

798W Project

Kelsey Canada

January 20, 2016

```
HMNdata <- read.csv("KelseyData.csv", header=T, na.strings = c("NA", "9/9/99", "0:00", "#NULL!"))
```

Function code:

```
clean.hmn <- function(HMNdata=HMNdata) {  
  library(reshape2)  
  HMNdata<-data.frame(HMNdata$Subject_ID, HMNdata$ExactAgeCalc, HMNdata$AgeGroup, HMNdata$All_Primary, L  
    newnames<-c("Subject_ID", "ExactAge", "AgeGroup", "PrimacyOverall", "SleepDuration_LN", "SleepDuration  
colnames(HMNdata)<-newnames  
  cleaneddata<-(subset( HMNdata[!is.na(HMNdata$SleepDuration_LN),]))  
  cleaneddata<-melt(cleaneddata, measure.vars = c("SleepDuration_LN", "SleepDuration_N1", "SleepDuration  
    newlevels<-c("LastNight", "Night1", "Night2", "Night3", "Night4", "Night5", "Night6", "Night7", "Night8")  
levels(cleaneddata$Night)<-newlevels  
  cleaneddata$AgeGroup <- as.factor(cleaneddata$AgeGroup)  
  cleaneddata<- dcast(cleaneddata, Subject_ID + ExactAge + PrimacyOverall + Lorschbach_Percent + SourceM  
colnames(cleaneddata)[11]<- "AverageSleep"  
  cleaneddata$AverageSleep<-as.numeric(cleaneddata$AverageSleep)  
  cleaneddata  
}
```

```
HMNclean<-clean.hmn(HMNdata)
```

Combining sleep questionnaire data

```
sleepdata <- read.csv("sleep.csv", header=T, na.strings = c("NA", "9/9/99", "0:00", "#NULL!"))

sleep.subset<-data.frame(sleepdata$Subject_ID, sleepdata$Subscale_1_Bedtime_Resistance,sleepdata$Subscale_2_Sleep_Onset_Delay,sleepdata$Subscale_3_Sleep_Duration,sleepdata$Subscale_4_Sleep_Anxiety)

newnamesleep<-c("Subject_ID", "Bedtime_Resistance", "Sleep_Onset_Delay", "Sleep_Duration", "Sleep_Anxiety")
colnames(sleep.subset)<-newnamesleep
colnames(sleep.subset)
```

```
## [1] "Subject_ID"           "Bedtime_Resistance"
## [3] "Sleep_Onset_Delay"    "Sleep_Duration"
## [5] "Sleep_Anxiety"        "Night_Wakings"
## [7] "Parasomnias"          "Sleep_Disordered_Breathing"
## [9] "Daytime Sleepiness"   "Total Sleep Disturbance"
```

```
mydata <- merge(HMNClean, sleep.subset, by=c("Subject_ID"))
```

```
pairwise.t.test(mydata$Lorsbach Percent, mydata$AgeGroup)
```

```
##
## Pairwise comparisons using t tests with pooled SD
```

```
##
## data: mydata$Lorsbach_Percent and mydata$AgeGroup
##
##    4      5      6      7
## 5 0.1390 -      -      -
## 6 0.0023 0.1515 -      -
## 7 5.5e-06 0.0095 0.1390 -
## 8 6.7e-09 1.4e-05 0.0003 0.0378
##
## P value adjustment method: holm
```

```
pairwise.t.test(mydata$PrimacyOverall, mydata$AgeGroup)
```

```
##
## Pairwise comparisons using t tests with pooled SD
##
## data: mydata$PrimacyOverall and mydata$AgeGroup
##
##    4      5      6      7
## 5 1.000 -      -      -
## 6 0.069 0.363 -      -
## 7 0.042 0.314 1.000 -
## 8 0.070 0.350 1.000 1.000
##
## P value adjustment method: holm
```

```
sum(mydata$AgeGroup==8) #8
```

```
## [1] 8
```

```
sum(mydata$AgeGroup==7) #15
```

```
## [1] 15
```

```
sum(mydata$AgeGroup==6) #21
```

```
## [1] 21
```

```
sum(mydata$AgeGroup==5) #10
```

```
## [1] 10
```

```
sum(mydata$AgeGroup==4) #14
```

```
## [1] 14
```

```
#unequal n's is an issue due to having incomplete data
```

```
sleepquants<-as.numeric(quantile(mydata$Total_Sleep_Disturbance, na.rm=T))
sleepquants #high score is worse here
```

```
## [1] 31 36 39 44 61
```

```
fours<-subset(mydata[mydata$AgeGroup==4,])  
sixes<-subset(mydata[mydata$AgeGroup==6,])
```

```
t.test(fours$PrimacyOverall[fours$Total_Sleep_Disturbance<=39], fours$PrimacyOverall[fours$Total_Sleep_Disturbance>39])
```

```
##  
## Welch Two Sample t-test  
##  
## data: fours$PrimacyOverall[fours$Total_Sleep_Disturbance <= 39] and fours$PrimacyOverall[fours$Total_Sleep_Disturbance > 39]  
## t = 0.96867, df = 6.0917, p-value = 0.3696  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.1731747 0.4015081  
## sample estimates:  
## mean of x mean of y  
## 0.5866667 0.4725000
```

```
