We are fitting this model: $y_{i,j,g} = \alpha + \theta g + \beta_j + \gamma_j * g + \epsilon_{i,j}$ for $j = 1, \ldots, n$ and $g = 0, 1$ with $\beta_1 = \gamma_1 = 0$

- Calculate the expectation $E(y_{i,j,g})$ for different j and g.
- Let $\mu_{j,g} = E(y_{i,j,g})$. Then get the AUC minus baseline (baseline expectation is $\mu_{1,g}$) for $(\mu_{1,g}, \ldots, \mu_{n,g})$ when plotted against $(1, \ldots, n)$. AUC minus baseline is essentially the observed area under the $(\mu_{1,g}, \ldots, \mu_{n,g})$ - area assuming $\mu_{j,g} = \mu_{1,g}$ for all j. Let this quantity be AUCMB_g
- If the output of regression model looks like $\boldsymbol{\kappa} = (\alpha, \theta, \beta_2, \ldots, \beta_n, \gamma_2, \ldots, \gamma_n)$. Get ℓ such that $\ell^T \boldsymbol{\kappa} = \mathrm{AUCMB}_1$ - AUCMB_0.

To calculate the area, you can use trapezoidal rule as the plot $(\mu_{1,g}, \ldots, \mu_{n,g})$ vs $(1, \ldots, n)$ will look like $n - 1$ trapezoids placed side by side.

The area of a trapezoid is $\frac{1}{2}(a + b)h$ with height h and the top and bottom sides are of length a and b.