Reproduction of Analyses in Lohr (1999) using the survey package

Tobias Verbeke

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```
> library(SDA)
> library(survey)
```

1 Chapter 3: Ratio and Regression Estimation

```
> pf <- data.frame(photo = c(10, 12, 7, 13, 13, 6, 17, 16, 15,
+     10, 14, 12, 10, 5, 12, 10, 10, 9, 6, 11, 7, 9, 11, 10, 10),
+     field = c(15, 14, 9, 14, 8, 5, 18, 15, 13, 15, 11, 15, 12,
+         8, 13, 9, 11, 12, 9, 12, 13, 11, 10, 9, 8))
```

```
> df <- data.frame(tree = 1:10, x = c(1, 0, 8, 2, 76, 60, 25, 2,
+     1, 31), y = c(0, 0, 1, 2, 10, 15, 3, 2, 1, 27))
> names(df) <- c("tree", "x", "y")
```

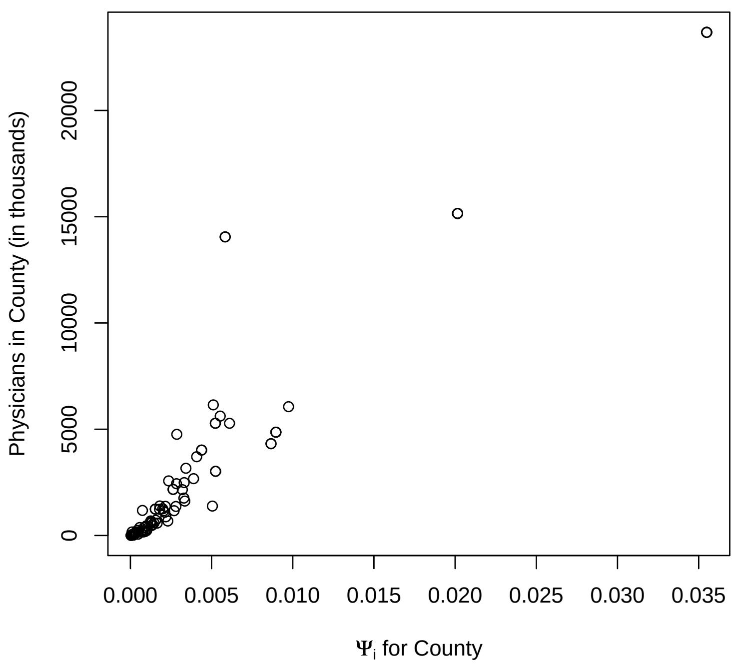
2 Chapter 5

```
> txt <- "person_num cluster gpa\n  1 1 3.08\n  2 1 2.60\n  3 1 3.44\n  4 1 3.04\n  1
> txtConn <- textConnection(txt)
> GPA <- read.table(txtConn, header = TRUE)
> GPA$pwt <- 100/5
> clusterDesign <- svydesign(ids = ~cluster, weights = ~pwt, data = GPA)
> svytotal(~gpa, design = clusterDesign)
```

```
     total     SE
gpa 1130.4 67.167
```

3 Chapter 6: Sampling with Unequal Probabilities

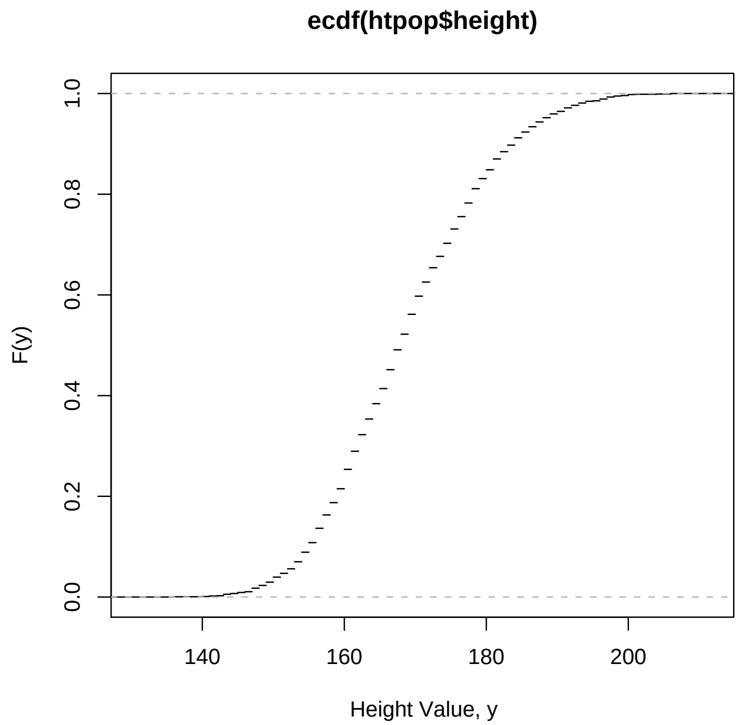
```
> data(statepop)
> statepop$psi <- statepop$popn/255077536

