ļ
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Previous version by Hugo Samano.

Last update by DJ MacGregor in 2024