V. Statistical analysis in R (solution)

Data Science Lab, University of Copenhagen

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Data

```
### Open help page for birthwt
?birthwt

### Make a tibble with the data
birthData <- as_tibble(birthwt)
birthData
```

```
## # A tibble: 189 x 10
##      low   age   lwt  race smoke   ptl    ht    ui   ftv   bwt
##    <int> <int> <int> <int> <int> <int> <int> <int> <int> <int>
##  1     0    19   182     2     0     0     0     1     0  2523
##  2     0    33   155     3     0     0     0     0     3  2551
##  3     0    20   105     1     1     0     0     0     1  2557
##  4     0    21   108     1     1     0     0     1     2  2594
##  5     0    18   107     1     1     0     0     1     0  2600
##  6     0    21   124     3     0     0     0     0     0  2622
##  7     0    22   118     1     0     0     0     0     1  2637
##  8     0    17   103     3     0     0     0     0     1  2637
##  9     0    29   123     1     1     0     0     0     1  2663
## 10     0    26   113     1     1     0     0     0     0  2665
## # ... with 179 more rows
```

```
### Make smoke into a factor
# Check if `smoke` is numerical
is.numeric(birthData$smoke)
```

```
## [1] TRUE
```

```
# Alternatively, review the summary of the whole dataset
summary(birthData)
```

```
##       low              age              lwt             race      
##  Min.   :0.0000   Min.   :14.00   Min.   : 80.0   Min.   :1.000  
##  1st Qu.:0.0000   1st Qu.:19.00   1st Qu.:110.0   1st Qu.:1.000  
##  Median :0.0000   Median :23.00   Median :121.0   Median :1.000  
##  Mean   :0.3122   Mean   :23.24   Mean   :129.8   Mean   :1.847  
##  3rd Qu.:1.0000   3rd Qu.:26.00   3rd Qu.:140.0   3rd Qu.:3.000  
##  Max.   :1.0000   Max.   :45.00   Max.   :250.0   Max.   :3.000  
##      smoke             ptl               ht                ui        
##  Min.   :0.0000   Min.   :0.0000   Min.   :0.00000   Min.   :0.0000  
##  1st Qu.:0.0000   1st Qu.:0.0000   1st Qu.:0.00000   1st Qu.:0.0000  
##  Median :0.0000   Median :0.0000   Median :0.00000   Median :0.0000
```

```
##  Mean   :0.3915   Mean   :0.1958   Mean   :0.06349   Mean   :0.1481
##  3rd Qu.:1.0000   3rd Qu.:0.0000   3rd Qu.:0.00000   3rd Qu.:0.0000
##  Max.   :1.0000   Max.   :3.0000   Max.   :1.00000   Max.   :1.0000
##       ftv              bwt
##  Min.   :0.0000   Min.   : 709
##  1st Qu.:0.0000   1st Qu.:2414
##  Median :0.0000   Median :2977
##  Mean   :0.7937   Mean   :2945
##  3rd Qu.:1.0000   3rd Qu.:3487
##  Max.   :6.0000   Max.   :4990
```

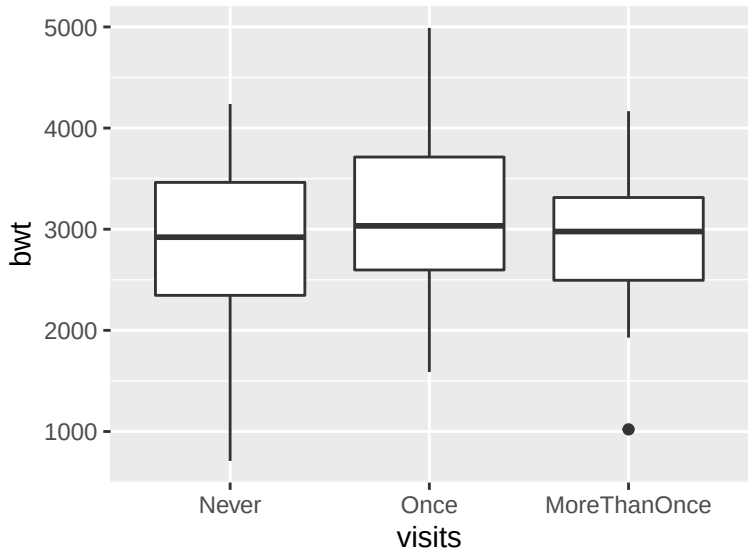
```
# Finally, make smoke into a factor
birthData <- mutate(birthData, smoke = factor(smoke))

# Check the ftv variable, make it a factor and collapse some of the levels
table(birthData$ftv)
```

```
##
##   0   1   2   3   4   6
## 100  47  30   7   4   1
```