t.test(sixes$PrimacyOverall[sixes$Total_Sleep_Disturbance<=39], sixes$PrimacyOverall[sixes$Total_Sleep_Disturbance>39])
```

```
##  
## Welch Two Sample t-test  
##  
## data: sixes$PrimacyOverall[sixes$Total_Sleep_Disturbance <= 39] and sixes$PrimacyOverall[sixes$Total_Sleep_Disturbance > 39]  
## t = 1.0904, df = 5.4625, p-value = 0.3213  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.1356460 0.3445349  
## sample estimates:  
## mean of x mean of y  
## 0.7944444 0.6900000
```

```
t.test(mydata$PrimacyOverall[mydata$Total_Sleep_Disturbance<=39], mydata$PrimacyOverall[mydata$Total_Sleep_Disturbance>39])
```

```
##  
## Welch Two Sample t-test  
##  
## data: mydata$PrimacyOverall[mydata$Total_Sleep_Disturbance <= 39] and mydata$PrimacyOverall[mydata$Total_Sleep_Disturbance > 39]  
## t = 0.71279, df = 38.264, p-value = 0.4803  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## -0.07103072 0.14826149  
## sample estimates:  
## mean of x mean of y  
## 0.7046154 0.6660000
```

```
###
```

```
t.test(sixes$Lorsbach_Percent[fours$Total_Sleep_Disturbance<=39], fours$Lorsbach_Percent[fours$Total_Sleep_Disturbance>39])
```

```
##
## Welch Two Sample t-test
##
## data:  sixes$Lorsbach_Percent[fours$Total_Sleep_Disturbance <= 39] and fours$Lorsbach_Percent[fours$
## t = 2.3491, df = 4.1718, p-value = 0.07591
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.02665566 0.35379851
## sample estimates:
## mean of x mean of y
## 0.6885714 0.5250000
```

```
t.test(sixes$Lorsbach_Percent[sixes$Total_Sleep_Disturbance<=39], sixes$Lorsbach_Percent[sixes$Total_Sl
```

```
##
## Welch Two Sample t-test
##
## data:  sixes$Lorsbach_Percent[sixes$Total_Sleep_Disturbance <= 39] and sixes$Lorsbach_Percent[sixes$
## t = 0.74627, df = 6.4065, p-value = 0.482
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.08606783 0.16329005
## sample estimates:
## mean of x mean of y
## 0.6711111 0.6325000
```

```
t.test(mydata$Lorsbach_Percent[mydata$Total_Sleep_Disturbance<=39], mydata$Lorsbach_Percent[mydata$Total
```

```
##
## Welch Two Sample t-test
##
## data:  mydata$Lorsbach_Percent[mydata$Total_Sleep_Disturbance <= 39] and mydata$Lorsbach_Percent[myd
## t = -0.79878, df = 38.689, p-value = 0.4293
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
## -0.12446647 0.05400493
## sample estimates:
## mean of x mean of y
## 0.6407692 0.6760000
```

```
###
```

```
sleepissues<-subset(mydata[mydata$Total_Sleep_Disturbance>=41,])
length(sleepissues$Subject_ID)
```

```
## [1] 38
```

```
#issue with the scale and validity of the measure as according to the outlines set by the CHSQ 38 of th
```

```
PrimacyReg <- lm(PrimacyOverall ~ Total_Sleep_Disturbance + AverageSleep + AgeGroup, data=mydata)
summary(PrimacyReg ) # average sleep approaching significance
```

```
##
## Call:
## lm(formula = PrimacyOverall ~ Total_Sleep_Disturbance + AverageSleep +
##     AgeGroup, data = mydata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.22081 -0.11416 -0.02018  0.09184  0.33119
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.477074    0.442156   3.341  0.00185 **
## Total_Sleep_Disturbance -0.003391    0.003708  -0.914  0.36610
## AverageSleep      -0.078115    0.039135  -1.996  0.05295 .
## AgeGroup5          0.005692    0.077314   0.074  0.94169
## AgeGroup6          0.192688    0.064277   2.998  0.00471 **
## AgeGroup7          0.188668    0.065792   2.868  0.00664 **
## AgeGroup8          0.187791    0.080943   2.320  0.02566 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1485 on 39 degrees of freedom
## (22 observations deleted due to missingness)
## Multiple R-squared:  0.3986, Adjusted R-squared:  0.3061
## F-statistic: 4.308 on 6 and 39 DF,  p-value: 0.002003
```

```
PrimacySleep <- glm(PrimacyOverall ~ AverageSleep, data=mydata)
summary(PrimacySleep ) # average sleep sig without age groups.