> plot(phys ~ psi, data = statepop, xlab = expression(paste(Psi[i],
+     " for County")), ylab = "Physicians in County (in thousands)")
```



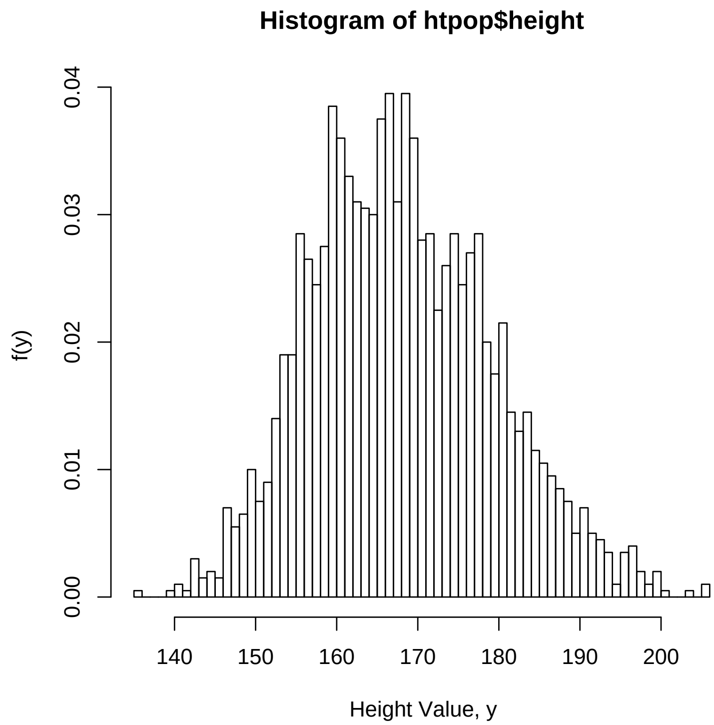
4 Chapter 7: Complex Surveys

4.1 Estimating a Distribution Function

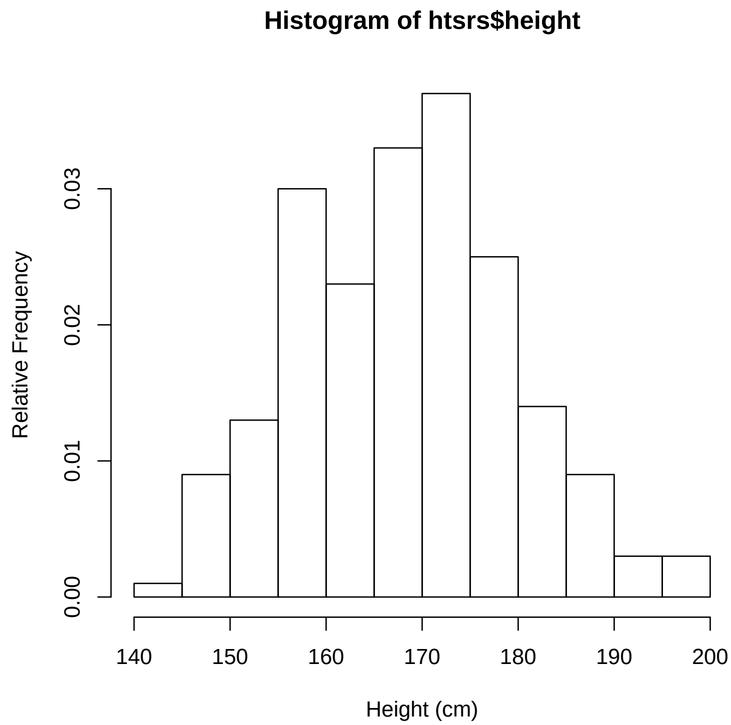
```
> data(htpop)
> popecdf <- ecdf(htpop$height)
> plot(popecdf, do.points = FALSE, ylab = "F(y)", xlab = "Height Value, y")
```




