

Examples from the **aplore3** package

Luca Braglia

October 20, 2016

Contents

1	aps	5
2	burn datasets	9
2.1	burn1000	9
2.2	burn13m	10
2.3	burn_eval_1	11
2.4	burn_eval_2	12
3	chdage	13
4	glow datasets	17
4.1	glow500	17
4.2	glow_bonemed	24
4.3	glow_mis_comp	26
4.4	glow_mis_wmissing	27
4.5	glow_rand	28
5	icu	31
6	lowbwt	33
7	myopia	35
8	nhanes	37
9	polypharm	39
10	scale_example	41

Chapter 1

aps

```
example(aps)

##
## aps> head(aps, n = 10)
##   id place place3   age   race gender   neuro   emot   danger
## 1  1  Day OutDay 15.95346   White Female   Severe   Severe Unlikely
## 2  2  Res   Res 14.57084 Non-white  Male     None Not Severe Possible
## 3  3  Out OutDay 15.81930 Non-white Female   None Not Severe Possible
## 4  4  Out OutDay 15.59754   White  Male     None Not Severe   Likely
## 5  5  Out OutDay 16.35044   White  Male Moderate Severe   Likely
## 6  6  Out OutDay 13.55236   White  Male     None Not Severe   Likely
## 7  7  Int   Int 14.44764   White Female   None     Severe Possible
## 8  8  Out OutDay 14.33812 Non-white Female   None Not Severe   Likely
## 9  9  Res   Res 13.50856 Non-white Female   None Not Severe Possible
## 10 10 Int   Int 12.55852 Non-white  Male     None Not Severe   Likely
##   elope los behav custd viol
## 1 No Risk 14   0   No  No
## 2 No Risk 44   7   No  Yes
## 3 No Risk 11   4   No  No
## 4 At Risk  4   6   Yes Yes
## 5 No Risk  5   7   No  Yes
## 6 At Risk  8   6   No  Yes
## 7 No Risk  6   4   Yes Yes
## 8 No Risk  3   5   No  Yes
## 9 At Risk 45   6   No  Yes
## 10 At Risk  8   7   Yes Yes
##
## aps> summary(aps)
##      id      place      place3      age      race
## Min.   : 1.0   Out:155   OutDay:259   Min.   :11.06   White   :230
## 1st Qu.:127.8   Day:104   Int  :130   1st Qu.:12.92   Non-white:278
## Median :254.5   Int:130   Res  :119   Median :14.18
## Mean   :254.5   Res:119           Mean   :14.27
## 3rd Qu.:381.2           3rd Qu.:15.51
```

```

## Max. :508.0 Max. :17.92
## gender neuro emot danger elope
## Female:274 None :350 Not Severe:389 Unlikely: 54 No Risk:316
## Male :234 Mild : 81 Severe :119 Possible:101 At Risk:192
## Moderate: 29 Probable:141
## Severe : 48 Likely :212
##
##
## los behav custd viol
## Min. : 1.00 Min. :0.000 No :317 No :121
## 1st Qu.: 6.00 1st Qu.:5.000 Yes:191 Yes:387
## Median : 8.00 Median :6.000
## Mean : 21.83 Mean :5.878
## 3rd Qu.: 17.00 3rd Qu.:7.000
## Max. :305.00 Max. :9.000
##
## aps> ## Table 8.2 p. 274
## aps> library(nnet)
##
## aps> modt8.2 <- multinom(place3 ~ viol, data = aps)
## # weights: 9 (4 variable)
## initial value 558.095043
## final value 515.732252
## converged
##
## aps> summary(modt8.2)
## Call:
## multinom(formula = place3 ~ viol, data = aps)
##
## Coefficients:
## (Intercept) violYes
## Int -1.123943 0.580948
## Res -1.674016 1.131020
##
## Std. Errors:
## (Intercept) violYes
## Int 0.2257469 0.2572229
## Res 0.2813693 0.3071981
##
## Residual Deviance: 1031.465
## AIC: 1039.465
##
## aps> exp(coef(modt8.2)[, "violYes"])
## Int Res
## 1.787732 3.098815
##
## aps> t(exp(confint(modt8.2)["violYes", ,]))
## 2.5 % 97.5 %
## Int 1.079826 2.959723

```

```

## Res 1.697103 5.658264
##
## aps> ## To test differences between b_2 and b_1 we need the estimated variance
## aps> ## covariance matrix for the fitted model (Table 8.3 p. 274).
## aps> vcov(modt8.2) # 'raw'
##
##           Int:(Intercept) Int:violYes Res:(Intercept) Res:violYes
## Int:(Intercept)      0.05096165 -0.05096165      0.01249990 -0.01249990
## Int:violYes          -0.05096165  0.06616363      -0.01249990  0.01808649
## Res:(Intercept)      0.01249990 -0.01249990      0.07916868 -0.07916868
## Res:violYes         -0.01249990  0.01808649      -0.07916868  0.09437067
##
## aps> ## To have exactly the same output as the text we need to rearrange just a
## aps> ## minimum
## aps> VarCovM <- vcov(modt8.2)[c(2, 1, 4, 3), c(2, 1, 4, 3)]
##
## aps> VarCovM[upper.tri(VarCovM)] <- NA
##
## aps> VarCovM
##
##           Int:violYes Int:(Intercept) Res:violYes Res:(Intercept)
## Int:violYes      0.06616363                NA                NA                NA
## Int:(Intercept) -0.05096165      0.05096165                NA                NA
## Res:violYes      0.01808649      -0.01249990  0.09437067                NA
## Res:(Intercept) -0.01249990      0.01249990 -0.07916868      0.07916868
##
## aps> ## Testing against null model.
## aps> modt8.2Null <- multinom(place3 ~ 1, data = aps)
## # weights:  6 (2 variable)
## initial value 558.095043
## final value 524.370933
## converged
##
## aps> anova(modt8.2, modt8.2Null, test = "Chisq")
##   Model Resid. df Resid. Dev  Test    Df LR stat.      Pr(Chi)
## 1     1      1014   1048.742      NA     NA      NA         NA
## 2    viol     1012   1031.465 1 vs 2     2 17.27736 0.0001771204

```


Chapter 2

burn datasets

2.1 burn1000

```
example(burn1000)
```

```
##
## br1000> head(burn1000, n = 10)
##   id facility death age gender      race tbsa inh_inj flame
## 1  1         11 Alive 26.6  Male      White 25.3     No   Yes
## 2  2          1 Alive  2.0 Female Non-White  5.0     No   No
## 3  3         12 Alive 22.0 Female Non-White  2.0     No   No
## 4  4          1 Alive 37.3  Male      White  2.0     No   No
## 5  5          1 Alive 52.1  Male      White  6.0     No   Yes
## 6  6          6 Alive 50.2  Male      White  7.0     No   No
## 7  7         22 Alive  2.5 Female Non-White  7.0     No   No
## 8  8          1 Alive 53.8 Female      White  0.9     No   Yes
## 9  9          1 Alive 31.9  Male      White  2.0     No   No
## 10 10         1 Alive 41.1  Male      White 22.0     No   Yes
##
## br1000> summary(burn1000)
##      id          facility      death      age      gender
## Min.   : 1.0    Min.   : 1.00    Alive:850  Min.   : 0.10  Female:295
## 1st Qu.: 250.8  1st Qu.: 2.00    Dead :150  1st Qu.:10.85  Male  :705
## Median : 500.5  Median : 8.00
## Mean   : 500.5  Mean   :11.56
## 3rd Qu.: 750.2  3rd Qu.:18.25
## Max.   :1000.0  Max.   :40.00
## Max.   :89.70
##      race      tbsa      inh_inj      flame
## Non-White:411  Min.   : 0.10  No :878  No :471
## White      :589  1st Qu.: 2.50  Yes:122  Yes:529
##      Median : 6.00
##      Mean   :13.54
##      3rd Qu.:16.00
##      Max.   :98.00
##
```

```
## br1000> ## Table 3.15 p. 80
## br1000> summary(mod3.15 <- glm(death ~ tbsa + inh_inj + age + gender + flame + race,
## br1000+ family = binomial, data = burn1000 ))
##
## Call:
## glm(formula = death ~ tbsa + inh_inj + age + gender + flame +
## race, family = binomial, data = burn1000)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -3.01879  -0.24566  -0.08874  -0.03351   2.66144
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -7.695153   0.691169 -11.134 < 2e-16 ***
## tbsa          0.089345   0.009087   9.832 < 2e-16 ***
## inh_injYes    1.365277   0.361780   3.774 0.000161 ***
## age           0.082890   0.008629   9.606 < 2e-16 ***
## genderMale   -0.201494   0.307784  -0.655 0.512687
## flameYes     0.582578   0.354493   1.643 0.100298
## raceWhite    -0.701389   0.309781  -2.264 0.023565 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 845.42  on 999  degrees of freedom
## Residual deviance: 336.46  on 993  degrees of freedom
## AIC: 350.46
##
## Number of Fisher Scoring iterations: 7
```