```

```
##
## Call:
## glm(formula = PrimacyOverall ~ AverageSleep, data = mydata)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.31011 -0.09715 -0.00472  0.09134  0.41005
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      1.42149    0.32279   4.404 4.74e-05 ***
## AverageSleep    -0.07454    0.03251  -2.292  0.0256 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for gaussian family taken to be 0.02517147)
##
##      Null deviance: 1.5671  on 58  degrees of freedom
## Residual deviance: 1.4348  on 57  degrees of freedom
## (9 observations deleted due to missingness)
```

```
## AIC: -45.841
##
## Number of Fisher Scoring iterations: 2

LorsbachReg <- lm(Lorsbach_Percent ~ Total_Sleep_Disturbance + AverageSleep + AgeGroup, data=mydata)
summary(LorsbachReg) #age but not sleep significant

##
## Call:
## lm(formula = Lorsbach_Percent ~ Total_Sleep_Disturbance + AverageSleep +
##     AgeGroup, data = mydata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.143170 -0.075590 -0.003076  0.075995  0.157624
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.185968   0.275693   0.675   0.504
## Total_Sleep_Disturbance 0.002972   0.002312   1.285   0.206
## AverageSleep      0.018582   0.024401   0.762   0.451
## AgeGroup5         0.069895   0.048207   1.450   0.155
## AgeGroup6         0.175602   0.040078   4.382 8.61e-05 ***
## AgeGroup7         0.256460   0.041023   6.252 2.32e-07 ***
## AgeGroup8         0.354005   0.050470   7.014 2.05e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0926 on 39 degrees of freedom
## (22 observations deleted due to missingness)
## Multiple R-squared:  0.6499, Adjusted R-squared:  0.596
## F-statistic: 12.07 on 6 and 39 DF, p-value: 1.268e-07

LorsbachReg <- lm(Lorsbach_Percent ~ Total_Sleep_Disturbance + AverageSleep + AgeGroup, data=mydata)
summary(LorsbachReg)

##
## Call:
## lm(formula = Lorsbach_Percent ~ Total_Sleep_Disturbance + AverageSleep +
##     AgeGroup, data = mydata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.143170 -0.075590 -0.003076  0.075995  0.157624
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.185968   0.275693   0.675   0.504
## Total_Sleep_Disturbance 0.002972   0.002312   1.285   0.206
## AverageSleep      0.018582   0.024401   0.762   0.451
## AgeGroup5         0.069895   0.048207   1.450   0.155
## AgeGroup6         0.175602   0.040078   4.382 8.61e-05 ***
## AgeGroup7         0.256460   0.041023   6.252 2.32e-07 ***
```

```
## AgeGroup8          0.354005    0.050470    7.014 2.05e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.0926 on 39 degrees of freedom
## (22 observations deleted due to missingness)
## Multiple R-squared:  0.6499, Adjusted R-squared:  0.596
## F-statistic: 12.07 on 6 and 39 DF,  p-value: 1.268e-07
```

```
# show results
```

```
Allsleepreg<-lm(Lorsbach_Percent ~ Bedtime_Resistance + Sleep_Onset_Delay+ Sleep_Anxiety + Night_Wakings)
summary(Allsleepreg) #nothing significant, not surprised after finding and article that failed to correlate
```

```
##
## Call:
## lm(formula = Lorsbach_Percent ~ Bedtime_Resistance + Sleep_Onset_Delay +
##     Sleep_Anxiety + Night_Wakings + Parasomnias + Sleep_Disordered_Breathing +
##     Daytime_Sleepiness + Sleep_Duration + Total_Sleep_Disturbance,
##     data = mydata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.263755 -0.102785 -0.000989  0.098415  0.223897
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)      0.25839    0.21986   1.175   0.248
## Bedtime_Resistance -0.07522    0.04891  -1.538   0.133
## Sleep_Onset_Delay -0.02536    0.08927  -0.284   0.778
## Sleep_Anxiety     -0.03005    0.04158  -0.723   0.475
## Night_Wakings     -0.06976    0.06461  -1.080   0.287
## Parasomnias       -0.08768    0.06410  -1.368   0.180
## Sleep_Disordered_Breathing -0.02356    0.09670  -0.244   0.809
## Daytime_Sleepiness -0.08422    0.05988  -1.407   0.168
## Sleep_Duration     -0.03632    0.06432  -0.565   0.576
## Total_Sleep_Disturbance  0.07950    0.05898   1.348   0.186
##
## Residual standard error: 0.1464 on 36 degrees of freedom
## (22 observations deleted due to missingness)
## Multiple R-squared:  0.1922, Adjusted R-squared:  -0.00978
## F-statistic: 0.9516 on 9 and 36 DF,  p-value: 0.4945
```

```
#full data set
```

```
HMN2<- read.csv("KelseyData.csv", header=T, na.strings = c("NA", "9/9/99", "0:00", "#NULL!"))