```
> minht <- min(htpop$height)
> breaks <- c(minht - 1, seq(from = minht, to = max(htpop$height),
+     by = 1))
> hist(htpop$height, ylab = "f(y)", breaks = breaks, xlab = "Height Value, y",
+     freq = FALSE)
```

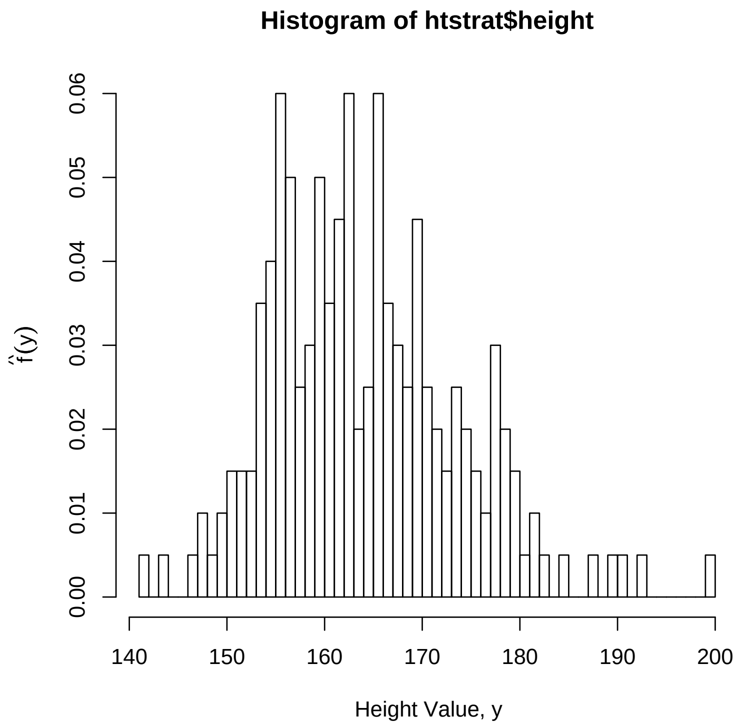



```
> data(htsrs)
> hist(htsrs$height, ylab = "Relative Frequency", xlab = "Height (cm)",
+     freq = FALSE)
```

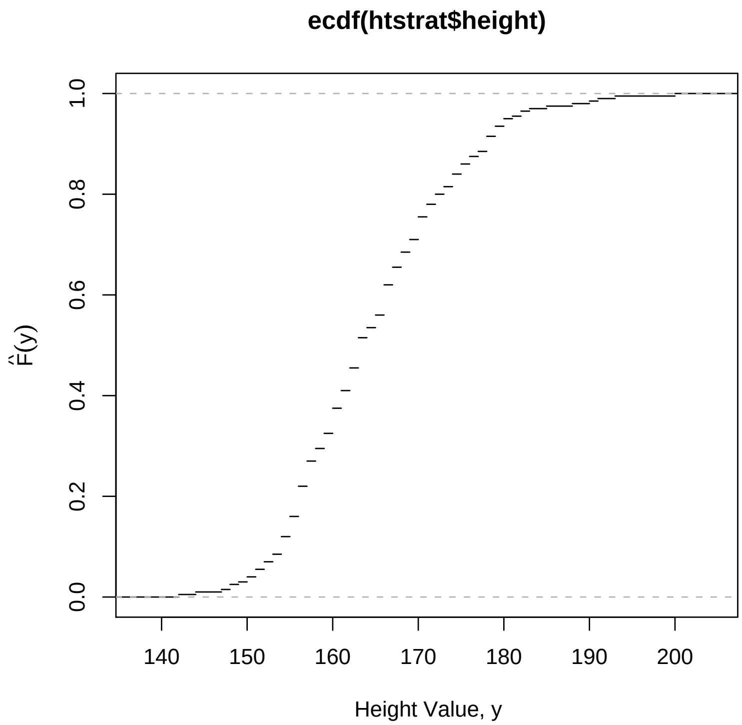