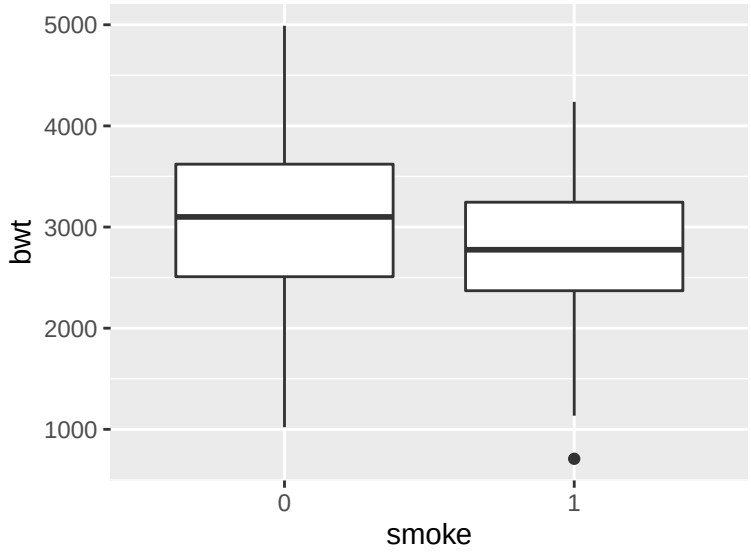
```
birthData <- mutate(birthData, ftvFac = factor(ftv))
birthData <- mutate(birthData, visits = fct_collapse(ftvFac, Never="0", Once="1", other_level="MoreThan
summary(birthData)
```

```
##       low              age              lwt             race       smoke
##  Min.   :0.0000   Min.   :14.00   Min.   : 80.0   Min.   :1.000   0:115
##  1st Qu.:0.0000   1st Qu.:19.00   1st Qu.:110.0   1st Qu.:1.000   1: 74
##  Median :0.0000   Median :23.00   Median :121.0   Median :1.000
##  Mean   :0.3122   Mean   :23.24   Mean   :129.8   Mean   :1.847
##  3rd Qu.:1.0000   3rd Qu.:26.00   3rd Qu.:140.0   3rd Qu.:3.000
##  Max.   :1.0000   Max.   :45.00   Max.   :250.0   Max.   :3.000
##       ptl               ht                ui              ftv
##  Min.   :0.0000   Min.   :0.00000   Min.   :0.0000   Min.   :0.0000
##  1st Qu.:0.0000   1st Qu.:0.00000   1st Qu.:0.0000   1st Qu.:0.0000
##  Median :0.0000   Median :0.00000   Median :0.0000   Median :0.0000
##  Mean   :0.1958   Mean   :0.06349   Mean   :0.1481   Mean   :0.7937
##  3rd Qu.:0.0000   3rd Qu.:0.00000   3rd Qu.:0.0000   3rd Qu.:1.0000
##  Max.   :3.0000   Max.   :1.00000   Max.   :1.0000   Max.   :6.0000
##       bwt       ftvFac           visits
##  Min.   : 709   0:100   Never       :100
##  1st Qu.:2414   1: 47   Once        : 47
##  Median :2977   2: 30   MoreThanOnce: 42
##  Mean   :2945   3:  7
##  3rd Qu.:3487   4:  4
##  Max.   :4990   6:  1
```

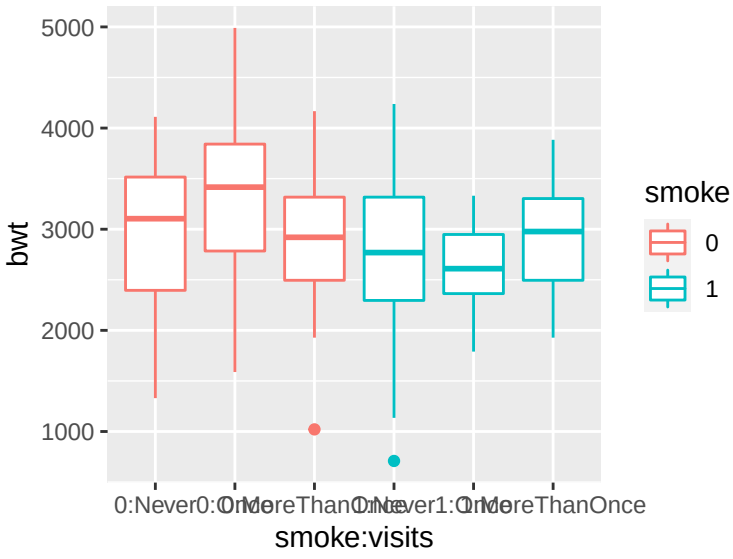
```
### Parallell boxplots
ggplot(birthData, aes(x=visits, y=bwt)) + geom_boxplot()
```