2.2 burn13m

```
example(burn13m)
```

```
##
## brn13m> head(burn13m, n = 10)
##   pair pairid id facility death age gender      race tbsa inh_inj flame
## 1     1     1 848      36 Alive 0.6 Female Non-White 31.9   Yes   Yes
## 2     1     2 103      38 Alive 0.6  Male Non-White 23.5   Yes   No
## 3     1     3  20      28 Alive 1.7  Male   White    0.5    No   No
## 4     1     4 913      38 Dead 0.9  Male Non-White 66.0   No   Yes
## 5     2     1  65      15 Alive 2.0  Male   White    3.0    No   No
## 6     2     2 421      38 Alive 0.8  Male Non-White 35.0   Yes   Yes
## 7     2     3 563      50 Alive 2.4  Male Non-White 16.0   No   No
## 8     2     4 975      36 Dead 2.4  Male   White   86.5   Yes   Yes
```

```
## 9      3      1 822      34 Alive 1.1  Male      White  9.0      No      No
## 10     3      2 798      38 Alive 1.6 Female    White  3.0      No      No
##
## brn13m> summary(burn13m)
##      pair      pairid      id      facility      death
## Min.   : 1      Min.   :1.00      Min.   :  1.0      Min.   : 1.0      Alive:291
## 1st Qu.:25      1st Qu.:1.75      1st Qu.: 286.8      1st Qu.:15.0      Dead : 97
## Median :49      Median :2.50      Median : 554.5      Median :32.0
## Mean   :49      Mean   :2.50      Mean   : 547.1      Mean   :33.4
## 3rd Qu.:73      3rd Qu.:3.25      3rd Qu.: 850.5      3rd Qu.:50.0
## Max.   :97      Max.   :4.00      Max.   :1000.0      Max.   :83.0
##      age      gender      race      tbsa      inh_inj
## Min.   : 0.60      Female:116      Non-White:154      Min.   : 0.10      No :301
## 1st Qu.:38.30      Male :272      White :234      1st Qu.: 3.00      Yes: 87
## Median :49.75
## Mean   :47.32
## 3rd Qu.:60.45
## Max.   :89.70
##      flame
## No :137
## Yes:251
##
##
##
##
```

2.3 burn_eval_1

```
example(burn_eval_1)
##
## brn__1> head(burn_eval_1, n = 10)
##      id facility death age gender race tbsa inh_inj flame
## 1      1      15 Alive 26.0  Male White 10.0      No      No
## 2      2      48 Alive 48.8  Male White  3.0      No      Yes
## 3      3      62 Alive 15.8  Male White  4.0      No      No
## 4      4      32 Alive 38.2  Male White  8.0      No      Yes
## 5      5      28 Alive  0.5  Male White  1.0      No      No
## 6      6      28 Alive 37.1  Male White  1.0      No      No
## 7      7      55 Alive 24.3  Male White  8.0      No      Yes
## 8      8      15 Alive 17.1  Male White 10.0      No      Yes
## 9      9      20 Alive 37.5  Male White  0.9      No      No
## 10    10      15 Alive 15.0  Male White 10.3      No      Yes
##
## brn__1> summary(burn_eval_1)
##      id      facility      death      age      gender
## Min.   : 1.0      Min.   : 1.00      Alive:428      Min.   : 0.10      Female:156
```

```
## 1st Qu.:125.8 1st Qu.:15.00 Dead : 72 1st Qu.:14.15 Male :344
## Median :250.5 Median :32.00 Median :35.45
## Mean :250.5 Mean :32.67 Mean :34.96
## 3rd Qu.:375.2 3rd Qu.:48.00 3rd Qu.:51.92
## Max. :500.0 Max. :83.00 Max. :89.00
## race tbsa inh_inj flame
## Non-White:197 Min. : 0.100 No :434 No :230
## White :303 1st Qu.: 2.225 Yes: 66 Yes:270
## Median : 6.000
## Mean : 13.762
## 3rd Qu.: 13.625
## Max. :100.000
```

2.4 burn_eval_2

```
example(burn_eval_2)

##
## brn__2> head(burn_eval_2, n = 10)
## id facility death age gender race tbsa inh_inj flame
## 1 1 15 Dead 34.9 Female White 26.0 Yes Yes
## 2 2 73 Dead 40.9 Male White 3.5 No No
## 3 3 4 Dead 53.4 Male White 49.5 Yes Yes
## 4 4 28 Dead 59.2 Male White 2.0 No No
## 5 5 43 Dead 76.4 Male Non-White 20.5 Yes Yes
## 6 6 15 Dead 65.3 Male White 25.0 No Yes
## 7 7 58 Dead 62.8 Male White 87.0 No Yes
## 8 8 1 Dead 85.1 Male White 64.5 Yes Yes
## 9 9 64 Dead 56.0 Male White 39.5 No Yes
## 10 10 36 Dead 3.1 Male White 76.0 Yes Yes
##
## brn__2> summary(burn_eval_2)
## id facility death age gender
## Min. : 1.0 Min. : 1.00 Alive:379 Min. : 0.10 Female:152
## 1st Qu.:125.8 1st Qu.:15.00 Dead :121 1st Qu.:13.45 Male :348
## Median :250.5 Median :32.00 Median :33.40
## Mean :250.5 Mean :32.14 Mean :35.27
## 3rd Qu.:375.2 3rd Qu.:48.00 3rd Qu.:52.98
## Max. :500.0 Max. :83.00 Max. :89.16
## race tbsa inh_inj flame
## Non-White:190 Min. : 0.100 No :437 No :235
## White :310 1st Qu.: 2.375 Yes: 63 Yes:265
## Median : 6.500
## Mean :15.204
## 3rd Qu.:19.275
## Max. :98.500
```

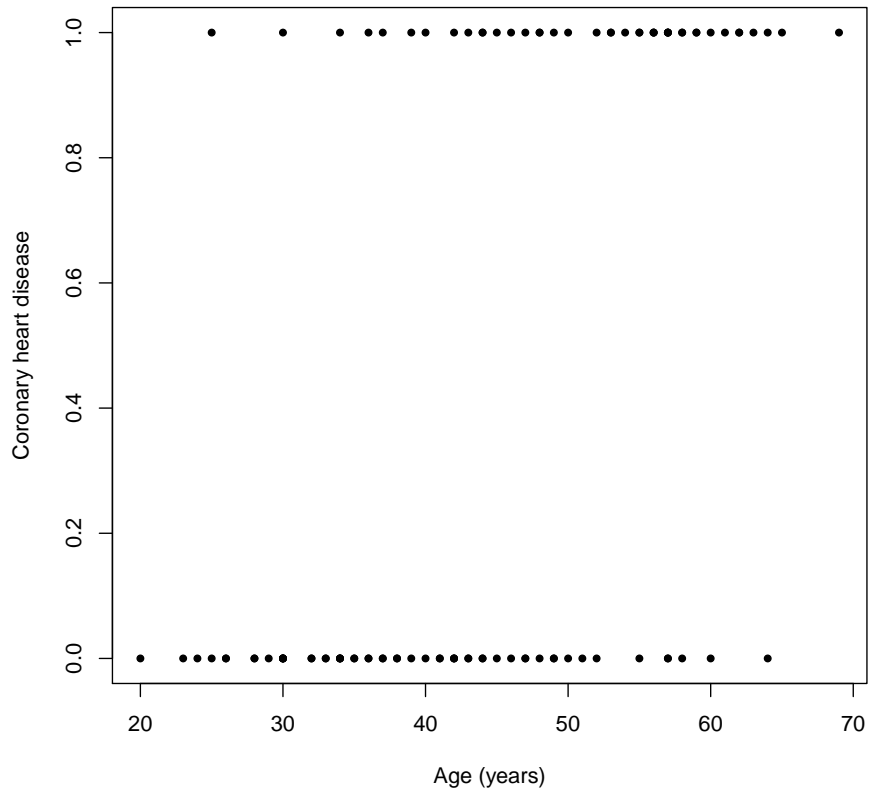
Chapter 3

chdage

```
example(chdage)

##
## chdage> head(chdage, n = 10)
##   id age agegrp chd
## 1  1  20 20-39 No
## 2  2  23 20-39 No
## 3  3  24 20-39 No
## 4  4  25 20-39 No
## 5  5  25 20-39 Yes
## 6  6  26 20-39 No
## 7  7  26 20-39 No
## 8  8  28 20-39 No
## 9  9  28 20-39 No
## 10 10 29 20-39 No
##
## chdage> summary(chdage)
##      id          age          agegrp      chd
## Min.   : 1.00   Min.   :20.00   55-59 :17   No :57
## 1st Qu.: 25.75   1st Qu.:34.75   30-34 :15   Yes:43
## Median : 50.50   Median :44.00   40-44 :15
## Mean   : 50.50   Mean   :44.38   45-49 :13
## 3rd Qu.: 75.25   3rd Qu.:55.00   35-39 :12
## Max.   :100.00   Max.   :69.00   20-39 :10
##                                     (Other):18
##
## chdage> ## Figure 1.1 p. 5
## chdage> plot(as.integer(chd)-1 ~ age,
## chdage+      pch = 20,
## chdage+      main = "Figure 1.1 p. 5",
## chdage+      ylab = "Coronary heart disease",
## chdage+      xlab = "Age (years)",
## chdage+      data = chdage)
```

