```r
sum(nhanes$modvigmin==0)/nrow(nhanes)
```

```
## [1] 0.07841659
```

```r
sum(nhanes$vigmin==0)/nrow(nhanes)
```

```
## [1] 0.8801602
```

```r
sum(nhanes$lightmin==0)/nrow(nhanes)
```

```
## [1] 0
```

```r
#no diff in modmin by day really except 7th
nhanes %>% group_by(rep) %>% summarise(m=mean(modvigmin),s=sd(modmin)/sqrt(length(modmin)))
```

```
## # A tibble: 7  3
##     rep        m         s
##   <int>    <dbl>     <dbl>
## 1     1 22.60066 0.3411052
## 2     2 23.01777 0.3518468
## 3     3 22.96771 0.3583861
## 4     4 22.41386 0.3488521
## 5     5 22.24356 0.3589189
## 6     6 21.15523 0.3571320
## 7     7 19.41996 0.3616865
```

```r
#no diff in modmin by day really except 7th and 2nd
nhanes %>% group_by(rep) %>% summarise(m=mean(lightmin),s=sd(lightmin)/sqrt(length(lightmin)))
```

```
## # A tibble: 7  3
##     rep        m        s
##   <int>    <dbl>    <dbl>
```

```
## 1     1 258.6827 1.048918
## 2     2 261.5339 1.093391
## 3     3 258.6147 1.096388
## 4     4 258.8213 1.136550
## 5     5 258.2212 1.160056
## 6     6 255.2295 1.186014
## 7     7 244.4119 1.253172
```

```
#mondays most vig, fri-sun least, tues-thurs similar
nhanes %>% group_by(rep) %>% summarise(m=mean(vigmin),s=sd(vigmin)/sqrt(length(lightmin)))
```

```
## # A tibble: 7  3
##     rep         m          s
##   <int>     <dbl>      <dbl>
## 1     1 0.9411853 0.06110670
## 2     2 0.8115414 0.05276647
## 3     3 0.8965840 0.06021138
## 4     4 0.7660865 0.05689883
## 5     5 0.7392597 0.05397894
## 6     6 0.8310108 0.06361269
## 7     7 0.6902050 0.06106663
```

```
anova(lm(modvigmin~as.factor(rep),data=subset(nhanes,rep<6))) #first 5 days are similar, last t
```

```
## Analysis of Variance Table
##
## Response: modvigmin
##                   Df   Sum Sq Mean Sq F value Pr(>F)
## as.factor(rep)     4     2902  725.44  0.8288 0.5065
## Residuals      31937 27954416  875.30
```

```r
#weekends lower
nhanes %>% group_by(dow) %>% summarise(m=mean(modvigmin),s=sd(modvigmin)/sqrt(length(modvigmin)
```

```