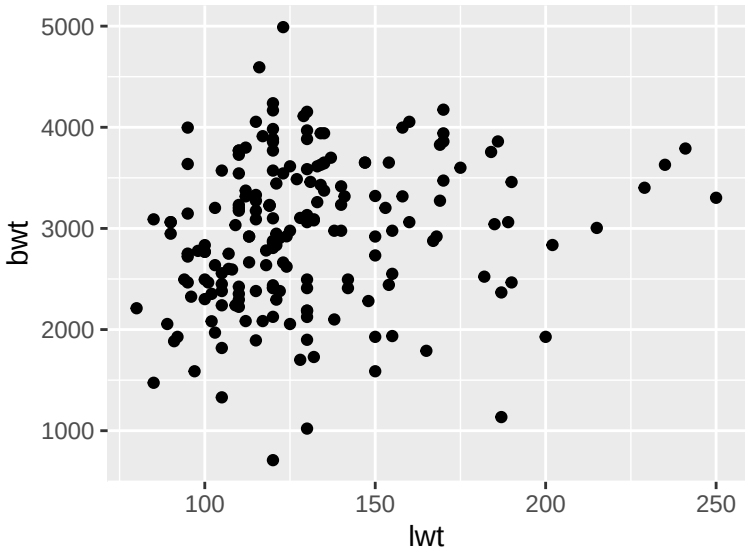

```
ggplot(birthData, aes(x=smoke, y=bwt)) + geom_boxplot()
```



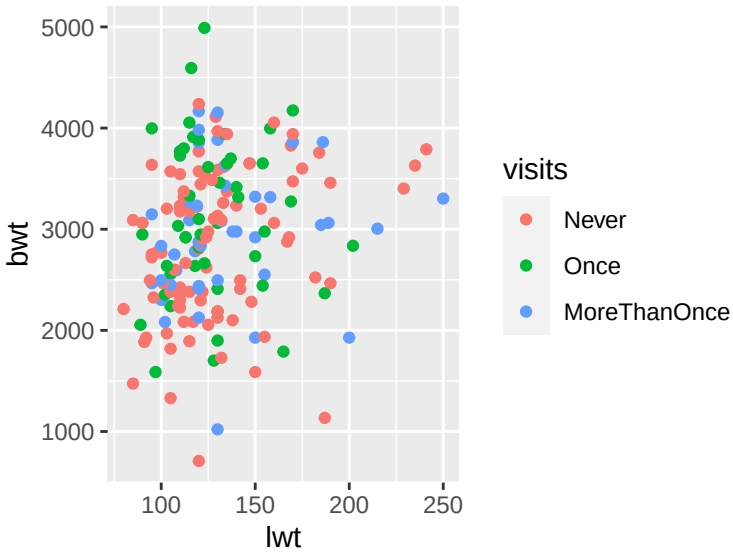

```
# Groupwise boxplots
ggplot(birthData, aes(x=smoke:visits, y=bwt, col=smoke)) + geom_boxplot()
```



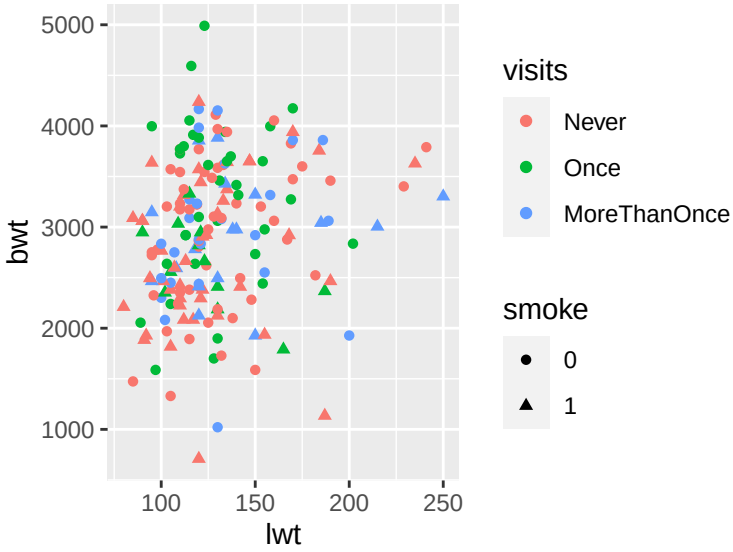

```
### Scatterplot
ggplot(birthData, aes(x=lwt, y=bwt)) + geom_point()
```




```
### Scatter plot with points coloured after visits, and point types after smoke status
ggplot(birthData, aes(x=lwt, y=bwt, col=visits)) + geom_point()
```




```
ggplot(birthData, aes(x=lwt, y=bwt, col=visits, pch=smoke)) + geom_point()
```



