The data `bayesrules::spotify` has information on musical tracks released by Spotify musicians, and is featured in Chapter 16.

I. Danceability

1. Make a table showing the number of tracks by each artist.
2. Make a histogram of the `danceability` variable.
3. Make a chart showing a boxplot for each artist, giving their distribution of danceability scores. Use `forcats::fct_reorder()` to make the artists appear in order of danceability, and use `coord_flip()` to make the boxes horizontal and the artist names legible.
4. Based on your chart, who are the most and least danceable artists? How many tracks do they have in this data set? Do you notice any other interesting features of the danceability chart?

II. Pooled model

Ignore the grouping by artist and consider a "pooled" model, which is just the normal model with random mean and sd:

$$\begin{aligned} Y_i|\mu,\sigma &\sim N(\mu,\sigma^2) \\ \mu &\sim N(m,s^2) \\ \sigma &\sim \text{Exp}(\lambda) \end{aligned}$$

Here Y_i is the danceability of song i and μ and σ are parameters.

1. Fit this model with `rstanarm` using default weakly informative priors.
2. Make a density plot of the parameters.
3. What assumption of the normal model fails for this data?

III. Hierarchical model

Assume each artist has a mean danceability μ_j which is a random effect. The hierarchical model is:

$$\begin{aligned} Y_{ij}|\mu_j,\sigma &\sim N(\mu_j,\sigma_y^2) \\ \mu_j &\sim N(\mu,\sigma_\mu) \\ \mu &\sim N(m,s^2) \\ \sigma_y &\sim \text{Exp}(\lambda_y) \\ \sigma_\mu &\sim \text{Exp}(\lambda_\mu) \end{aligned}$$

1. Fit this model with `rstanarm` using default weakly informative priors.
2. Give a 95% credible interval for μ, the posterior mean overall danceability score and compare with the plot from section II.
3. Make a plot showing 90% posterior credible intervals for each artist's mean μ_j. You can use: `broom.mixed::tidy(dance_model, effects = "ran_vals", conf.int = TRUE)` to calculate these intervals as a data frame and `geom_pointrange()` to display them.
4. Based on your plot, who are the most and least danceable artists? How does this compare to the same question in part I?

IV. Posterior prediction

1. If Missy Elliott releases a new song, how danceable will it be? If Sufjan Stevens releases a new song, how danceable will it be? Make density plots for each artist.

2. What is the probability that Sufjan Stevens drops a more danceable track than Missy Elliott?