6.10: Chapter 6 Summary

Random effects of an ANOVA model, represent measurements arising from a larger population and are assumed to be $\mathcal{N}\left(\mu, \sigma_\tau^2\right)$. In other words, the levels or groups of the random effect that are observed can be considered as a sample from an original population. Random effects can also be **subject effects**. Consequently, in public health, a random effect is referred to as the **subject-specific effect**.

As all the levels of a random effect have the same mean, its significance is measured in terms of the variance with $H_0: \sigma_\tau^2 = 0$ vs. $H_a: \sigma_\tau^2 > 0$. Note also that any interaction effect involving at least one random effect is also a random effect. Due to the added variability incurred by each random effect, the variance of the response now will have several components which are called **variance components**. In the most basic case, with only one single factor and no fixed effects, this compound variance of the response will be $\sigma_Y^2 = \sigma_\tau^2 + \sigma_\epsilon^2$, where σ_τ^2 is the variance component associated with the random factor. The **intra-class correlation (ICC)**, defined in terms of the variance components, is a useful indicator of the high or low variability within groups (or subjects).

Mixed models, as introduced in section 6.7, include both fixed and random effects. Throughout the lesson, we learned how EMS quantities can be used to determine the correct F-test to test the hypotheses associated with the effects. EMS quantities can be thought of as the population counterparts of the Mean sums of squares (MS), which are computable for each source in the ANOVA table.