Regression

```
### Simple linear regression
reg1 <- lm(bwt ~ lwt, data=birthData)
summary(reg1)
```

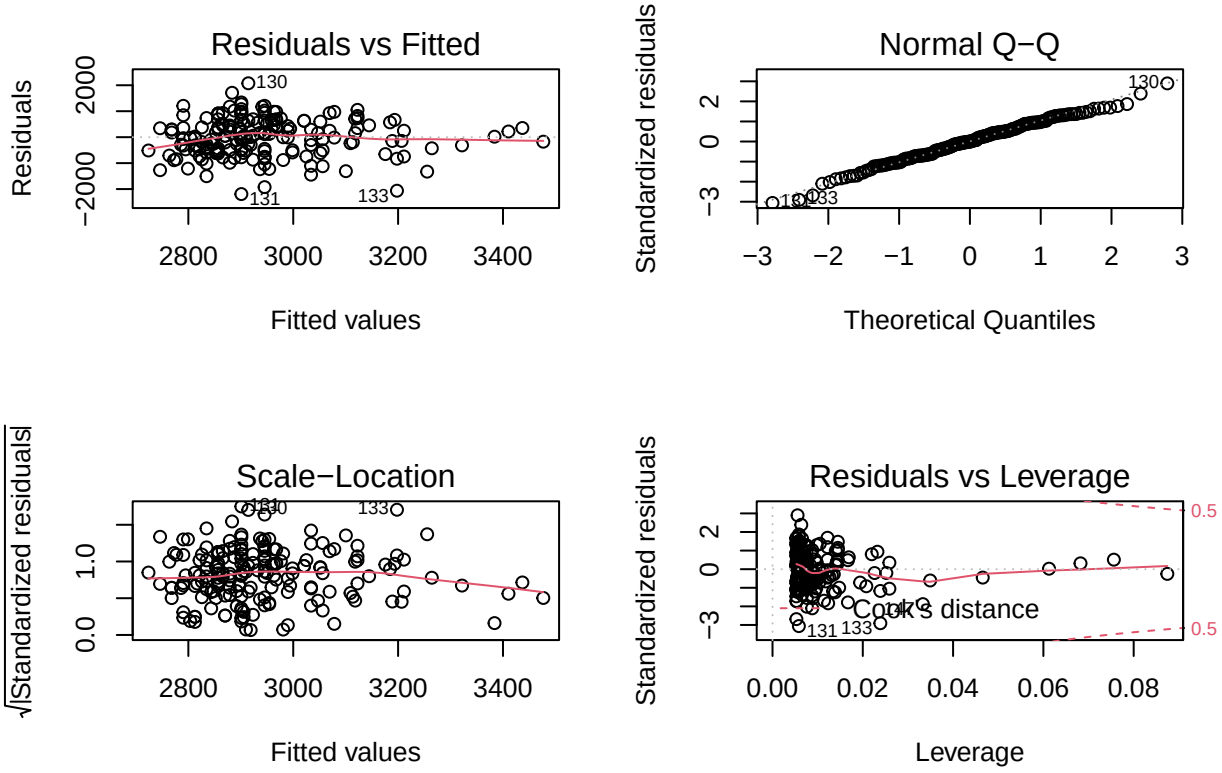
```
##
## Call:
## lm(formula = bwt ~ lwt, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2192.12  -497.97    -3.84   508.32  2075.60
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
```

```
## (Intercept) 2369.624    228.493  10.371   <2e-16 ***
## lwt            4.429      1.713   2.585   0.0105 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 718.4 on 187 degrees of freedom
## Multiple R-squared:  0.0345, Adjusted R-squared:  0.02933
## F-statistic: 6.681 on 1 and 187 DF,  p-value: 0.0105
```

```
confint(reg1)
```

```
##                   2.5 %     97.5 %
## (Intercept) 1918.867879 2820.37916
## lwt            1.048845    7.80937
```

```
### Model validation
par(mfrow=c(2,2))
plot(reg1)
```




```
### Include age and ftv as covariate
reg2 <- lm(bwt ~ lwt + age + ftv, data=birthData)
summary(reg2)
```

```
##
## Call:
## lm(formula = bwt ~ lwt + age + ftv, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2218.60  -488.73    11.56   516.63  1907.42
##
```

```
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2223.506    301.567   7.373  5.4e-12 ***
## lwt            4.121      1.758   2.344   0.0201 *
## age            7.486     10.285   0.728   0.4676
## ftv           15.364     51.114   0.301   0.7641
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 720.9 on 185 degrees of freedom
## Multiple R-squared:  0.03831,    Adjusted R-squared:  0.02271
## F-statistic: 2.457 on 3 and 185 DF,  p-value: 0.06446
```

```
# Just to view the coefficients
summary(reg2)$coefficients
```

```