## # A tibble: 7  3
##     dow        m         s
##   <int>    <dbl>     <dbl>
## 1     1 17.46672 0.3539009
## 2     2 23.63394 0.3753241
## 3     3 23.49455 0.3683897
## 4     4 23.63173 0.3842220
## 5     5 23.18340 0.3712310
## 6     6 22.43408 0.3639320
## 7     7 19.52794 0.3799264
```

```r
#weekends and thursday lower, friday higher
nhanes %>% group_by(dow) %>% summarise(m=mean(lightmin),s=sd(lightmin)/sqrt(length(lightmin)))
```

```
## # A tibble: 7  3
##     dow        m        s
##   <int>    <dbl>    <dbl>
## 1     1 239.7397 1.171315
## 2     2 259.8399 1.106457
## 3     3 260.0095 1.095333
## 4     4 259.8370 1.102353
## 5     5 256.6507 1.103868
## 6     6 263.0100 1.146749
## 7     7 256.8055 1.218114
```

```r
#first day vig
nhanes %>% group_by(dow) %>% summarise(m=mean(vigmin),s=sd(vigmin)/sqrt(length(lightmin)))
```

```
## # A tibble: 7  3
```

```
##     dow         m          s
##   <int>     <dbl>      <dbl>
## 1     1 0.7239862 0.06502960
## 2     2 0.9462687 0.06184397
## 3     3 0.8742129 0.05357820
## 4     4 0.8859250 0.06278267
## 5     5 0.8446359 0.05683506
## 6     6 0.7264334 0.05487292
## 7     7 0.6707994 0.05419137
```

```
anova(lm(modvigmin~as.factor(dow),data=subset(nhanes,dow%in%c(2:6)))) #M-F similar
```

```
## Analysis of Variance Table
##
## Response: modvigmin
##                   Df   Sum Sq Mean Sq F value Pr(>F)
## as.factor(dow)     4     6363 1590.75  1.7992 0.1259
## Residuals      31803 28118692  884.15
```

```
#test for weekend effects
anova(lm(modvigmin ~ as.factor(weekend),data=nhanes))
```

```
## Analysis of Variance Table
##
## Response: modvigmin
##                       Df   Sum Sq Mean Sq F value    Pr(>F)
## as.factor(weekend)     1   181096  181096  214.83 < 2.2e-16 ***
## Residuals          42438 35773439     843
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
anova(lm(lightmin ~ as.factor(weekend),data=nhanes))
```

```
## Analysis of Variance Table
##
## Response: lightmin
##                        Df    Sum Sq Mean Sq F value    Pr(>F)
## as.factor(weekend)      1   1042016 1042016  133.48 < 2.2e-16 ***
## Residuals           42438 331295573    7807
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

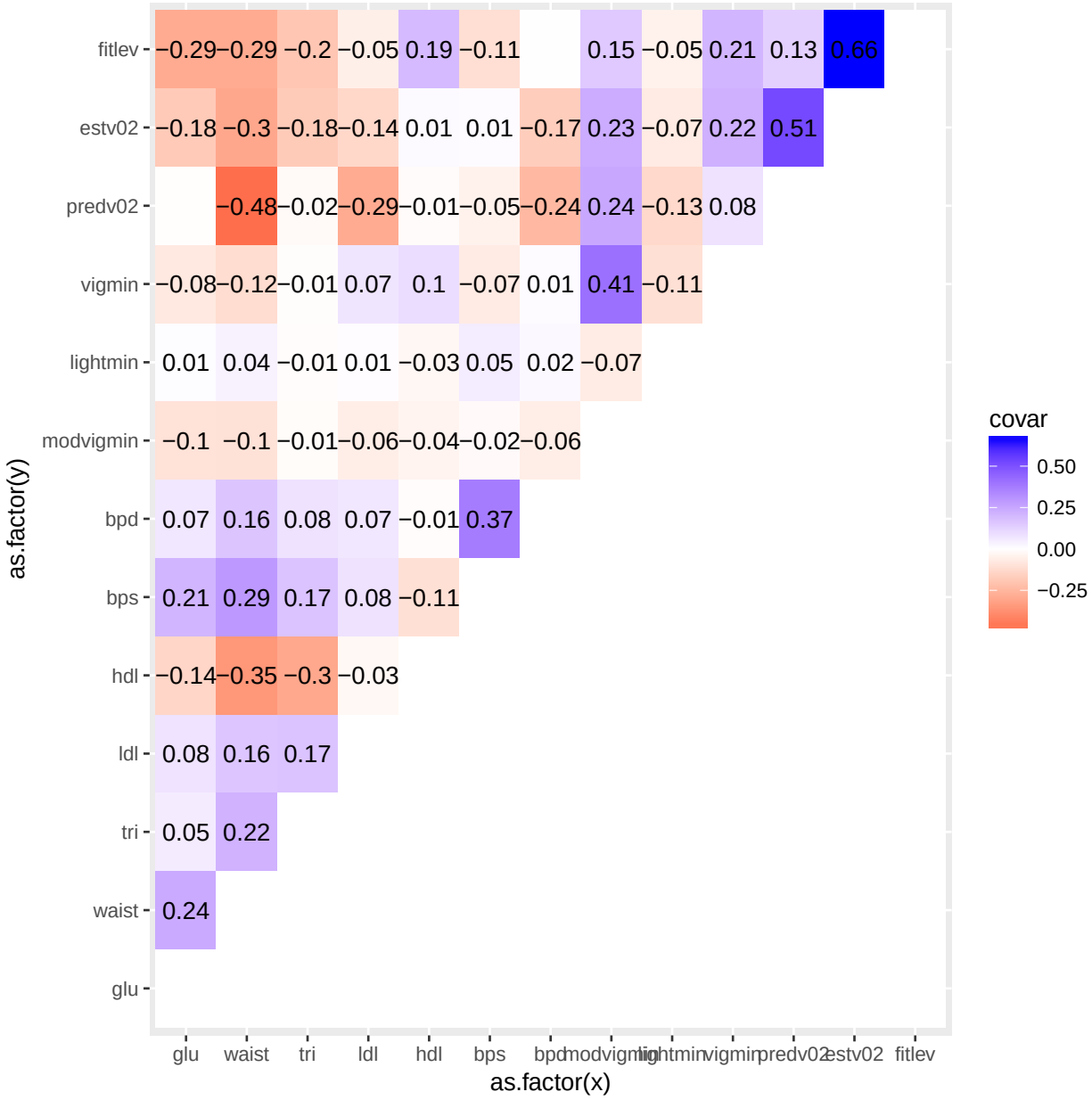
```
anova(lm(vigmin ~ as.factor(weekend),data=nhanes))
```

