RMR Calculator Variance Formulas

Step 2 of the GRT, IRGT, and SWGRT calculators asks for the expected distribution of the outcome variable. This document describes the three outcome variable distributions used by the calculators, shows the formulas used to calculate total variance for each outcome, and presents an example calculation. In the following examples, let be σ^2 the total variance of the outcome and let Δ be the effect of the intervention.

Continuous Outcomes

Continuous outcomes are measured on an unbounded numerical scale. The user enters σ^2 in Step 2, with no further calculation needed. If σ^2 = 1, then Δ can be interpreted in standard deviation units.

Dichotomous Outcomes

At the individual level, dichotomous outcomes are coded as 1 for having the trait or quality of interest and 0 otherwise. They are summarized using proportions. Let the expected proportion in the control condition be p_0. Let the expected proportion in the intervention condition be $p_1 = p_0 + \Delta$. The value of σ^2 for dichotomous outcomes is therefore:

$$\begin{aligned}\sigma^2 &= \frac{p_0(1-p_0)+p_1(1-p_1)}{2} \\ &= \frac{p_0(1-p_0)+(p_0+\Delta)(1-(p_0+\Delta))}{2}\end{aligned}$$

Example: Let p_0 = 0.50 and Δ = 0.20. Then the variance is

$$\sigma^2 = \frac{0.50(1-0.50)+(0.50+0.20)(1-(0.50+0.20))}{2} = 0.23$$

Count Outcomes

At the individual level, count outcomes are discrete numerical quantities with a minimum value of 0 and no maximum. They are summarized using the event rate, which is the average count per measure of exposure. Let the expected event rate in the control condition be r_0. Let the expected event rate in the intervention condition be $r_1 = r_0 + \Delta$. Let the expected overdispersion factor be γ – if overdispersion is not present, then γ = 1. The value of σ^2 for count outcomes is therefore:

$$\sigma^2 = \gamma\left(\frac{r_0+r_1}{2}\right) = \gamma\left(r_0+\frac{\Delta}{2}\right)$$

Example: Let r_0 = 0.01 and delta = 0.05 with no overdispersion (γ = 1). Then the variance is

$$\sigma^2 = 1\left(0.01+\frac{0.05}{2}\right) = 0.035$$