```
> data(htstrat)
> hist(htstrat$height, ylab = "Relative Frequency", xlab = "Height (cm)",
+      freq = FALSE)
```


```
> minht <- min(htstrat$height)
> breaks <- c(minht - 1, seq(from = minht, to = max(htstrat$height),
+     by = 1))
> hist(htstrat$height, ylab = expression(hat(f)(y)), breaks = breaks,
+     xlab = "Height Value, y", freq = FALSE)
```

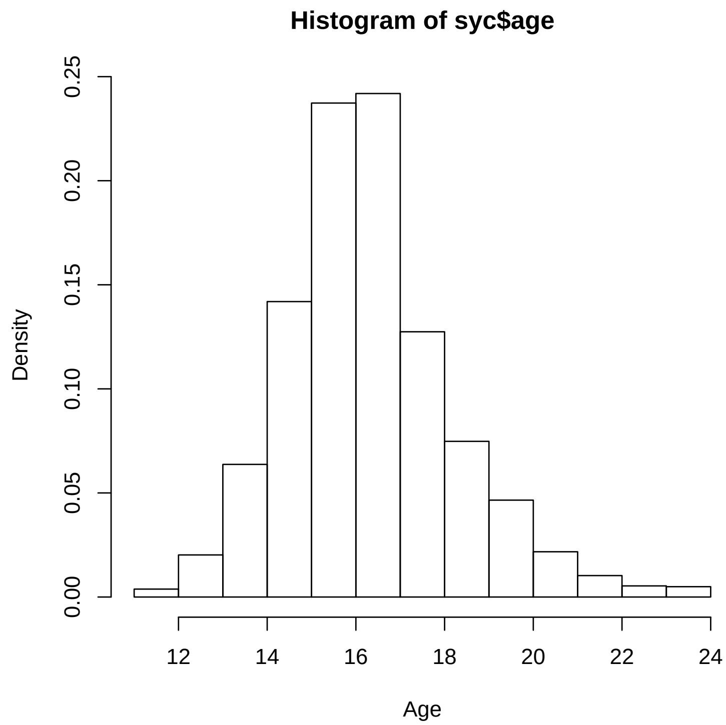



```
> stratecdf <- ecdf(htstrat$height)
> plot(stratecdf, do.points = FALSE, ylab = expression(hat(F)(y)),
+      xlab = "Height Value, y")
```



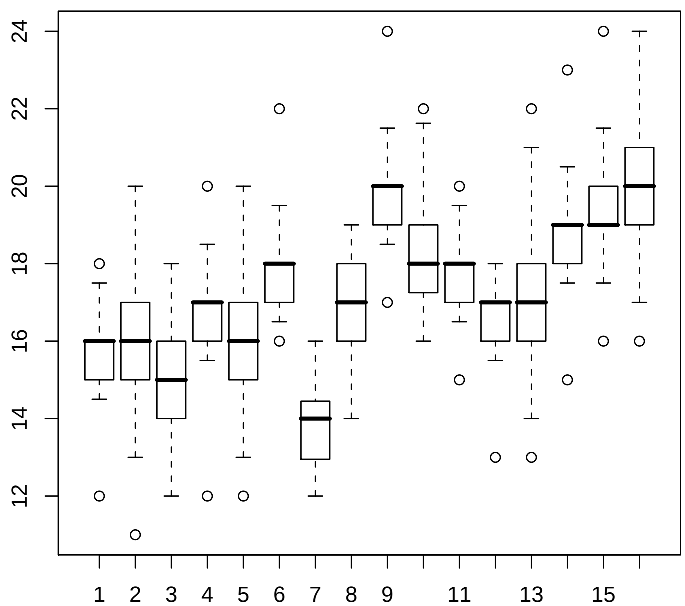
4.2 Plotting Data from a Complex Survey