```

```
fulldata<- merge(HMN2, sleep.subset, by=c("Subject_ID"))
```

```
nights<-cbind( fulldata$Hours_Sleep_1,fulldata$Hours_Sleep_2,fulldata$Hours_Sleep_3+fulldata$Hours_Sleep_4)
fulldata$AverageSleep<-rowMeans(nights, na.rm=T)
```

```
LorsbachFull <- lm(Lorsbach_Percent ~ Total_Sleep_Disturbance+AverageSleep, data=fulldata)
summary(LorsbachFull)
```

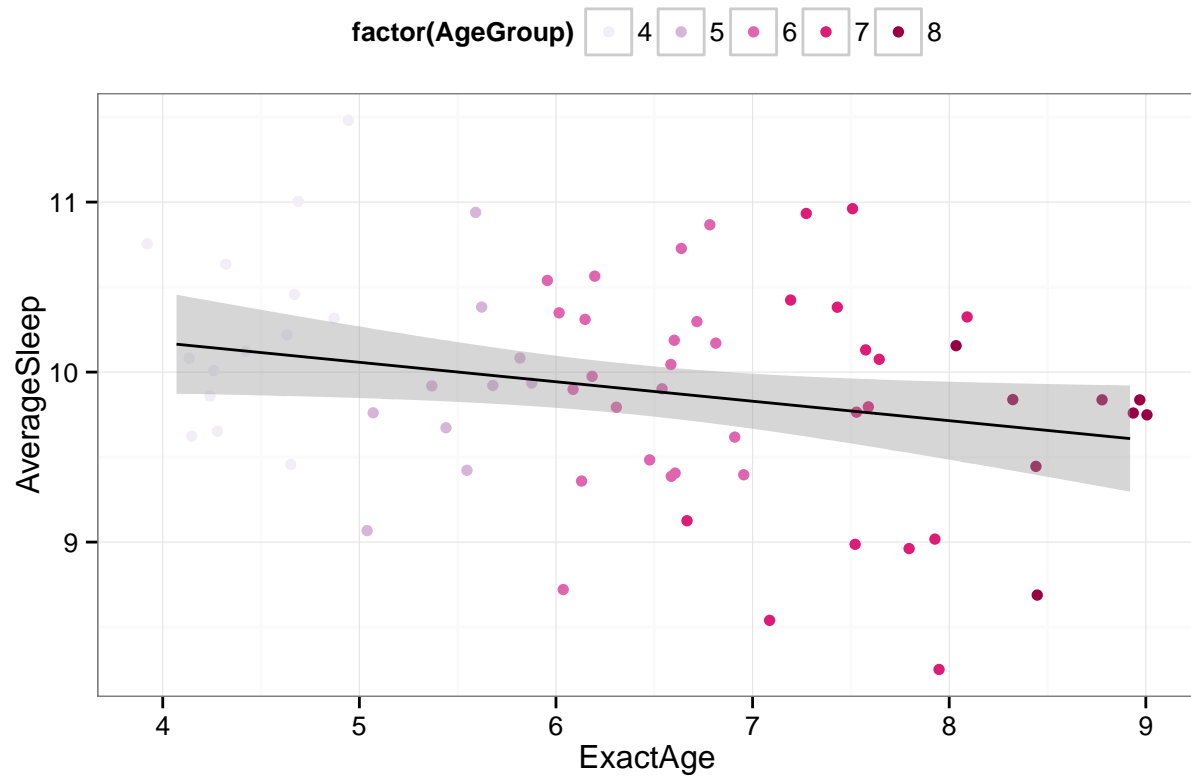
```
##
## Call:
## lm(formula = Lorsbach_Percent ~ Total_Sleep_Disturbance + AverageSleep,
##     data = fulldata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.29017 -0.09273 -0.01427  0.10592  0.26525
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    0.883229   0.356348   2.479   0.0172 *
## Total_Sleep_Disturbance 0.002571   0.003521   0.730   0.4693
## AverageSleep    -0.028372   0.027436  -1.034   0.3069
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1462 on 43 degrees of freedom
## (49 observations deleted due to missingness)
## Multiple R-squared:  0.0379, Adjusted R-squared:  -0.006852
## F-statistic: 0.8469 on 2 and 43 DF,  p-value: 0.4358
```