##                Estimate Std. Error   t value     Pr(>|t|)
## (Intercept) 2223.505618 301.567140 7.3731694 5.402210e-12
## lwt            4.120744   1.757787 2.3442798 2.012498e-02
## age            7.485748  10.285178 0.7278189 4.676446e-01
## ftv           15.363944  51.113921 0.3005824 7.640705e-01
```

```
### Prediction
newData <- data.frame(lwt=100, age=25, ftv=0)
newData
```

```
##   lwt age ftv
## 1 100  25   0
```

```
predict(reg2, newData)
```

```
##        1
## 2822.724
```

```
predict(reg2, newData, interval="prediction")
```

```
##        fit      lwr      upr
## 1 2822.724 1390.148 4255.299
```

```
### Use only data from mothers with weight below 160
reg3 <- lm(bwt ~ lwt + age + ftv, data=filter(birthData, lwt<160))
summary(reg3)
```

```
##
## Call:
## lm(formula = bwt ~ lwt + age + ftv, data = filter(birthData,
##     lwt < 160))
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2233.9  -487.0    25.7   476.2  1852.5
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 1824.063    444.508   4.104 6.52e-05 ***
## lwt            7.182      3.342   2.149   0.0332 *
## age            9.179     11.624   0.790   0.4310
## ftv           16.986     60.012   0.283   0.7775
```

```
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 716.3 on 157 degrees of freedom
## Multiple R-squared:  0.03956,    Adjusted R-squared:  0.0212
## F-statistic: 2.155 on 3 and 157 DF,  p-value: 0.09549
```

```
# Just to view the coefficients
summary(reg3)$coefficients
```

```
##                Estimate Std. Error   t value     Pr(>|t|)
## (Intercept) 1824.063262 444.508301 4.1035528 0.0000651941
## lwt            7.182184   3.341787 2.1492047 0.0331503757
## age            9.178577  11.624301 0.7896024 0.4309508695
## ftv           16.986307  60.011783 0.2830495 0.7775117320
```