Figure 1.1 p. 5



```
##
## chdage> ## Table 1.2
## chdage> with(chdage, addmargins(table(agegrp)))
## agegrp
## 20-39 30-34 35-39 40-44 45-49 50-54 55-59 60-69 Sum
## 10 15 12 15 13 8 17 10 100
##
## chdage> with(chdage, addmargins(table(agegrp, chd)))
## chd
## agegrp No Yes Sum
## 20-39 9 1 10
## 30-34 13 2 15
## 35-39 9 3 12
## 40-44 10 5 15
## 45-49 7 6 13
## 50-54 3 5 8
## 55-59 4 13 17
## 60-69 2 8 10
## Sum 57 43 100
##
```

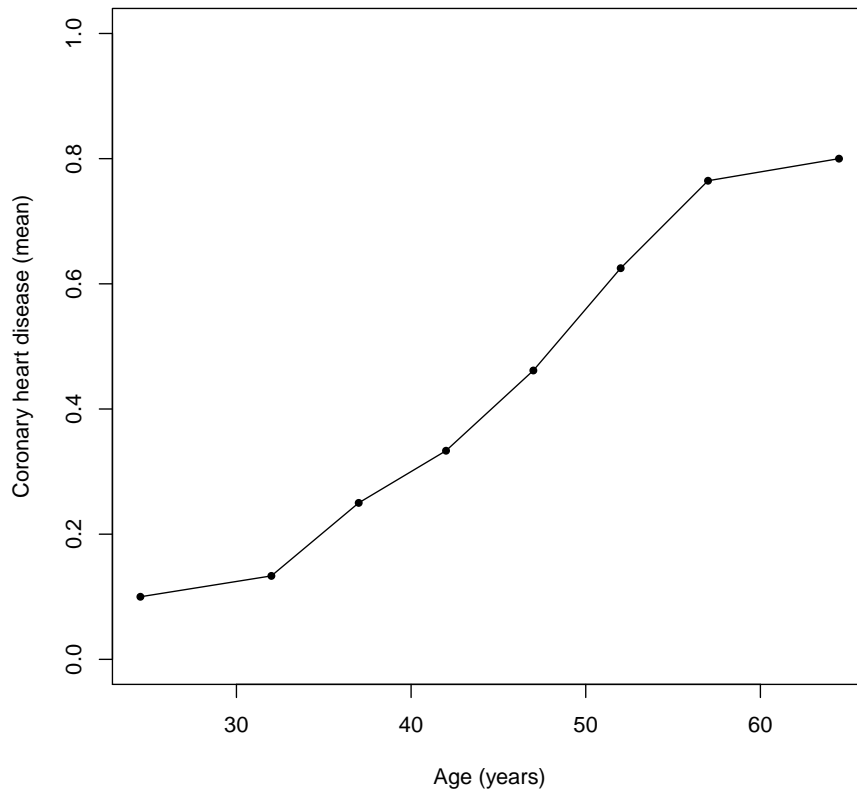
```

## chdage> (Means <- with(chdage, tapply(as.integer(chd)-1, list(agegrp), mean)))
##      20-39      30-34      35-39      40-44      45-49      50-54      55-59
## 0.1000000 0.1333333 0.2500000 0.3333333 0.4615385 0.6250000 0.7647059
##      60-69
## 0.8000000
##
## chdage> ## Figure 1.2 p. 6
## chdage> midPoints <- c(24.5, seq(32, 57, 5), 64.5)
##
## chdage> plot(midPoints, Means, pch = 20,
## chdage+      ylab = "Coronary heart disease (mean)",
## chdage+      xlab = "Age (years)", ylim = 0:1,
## chdage+      main = "Figure 1.2 p. 6")
##
## chdage> lines(midPoints, Means)
##
## chdage> ## Table 1.3
## chdage> summary( mod1.3 <- glm( chd ~ age, family = binomial, data = chdage ))
##
## Call:
## glm(formula = chd ~ age, family = binomial, data = chdage)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.9718  -0.8456  -0.4576   0.8253   2.2859
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept) -5.30945     1.13365  -4.683 2.82e-06 ***
## age          0.11092     0.02406   4.610 4.02e-06 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 136.66  on 99  degrees of freedom
## Residual deviance: 107.35  on 98  degrees of freedom
## AIC: 111.35
##
## Number of Fisher Scoring iterations: 4
##
##
## chdage> ## Table 1.4
## chdage> vcov(mod1.3)
##              (Intercept)          age
## (Intercept)  1.28517059 -0.0266769747
## age         -0.02667697  0.0005788748
##
## chdage> ## Computing OddsRatio and confidence intervals for age ...

```

```
## chdage> exp(coef(mod1.3))[-1]
##      age
## 1.117307
##
## chdage> exp(confint(mod1.3))[-1, ]
## Waiting for profiling to be done...
```

Figure 1.2 p. 6



```
##      2.5 %  97.5 %
## 1.069222 1.175868
```


Chapter 4

glow datasets

4.1 glow500

```
example(glow500)
```

```
##
## glw500> head(glow500, n = 10)
##   sub_id site_id phy_id priorfrac age weight height      bmi premeno
## 1      1      1      14         No  62   70.3   158 28.16055     No
## 2      2      4     284         No  65   87.1   160 34.02344     No
## 3      3      6     305         Yes  88   50.8   157 20.60936     No
## 4      4      6     309         No  82   62.1   160 24.25781     No
## 5      5      1      37         No  61   68.0   152 29.43213     No
## 6      6      5     299         Yes  67   68.0   161 26.23356     No
## 7      7      5     302         No  84   50.8   150 22.57778     No
## 8      8      1      36         Yes  82   40.8   153 17.42919     No
## 9      9      1       8         Yes  86   62.6   156 25.72321     No
## 10    10     10      4     282         No  58   63.5   166 23.04398     No
##   momfrac armassist smoke raterisk fracscore fracture
## 1      No      No      No      Same         1      No
## 2      No      No      No      Same         2      No
## 3     Yes     Yes     No     Less         11     No
## 4      No      No      No     Less         5      No
## 5      No      No      No     Same         1      No
## 6      No      No     Yes     Same         4      No
## 7      No      No      No     Less         6      No
## 8      No      No      No     Same         7      No
## 9      No      No      No     Same         7      No
## 10     No      No      No     Less         0      No
##
## glw500> summary(glow500)
##   sub_id      site_id      phy_id      priorfrac
## Min.   : 1.0      Min.   :1.000      Min.   : 1.00      No :374
## 1st Qu.:125.8     1st Qu.:2.000     1st Qu.: 57.75     Yes:126
## Median :250.5     Median :3.000     Median :182.50
```

```

## Mean :250.5 Mean :3.436 Mean :178.55
## 3rd Qu.:375.2 3rd Qu.:5.000 3rd Qu.:298.00
## Max. :500.0 Max. :6.000 Max. :325.00
## age weight height bmi
## Min. :55.00 Min. : 39.90 Min. :134.0 Min. :14.88
## 1st Qu.:61.00 1st Qu.: 59.90 1st Qu.:157.0 1st Qu.:23.27
## Median :67.00 Median : 68.00 Median :161.5 Median :26.42
## Mean :68.56 Mean : 71.82 Mean :161.4 Mean :27.55
## 3rd Qu.:76.00 3rd Qu.: 81.30 3rd Qu.:165.0 3rd Qu.:30.79
## Max. :90.00 Max. :127.00 Max. :199.0 Max. :49.08
## premeno momfrac armassist smoke raterisk fracscore
## No :403 No :435 No :312 No :465 Less :167 Min. : 0.000
## Yes: 97 Yes: 65 Yes:188 Yes: 35 Same :186 1st Qu.: 2.000
## Greater:147 Median : 3.000
## Mean : 3.698
## 3rd Qu.: 5.000
## Max. :11.000
## fracture
## No :375
## Yes:125
##
##
##
##
## glw500> ## Table 2.2 p. 39
## glw500> summary(mod2.2 <- glm(fracture ~ age + weight + priorfrac +
## glw500+ premeno + raterisk,
## glw500+ family = binomial,
## glw500+ data = glow500))
##
## Call:
## glm(formula = fracture ~ age + weight + priorfrac + premeno +
## raterisk, family = binomial, data = glow500)
##
## Deviance Residuals:
## Min 1Q Median 3Q Max
## -1.42250 -0.74873 -0.59711 -0.06046 2.28830
##
## Coefficients:
## Estimate Std. Error z value Pr(>|z|)
## (Intercept) -5.605794 1.220668 -4.592 4.38e-06 ***
## age 0.050142 0.013417 3.737 0.000186 ***
## weight 0.004080 0.006926 0.589 0.555803
## priorfracYes 0.679457 0.242384 2.803 0.005059 **
## premenoYes 0.186958 0.276710 0.676 0.499266
## rateriskSame 0.534493 0.275858 1.938 0.052676 .
## rateriskGreater 0.874123 0.289157 3.023 0.002503 **
## ---