```
## Analysis of Variance Table
##
## Response: vigmin
##                        Df Sum Sq Mean Sq F value  Pr(>F)
## as.factor(weekend)      1    202 202.477   9.714 0.00183 **
## Residuals           42438 884572  20.844
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
nrep <- (nhanes %>% group_by(id) %>% summarise(n=length(id)))$n

#m1 <- lme(modvigmin~1,data=nhanes,random=~1|id,correlation=corAR1(form=~1|id),method="ML")
m1 <- lme(modvigmin~as.factor(rep)+as.factor(dow),data=nhanes,random=~1|id,method="ML")

re <- rep(unlist(ranef(m1)),nrep)
nhanes$error <- nhanes$modvigmin  - predict(m1)
eht <- nhanes %>% group_by(id) %>% summarise(e1=error[1],e2=error[2],e3=error[3],e4=error[4],e5

# ind <- which(!is.na(eht$e7))
# boxtest <- rep(0,length(ind))
```

```r
# for(i in 1:length(ind)){
#   boxtest[i] <- Box.test(unlist(eht[ind[i],-1]),lag=2,type="Ljung-Box")$p.value
# }
# summary(boxtest)

#lag 1 difference
o1a = c(eht$e1[nrep > 1],eht$e2[nrep > 2],eht$e3[nrep > 3],eht$e4[nrep > 4],eht$e5[nrep > 5],eh
o1b = c(eht$e2[nrep > 1],eht$e3[nrep > 2],eht$e4[nrep > 3],eht$e5[nrep > 4],eht$e6[nrep > 5],eh
cor(o1a,o1b)

## [1] -0.1000537

#lag 2 diff
o2a = c(eht$e1[nrep > 2],eht$e2[nrep > 3],eht$e3[nrep > 4],eht$e4[nrep > 5],eht$e5[nrep > 6])
o2b = c(eht$e3[nrep > 2],eht$e4[nrep > 3],eht$e5[nrep > 4],eht$e6[nrep > 5],eht$e7[nrep > 6])
cor(o2a,o2b)

## [1] -0.1892647

#lag 3 diff
o3a = c(eht$e1[nrep > 3],eht$e2[nrep > 4],eht$e3[nrep > 5],eht$e4[nrep > 6])
o3b = c(eht$e4[nrep > 3],eht$e5[nrep > 4],eht$e6[nrep > 5],eht$e7[nrep > 6])
cor(o3a,o3b)

## [1] -0.2558842

#lag 4 diff
o4a = c(eht$e1[nrep > 4],eht$e2[nrep > 5],eht$e3[nrep > 6])
o4b = c(eht$e5[nrep > 4],eht$e6[nrep > 5],eht$e7[nrep > 6])
cor(o4a,o4b)

## [1] -0.2653008
```

```
#lag 5 diff
o5a = c(eht$e1[nrep > 5],eht$e2[nrep > 6])
o5b = c(eht$e6[nrep > 5],eht$e7[nrep > 6])
cor(o5a,o5b)

## [1] -0.1862721
```



```r
#multivariate regression on mean observed modvig, light
a <- nhanes %>% group_by(id) %>% summarise(modvig=mean(modvigmin),light=mean(lightmin))
y$modvig <- a$modvig
y$light <- a$light

m3 <- lm(with(y,cbind(glu,waist,tri,hdl,bps,bpd))~y$modvig)
summary(m3)

