Goals of the statistical analysis

- Comparison of groups of results (e.g. several laboratories analyzing one and the same sample by one and the same technique) in order to assess if some of the laboratories are subject to systematic error (wrong results);
- Is the LASBORATORY a **Factor** determining the outcome of the results?
- Are there only random errors in the course of the work?
- Which is the “laboratory – sinner”?

VARIATION

$$s^2 = \frac{SS}{df} = \frac{\sum \left(X - \bar{X} \right)^2}{N-1}$$

Input table

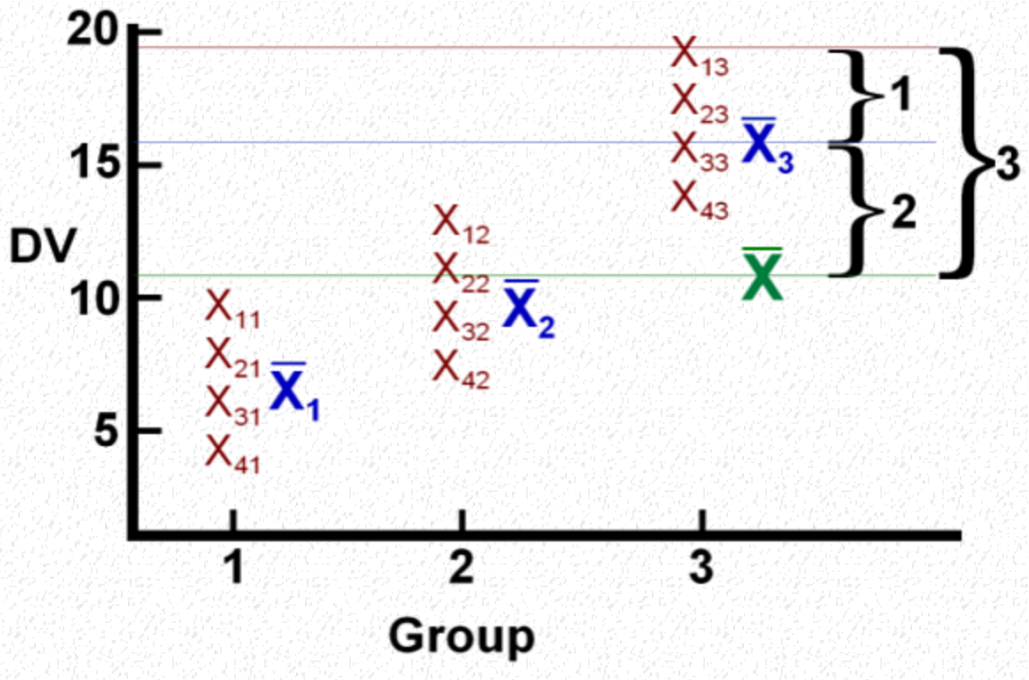
	Labs (groups)								
Repeats	1	2	3	.	.	j	.	.	p
1	x_{11}	x_{12}	x_{13}	.	.	x_{1j}	.	.	x_{1p}
2	x_{21}	x_{22}	x_{23}	.	.	x_{2j}	.	.	x_{2p}
3	x_{31}	x_{32}	x_{33}	.	.	x_{3j}	.	.	x_{3p}
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
i	x_{i1}	x_{i2}	x_{i3}	.	.	x_{ij}	.	.	x_{ip}
.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.
n	x_{n1}	x_{n2}	x_{n3}	.	.	x_{nj}	.	.	x_{np}

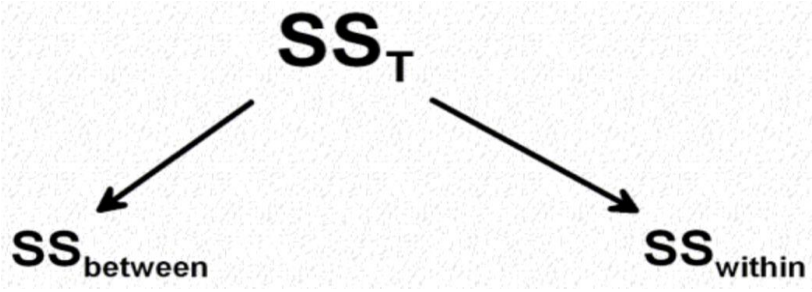
Repeats: i=1..n
Labs: j=1..p

Gross average and variation

Average and variation for each group

Calculations for ANOVA





$$(X_{ij} - \bar{X}) = (X_{ij} - \bar{X}_j) + (\bar{X}_j - \bar{X})$$

total	within groups	between groups
#3	#1	#2

Calculations of sum of squares

$$(X_{ij}-\bar{X}) = (X_{ij}-\bar{X}_j) + (\bar{X}_j-\bar{X})$$

total = within groups + between groups

$$\sum_{j=1}^{p}\sum_{i=1}^{n_j}(X_{ij}-\bar{X})^2 = SS_{Tot}$$

$$\sum_{j=1}^{p} n_j(\bar{X}_j-\bar{X})^2 = SS_{Betw}$$

$$\sum_{j=1}^{p}\sum_{i=1}^{n_j}(X_{ij}-\bar{X}_j)^2 = SS_{W/in}$$

Statistical Hypotheses

- $SS_{tot} = SS_{between} + SS_{within}$
- $df_{tot} = df_{between} + df_{within}$

Source of variaton	df	SS	Variation
Between	p-1	$SS_{between}$	$s^2_{between}$
Within	p*(n-1)	SS_{within}	s^2_{within}
Total	n*p-1	SS_{total}	s^2_{total}

$$H_0: \; s^2_{between} = s^2_{within}$$

$$H_1: \; s^2_{between} > s^2_{within}$$

$$F = \frac{s^2_{between}}{s^2_{within}} \; !!!$$