```
PrimacyFull <- lm(All_Primary ~ AverageSleep, data=fulldata)
summary(PrimacyFull)
```

```
##
## Call:
## lm(formula = All_Primary ~ AverageSleep, data = fulldata)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.32341 -0.08089 -0.00687  0.08777  0.41424
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept)    1.40926   0.29257   4.817 1.09e-05 ***
## AverageSleep  -0.06274   0.02526  -2.484   0.0159 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.1565 on 58 degrees of freedom
## (35 observations deleted due to missingness)
## Multiple R-squared:  0.09617, Adjusted R-squared:  0.08059
## F-statistic: 6.172 on 1 and 58 DF,  p-value: 0.01589
```

```
library(ggplot2)
```

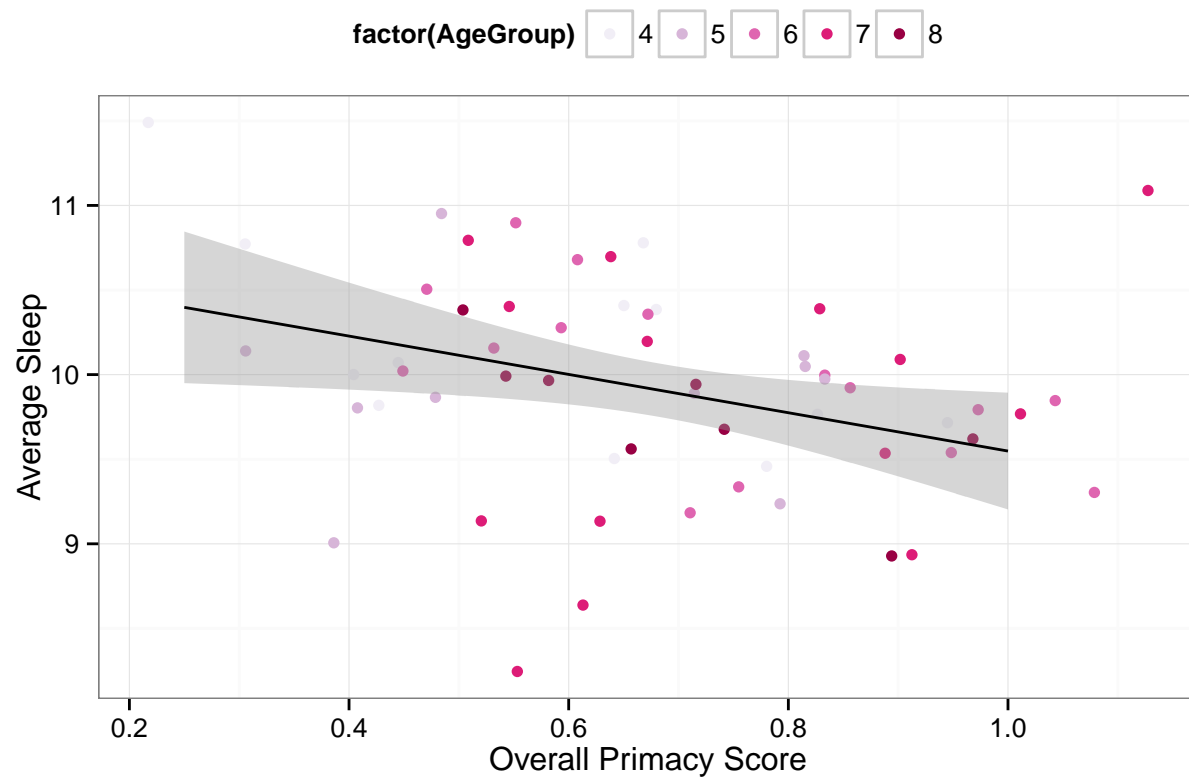
```
agesleep<-ggplot(mydata, aes(y=AverageSleep, x=ExactAge)) + geom_point(aes(color = factor(AgeGroup)), p
agesleep
```

```
PrimacyPlot<-ggplot(mydata, aes(y=AverageSleep, x=PrimacyOverall)) + geom_point(aes(color = factor(AgeGroup)))
PrimacyPlot
```

