

Analysis of a Completely Randomized Design with a One-Way Treatment Structure Using SAS

The Environmental Protection Agency (EPA) utilizes the services of a number of analytic laboratories. It is of interest to EPA that these laboratories produce equivalent results when asked to analyze water samples for possible contamination. In order to assess the quality of the analyses from these laboratories the EPA decided to send each of 3 laboratories a set of 6 samples that were known to have a DDT contamination level of 1000 ppm. Each water sample was constructed independent of the others and randomly assigned to a laboratory. The resulting data are given in the following table:

Laboratory	Replicates					
	1	2	3	4	5	6
1	1005	1015	1033	1028	1023	1043
2	995	1008	976	1014	1011	982
3	950	975	988	1015	1008	994

```
title "Analysis of EPA Laboratory Data";
title2 "Using a Completely Randomized Design";
title3 "With a One-Way Treatment Structure";
data epa;
input laboratory ddt @@;
cards;
1 1005 1 1015 1 1033 1 1028 1 1023 1 1043
2 995 2 1008 2 976 2 1014 2 1011 2 982
3 950 3 975 3 988 3 1015 3 1008 3 994
;
run;
proc print data = epa;
run;
proc glm data = epa;
class laboratory;
model ddt = laboratory;
run;
```

The statistical design is a completely randomized design with a one-way treatment structure (Laboratories). The model for a CRD with a one-way treatment structure codes for a “grand mean” or model intercept and the treatment effects (Laboratory in the above example). Replicates are the source of random variation and appear in the residual error. In the above code, the response (DDT) is a function of the treatment (Laboratory). Any remaining variation goes to the residual error.

The key elements of the analysis are:

```
proc glm data = epa;

class laboratory;

model ddt = laboratory;

run;
```

Proc GLM is the general linear models procedure which can be used to run ANOVA or regression analysis. The class statement tells Proc GLM which factors are in the ANOVA. In this case Laboratory is the factor. The model statement relates the response (DDT) to the factor (Laboratory). This will produce the ANOVA table with the F-test and Pvalues