```
> data(syc)
> hist(syc$age, freq = FALSE, xlab = "Age")
```



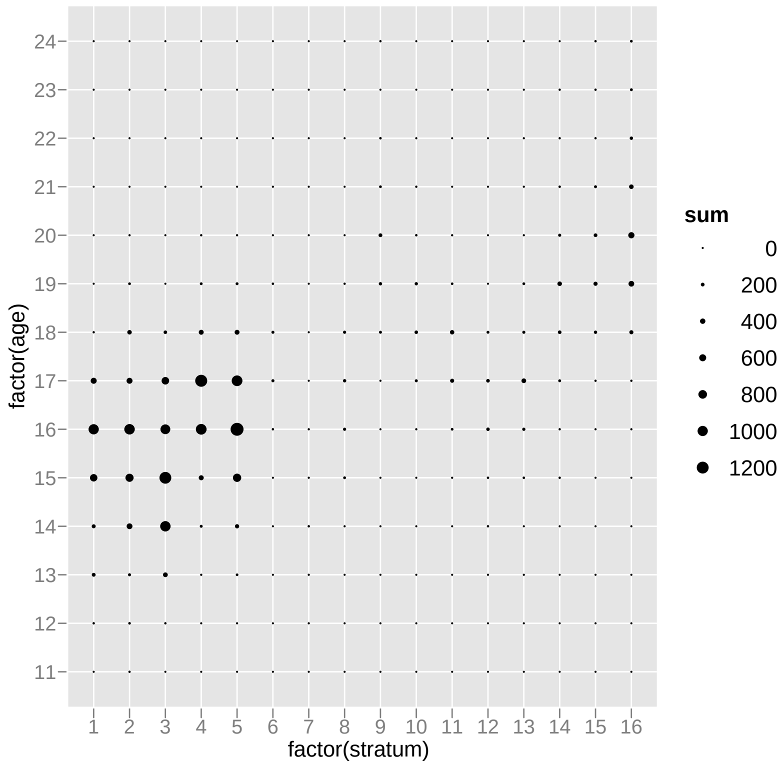
Note that in its current implementation, `svyboxplot` will only plot minimum and maximum as outliers if they are situated outside the whiskers. Other outliers are not plotted (see `?svyboxplot`). This explains the minor difference with Figure 7.8 on p. 237 of Lohr (1999).

```
> sycdesign <- svydesign(ids = ~psu, strata = ~stratum, data = syc,
+     weights = ~finalwt)
> oo <- options(survey.lonely.psu = "certainty")
> svyboxplot(age ~ factor(stratum), design = sycdesign)
> options(oo)
```



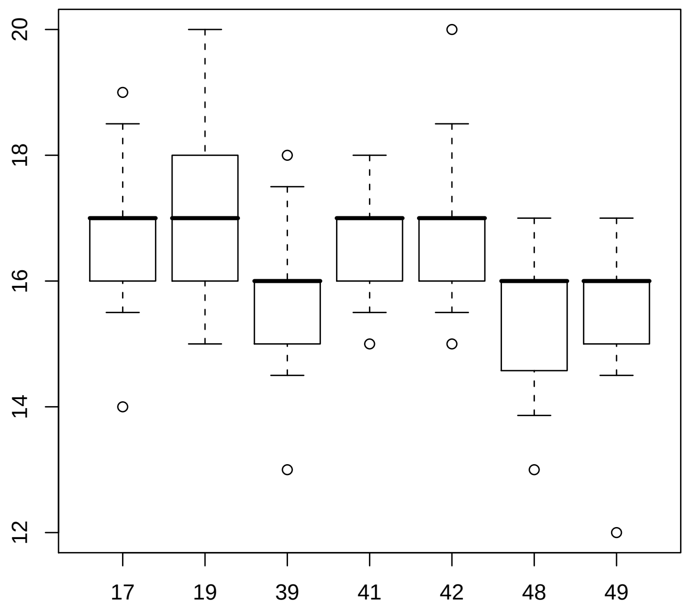
This kind of plot is particularly easy to formulate in the grammar of graphics, i.e. using the `ggplot2` package :

