Module 7 Assignment

Daniel Bihnam

Prepare Data

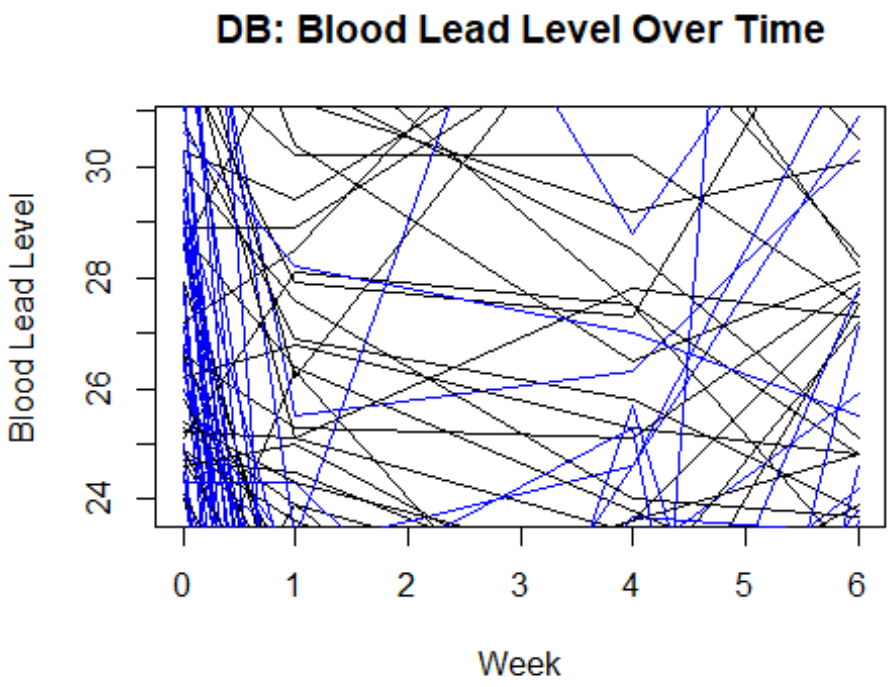
```
tlc <- read.table('C:/Users/Daniel/Desktop/BioCoding/LSC541/Module 7/tlc-
data.txt')

colnames(tlc) <- c('ID','Trt','W0','W1','W4','W6')

time <- c(0,1,4,6)
n <- dim(tlc)[1]
```

Plot Subject Trajectories

```
plot(time, as.numeric(tlc[1,-(1:2)]),
     type='l',
     pch=19,
     xlab='Week',
     ylab='Blood Lead Level',
     main='DB: Blood Lead Level Over Time',
     col=ifelse(tlc$Trt[1] =='P','black','blue'))
for(i in 2:n){
  lines(time,as.numeric(tlc[i,-(1:2)]),
        pch=19,
        col=ifelse(tlc$Trt[i]=='P','black','blue'))
}
```



Placebo group shown in black, and new agent group shown in blue. Notice many of the blue lines drop lower within the first week of treatment while black placebo lines do not decrease/increase as much.

Prepare Data for Mixed Effect Models

```
library(tidyr)

tlc_long <- tlc%>%gather(Week,Level,W0,W1,W4,W6)
tlc_wide <- tlc_long%>%spread(Week,Level)
```

