practice15

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```
> ## One-sample test.
> ## Hollander & Wolfe (1973), 29f.
> ## Hamilton depression scale factor measurements in 9 patients with
> ## mixed anxiety and depression, taken at the first (x) and second
> ## (y) visit after initiation of a therapy (administration of a
> ## tranquilizer).
> x <- c(1.83, 0.50, 1.62, 2.48, 1.68, 1.88, 1.55, 3.06, 1.30)
> y <- c(0.878, 0.647, 0.598, 2.05, 1.06, 1.29, 1.06, 3.14, 1.29)
> wilcox.test(x, y, paired = TRUE, alternative = "greater")
```

```
##
##  Wilcoxon signed rank exact test
##
## data:  x and y
## V = 40, p-value = 0.01953
## alternative hypothesis: true location shift is greater than 0
```

```
> wilcox.test(y - x, alternative = "less") # The same.
```

```
##
##  Wilcoxon signed rank exact test
##
## data:  y - x
## V = 5, p-value = 0.01953
## alternative hypothesis: true location is less than 0
```

```
> wilcox.test(y - x, alternative = "less",
+             exact = FALSE, correct = FALSE) # H&W large sample
```

```
##
##  Wilcoxon signed rank test
##
## data:  y - x
## V = 5, p-value = 0.01908
## alternative hypothesis: true location is less than 0
```

```
> # approximation
> ## Two-sample test.
> ## Hollander & Wolfe (1973), 69f.
> ## Permeability constants of the human chorioamnion (a placental
> ## membrane) at term (x) and between 12 to 26 weeks gestational
> ## age (y). The alternative of interest is greater permeability
> ## of the human chorioamnion for the term pregnancy.
> x <- c(0.80, 0.83, 1.89, 1.04, 1.45, 1.38, 1.91, 1.64, 0.73, 1.46)
> y <- c(1.15, 0.88, 0.90, 0.74, 1.21)
> wilcox.test(x, y, alternative = "g") # greater
```

```
##
##  Wilcoxon rank sum exact test
##
## data:  x and y
## W = 35, p-value = 0.1272
## alternative hypothesis: true location shift is greater than 0
```

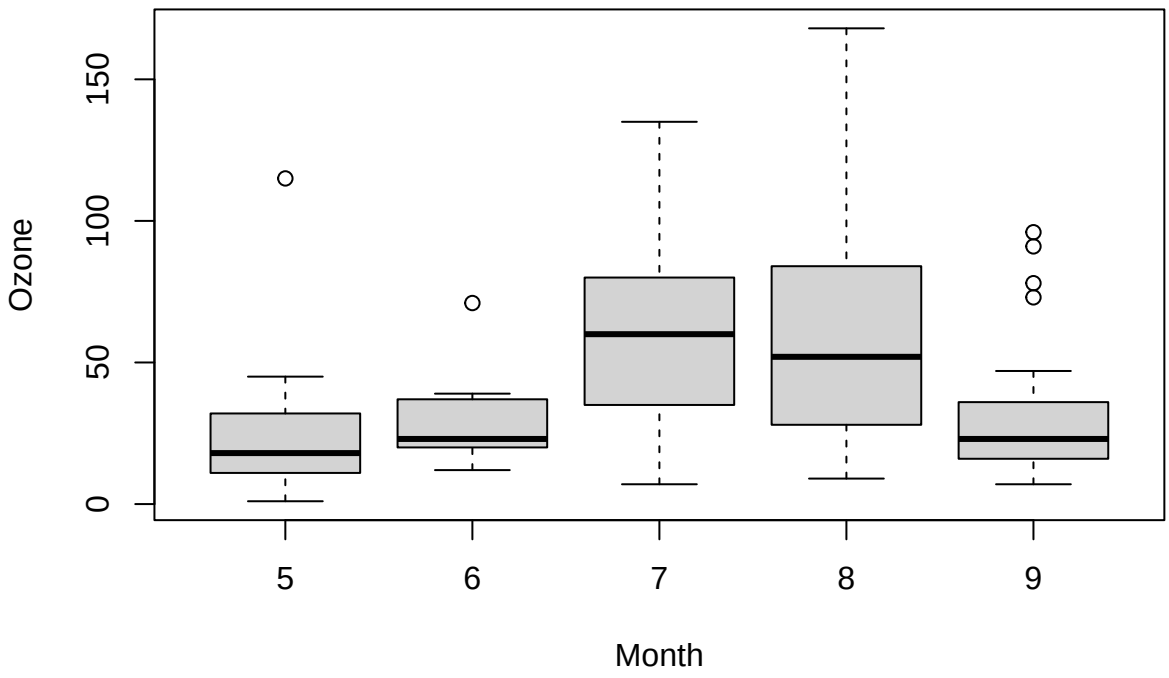
```
> wilcox.test(x, y, alternative = "greater",
+             exact = FALSE, correct = FALSE) # H&W large sample
```

