Wilcoxon Test for Participants with Glaucoma and Unilateral Hemifield Defects

Introduction:

Open angle glaucoma and unilateral hemifield defects are the most common eye disease among individuals 50 and above. This disease is unambiguous among older individuals and those who do not wear sunglasses on a regular basis. Glaucoma is caused by increased eye pressure which can cause pressure on the optic nerve that can eventually result in blindness. Without treatment glaucoma can cause permanent damage. Thienprashidi et al. examined the ages of a sample of 16 subjects with open angle glaucoma and unilateral hemifield defects. Using data from this study, it was of interest to determine if the median age group of individuals with glaucoma and unilateral hemifield defects is less than 60.

Methods:

Age levels were obtained from participants in the Thienprashidi et al. study. These ages were checked for normality using QQ plots, and then were summarized with the median, IQR, and sample size. The alternative hypothesis (Ha: median < 60) is that the median age level is less than 60 was assessed with a one sample Wilcoxon Signed-Rank Test against a null hypothesis (Ho: median=60) that the median age level is equal to 60.We will reject the null hypothesis if the resulting p-value is less than the stated significance level, and we will fail to reject otherwise. All data summaries and tests were performed using the R statistical software (2.11.1), and all tests were conducted using a significance level of $\alpha = 0.05$.

Results:

The sample is assumed representative, subjects are assumed independent, and inspection of the QQ plot does not show normality. The median age for those participants with open angle glaucoma and unilateral hemifield defects is reported as 57 (first quartile: 50.75; third quartile: 62. Minimum value: 34 and Maximum value:68.0) The central limit theorem does not apply due to the small sample size (n=16) and the data not being normally distributed. The results from the one-sample Wilcoxon Signed-Rank Test is p-value = 0.02163. Since p-value = 0.02163 < 0.05 we reject the null hypothesis that the median age group is equal to 60.

Discussion:

This study found evidence that the median age group of participants with glaucoma and unilateral hemifield defects is less than 60. We can use this data to implement to health care professionals to screen more patients who are under 60 for these eye disease.

T-Test for Maximum Voluntary Levels Among Healthy College Seniors

Introduction:

Lung disorders can arise from several different causes, most notably is smoking among young adults. However, lung disorders can arise from other causes, such as sarcoidosis or interstitial lung disease which can be hereditary. Using maximum voluntary levels allows treating physicians to assess the lung function of patients, and they are measured in liters per minute. Using data from this study it was of interest to test the mean value of the maximum voluntary levels of apparently 20 health college seniors.

Methods:

Maximum voluntary levels were obtained from 20 apparently healthy college seniors in the study. These maximum voluntary levels were checked for normality using QQ plots, and were summarized with means, standard deviations and 99 % confidence intervals. The alternative hypothesis (Ha: mean ≠ 110 liters per minute) that the mean maximum voluntary levels was not equal to 110 was assessed using a one-sample t-test against a null hypothesis (Ho: mean = 110 liters per minute) that the mean maximum voluntary levels was equal to 110. We will reject the null hypothesis if the resulting p-value is less than the stated significance level, and we will fail to reject otherwise. All data summaries and tests were performed using the R statistical software (2.11.1), and all tests were conducted using a significance level of $\alpha = 0.01$.

Results:

The sample is assumed representative, subjects are assumed independent, and inspection of the QQ plot shows evidence of normality, so that we can conclude a large enough sample size. The mean maximum voluntary levels of the 20 college students was 111.6 (SD =56.30, 99 % C I: 75.58151,147.61849). The results from the one-sample t = 0.12709, p-value

= 0.9002. Since p-value = 0.9002 > 0.05, we fail to reject the null hypothesis that the mean maximum voluntary value in healthy college students is equal to 110 liters per minute.

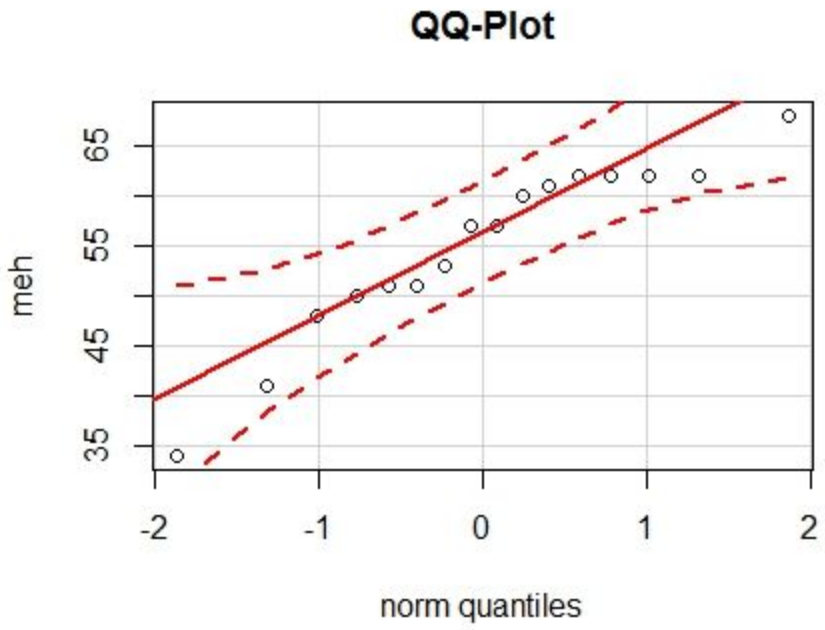
Discussion:

This study found evidence that healthy college students exhibit a mean maximum voluntary value of 110 liters per minute. This maximum voluntary value is in line with the national average among healthy young adults ages (18-25) and primary care doctors should continue to screen smokers using the spirometry test.

Appendix: R Code

Question 1

```
#median, not normally distrubuted. skewed left.
#less than 30. CLT theroum does not apply
problem1<-c(62,62,68,48,51,60,51,57,57,41,62,50,53,34,62,61)
qqPlot(problem1, ylab="meh", main = "QQ-Plot")
#per histogram and qqplot, the data is not normally distrubted
> summary(problem1)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  34.00   50.75   57.00   54.94   62.00   68.00
wilcox.test(problem1, mu=60, alternative = "less")
#data:  problem1
#V = 24, p-value = 0.02163
#alternative hypothesis: true location is less than 60
#p-value is less than out alpha, therefore we reject the null hypothesis
```



##

Question 2

#mean.normally distrubuted.less than 30. CLT thearum does not apply

problem2<-c(132,33,91,108,67,169,54,203,190,133,96,30,187,21,63,166,84,110,157,138)

qqPlot(problem2, ylab="meh", main = "QQ-Plot")

#per the qq plot it is normally distrbuted

t.test(problem2, mu=110, alternative = "two.sided")

#data: problem2

#t = 0.12709, df = 19, p-value = 0.9002

#alternative hypothesis: true mean is not equal to 110

#99 percent confidence interval:

 # 75.58151 147.61849

#sample estimates:

mean of x : 111.6