```

```

## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 562.34  on 499  degrees of freedom
## Residual deviance: 518.08  on 493  degrees of freedom
## AIC: 532.08
##
## Number of Fisher Scoring iterations: 4
##
##
## glw500> ## Table 2.3 p. 40
## glw500> summary(mod2.3 <- update(mod2.2, . ~ . - weight - premeno))
##
## Call:
## glm(formula = fracture ~ age + priorfrac + raterisk, family = binomial,
##      data = glow500)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -1.42693  -0.73132  -0.60772  -0.07484   2.23819
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -4.99060    0.90270  -5.529 3.23e-08 ***
## age           0.04591    0.01244   3.690 0.000224 ***
## priorfracYes  0.70023    0.24116   2.904 0.003689 **
## rateriskSame  0.54856    0.27501   1.995 0.046075 *
## rateriskGreater 0.86576    0.28621   3.025 0.002487 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 562.34  on 499  degrees of freedom
## Residual deviance: 518.90  on 495  degrees of freedom
## AIC: 528.9
##
## Number of Fisher Scoring iterations: 4
##
##
## glw500> ## Table 2.4 p. 44
## glw500> vcov(mod2.3)
##              (Intercept)          age priorfracYes rateriskSame
## (Intercept)   0.81486728 -0.0108886686  0.0445010519 -0.0603876325
## age           -0.01088867  0.0001547891 -0.0008344776  0.0002239259
## priorfracYes  0.04450105 -0.0008344776  0.0581588491 -0.0031271822
## rateriskSame -0.06038763  0.0002239259 -0.0031271822  0.0756289050
## rateriskGreater -0.08055123  0.0005370070 -0.0118441110  0.0462406814

```

```

##           rateriskGreater
## (Intercept)   -0.080551235
## age           0.000537007
## priorfracYes -0.011844111
## rateriskSame  0.046240681
## rateriskGreater 0.081913370
##
## glw500> ## Table 3.6 p. 58
## glw500> contrasts(glow500$raterisk)
##           Same Greater
## Less      0         0
## Same      1         0
## Greater   0         1
##
## glw500> ## Contrasts: Table 3.8 and 3.9 p. 60
## glw500> contrasts(glow500$raterisk) <- matrix(c(-1,-1,1,0,0,1), byrow= TRUE, ncol
##
## glw500> summary(mod3.9 <- glm(fracture ~ raterisk, family = binomial,
## glw500+           data = glow500))
##
## Call:
## glm(formula = fracture ~ raterisk, family = binomial, data = glow500)
##
## Deviance Residuals:
##      Min       1Q   Median       3Q      Max
## -0.9005  -0.7726  -0.6058  -0.0838   1.8899
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  -1.1172     0.1062 -10.514 < 2e-16 ***
## raterisk1     0.0611     0.1437   0.425  0.67067
## raterisk2     0.4240     0.1466   2.892  0.00383 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##      Null deviance: 562.34  on 499  degrees of freedom
## Residual deviance: 550.58  on 497  degrees of freedom
## AIC: 556.58
##
## Number of Fisher Scoring iterations: 4
##
##
## glw500> # cleaning modified dataset ...
## glw500> rm(glow500)
##
## glw500> ## Table 5.1 pg 160 - Hosmer-Lemeshow test (with vcdExtra package)
## glw500> mod4.16 <- glm(fracture ~ age * priorfrac + height + momfrac * armassist +

```

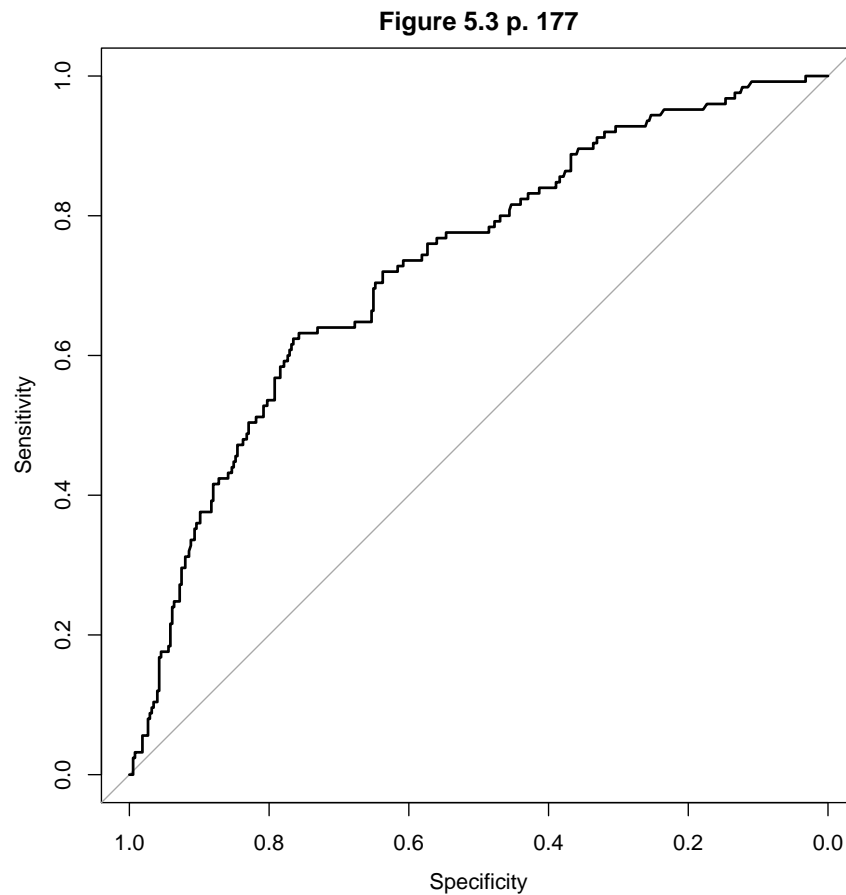
```
## glw500+                                I(as.integer(raterisk) == 3) ,
## glw500+                                family = binomial,
## glw500+                                data = glow500)
##
## glw500> library(vcdExtra)

## Loading required package: vcd
## Loading required package: grid
## Loading required package: gnm

##
## glw500> summary(HLtest(mod4.16))
## Partition for Hosmer and Lemeshow Goodness-of-Fit Test
##
##           cut total obs      exp      chi
## 1 [0.0209,0.0847]   50  47 46.68709  0.04579536
## 2 (0.0847,0.111]   50  46 45.13980  0.12803215
## 3 (0.111,0.141]   50  43 43.72511 -0.10965679
## 4 (0.141,0.176]   51  40 42.92385 -0.44627785
## 5 (0.176,0.208]   49  42 39.60399  0.38073192
## 6 (0.208,0.249]   50  37 38.60188 -0.25782525
## 7 (0.249,0.322]   50  41 35.73499  0.88075020
## 8 (0.322,0.388]   50  31 32.37786 -0.24214783
## 9 (0.388,0.482]   50  25 28.18856 -0.60056317
## 10 (0.482,0.747]   50  23 22.01688  0.20952147
## Hosmer and Lemeshow Goodness-of-Fit Test
##
## Call:
## glm(formula = fracture ~ age * priorfrac + height + momfrac *
##      armassist + I(as.integer(raterisk) == 3), family = binomial,
##      data = glow500)
##   ChiSquare df    P_value
##   6.391925  8 0.6034186
##
## glw500> ## Table 5.3 p. 171 - Classification table
## glw500> glow500$pred4.16 <- predict(mod4.16, type = "response")
##
## glw500> with(glow500, addmargins(table( pred4.16 > 0.5, fracture)))
##           fracture
##           No Yes Sum
## FALSE 356 103 459
## TRUE   19  22  41
## Sum   375 125 500
##
## glw500> ## Sensitivity, specificity, ROC (using pROC)
## glw500> library(pROC)

## Type 'citation("pROC")' for a citation.
##
## Attaching package: 'pROC'
```

```
## The following objects are masked from 'package:stats':
##
##   cov, smooth, var
##
## glw500> ## Figure 5.3 p. 177 - ROC curve (using pROC package)
## glw500> print(roc4.16 <- roc(fracture ~ pred4.16, data = glw500))
##
## Call:
## roc.formula(formula = fracture ~ pred4.16, data = glw500)
##
## Data: pred4.16 in 375 controls (fracture No) < 125 cases (fracture Yes).
## Area under the curve: 0.7286
##
## glw500> plot(roc4.16, main = "Figure 5.3 p. 177")
```