## Response glu :
##
## Call:
## lm(formula = glu ~ y$modvig)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -62.50 -14.31  -6.71   2.63 440.78
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 107.87227    0.74640 144.524   <2e-16 ***
## y$modvig     -0.18519    0.02181  -8.491   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 32.92 on 3574 degrees of freedom
##   (4668 observations deleted due to missingness)
## Multiple R-squared:  0.01977,Adjusted R-squared:  0.0195
## F-statistic:  72.1 on 1 and 3574 DF,  p-value: < 2.2e-16
##
##
## Response waist :
```

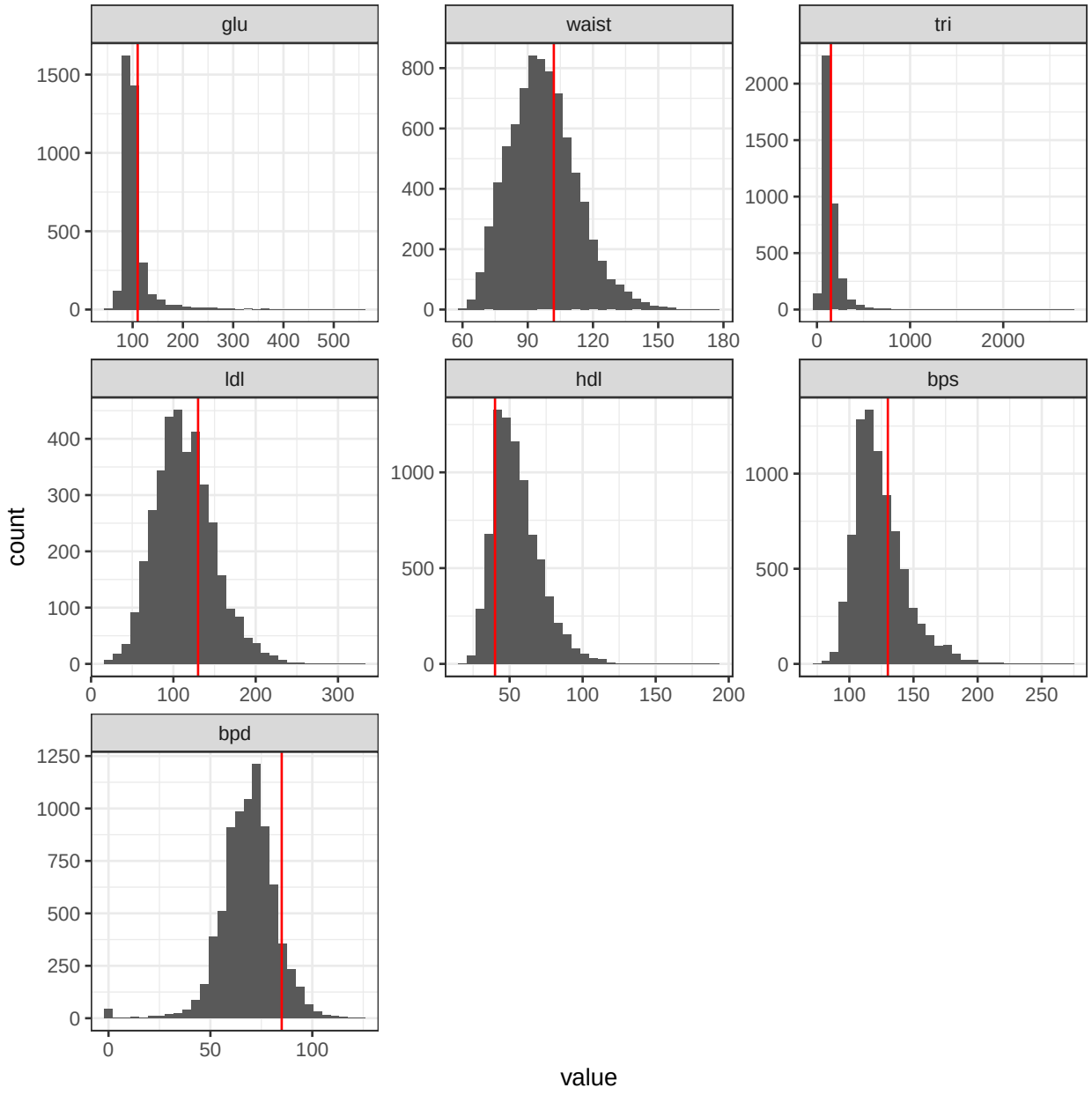
```
##
## Call:
## lm(formula = waist ~ y$modvig)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -37.507 -10.795  -1.156   9.475  58.162
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 100.19115    0.34288  292.20   <2e-16 ***
## y$modvig     -0.12379    0.01002  -12.36   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 15.12 on 3574 degrees of freedom
##   (4668 observations deleted due to missingness)
## Multiple R-squared:  0.04096,Adjusted R-squared:  0.0407
## F-statistic: 152.7 on 1 and 3574 DF,  p-value: < 2.2e-16
##
##
## Response tri :
##
## Call:
## lm(formula = tri ~ y$modvig)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -121.18  -65.00  -30.59   27.40 2585.85
##
## Coefficients:
```