Random Intercept Model

```
library(lme4)
```

```
Loading required package: Matrix


Attaching package: 'Matrix'

The following objects are masked from 'package:tidyr':

    expand, pack, unpack
```

```
library(Matrix)

tlc_long_2 <- separate(tlc_long,Week,sep='W',into=c('Baseline','Week'))
```

```
RIModel <- lmer(Level~Trt+Week+(1|ID),data=tlc_long_2)
summary(RIModel)

Linear mixed model fit by REML ['lmerMod']
Formula: Level ~ Trt + Week + (1 | ID)
   Data: tlc_long_2

REML criterion at convergence: 2564

Scaled residuals:
    Min      1Q  Median      3Q     Max
-3.2841 -0.5432  0.0038  0.4504  6.9510

Random effects:
 Groups   Name        Variance Std.Dev.
 ID       (Intercept) 24.48    4.947
 Residual             24.42    4.941
Number of obs: 400, groups:  ID, 100

Fixed effects:
            Estimate Std. Error t value
(Intercept)  23.6173     0.8915  26.492
TrtP          5.5775     1.1060   5.043
Week1        -7.3150     0.6988 -10.468
Week4        -6.6140     0.6988  -9.465
Week6        -4.2020     0.6988  -6.013

Correlation of Fixed Effects:
      (Intr) TrtP   Week1  Week4
TrtP  -0.620
Week1 -0.392  0.000
Week4 -0.392  0.000  0.500
Week6 -0.392  0.000  0.500  0.500

confint(RIModel)

Computing profile confidence intervals ...

                2.5 %    97.5 %
.sig01       4.106997  5.836856
.sigma       4.547969  5.337861
(Intercept) 21.875296 25.359204
TrtP         3.410828  7.744172
Week1       -8.682161 -5.947839
Week4       -7.981161 -5.246839
Week6       -5.569161 -2.834839
```

We see with this model a definitive decrease in blood lead level in out treated groups based upon the t-values and confidence intervals.

Random Intercept and Time Model

```
RIModel2 <- lmer(Level~Trt*Week+(1|ID),data=tlc_long_2)
summary(RIModel2)

Linear mixed model fit by REML ['lmerMod']
Formula: Level ~ Trt * Week + (1 | ID)
   Data: tlc_long_2

REML criterion at convergence: 2460.6

Scaled residuals:
    Min      1Q  Median      3Q     Max
-4.1850 -0.4650 -0.0473  0.3650  7.6671

Random effects:
 Groups   Name        Variance Std.Dev.
 ID       (Intercept) 26.14    5.113
 Residual             17.76    4.214
Number of obs: 400, groups:  ID, 100

Fixed effects:
            Estimate Std. Error t value
(Intercept)  26.5400     0.9370  28.324
TrtP         -0.2680     1.3251  -0.202
Week1       -13.0180     0.8429 -15.445
Week4       -11.0260     0.8429 -13.082
Week6        -5.7780     0.8429  -6.855
TrtP:Week1   11.4060     1.1920   9.569
TrtP:Week4    8.8240     1.1920   7.403
TrtP:Week6    3.1520     1.1920   2.644

Correlation of Fixed Effects:
           (Intr) TrtP   Week1  Week4  Week6  TrP:W1 TrP:W4
TrtP       -0.707
Week1      -0.450  0.318
Week4      -0.450  0.318  0.500
Week6      -0.450  0.318  0.500  0.500
TrtP:Week1  0.318 -0.450 -0.707 -0.354 -0.354
TrtP:Week4  0.318 -0.450 -0.354 -0.707 -0.354  0.500
TrtP:Week6  0.318 -0.450 -0.354 -0.354 -0.707  0.500  0.500

confint(RIModel2)

Computing profile confidence intervals ...

                  2.5 %     97.5 %
.sig01        4.3126970   5.978533
.sigma        3.8591323   4.529387
(Intercept)  24.7128247  28.367175
TrtP         -2.8520161   2.316016
```

```
Week1       -14.6586159 -11.377384
Week4       -12.6666159  -9.385384
Week6        -7.4186159  -4.137384
TrtP:Week1    9.0858188  13.726181
TrtP:Week4    6.5038188  11.144181
TrtP:Week6    0.8318188   5.472181
```

Based on the large magnitude of the t-value at week 1, we may be able to draw that the effect of treatment in reducing blood lead levels is greatest at that week. That along with the confidence intervals show that the effect is diminished over the next 6 weeks, but is still present between the two treatment groups. This is the same trend shown in the first model, just more exaggerated.