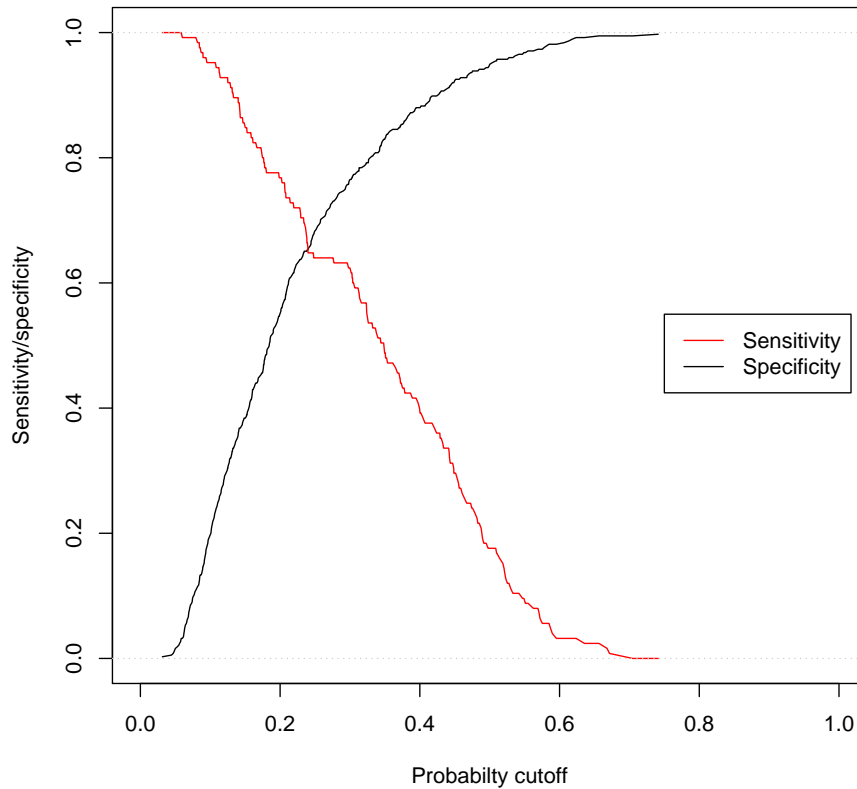
```
##
## Call:
## roc.formula(formula = fracture ~ pred4.16, data = glw500)
##
```

```

## Data: pred4.16 in 375 controls (fracture No) < 125 cases (fracture Yes).
## Area under the curve: 0.7286
##
## glw500> ## Table 5.8 p. 175
## glw500> vars <- c("thresholds","sensitivities","specificities")
##
## glw500> tab5.8 <- data.frame(roc4.16[vars])
##
## glw500> ## Now, for printing/comparison purposes, steps below in order to find
## glw500> ## threshold values most similar to those in the table
## glw500> findIndex <- function(x, y) which.min( (x-y)^2 )
##
## glw500> cutPoints <- seq(0.05, 0.75, by = 0.05)
##
## glw500> tableIndex <- mapply(findIndex, y = cutPoints,
## glw500+           MoreArgs = list(x = roc4.16$thresholds))
##
## glw500> ## And finally, let's print a reasonable approximation of table 5.8
## glw500> writeLines("\nTable 5.8 p. 175\n")
##
## Table 5.8 p. 175
##
##
## glw500> tab5.8[tableIndex, ]
##      thresholds sensitivities specificities
## 6    0.05006609         1.000    0.0160000
## 64   0.09986050         0.952    0.1973333
## 136  0.15020771         0.848    0.3840000
## 201  0.20022684         0.768    0.5520000
## 263  0.24951185         0.640    0.6826667
## 294  0.30000935         0.624    0.7653333
## 335  0.34960972         0.488    0.8293333
## 366  0.40031190         0.392    0.8800000
## 393  0.44967455         0.296    0.9226667
## 417  0.50009629         0.176    0.9493333
## 434  0.54891768         0.096    0.9680000
## 447  0.59548830         0.032    0.9813333
## 453  0.65647052         0.024    0.9946667
## 456  0.70450302         0.000    0.9946667
## 457  0.74119791         0.000    0.9973333
##
## glw500> ## Figure 5.1 p. 175
## glw500> plot(specificities ~ thresholds, xlim = c(0, 1), type = "l",
## glw500+       xlab = "Probabilty cutoff", ylab = "Sensitivity/specificity",
## glw500+       ylim = c(0, 1), data = tab5.8, main = "Figure 5.1 p. 175")

```

Figure 5.1 p. 175



```
##
## glw500> with(tab5.8, lines(thresholds, sensitivities, col = "red"))
##
## glw500> legend(x = 0.75, y = 0.55, legend = c("Sensitivity", "Specificity"),
## glw500+      lty = 1, col = c("red","black"))
##
## glw500> abline(h = c(0, 1), col = "grey80", lty = "dotted")
```

4.2 glow_bonemed

```
example(glow_bonemed)
```

```
##
## glw_bn> head(glow_bonemed, n = 10)
##   sub_id site_id phy_id priorfrac age weight height      bmi premeno
## 1      1      1     14        No  62  70.3   158 28.16055      No
## 2      2      4    284        No  65  87.1   160 34.02344      No
```



```

## 3      3      6    305      Yes 88   50.8   157 20.60936   No
## 4      4      6    309      No  82   62.1   160 24.25781   No
## 5      5      1     37      No  61   68.0   152 29.43213   No
## 6      6      5    299      Yes 67   68.0   161 26.23356   No
## 7      7      5    302      No  84   50.8   150 22.57778   No
## 8      8      1     36      Yes 82   40.8   153 17.42919   No
## 9      9      1      8      Yes 86   62.6   156 25.72321   No
## 10     10     4    282      No  58   63.5   166 23.04398   No
##      momfrac armassist smoke raterisk fracscore fracture bonemed bonemed_fu
## 1      No      No      No      Same      1      No      No      No
## 2      No      No      No      Same      2      No      No      No
## 3      Yes     Yes     No      Less     11     No      No      No
## 4      No      No      No      Less     5      No      No      No
## 5      No      No      No      Same     1      No      No      No
## 6      No      No     Yes     Same     4      No      No      No
## 7      No      No      No      Less     6      No      No      No
## 8      No      No      No      Same     7      No      Yes     Yes
## 9      No      No      No      Same     7      No      No      No
## 10     No      No      No      Less     0      No      No      No
##      bonetreat
## 1      No
## 2      No
## 3      No
## 4      No
## 5      No
## 6      No
## 7      No
## 8      Yes
## 9      No
## 10     No
##
## glw_bn> summary(glow_bonemed)
##      sub_id      site_id      phy_id      priorfrac
## Min.   : 1.0    Min.   :1.000    Min.   : 1.00    No :374
## 1st Qu.:125.8  1st Qu.:2.000    1st Qu.: 57.75   Yes:126
## Median :250.5  Median :3.000    Median :182.50
## Mean   :250.5  Mean   :3.436    Mean   :178.55
## 3rd Qu.:375.2  3rd Qu.:5.000    3rd Qu.:298.00
## Max.   :500.0  Max.   :6.000    Max.   :325.00
##      age      weight      height      bmi
## Min.   :55.00  Min.   : 39.90  Min.   :134.0  Min.   :14.88
## 1st Qu.:61.00  1st Qu.: 59.90  1st Qu.:157.0  1st Qu.:23.27
## Median :67.00  Median : 68.00  Median :161.5  Median :26.42
## Mean   :68.56  Mean   : 71.82  Mean   :161.4  Mean   :27.55
## 3rd Qu.:76.00  3rd Qu.: 81.30  3rd Qu.:165.0  3rd Qu.:30.79
## Max.   :90.00  Max.   :127.00  Max.   :199.0  Max.   :49.08
##      premeno  momfrac  armassist  smoke      raterisk  fracscore
## No :403    No :435    No :312    No :465    Less :167  Min.   : 0.000
## Yes: 97    Yes: 65    Yes:188    Yes: 35    Same :186  1st Qu.: 2.000