```
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 154.32305    2.85134  54.123  < 2e-16 ***
## y$modvig     -0.40685    0.08331  -4.883 1.09e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 125.7 on 3574 degrees of freedom
##   (4668 observations deleted due to missingness)
## Multiple R-squared:  0.006628,Adjusted R-squared:  0.00635
## F-statistic: 23.85 on 1 and 3574 DF,  p-value: 1.089e-06
##
##
## Response hdl :
##
## Call:
## lm(formula = hdl ~ y$modvig)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -38.675 -11.922  -2.698   9.320 132.359
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  55.6949     0.3695 150.740   <2e-16 ***
## y$modvig     -0.0233     0.0108  -2.158    0.031 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 16.29 on 3574 degrees of freedom
##   (4668 observations deleted due to missingness)
## Multiple R-squared:  0.001302,Adjusted R-squared:  0.001022
```

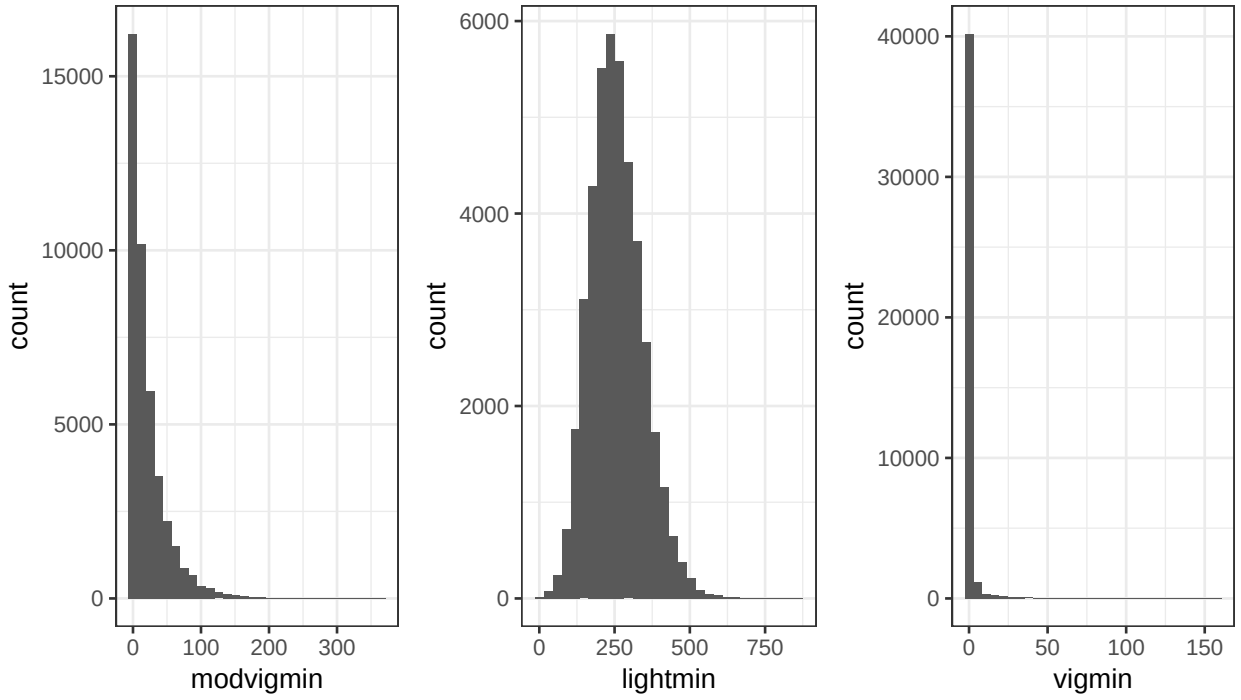
```
## F-statistic: 4.658 on 1 and 3574 DF,  p-value: 0.03097
##
##
## Response bps :
##
## Call:
## lm(formula = bps ~ y$modvig)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -44.510 -13.122  -2.921  10.172  93.694
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 126.33975    0.43377  291.26   <2e-16 ***
## y$modvig     -0.13340    0.01267  -10.53   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 19.13 on 3574 degrees of freedom
##   (4668 observations deleted due to missingness)
## Multiple R-squared:  0.03006,Adjusted R-squared:  0.02979
## F-statistic: 110.8 on 1 and 3574 DF,  p-value: < 2.2e-16
##
##
## Response bpd :
##
## Call:
## lm(formula = bpd ~ y$modvig)
##
## Residuals:
```