ANOVA

```
### Oneway ANOVA against smoke
oneway1 <- lm(bwt ~ smoke, data=birthData)
summary(oneway1)
```

```
##
## Call:
## lm(formula = bwt ~ smoke, data = birthData)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -2062.9  -475.9    34.3   545.1  1934.3
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)  3055.70      66.93  45.653  < 2e-16 ***
## smoke1       -283.78     106.97  -2.653  0.00867 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 717.8 on 187 degrees of freedom
## Multiple R-squared:  0.03627,    Adjusted R-squared:  0.03112
## F-statistic: 7.038 on 1 and 187 DF,  p-value: 0.008667
```

```
summary(oneway1)$coefficients
```

```
##               Estimate Std. Error   t value      Pr(>|t|)
## (Intercept) 3055.6957   66.93326 45.652875 2.463035e-103
## smoke1      -283.7767  106.96877 -2.652893  8.666726e-03
```

```
emmeans(oneway1,~smoke)
```

```
##  smoke emmean   SE  df lower.CL upper.CL
##  0       3056 66.9 187     2924     3188
##  1       2772 83.4 187     2607     2937
##
## Confidence level used: 0.95
```

```
pairs(emmeans(oneway1,~smoke))
```

```
##  contrast estimate  SE  df t.ratio p.value
##  0 - 1         284 107 187 2.653   0.0087
```

```
### Oneway ANOVA against visits
oneway2 <- lm(bwt ~ visits, data=birthData)
summary(oneway2)
```

```
##
## Call:
## lm(formula = bwt ~ visits, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2156.14  -484.88    26.12   578.86  1882.00
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)         2865.14      72.62  39.456   <2e-16 ***
## visitsOnce           242.86     128.42   1.891   0.0602 .
## visitsMoreThanOnce    85.74     133.52   0.642   0.5216
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 726.2 on 186 degrees of freedom
## Multiple R-squared:  0.01888,    Adjusted R-squared:  0.008335
## F-statistic:  1.79 on 2 and 186 DF,  p-value: 0.1698
```

```
emmeans(oneway2,~visits)
```

```
##  visits       emmean    SE  df lower.CL upper.CL
##  Never          2865  72.6 186     2722     3008
##  Once           3108 105.9 186     2899     3317
##  MoreThanOnce   2951 112.1 186     2730     3172
##
## Confidence level used: 0.95
```

```
pairs(emmeans(oneway2,~visits))
```

```
##  contrast             estimate  SE  df t.ratio p.value
##  Never - Once           -242.9 128 186 -1.891  0.1441
##  Never - MoreThanOnce    -85.7 134 186 -0.642  0.7970
##  Once - MoreThanOnce     157.1 154 186  1.019  0.5658
##
## P value adjustment: tukey method for comparing a family of 3 estimates
```

```
drop1(oneway2,test="F")
```

```
## Single term deletions
##
## Model:
## bwt ~ visits
##        Df Sum of Sq      RSS    AIC F value Pr(>F)
## <none>              98081730 2493.2
## visits  2   1887925 99969656 2492.8  1.7901 0.1698
```

```
### Twoway ANOVA without interaction
twoway1 <- lm(bwt ~ visits + smoke, data=birthData)
```

```
summary(twoway1)
```

```
##
## Call:
## lm(formula = bwt ~ visits + smoke, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2034.02  -504.02    34.98   536.36  1816.31
##
## Coefficients:
##                    Estimate Std. Error t value Pr(>|t|)
## (Intercept)         2980.92      86.74  34.367   <2e-16 ***
## visitsOnce           192.77     128.60   1.499   0.1356
## visitsMoreThanOnce    74.10     131.98   0.561   0.5752
## smoke1              -257.28     108.37  -2.374   0.0186 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 717.3 on 185 degrees of freedom
## Multiple R-squared:  0.04789,    Adjusted R-squared:  0.03245
## F-statistic: 3.102 on 3 and 185 DF,  p-value: 0.02795
```

```
summary(twoway1)$coefficients
```

```
##                      Estimate Std. Error    t value     Pr(>|t|)
## (Intercept)        2980.91672   86.73734 34.3671676 3.021284e-82
## visitsOnce          192.77220  128.59583  1.4990548 1.355639e-01
## visitsMoreThanOnce   74.10202  131.98092  0.5614601 5.751634e-01
## smoke1             -257.28159  108.37493 -2.3739954 1.862096e-02
```

```
### Twoway ANOVA with interaction, test for interaction in two ways
twoway2 <- lm(bwt ~ visits * smoke, data=birthData)
summary(twoway2)
```

```
##
## Call:
## lm(formula = bwt ~ visits * smoke, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2045.82  -460.29    50.71   505.18  1713.77
##
## Coefficients:
##                            Estimate Std. Error t value Pr(>|t|)
## (Intercept)                 2955.40      96.22  30.714   <2e-16 ***
## visitsOnce                   320.83     154.30   2.079    0.039 *
## visitsMoreThanOnce            12.20     172.13   0.071    0.944
## smoke1                      -200.58     143.44  -1.398    0.164
## visitsOnce:smoke1           -458.32     278.50  -1.646    0.102
## visitsMoreThanOnce:smoke1    159.27     266.27   0.598    0.550
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 713.6 on 183 degrees of freedom
```

```
## Multiple R-squared:  0.06783,    Adjusted R-squared:  0.04236
## F-statistic: 2.663 on 5 and 183 DF,  p-value: 0.02378
```

```
anova(twoway2, twoway1)
```

```
## Analysis of Variance Table
##
## Model 1: bwt ~ visits * smoke
## Model 2: bwt ~ visits + smoke
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1    183 93189162
## 2    185 95182096 -2  -1992934 1.9568 0.1443
```

```
drop1(twoway2,test="F")
```

```
## Single term deletions
##
## Model:
## bwt ~ visits * smoke
##              Df Sum of Sq      RSS    AIC F value Pr(>F)
## <none>                    93189162 2489.5
## visits:smoke  2   1992934 95182096 2489.5  1.9568 0.1443
```

```
# Compute the expected birth weight of infants for smokers and non-smokers, respectively, on average ov
emmeans(twoway2, ~smoke)
```

```
## NOTE: Results may be misleading due to involvement in interactions
```

```
##  smoke emmean   SE  df lower.CL upper.CL
##  0       3066 70.1 183     2928     3205
##  1       2766 96.4 183     2576     2956
##
## Results are averaged over the levels of: visits
## Confidence level used: 0.95
```