```

```
##          Greater:147   Median : 3.000
##                               Mean  : 3.698
##                               3rd Qu.: 5.000
##                               Max.   :11.000
## fracture  bonemed   bonemed_fu bonetreat
## No :375   No :371   No :361   No :382
## Yes:125   Yes:129   Yes:139   Yes:118
##
##
##
##
```

4.3 glow_mis_comp

```
example(glow_mis_comp)

##
## glw_m-> head(glow_mis_comp, n = 10)
##   sub_id site_id phy_id priorfrac age weight height momfrac raterisk
## 1     1     1     14      No  62  70.3   158     No    Same
## 2     2     4    284      No  65  87.1   160     No    Same
## 3     3     6    305     Yes  88  50.8   157     Yes   Less
## 4     4     6    309      No  82  62.1   160     No    Less
## 5     5     1     37      No  61  68.0   152     No    Same
## 6     6     5    299     Yes  67  68.0   161     No    Same
## 7     7     5    302      No  84  50.8   150     No    Less
## 8     8     1     36     Yes  82  40.8   153     No    Same
## 9     9     1     8      Yes  86  62.6   156     No    Same
## 10    10    4    282      No  58  63.5   166     No    Less
##   fracture
## 1         No
## 2         No
## 3         No
## 4         No
## 5         No
## 6         No
## 7         No
## 8         No
## 9         No
## 10        No
##
## glw_m-> summary(glow_mis_comp)
##   sub_id      site_id      phy_id      priorfrac
## Min.   : 1.0   Min.   :1.000   Min.   : 1.00   No :374
## 1st Qu.:125.8 1st Qu.:2.000   1st Qu.: 57.75  Yes:126
## Median :250.5 Median :3.000   Median :182.50
## Mean   :250.5 Mean   :3.436   Mean   :178.55
```

```
## 3rd Qu.:375.2 3rd Qu.:5.000 3rd Qu.:298.00
## Max. :500.0 Max. :6.000 Max. :325.00
## age weight height momfrac raterisk
## Min. :55.00 Min. : 39.90 Min. :134.0 No :435 Less :167
## 1st Qu.:61.00 1st Qu.: 59.90 1st Qu.:157.0 Yes: 65 Same :186
## Median :67.00 Median : 68.00 Median :161.5 Greater:147
## Mean :68.56 Mean : 71.82 Mean :161.4
## 3rd Qu.:76.00 3rd Qu.: 81.30 3rd Qu.:165.0
## Max. :90.00 Max. :127.00 Max. :199.0
## fracture
## No :375
## Yes:125
##
##
##
##
```

4.4 glow_mis_wmissing

```
example(glow_mis_wmissing)

##
## glw_m_> head(glow_mis_wmissing, n = 10)
## sub_id site_id phy_id fracture age weight height momfrac raterisk
## 1 1 1 14 No 62 70.3 158 No <NA>
## 2 2 4 284 No 65 87.1 160 <NA> Same
## 3 3 6 305 No 88 50.8 157 Yes Less
## 4 4 6 309 No 82 62.1 160 <NA> Less
## 5 5 1 37 No 61 68.0 NA No Same
## 6 6 5 299 No NA 68.0 NA No Same
## 7 7 5 302 No 84 50.8 150 <NA> Less
## 8 8 1 36 No 82 40.8 153 No Same
## 9 9 1 8 No 86 62.6 156 No Same
## 10 10 4 282 No NA 63.5 166 No <NA>
## priorfrac
## 1 No
## 2 <NA>
## 3 Yes
## 4 <NA>
## 5 No
## 6 Yes
## 7 No
## 8 Yes
## 9 Yes
## 10 <NA>
##
## glw_m_> summary(glow_mis_wmissing)
```

```
##      sub_id      site_id      phy_id      fracture
## Min.   : 1.0    Min.   :1.000    Min.   : 1.00    No :375
## 1st Qu.:125.8  1st Qu.:2.000    1st Qu.: 57.75   Yes:125
## Median :250.5  Median :3.000    Median :182.50
## Mean   :250.5  Mean   :3.436    Mean   :178.55
## 3rd Qu.:375.2  3rd Qu.:5.000    3rd Qu.:298.00
## Max.   :500.0  Max.   :6.000    Max.   :325.00
##
##      age      weight      height      momfrac      raterisk
## Min.   :55.00  Min.   : 39.90  Min.   :134.0    No :352    Less :129
## 1st Qu.:60.75  1st Qu.: 59.90  1st Qu.:157.0    Yes : 48    Same :143
## Median :67.00  Median : 68.90  Median :162.0    NA's:100   Greater:128
## Mean   :68.49  Mean   : 72.06  Mean   :161.4    NA's :100
## 3rd Qu.:76.00  3rd Qu.: 81.60  3rd Qu.:165.0
## Max.   :90.00  Max.   :127.00  Max.   :199.0
## NA's   :100    NA's   :100     NA's   :100
## priorfrac
## No :294
## Yes :106
## NA's:100
##
##
##
##
```

4.5 glow_rand

```
example(glow_rand)
##
## glw_rn> head(glow_rand, n = 10)
##      sub_id site_id phy_id priorfrac age weight height  bmi premeno momfrac
## 1         1      2     80         No  69  72.6  157.5  29.3      No      No
## 2         2      3     95         No  66  79.4  162.6  30.0      No      No
## 3         3      3    184         No  62  78.5  170.2  27.1      No      No
## 4         4      4    280         No  69  72.6  154.9  30.2      Yes     No
## 5         5      5    289         No  58  48.5  157.5  19.6      No      No
## 6         6      1     39         No  86  80.7  154.9  33.6      No      Yes
## 7         7      3    114         Yes  64  68.0  175.3  22.2      No      No
## 8         8      5    297         No  75  77.1  160.0  30.1      Yes     No
## 9         9      5    294         No  62  49.9  160.0  19.5      No      No
## 10        10     1     39         No  80  62.6  154.9  26.1      No      No
##      armassist smoke raterisk fracscore fracture
## 1         Yes    No    Greater      4         No
## 2         Yes    No    Greater      4         No
## 3         No     No     Same       1         No
## 4         Yes    Yes    Same       4         No
```

```

## 5      No  No  Greater      1      No
## 6      No  No   Same      7      No
## 7      No  No  Greater      2      No
## 8      Yes No   Less      6      No
## 9      No  No  Greater      2      No
## 10     No  No   Same      5      No
##
## glw_rn> summary(glow_rand)
##      sub_id      site_id      phy_id      priorfrac      age
## Min.   : 1.0   Min.   :1.000   Min.   : 1.0   No :359   Min.   :55.00
## 1st Qu.:125.8  1st Qu.:2.000   1st Qu.: 53.0   Yes:141  1st Qu.:61.00
## Median :250.5  Median :3.000   Median :139.0           Median :67.00
## Mean   :250.5  Mean   :3.236   Mean   :163.9           Mean   :68.62
## 3rd Qu.:375.2  3rd Qu.:5.000   3rd Qu.:294.0           3rd Qu.:75.00
## Max.   :500.0  Max.   :6.000   Max.   :325.0           Max.   :90.00
##      weight      height      bmi      premeno      momfrac
## Min.   : 38.10   Min.   :142.2   Min.   :15.40   No :409   No :432
## 1st Qu.: 60.80   1st Qu.:157.5   1st Qu.:23.30   Yes: 91   Yes: 68
## Median : 70.30   Median :162.6   Median :26.60
## Mean   : 71.79   Mean   :161.9   Mean   :27.36
## 3rd Qu.: 79.80   3rd Qu.:165.1   3rd Qu.:30.50
## Max.   :129.30   Max.   :182.9   Max.   :48.10
##      armassist smoke      raterisk      fracscore      fracture
## No :309   No :469   Less  :137   Min.   : 0.000   No :375
## Yes:191   Yes: 31   Same  :210   1st Qu.: 2.000   Yes:125
##                                     Greater:153   Median : 3.000
##                                     Mean   : 3.638
##                                     3rd Qu.: 5.000
##                                     Max.   :10.000