```
##     Min      1Q  Median      3Q     Max
## -68.064  -7.423   0.529   8.164  47.533
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 67.729506   0.310267 218.294   <2e-16 ***
## y$modvig     0.013836   0.009066   1.526    0.127
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 13.68 on 3574 degrees of freedom
##   (4668 observations deleted due to missingness)
## Multiple R-squared:  0.0006513,Adjusted R-squared:  0.0003717
## F-statistic: 2.329 on 1 and 3574 DF,  p-value: 0.1271
```

```
## Using  as id variables

## `stat_bin()` using `bins = 30`.  Pick better value with `binwidth`.

## Warning:  Removed 14799 rows containing non-finite values (stat_bin).
```




```
## `stat_bin()` using `bins = 30`.  Pick better value with `binwidth`.

## `stat_bin()` using `bins = 30`.  Pick better value with `binwidth`.

## `stat_bin()` using `bins = 30`.  Pick better value with `binwidth`.
```




```
summary(lm(modvigmin~as.factor(rep),data=nhanes))


##
## Call:
## lm(formula = modvigmin ~ as.factor(rep), data = nhanes)
##
## Residuals:
##    Min     1Q Median     3Q    Max
## -23.02 -18.97 -10.60   7.84 341.98
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)      22.6007     0.3572  63.271  < 2e-16 ***
## as.factor(rep)2   0.4171     0.5060   0.824  0.40981
## as.factor(rep)3   0.3670     0.5095   0.720  0.47126
## as.factor(rep)4  -0.1868     0.5125  -0.364  0.71551
## as.factor(rep)5  -0.3571     0.5171  -0.691  0.48983
## as.factor(rep)6  -1.4454     0.5262  -2.747  0.00601 **
```

```
## as.factor(rep)7  -3.1807     0.5503  -5.780 7.51e-09 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 29.09 on 42433 degrees of freedom
## Multiple R-squared:  0.001461,Adjusted R-squared:  0.001319
## F-statistic: 10.34 on 6 and 42433 DF,  p-value: 1.743e-11
```

```
summary(lm(wearmin~as.factor(dow),data=nhanes))
```

```
##
## Call:
## lm(formula = wearmin ~ as.factor(dow), data = nhanes)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -261.67 -108.24  -10.55   86.38  621.12
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)      818.882      2.048 399.784  < 2e-16 ***
## as.factor(dow)2   36.599      2.764  13.240  < 2e-16 ***
## as.factor(dow)3   39.281      2.750  14.282  < 2e-16 ***
## as.factor(dow)4   40.428      2.764  14.629  < 2e-16 ***
## as.factor(dow)5   34.328      2.762  12.427  < 2e-16 ***
## as.factor(dow)6   42.792      2.784  15.373  < 2e-16 ***
## as.factor(dow)7   21.738      2.873   7.566 3.92e-14 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 148.1 on 42433 degrees of freedom
```

```
## Multiple R-squared:  0.008106,Adjusted R-squared:  0.007965
## F-statistic: 57.79 on 6 and 42433 DF,  p-value: < 2.2e-16
```

