How to Perform Levene’s Test in R for Equality of Variances

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Levene's test is a statistical method used to determine if there is equality of variances between two or more groups. This test is important because it allows us to assess the assumption of homogeneity of variances, which is necessary for many statistical analyses. To conduct Levene's test in R, you can use the "leveneTest" function from the "car" package. This function takes in the data for each group and performs a hypothesis test to determine if the variances are significantly different. If the p-value is greater than the chosen significance level, we can conclude that the variances are not significantly different and the assumption of homogeneity of variances is met. However, if the p-value is less than the significance level, we can reject the assumption and use alternative methods for our analysis. Overall, conducting Levene's test in R is a crucial step in ensuring the validity of statistical analyses involving multiple groups.

Conduct Levene's Test for Equality of Variances in R

Many statistical tests (like a or) make the assumption that the variance among several groups is equal.

One way to formally test this assumption is to use Levene's Test, which tests whether or not the variance among two or more groups is equal.

This test has the following hypotheses:

Null hypothesis (H0): The variance among the groups is equal.

Alternative hypothesis (HA): The variance among the groups is *not* equal.

If the p-value from the test is less than our chosen significance level, we can reject the null hypothesis and

conclude that we have enough evidence to state that the variance among the groups is not equal.

How to Conduct Levene's Test in R

To conduct Levene's test in R, we can use the leveneTest() function from the car library, which uses the following syntax:

leveneTest(response variable ~ group variable, data = data)

As an example, consider the following data frame that shows how much weight people lost on three different weight loss programs:

```
#make this example reproducible
set.seed(0)

#create data frame
data <- data.frame(program = rep(c("A", "B", "C"), each = 30),
weight_loss = c(runif(30, 0, 3),
runif(30, 0, 5),
runif(30, 1, 7)))
```

```
#view first six rows of data frame
head(data)

# program weight_loss
#1 A 2.6900916
#2 A 0.7965260
#3 A 1.1163717
#4 A 1.7185601
#5 A 2.7246234
#6 A 0.6050458
```

To check if the variance in weight loss is equal among these three programs, we can use the leveneTest() function and use 0.05 as our significance level:

```
#load car package
library(car)

#conduct Levene's Test for equality of variances
leveneTest(weight_loss ~ program, data = data)

#Levene's Test for Homogeneity of Variance (center = median)
# Df F value Pr(>F)
#group 2 4.1716 0.01862 *
```

```
# 87
#---
#Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

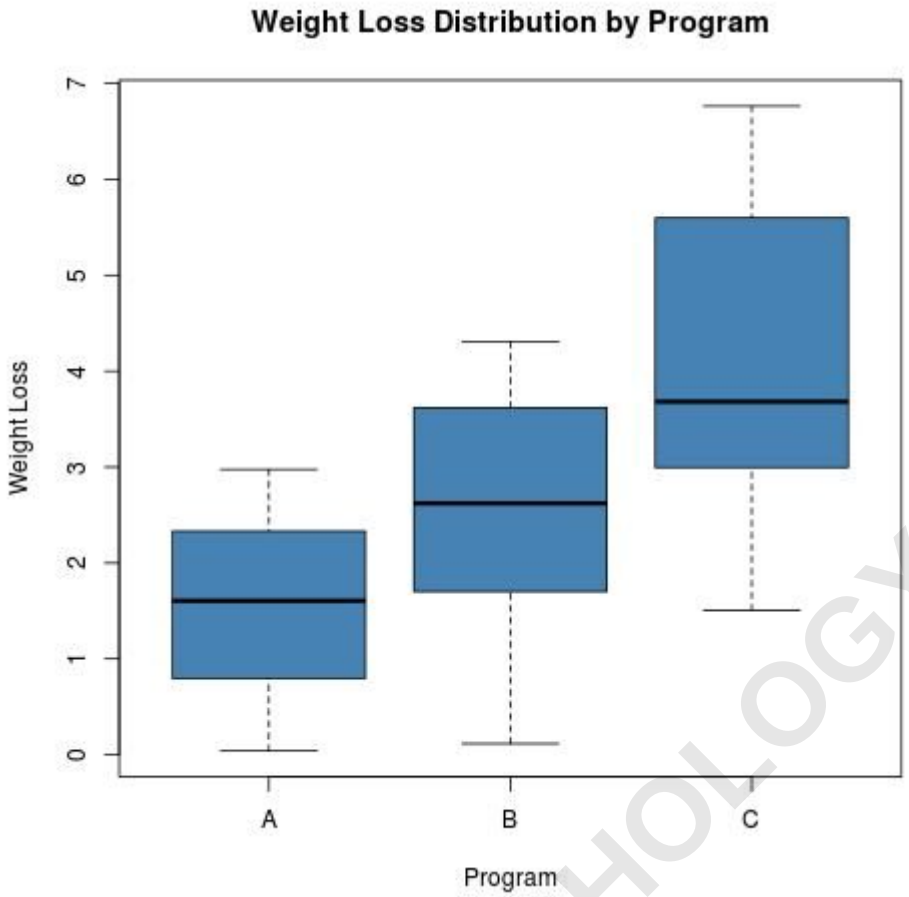
The p-value of the test is 0.01862, which is less than our significance level of 0.05.

Thus, we reject the null hypothesis and conclude that the variance among the three groups is *not* equal.

Visualizing the Differences in Variances

From conducting Levene's test, we know that the variances among the three groups are not equal.

```
boxplot(weight_loss ~ program,
data = data,
main = "Weight Loss Distribution by Program",
xlab = "Program",
ylab = "Weight Loss",
col = "steelblue",
border = "black")
```



We can see that the variance for weight loss is noticeably higher for participants in Program C compared to the other two programs.

Thus, it makes sense that Levene's test rejected the null hypothesis that the variances are equal among the three groups.

The following tutorials explain how to perform Levene's Test in different statistical software: