

Meta Analyses

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Since running a single linear mixed-effect model per trait turned out to be more complex than originally thought (mainly because of the different data structure between labs) we used a meta analysis framework to combine the outputs of individual linear mixed-effect models that have been ran separately for each single lab.

The aim of the meta analysis approach is to combine the effects of a variable observed in different studies to identify an overall effect. In our case, for a given trait, we consider each lab as being a study in which the effect of the population variable has been assessed via a linear mixed-effect model. However, as we are not directly interested in finding overall effects and because the population variable has 9 levels, we go a step further than in classic meta analysis and perform a subgroup analysis that allows to test for differences between populations (each population being considered as a subgroup). In a way, this is conceptually similar to performing a regression analysis where one tests the effect of the population variable on a given trait.

The input data for the subgroup meta analysis consists of the estimates and standard errors obtained for the population variable in the lab-specific linear mixed-effect models. Estimates are used as populations effects, and the standard errors of those estimates can be used as weights in the meta analysis model — to give more or less weight to studies depending on their sample size and replication level.

Below is how the input data looks like for left wing area in females measured in Banu Onder's lab:

##	Model	Predictor	Trait	Lab	Sex	Population	Estimate	SE
## 1	lmer	pop	WA_L	Onder	F	AK	2813.821	19.10681
## 2	lmer	pop	WA_L	Onder	F	GI	2852.889	20.67155
## 3	lmer	pop	WA_L	Onder	F	KA	2858.673	19.15670
## 4	lmer	pop	WA_L	Onder	F	MA	2898.805	19.19845
## 5	lmer	pop	WA_L	Onder	F	MU	2860.100	18.90833
## 6	lmer	pop	WA_L	Onder	F	RE	2943.866	20.22411
## 7	lmer	pop	WA_L	Onder	F	UM	2901.096	19.80131
## 8	lmer	pop	WA_L	Onder	F	VA	2843.502	19.07182
## 9	lmer	pop	WA_L	Onder	F	YE	2815.297	19.23505

We run the meta analysis with the