Models with numerical as well as categorical predictors

```
### Model with linear (lwt,bwt) association.
### Intercept differ between smokers and non-smokers, one common slope.
model1 <- lm(bwt ~ lwt + smoke, data=birthData)
summary(model1)
```

```
##
## Call:
## lm(formula = bwt ~ lwt + smoke, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2030.90  -445.69    29.16   521.76  1967.76
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2501.125    230.836  10.835   <2e-16 ***
## lwt            4.237      1.690   2.507   0.0130 *
## smoke1      -272.081    105.591  -2.577   0.0107 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 707.8 on 186 degrees of freedom
## Multiple R-squared:  0.06777,    Adjusted R-squared:  0.05775
## F-statistic: 6.761 on 2 and 186 DF,  p-value: 0.001464
```

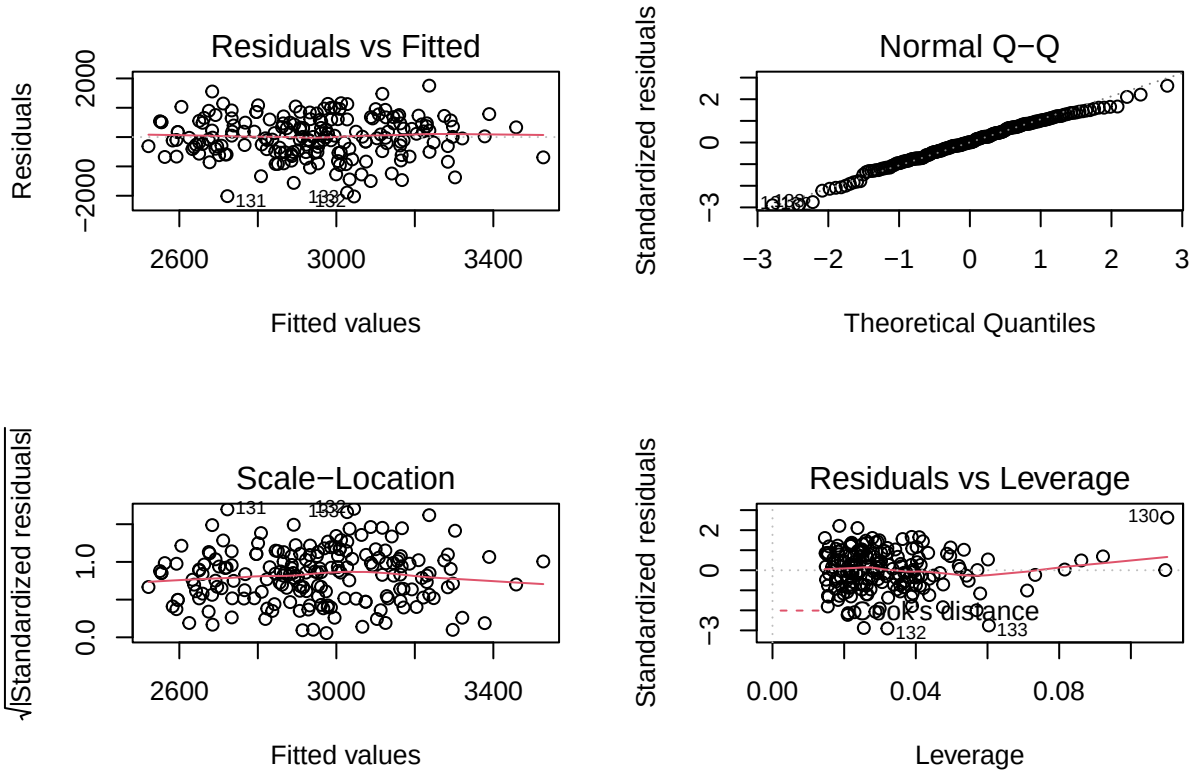
```
### Model with linear (lwt,bwt) association. Intercept and slope both differ between visit groups
model2 <- lm(bwt ~ lwt * smoke, data=birthData)
summary(model2)
```

```
##
## Call:
## lm(formula = bwt ~ lwt * smoke, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2038.80  -454.76    28.36   530.84  1976.84
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 2350.578    312.733   7.516 2.35e-12 ***
## lwt            5.387      2.335   2.307   0.0222 *
## smoke1        41.384    451.187   0.092   0.9270
## lwt:smoke1    -2.422      3.388  -0.715   0.4757
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 708.8 on 185 degrees of freedom
## Multiple R-squared:  0.07034,    Adjusted R-squared:  0.05527
## F-statistic: 4.666 on 3 and 185 DF,  p-value: 0.003621
```

```
### Test if slopes differ between visit groups
anova(model2, model1)
```

```
## Analysis of Variance Table
##
## Model 1: bwt ~ lwt * smoke
## Model 2: bwt ~ lwt + smoke
##   Res.Df      RSS Df Sum of Sq      F Pr(>F)
## 1    185 92937722
## 2    186 93194298 -1   -256576 0.5107 0.4757
```

```
### Model with many effects (no interactions)
model3 <- lm(bwt ~ lwt + smoke + age + visits, data=birthData)
par(mfrow=c(2,2))
plot(model3)
```




```
summary(model3)
```

```
##
## Call:
## lm(formula = bwt ~ lwt + smoke + age + visits, data = birthData)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2024.13  -491.65     6.56   507.56  1753.25
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)         2346.442    301.420   7.785    5e-13 ***
## lwt                    4.167      1.727   2.413   0.0168 *
## smoke1              -244.402    107.187  -2.280   0.0238 *
## age                    4.300     10.252   0.419   0.6754
## visitsOnce           184.314    130.194   1.416   0.1586
## visitsMoreThanOnce    32.318    133.410   0.242   0.8089
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 708.6 on 183 degrees of freedom
## Multiple R-squared:  0.08076,    Adjusted R-squared:  0.05564
## F-statistic: 3.215 on 5 and 183 DF,  p-value: 0.008306
```