```
summary(lm(wearmin~as.factor(rep),data=nhanes))
```

```
##
## Call:
## lm(formula = wearmin ~ as.factor(rep), data = nhanes)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -258.59 -109.09  -11.53   87.27  615.71
##
## Coefficients:
##                 Estimate Std. Error t value Pr(>|t|)
## (Intercept)      850.727      1.822 466.907  < 2e-16 ***
## as.factor(rep)2    7.868      2.581   3.048  0.00231 **
## as.factor(rep)3    5.366      2.599   2.065  0.03893 *
## as.factor(rep)4    5.782      2.614   2.212  0.02700 *
## as.factor(rep)5    2.224      2.638   0.843  0.39906
## as.factor(rep)6   -2.202      2.684  -0.820  0.41198
## as.factor(rep)7  -26.440      2.807  -9.420  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 148.4 on 42433 degrees of freedom
## Multiple R-squared:  0.004513,Adjusted R-squared:  0.004372
## F-statistic: 32.06 on 6 and 42433 DF,  p-value: < 2.2e-16
```

```
table(nhanes$rep,nhanes$dow)
```

```
##
```

```
##        1    2    3    4    5    6    7
##   1 1507 1482 1180  547  586  543  786
##   2  722 1700 1458 1124  512  567  502
##   3  451  797 1687 1378 1102  480  516
##   4  473  503  789 1638 1368 1062  430
##   5  398  529  486  776 1624 1294  945
##   6  830  472  513  465  764 1545 1080
##   7  847  882  398  445  429  683 1145
```

```
dim(nhanes)
```

```
## [1] 42440    39
```

```
length(unique(nhanes$id))
```

```
## [1] 8244
```

```
table(nrep) #gives distribution of number of replicates
```

```
## nrep
##    1    2    3    4    5    6    7
##  510  555  656  834 1249 1809 2631
```

```
meas7 <- subset(nhanes, id %in% unique(id)[nrep==7]) #individuals with all 7 days
length(unique(meas7$id[complete.cases(meas7[,c("smplwt","sex","age","race","rep","dow","wearmin
```

```
## [1] 1103
```

```
#no big changes by taking one of the 7 metsynd variables out
```

```
meas67 <- subset(nhanes, id %in% unique(id)[nrep>=6]) #individuals with 6 days
length(unique(meas67$id[complete.cases(meas67[,c("smplwt","sex","age","race","rep","dow","wearm
```

```
## [1] 1878
```

```
meas57 <- subset(nhanes, id %in% unique(id)[nrep>=5]) #individuals with 6 days
length(unique(meas57$id[complete.cases(meas57[,c("smplwt","sex","age","race","rep","dow","wearm
```

```
## [1] 2424
```

```
m1a <- gls(modvigmin~1,data=meas7,correlation=corCompSymm(form=~1|id),method="ML")
m2a <- gls(modvigmin~1,data=meas7,correlation=corAR1(form=~1|id),method="ML")
m3a <- gls(modvigmin~1,data=meas7,correlation=corARMA(form=~1|id,p=1,q=1),method="ML")
m4a <- gls(modvigmin~1,data=meas7,correlation=corARMA(form=~1|id,p=2,q=0),method="ML")
m5a <- gls(modvigmin~1,data=meas7,correlation=corARMA(form=~1|id,p=0,q=2),method="ML")
m6a <- gls(modvigmin~1,data=meas7,correlation=corARMA(form=~1|id,p=2,q=1),method="ML")
m7a <- gls(modvigmin~1,data=meas7,correlation=corSymm(form=~1|id),method="ML")

extractAIC(m1a)
```

```
## [1]      3.0 164612.6
```

```
extractAIC(m2a)
```

```
## [1]      3.0 166406.4
```

```
extractAIC(m3a)
```

```
## [1]      4 164463
```

```
extractAIC(m4a)
```

```
## [1]      4 165127
```

```
extractAIC(m5a)
```

```
## [1]      4.0 167597.3
```

```
extractAIC(m6a)
```

```
## [1]      5.0 164385.4
```

```
extractAIC(m7a)
```

```
## [1]     23 164230
```

```
anova(m3a,m2a)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m3a     1  4 164463.0 164494.3 -82227.49
## m2a     2  3 166406.4 166429.9 -83200.20 1 vs 2 1945.413  <.0001
```

```
anova(m6a,m3a)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m6a     1  5 164385.4 164424.5 -82187.69
## m3a     2  4 164463.0 164494.3 -82227.49 1 vs 2 79.59778  <.0001
```

```
anova(m7a,m6a)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m7a     1 23 164230.0 164409.9 -82091.98
## m6a     2  5 164385.4 164424.5 -82187.69 1 vs 2 191.4168  <.0001
```