```
## Warning: Removed 9 rows containing missing values (stat_smooth).
```

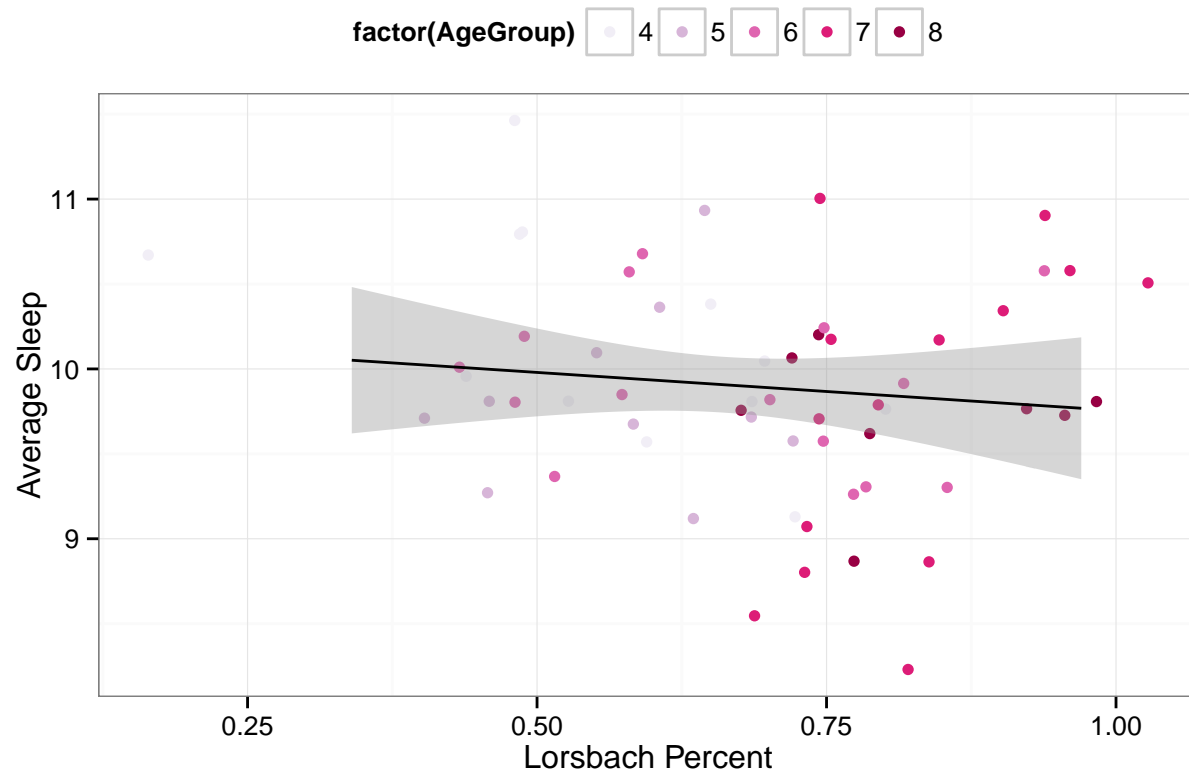
```
## Warning: Removed 9 rows containing missing values (geom_point).
```



```
LorsbachPlot<-ggplot(mydata, aes(y=AverageSleep, x=Lorsbach_Percent)) + geom_point(aes(color = factor(AgeGroup)))
LorsbachPlot
```

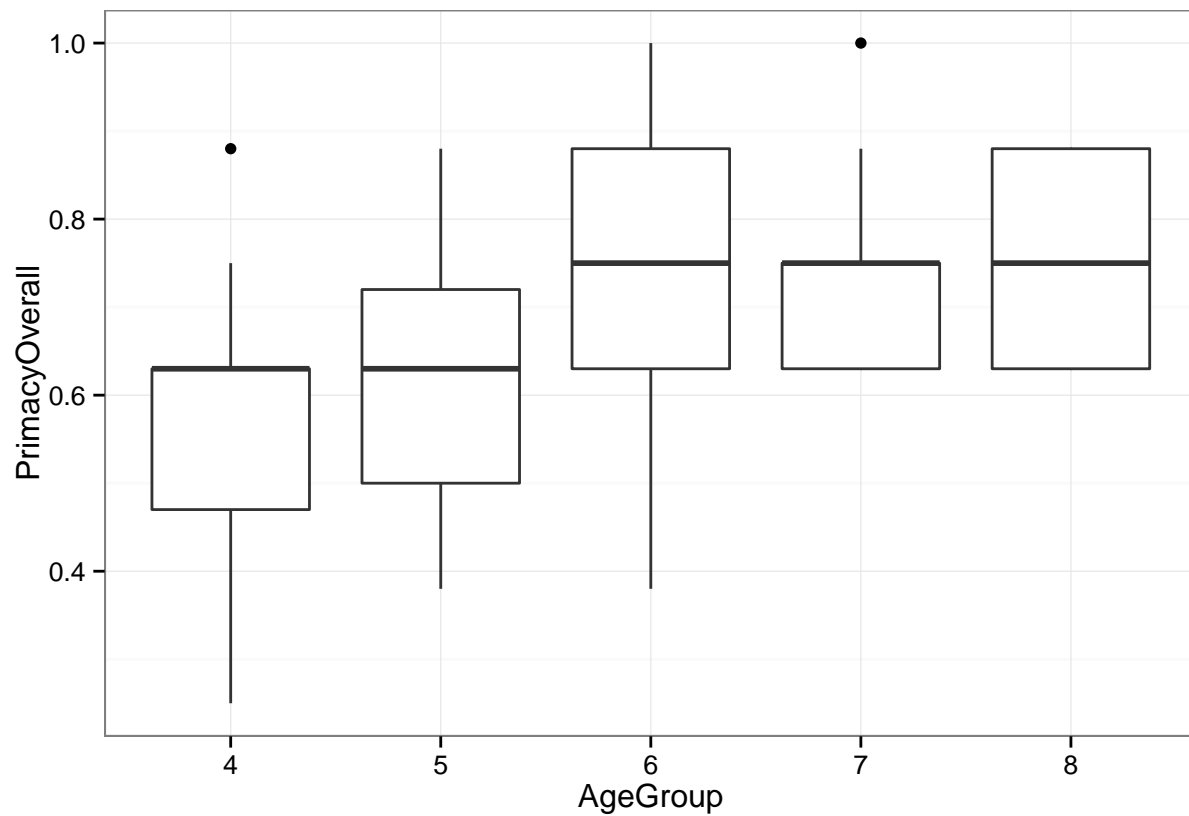
```
## Warning: Removed 9 rows containing missing values (stat_smooth).
```