Logistic regression

```
### Logistic regression with many predictors (no interactions)
logreg1 <- glm(low ~ lwt + smoke + age + visits, data=birthData, family="binomial")
```

```
summary(logreg1)
```

```
##
## Call:
## glm(formula = low ~ lwt + smoke + age + visits, family = "binomial",
##     data = birthData)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -1.3128  -0.8665  -0.6732   1.2390   2.0197
##
## Coefficients:
##                     Estimate Std. Error z value Pr(>|z|)
## (Intercept)         1.370311   1.016623   1.348   0.1777
## lwt                -0.012276   0.006138  -2.000   0.0455 *
## smoke1              0.619077   0.330428   1.874   0.0610 .
## age                -0.031764   0.033933  -0.936   0.3492
## visitsOnce         -0.413043   0.424527  -0.973   0.3306
## visitsMoreThanOnce -0.148285   0.420965  -0.352   0.7247
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 234.67  on 188  degrees of freedom
## Residual deviance: 221.91  on 183  degrees of freedom
## AIC: 233.91
##
## Number of Fisher Scoring iterations: 4
```

Linear mixed models

```
### Make artificial center variable
set.seed(123)
center <- sample(rep(1:19, each=10)[1:189])
birthData <- mutate(birthData,center=factor(center))

### Remember to install lme4 before this can run
# install.packages("lme4")
library(lme4)
```

```
## Loading required package: Matrix
```

```
##
## Attaching package: 'Matrix'
```

```
## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack
```

```
### Linear mixed model with random effect of center
lmm1 <- lmer(bwt ~ lwt + smoke + age + visits + (1|center), data=birthData)
```

```
## boundary (singular) fit: see ?isSingular
```

```
summary(lmm1)
```

```
## Linear mixed model fit by REML ['lmerMod']
## Formula: bwt ~ lwt + smoke + age + visits + (1 | center)
##    Data: birthData
##
## REML criterion at convergence: 2958
##
## Scaled residuals:
##      Min       1Q   Median       3Q      Max
## -2.85637 -0.69380  0.00926  0.71625  2.47412
##
## Random effects:
##  Groups   Name        Variance  Std.Dev.
##  center   (Intercept) 9.668e-12 3.109e-06
##  Residual             5.022e+05 7.086e+02
## Number of obs: 189, groups:  center, 19
##
## Fixed effects:
##                    Estimate Std. Error t value
## (Intercept)        2346.442    301.420   7.785
## lwt                   4.167      1.727   2.413
## smoke1             -244.402    107.187  -2.280
## age                   4.300     10.252   0.419
## visitsOnce          184.314    130.194   1.416
## visitsMoreThanOnce   32.318    133.410   0.242
##
## Correlation of Fixed Effects:
##             (Intr) lwt    smoke1 age    vstsOn
## lwt         -0.613
## smoke1      -0.196  0.046
## age         -0.620 -0.173  0.003
## visitsOnce  -0.026  0.048  0.160 -0.218
## vstsMrThnOn  0.055 -0.058  0.031 -0.190  0.335
## optimizer (nloptwrap) convergence code: 0 (OK)
## boundary (singular) fit: see ?isSingular
```