```
##
##  Wilcoxon rank sum test
##
## data:  x and y
## W = 35, p-value = 0.1103
## alternative hypothesis: true location shift is greater than 0
```

```
> wilcox.test(rnorm(10), rnorm(10, 2), conf.int = TRUE)
```

```
##
##  Wilcoxon rank sum exact test
##
## data:  rnorm(10) and rnorm(10, 2)
## W = 12, p-value = 0.002879
## alternative hypothesis: true location shift is not equal to 0
## 95 percent confidence interval:
##  -2.8200515 -0.6504398
## sample estimates:
## difference in location
##              -1.904762
```

```
> ## Formula interface.
> boxplot(Ozone ~ Month, data = airquality)
```




```
> wilcox.test(Ozone ~ Month, data = airquality,
+             subset = Month %in% c(5, 8))
```

```
## Warning in wilcox.test.default(x = DATA[[1L]], y = DATA[[2L]], ...):
##    p
```

```
##
##  Wilcoxon rank sum test with continuity correction
##
## data:  Ozone by Month
## W = 127.5, p-value = 0.0001208
## alternative hypothesis: true location shift is not equal to 0
```

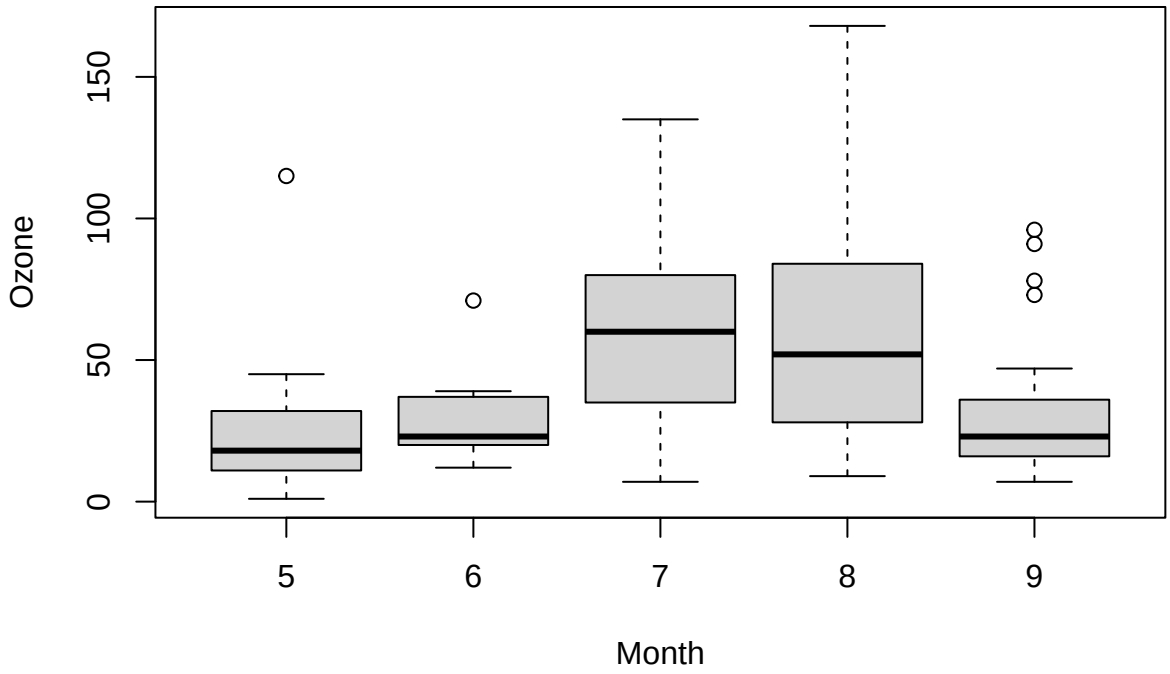
```
> ## Hollander & Wolfe (1973), 116.
> ## Mucociliary efficiency from the rate of removal of dust in normal
> ## subjects, subjects with obstructive airway disease, and subjects
> ## with asbestosis.
> x <- c(2.9, 3.0, 2.5, 2.6, 3.2) # normal subjects
> y <- c(3.8, 2.7, 4.0, 2.4) # with obstructive airway disease
> z <- c(2.8, 3.4, 3.7, 2.2, 2.0) # with asbestosis
> kruskal.test(list(x, y, z))
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  list(x, y, z)
## Kruskal-Wallis chi-squared = 0.77143, df = 2, p-value = 0.68
```