```
## Warning: Removed 9 rows containing missing values (geom_point).
```



```
PrimacyAgeBox<-ggplot(mydata, aes(x=AgeGroup, y=PrimacyOverall)) + geom_boxplot() +theme_bw()
PrimacyAgeBox
```

```
## Warning: Removed 9 rows containing non-finite values (stat_boxplot).
```

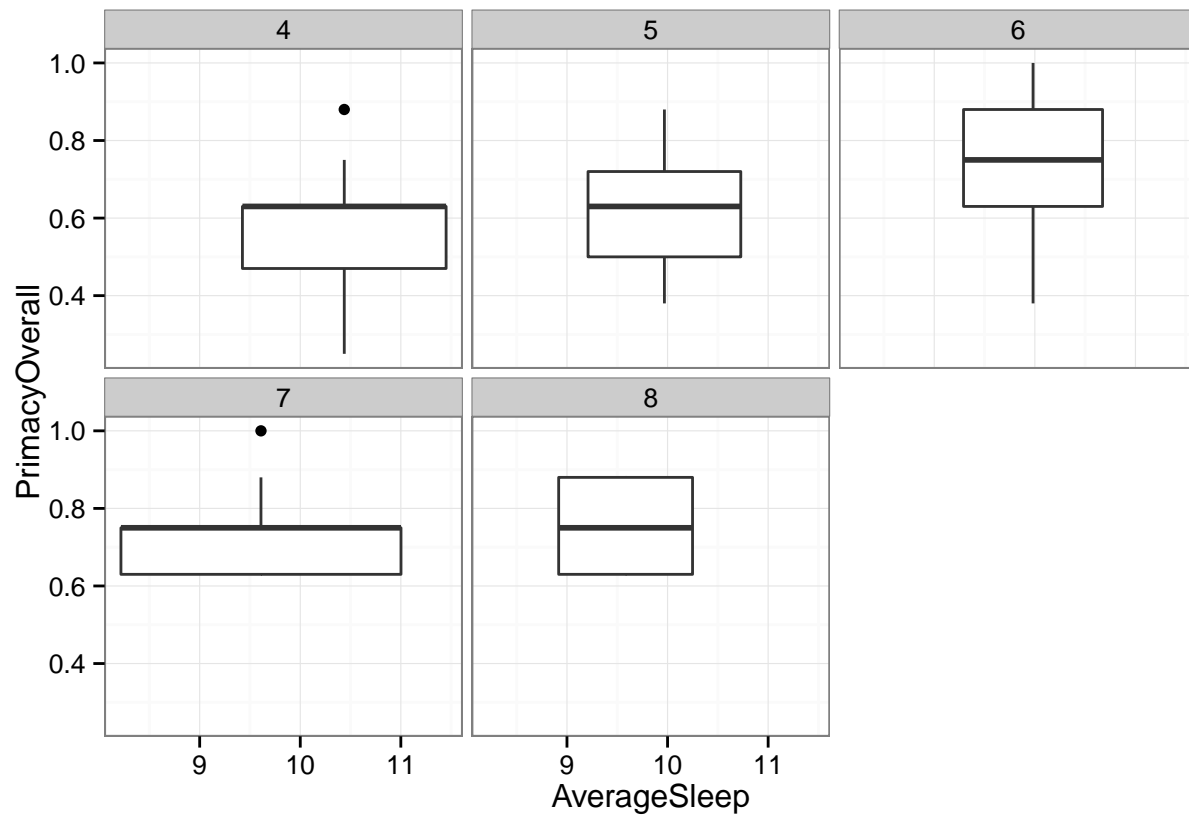


```
PrimacySleepBox<-ggplot(mydata, aes(x=AverageSleep, y=PrimacyOverall)) + geom_boxplot()+facet_wrap(~AgeGroup)
PrimacySleepBox
```