```


Chapter 5

icu

```
example(icu)

##
## icu> head(icu, n = 10)
##   id  sta age gender  race      ser can crn inf cpr sys hra pre
## 1   4  Died  87 Female White Surgical No  No Yes  No  80  96  No
## 2   8  Lived  27 Female White  Medical No  No Yes  No 142  88  No
## 3  12  Lived  59  Male White  Medical No  No No   No 112  80  Yes
## 4  14  Lived  77  Male White Surgical No  No No   No 100  70  No
## 5  27  Died  76 Female White Surgical No  No Yes  No 128  90  Yes
## 6  28  Lived  54  Male White  Medical No  No Yes  No 142 103  No
## 7  32  Lived  87 Female White Surgical No  No Yes  No 110 154  Yes
## 8  38  Lived  69  Male White  Medical No  No Yes  No 110 132  No
## 9  40  Lived  63  Male White Surgical No  No No   No 104  66  No
## 10 41  Lived  30 Female White  Medical No  No No   No 144 110  No
##      type fra  po2    ph  pco  bic  cre  loc
## 1  Emergency Yes <= 60 < 7.25 > 45 >= 18 <= 2.0 Nothing
## 2  Emergency No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 3  Emergency No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 4  Elective  No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 5  Emergency No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 6  Emergency Yes  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 7  Emergency No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 8  Emergency No <= 60 >= 7.25 <= 45 < 18 <= 2.0 Nothing
## 9  Elective  No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
## 10 Emergency No  > 60 >= 7.25 <= 45 >= 18 <= 2.0 Nothing
##
## icu> summary(icu)
##      id          sta          age          gender          race
## Min.   : 4.0    Lived:160    Min.   :16.00    Male  :124    White:175
## 1st Qu.:210.2    Died : 40    1st Qu.:46.75    Female: 76    Black: 15
## Median :412.5                    Median :63.00                    Other: 10
## Mean   :444.8                    Mean   :57.55
## 3rd Qu.:671.8                    3rd Qu.:72.00
```

```

## Max. :929.0 Max. :92.00
## ser can crn inf cpr sys
## Medical : 93 No :180 No :181 No :116 No :187 Min. : 36.0
## Surgical:107 Yes: 20 Yes: 19 Yes: 84 Yes: 13 1st Qu.:110.0
## Median :130.0
## Mean :132.3
## 3rd Qu.:150.0
## Max. :256.0
## hra pre type fra po2
## Min. : 39.00 No :170 Elective : 53 No :185 > 60 :184
## 1st Qu.: 80.00 Yes: 30 Emergency:147 Yes: 15 <= 60: 16
## Median : 96.00
## Mean : 98.92
## 3rd Qu.:118.25
## Max. :192.00
## ph pco bic cre loc
## >= 7.25:187 <= 45:180 >= 18:185 <= 2.0:190 Nothing:185
## < 7.25 : 13 > 45 : 20 < 18 : 15 > 2.0 : 10 Stupor : 5
## Coma : 10
##
##
##

```


Chapter 6

lowbwt

```
example(lowbwt)

##
## lowbwt> head(lowbwt, n = 10)
##   id      low age lwt race smoke ptl ht ui      ftv bwt
## 1   4 < 2500 g  28 120 Other   Yes One No Yes      None 709
## 2  10 < 2500 g  29 130 White    No None No Yes Two, etc. 1021
## 3  11 < 2500 g  34 187 Black   Yes None Yes No      None 1135
## 4  13 < 2500 g  25 105 Other    No One Yes No      None 1330
## 5  15 < 2500 g  25  85 Other    No None No Yes      None 1474
## 6  16 < 2500 g  27 150 Other    No None No No      None 1588
## 7  17 < 2500 g  23  97 Other    No None No Yes       One 1588
## 8  18 < 2500 g  24 128 Black    No One No No      One 1701
## 9  19 < 2500 g  24 132 Other    No None Yes No      None 1729
## 10 20 < 2500 g  21 165 White   Yes None Yes No      One 1790
##
## lowbwt> summary(lowbwt)
##      id      low      age      lwt
## Min.   : 4.0   >= 2500 g:130   Min.    :14.00   Min.    : 80.0
## 1st Qu.: 68.0   < 2500 g : 59     1st Qu.:19.00   1st Qu.:110.0
## Median :123.0
## Mean   :121.1
## 3rd Qu.:176.0
## Max.   :226.0
##      race      smoke      ptl      ht      ui      ftv
## White:96   No :115   None    :159   No :177   No :161   None    :100
## Black:26   Yes: 74   One     : 24   Yes: 12   Yes: 28   One     : 47
## Other:67           Two, etc.: 6           Two, etc.: 42
##
##
##      bwt
## Min.   : 709
## 1st Qu.:2414
```

```
## Median :2977  
## Mean   :2945  
## 3rd Qu.:3475  
## Max.   :4990
```

Chapter 7

myopia

```
example(myopia)

##
## myopia> head(myopia, n = 10)
##   id studyyear myopic age gender  spheq    al    acd    lt    vcd sporthr
## 1   1     1992    Yes   6 Female -0.052 21.89 3.690 3.498 14.70    45
## 2   2     1995    No    6 Female 0.608 22.38 3.702 3.392 15.29     4
## 3   3     1991    No    6 Female 1.179 22.49 3.462 3.514 15.52    14
## 4   4     1990    Yes   6 Female 0.525 22.20 3.862 3.612 14.73    18
## 5   5     1995    No    5  Male 0.697 23.29 3.676 3.454 16.16    14
## 6   6     1995    No    6  Male 1.744 22.14 3.224 3.556 15.36    10
## 7   7     1993    No    6 Female 0.683 22.33 3.186 3.654 15.49    12
## 8   8     1991    No    6 Female 1.272 22.39 3.732 3.584 15.08    12
## 9   9     1991    No    7  Male 1.396 22.62 3.464 3.408 15.74     4
## 10 10     1991    No    6 Female 0.972 22.74 3.504 3.696 15.54    30
##   readhr comphr studyhr tvhr diopterhr mommy dadmy
## 1     8     0     0  10     34   Yes   Yes
## 2     0     1     1   7     12   Yes   Yes
## 3     0     2     0  10     14   No    No
## 4    11     0     0   4     37   No    Yes
## 5     0     0     0   4      4   Yes   No
## 6     6     2     1  19     44   No    Yes
## 7     7     2     1   8     36   No    Yes
## 8     0     0     0   8      8   No    No
## 9     0     3     1   3     12   No    No
## 10    5     1     0  10     27   No    No
##
## myopia> summary(myopia)
##      id      studyyear  myopic      age      gender
## Min.   : 1.0    Min.   :1990  No :537   Min.   :5.000  Male :316
## 1st Qu.:155.2  1st Qu.:1991  Yes: 81   1st Qu.:6.000  Female:302
## Median :309.5  Median :1992
## Mean   :309.5  Mean   :1992
## 3rd Qu.:463.8  3rd Qu.:1994
##      age      gender
```

```

## Max. :618.0 Max. :1995 Max. :9.000
## spheq al acd lt
## Min. :-0.6990 Min. :19.90 Min. :2.772 Min. :2.960
## 1st Qu.: 0.4562 1st Qu.:22.04 1st Qu.:3.424 1st Qu.:3.436
## Median : 0.7290 Median :22.46 Median :3.585 Median :3.542
## Mean : 0.8010 Mean :22.50 Mean :3.579 Mean :3.541
## 3rd Qu.: 1.0340 3rd Qu.:22.97 3rd Qu.:3.730 3rd Qu.:3.640
## Max. : 4.3720 Max. :24.56 Max. :4.250 Max. :4.112
## vcd sporthr readhr comphr
## Min. :13.38 Min. : 0.00 Min. : 0.000 Min. : 0.000
## 1st Qu.:14.93 1st Qu.: 6.00 1st Qu.: 0.000 1st Qu.: 0.000
## Median :15.36 Median :10.00 Median : 2.000 Median : 1.000
## Mean :15.38 Mean :11.95 Mean : 2.796 Mean : 2.105
## 3rd Qu.:15.84 3rd Qu.:16.00 3rd Qu.: 4.000 3rd Qu.: 3.000
## Max. :17.30 Max. :45.00 Max. :20.000 Max. :30.000
## studyhr tvhr diopterhr mommy dadmy
## Min. : 0.00 Min. : 0.000 Min. : 2.00 No :305 No :310
## 1st Qu.: 0.00 1st Qu.: 4.250 1st Qu.: 15.00 Yes:313 Yes:308
## Median : 1.00 Median : 8.000 Median : 23.00
## Mean : 1.49 Mean : 8.948 Mean : 26.02
## 3rd Qu.: 2.00 3rd Qu.:12.000 3rd Qu.: 34.00
## Max. :15.00 Max. :31.000 Max. :101.00