```
> ## Equivalently,
> x <- c(x, y, z)
> g <- factor(rep(1:3, c(5, 4, 5)),
+             labels = c("Normal subjects",
+                        "Subjects with obstructive airway disease",
+                        "Subjects with asbestosis"))
> kruskal.test(x, g)
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  x and g
## Kruskal-Wallis chi-squared = 0.77143, df = 2, p-value = 0.68
```

```
> ## Formula interface.
> require(graphics)
> boxplot(Ozone ~ Month, data = airquality)
```



```
> kruskal.test(Ozone ~ Month, data = airquality)
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  Ozone by Month
## Kruskal-Wallis chi-squared = 29.267, df = 4, p-value = 6.901e-06
```

```
> ## From Agresti(2007) p.39
> M <- as.table(rbind(c(762, 327, 468), c(484, 239, 477)))
> dimnames(M) <- list(gender = c("F", "M"),
+ party = c("Democrat","Independent", "Republican"))
> (Xsq <- chisq.test(M)) # Prints test summary
```

```
##
##  Pearson's Chi-squared test
##
## data:  M
## X-squared = 30.07, df = 2, p-value = 2.954e-07
```

```
> Xsq$observed # observed counts (same as M)
```

```
##        party
## gender Democrat Independent Republican
##      F      762         327        468
##      M      484         239        477
```

```
> Xsq$expected # expected counts under the null
```

```
##        party
## gender Democrat Independent Republican
##      F 703.6714    319.6453   533.6834
##      M 542.3286    246.3547   411.3166
```

```
> Xsq$residuals # Pearson residuals
```

```
##        party
## gender   Democrat Independent Republican
##      F  2.1988558   0.4113702 -2.8432397
##      M -2.5046695  -0.4685829  3.2386734
```

```
> Xsq$stdres # standardized residuals
```

```
##        party
## gender   Democrat Independent Republican
##      F  4.5020535   0.6994517 -5.3159455
##      M -4.5020535  -0.6994517  5.3159455
```

```
> ## Agresti (1990, p. 61f; 2002, p. 91) Fisher's Tea Drinker
> ## A British woman claimed to be able to distinguish whether milk or
> ## tea was added to the cup first. To test, she was given 8 cups of
> ## tea, in four of which milk was added first. The null hypothesis
> ## is that there is no association between the true order of pouring
> ## and the woman's guess, the alternative that there is a positive
> ## association (that the odds ratio is greater than 1).
> TeaTasting <-
+ matrix(c(3, 1, 1, 3),
+        nrow = 2,
+        dimnames = list(Guess = c("Milk", "Tea"),
+                        Truth = c("Milk", "Tea")))
> fisher.test(TeaTasting, alternative = "greater")
```

```
##
##  Fisher's Exact Test for Count Data
##
## data:  TeaTasting
## p-value = 0.2429
## alternative hypothesis: true odds ratio is greater than 1
## 95 percent confidence interval:
##  0.3135693       Inf
## sample estimates:
## odds ratio
##   6.408309
```