```
## Warning: Removed 2 rows containing non-finite values (stat_boxplot).
```

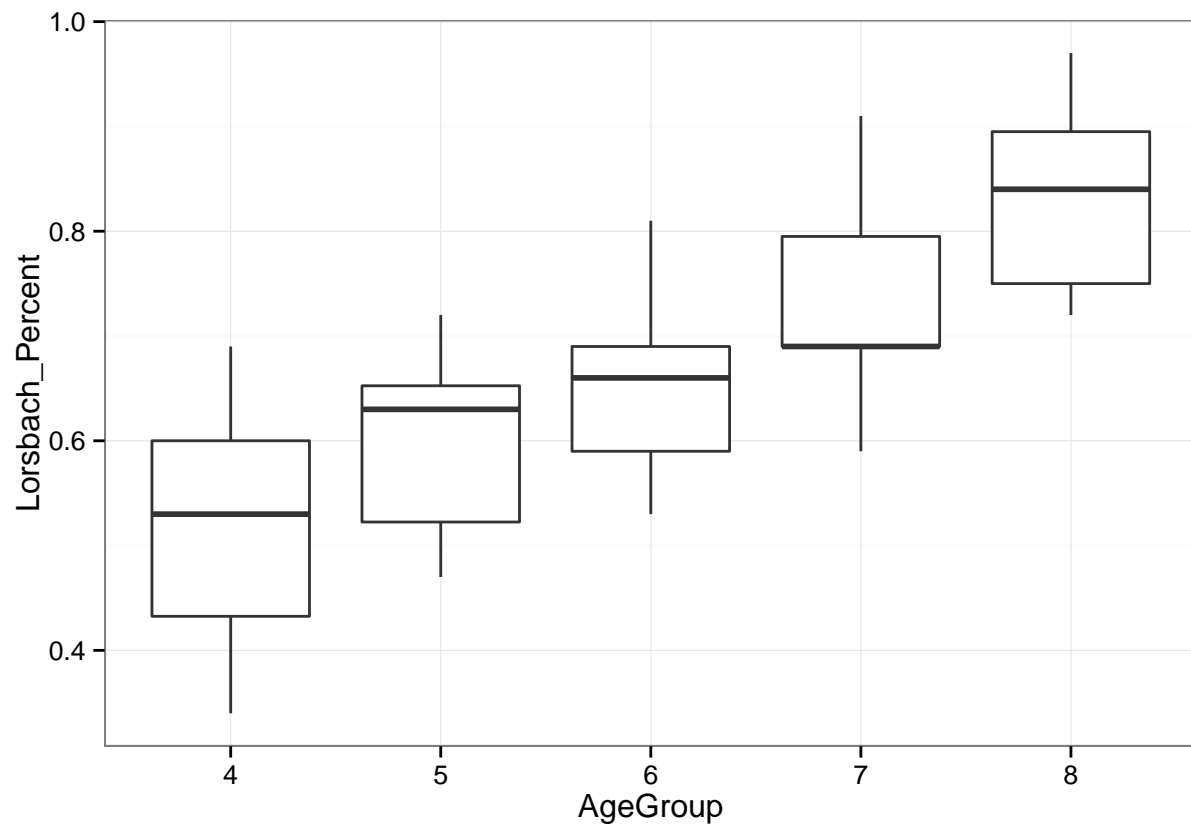
```
## Warning: Removed 6 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 1 rows containing non-finite values (stat_boxplot).
```



```
LorsAgeBox<-ggplot(mydata, aes(x=AgeGroup, y=Lorsbach_Percent)) + geom_boxplot()+theme_bw()
LorsAgeBox
```

```
## Warning: Removed 9 rows containing non-finite values (stat_boxplot).
```



```
LorsSleepBox<-ggplot(mydata, aes(x=AverageSleep, y=Lorschach_Percent)) + geom_boxplot()+facet_wrap(~AgeGroup)
LorsSleepBox
```

```
## Warning: Removed 2 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 6 rows containing non-finite values (stat_boxplot).
```

```
## Warning: Removed 1 rows containing non-finite values (stat_boxplot).
```