```
meas57sub <- subset(meas57,rep <=5)
```

```
m1b <- gls(modvigmin~1,data=meas57sub,correlation=corCompSymm(form=~1|id),method="ML")
m2b <- gls(modvigmin~1,data=meas57sub,correlation=corAR1(form=~1|id),method="ML")
```

```r
m3b <- gls(modvigmin~1,data=meas57sub,correlation=corARMA(form=~1|id,p=1,q=1),method="ML")
m4b <- gls(modvigmin~1,data=meas57sub,correlation=corARMA(form=~1|id,p=2,q=0),method="ML")
m5b <- gls(modvigmin~1,data=meas57sub,correlation=corARMA(form=~1|id,p=0,q=2),method="ML")
m6b <- gls(modvigmin~1,data=meas57sub,correlation=corARMA(form=~1|id,p=2,q=1),method="ML")
m7b <- gls(modvigmin~1,data=meas57sub,correlation=corSymm(form=~1|id),method="ML")

extractAIC(m1b)

## [1]      3.0 238635.3

extractAIC(m2b)

## [1]      3 240383

extractAIC(m3b)

## [1]      4.0 238399.2

extractAIC(m4b)

## [1]      4.0 238788.7

extractAIC(m5b)

## [1]      4 241848

extractAIC(m6b)

## [1]      5.0 238399.3

extractAIC(m7b)

## [1]     12.0 238283.9
```

```r
anova(m3b,m2b)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m3b     1  4 238399.2 238431.9 -119195.6
## m2b     2  3 240383.0 240407.5 -120188.5 1 vs 2 1985.732  <.0001
```

```r
anova(m6b,m3b)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m6b     1  5 238399.3 238440.2 -119194.6
## m3b     2  4 238399.2 238431.9 -119195.6 1 vs 2 1.924965  0.1653
```

```r
anova(m7b,m3b)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m7b     1 12 238283.9 238382.0 -119130.0
## m3b     2  4 238399.2 238431.9 -119195.6 1 vs 2 131.3118  <.0001
```

```r
meas67sub <- subset(meas67,rep <=6)

m1c <- gls(modvigmin~1,data=meas67sub,correlation=corCompSymm(form=~1|id),method="ML")
m2c <- gls(modvigmin~1,data=meas67sub,correlation=corAR1(form=~1|id),method="ML")
m3c <- gls(modvigmin~1,data=meas67sub,correlation=corARMA(form=~1|id,p=1,q=1),method="ML")
m4c <- gls(modvigmin~1,data=meas67sub,correlation=corARMA(form=~1|id,p=2,q=0),method="ML")
m5c <- gls(modvigmin~1,data=meas67sub,correlation=corARMA(form=~1|id,p=0,q=2),method="ML")
m6c <- gls(modvigmin~1,data=meas67sub,correlation=corARMA(form=~1|id,p=2,q=1),method="ML")
m7c <- gls(modvigmin~1,data=meas67sub,correlation=corSymm(form=~1|id),method="ML")

extractAIC(m1c)
```

```
## [1]      3.0 230673.6
```

```
extractAIC(m2c)
```

```
## [1]      3.0 232736.1
```

```
extractAIC(m3c)
```

```
## [1]      4.0 230358.5
```

```
extractAIC(m4c)
```

```
## [1]      4.0 230934.7
```

```
extractAIC(m5c)
```

```
## [1]      4.0 234300.7
```

```
extractAIC(m6c)
```

```
## [1]      5.0 230352.5
```

```
extractAIC(m7c)
```

```
## [1]     17.0 230219.8
```

```
anova(m3c,m2c)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m3c     1  4 230358.5 230391.1 -115175.2
## m2c     2  3 232736.1 232760.6 -116365.1 1 vs 2 2379.651  <.0001
```

```
anova(m6c,m3c)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m6c     1  5 230352.5 230393.3 -115171.3
## m3c     2  4 230358.5 230391.1 -115175.2 1 vs 2 7.915767  0.0049
```

```r
anova(m7c,m6c)
```

```
##     Model df      AIC      BIC    logLik   Test  L.Ratio p-value
## m7c     1 17 230219.8 230358.3 -115092.9
## m6c     2  5 230352.5 230393.3 -115171.3 1 vs 2 156.7862  <.0001
```