

Stat 402A, Effect of samples and subsamples on se(mean)

Notation:

C: number of containers per treatment

P: number of plants per container

σ_C^2 : Variance component between containers

σ_P^2 : Variance component between plants in same container

Basic formula:

$$\text{Var}(\text{mean}) = \frac{\sigma_C^2}{C} + \frac{\sigma_P^2}{C \times P}$$

Examples:

1. large variability between containers, small variability between plants, $\sigma_C^2 = 3.5$, $\sigma_P^2 = 0.30$

C	P	total plants	Var(mean)	s.e. mean
2	3	6	1.80	1.34
3	2	6	1.22	1.10
6	1	6	0.63	0.79
1	6	6	3.55	1.88
2	3	6	1.80	1.34
4	3	12	0.90	0.95
2	6	12	1.78	1.33
4	6	24	0.89	0.94

More containers: reduce s.e.

More plants: little change in s.e.

2. large variability between containers, same variability between plants, $\sigma_C^2 = 2.7$, $\sigma_P^2 = 2.7$

C	P	total plants	Var(mean)	s.e. mean
2	3	6	1.80	1.34
4	3	12	0.90	0.95
2	6	12	1.58	1.26

More containers: reduce s.e.

More plants: some change in s.e.

3. small variability between containers, large variability between plants, $\sigma_C^2 = 0.2$, $\sigma_P^2 = 10.2$

C	P	total plants	Var(mean)	s.e. mean
2	3	6	1.80	1.34
4	3	12	0.90	0.95
2	6	12	0.95	0.97

More containers: reduce s.e.

More plants: also reduce s.e.