```

Chapter 8

nhanes

```
example(nhanes)

##
## nhanes> head(nhanes, n = 10)
##   id gender age      marstat  samplewt psu strata tchol hdl sysbp dbp
## 1  1  Male  34      Married  80100.544  1    9    135  50  114  88
## 2  2  Male  16      <NA> 13953.078  1   10    192  60  112  62
## 3  3 Female  60      Widowed  20090.339  2    1    202  45  154  70
## 4  4  Male  26      Married  22537.827  1   14    160  45  102  50
## 5  5 Female  49 Living Together 74212.270  2   11    259  45  118  82
## 6  6  Male  80      Married  11998.401  1    3    182  75  142  62
## 7  7  Male  80      Widowed  21806.929  1    5    148  49  126  62
## 8  8  Male  17      <NA> 11445.167  1    7    178  66  122  76
## 9  9 Female  42      Married  39087.023  2    1    170  35   NA  NA
## 10 10 Male  66      Married  9286.357  1    1    217  40  146  68
##      wt   ht   bmi  vigwrk modwrk  wlk bik  vigrecexr modrecexr sedmin obese
## 1  87.4 164.7 32.22   No    No    No          No          No    480   No
## 2  72.3 181.3 22.00   No    No    Yes         No          Yes    240   No
## 3 116.8 166.0 42.39   No    No    No          No          No    240   Yes
## 4  97.6 173.0 32.61   No    No    Yes         Yes         No    720   No
## 5  86.7 168.4 30.57   No    No    No          No          No    240   No
## 6  79.1 174.3 26.04   No    Yes   Yes         No          Yes    60    No
## 7  89.6 180.1 27.62   No    Yes   No          No          No    540   No
## 8  74.7 169.6 25.97   No    Yes   No          Yes         Yes    480   No
## 9 107.7 164.3 39.90   No    No    No          No          No    30    Yes
## 10 82.9 171.3 28.25   No    No    No          No          No    NA    No
##
## nhanes> summary(nhanes)
##      id      gender      age      marstat
## Min.   : 1    Male :3164  Min.   :16.00  Married   :3019
## 1st Qu.:1621  Female:3318  1st Qu.:30.00  Widowed   : 505
## Median :3242                Median :46.00  Divorced  : 643
## Mean   :3242                Mean   :46.34  Separated : 195
## 3rd Qu.:4862                3rd Qu.:62.00  Never Married :1034
```

```

## Max. :6482 Max. :80.00 Living Together: 457
## NA's : 629
## samplewt psu strata tchol
## Min. : 4084 Min. :1.00 Min. : 1.000 Min. : 90.0
## 1st Qu.: 16460 1st Qu.:1.00 1st Qu.: 4.000 1st Qu.:162.0
## Median : 24217 Median :2.00 Median : 7.000 Median :188.0
## Mean : 34546 Mean :1.51 Mean : 7.225 Mean :192.1
## 3rd Qu.: 50435 3rd Qu.:2.00 3rd Qu.:11.000 3rd Qu.:218.0
## Max. :153810 Max. :2.00 Max. :15.000 Max. :383.0
## NA's :395
## hdl sysbp dbp wt
## Min. : 11.00 Min. : 90 Min. : 40.00 Min. : 33.20
## 1st Qu.: 41.00 1st Qu.:110 1st Qu.: 62.00 1st Qu.: 65.90
## Median : 50.00 Median :120 Median : 70.00 Median : 77.60
## Mean : 52.41 Mean :123 Mean : 69.59 Mean : 80.38
## 3rd Qu.: 61.00 3rd Qu.:132 3rd Qu.: 78.00 3rd Qu.: 91.80
## Max. :144.00 Max. :220 Max. :134.00 Max. :159.10
## NA's :395 NA's :553 NA's :594 NA's :37
## ht bmi vigwrk modwrk wlkbik
## Min. :123.3 Min. :13.18 Yes :1131 Yes :2190 Yes :1807
## 1st Qu.:160.0 1st Qu.:23.99 No :5350 No :4291 No :4674
## Median :166.9 Median :27.68 NA's: 1 NA's: 1 NA's: 1
## Mean :167.4 Mean :28.62
## 3rd Qu.:175.0 3rd Qu.:32.15
## Max. :202.7 Max. :65.19
## NA's :37 NA's :37
## vgrecexr modrecexr sedmin obese
## Yes :1402 Yes :2493 Min. : 0.0 No :5459
## No :5079 No :3987 1st Qu.:180.0 Yes : 986
## NA's: 1 NA's: 2 Median :300.0 NA's: 37
## Mean :321.1
## 3rd Qu.:480.0
## Max. :840.0
## NA's :79

```

Chapter 9

polypharm

```
example(polypharm)

##
## plyphr> head(polypharm, n = 10)
##   id polypharmacy mhv4 inptmhv3 year group urban comorbid anyprim numprim
## 1  1           No    0         0 2002  CFC Urban      Yes    Yes     1
## 2  1           No  1-5         0 2003  CFC Urban      Yes    Yes     1
## 3  1           No    0         0 2004  CFC Urban      No     No     0
## 4  1           No  1-5         0 2005  CFC Urban      Yes    Yes     1
## 5  1           No    0         0 2006  CFC Urban      Yes    Yes     1
## 6  1           No  1-5         0 2007  ABD Urban      Yes    Yes     1
## 7  1           No  6-14        0 2008  ABD Urban      Yes    Yes     1
## 8  2           No  6-14        0 2002  ABD Urban      Yes    Yes     1
## 9  2           No  6-14        0 2003  ABD Urban      Yes    Yes     1
## 10 2           No > 14        0 2004  ABD Urban      No     Yes     1
##   gender race  ethnic  age
## 1 Female White Non-Hisp 4.67
## 2 Female White Non-Hisp 5.67
## 3 Female White Non-Hisp 6.00
## 4 Female White Non-Hisp 7.08
## 5 Female White Non-Hisp 8.00
## 6 Female White Non-Hisp 9.92
## 7 Female White Non-Hisp 10.67
## 8  Male Black Non-Hisp 7.58
## 9  Male Black Non-Hisp 8.08
## 10 Male Black Non-Hisp 9.83
##
## plyphr> summary(polypharm)
##      id      polypharmacy  mhv4      inptmhv3      year
## Min.   : 1.0    No :2681      0   : 558    0 :3333  Min.   :2002
## 1st Qu.:125.8  Yes: 819    1-5 : 909    1  : 121  1st Qu.:2003
## Median :250.5                6-14:1002   > 1:  46  Median :2005
## Mean   :250.5                > 14:1031                Mean   :2005
## 3rd Qu.:375.2                                     3rd Qu.:2007
```

```
## Max. :500.0                               Max. :2008
## group      urban      comorbid  anyprim  numprim      gender
## CFC:1787   Urban:2529  No :2879  No : 991    0 : 991     Female: 798
## ABD:1251   Rural: 970   Yes: 621  Yes:2509   1 :2440     Male :2702
## FOS: 462   NA's : 1
##
##
##
##      race      ethnic      age
## White:2926  Non-Hisp:3458  Min. : 1.17
## Black: 553  Hispanic: 42   1st Qu.: 9.67
## Other: 21
##
##
##      Median :11.75
##      Mean   :11.65
##      3rd Qu.:13.75
##      Max.   :18.92
```


Chapter 10

scale_example

```
example(scale_example)

##
## scl_xm> head(scale_example, n = 10)
##      y      x
## 1  No 27.88814
## 2  No 26.41320
## 3  No 25.79367
## 4  Yes 22.48335
## 5  No 26.93008
## 6  Yes 21.31120
## 7  Yes 21.73849
## 8  Yes 22.05013
## 9  Yes 24.02452
## 10 Yes 22.61062
##
## scl_xm> summary(scale_example)
##      y      x
## No :360  Min.  :20.24
## Yes:140  1st Qu.:31.99
##      Median :44.14
##      Mean   :44.37
##      3rd Qu.:56.44
##      Max.   :70.00
```