```
> p <- ggplot(syc, aes(x = factor(stratum), y = factor(age)))
> g <- p + stat_sum(aes(group = 1, weight = finalwt, size = ..sum..))
> print(g)
```

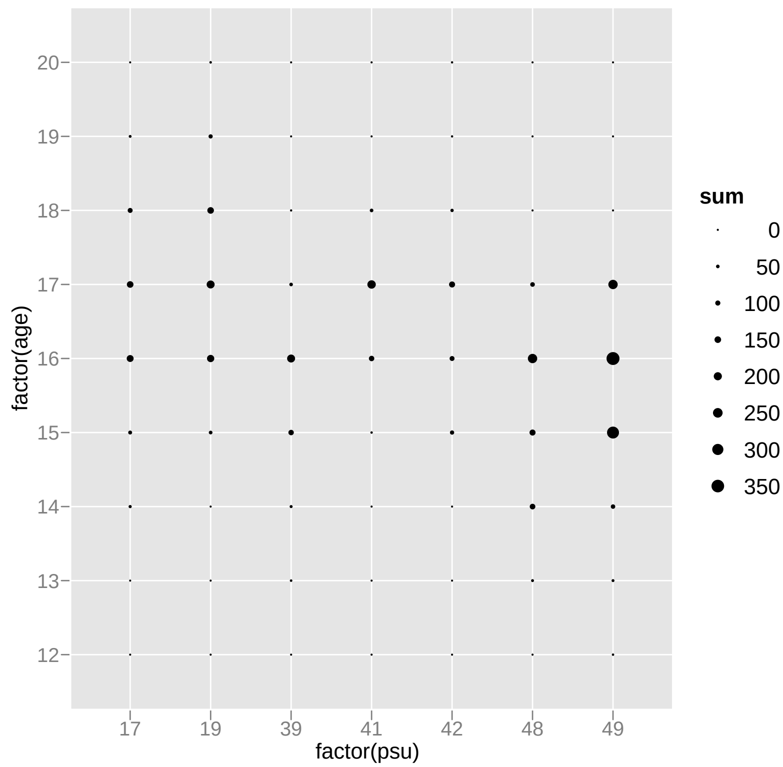


Note that in its current implementation, `svyboxplot` will only plot minimum and maximum as outliers if they are situated outside the whiskers. Other outliers are not plotted (see `?svyboxplot`). This explains the minor difference with Figure 7.10 on p. 238 of Lohr (1999).

```
> oo <- options(survey.lonely.psu = "certainty")
> sycstrat5 <- subset(sycdesign, stratum == 5)
> svyboxplot(age ~ factor(psu), design = sycstrat5)
> options(oo)
```




```
> sycstrat5df <- subset(syc, stratum == 5)
> p <- ggplot(sycstrat5df, aes(x = factor(psu), y = factor(age)))
> g <- p + stat_sum(aes(group = 1, weight = finalwt, size = ..sum..))
> print(g)
```



5 Chapter 10: Categorical Data Analysis in Complex Surveys

5.1 Chi-Square Tests with Multinomial Sampling

```
> hh <- rbind(c(119, 188), c(88, 105))
> rownames(hh) <- c("cableYes", "cableNo")
> colnames(hh) <- c("computerYes", "computerNo")
> addmargins(hh)
```

```
         computerYes computerNo Sum
cableYes         119        188 307
cableNo           88        105 193
Sum              207        293 500
```

```
> chisq.test(hh, correct = FALSE)
```

```
        Pearson's Chi-squared test

data:  hh
X-squared = 2.281, df = 1, p-value = 0.1310
```

```
> nst <- rbind(c(46, 222), c(41, 109), c(17, 40), c(8, 26))
> colnames(nst) <- c("NR", "R")
> rownames(nst) <- c("generalStudent", "generalTutor", "psychiatricStudent",
+     "psychiatricTutor")
> addmargins(nst)
```

```
                    NR   R Sum
generalStudent      46 222 268
generalTutor        41 109 150
psychiatricStudent  17  40  57
psychiatricTutor     8  26  34
Sum                112 397 509
```

```
> chisq.test(nst, correct = FALSE)
```

```
        Pearson's Chi-squared test

data:  nst
X-squared = 8.2176, df = 3, p-value = 0.04172
```

```
> afp <- data.frame(nAccidents = 0:7, nPilots = c(12475, 4117,
+     1016, 269, 53, 14, 6, 2))
> lambdahat <- sum(afp$nAccidents * afp$nPilots/sum(afp$nPilots))
> observed <- afp$nPilots
> expected <- dpois(0:7, lambda = lambdahat) * sum(afp$nPilots)
> sum((observed - expected)^2/expected)
```

```
[1] 1935.127
```

5.2 Effects of Survey Design on Chi-Square Tests

```
> hh2 <- rbind(c(238, 376), c(176, 210))
> rownames(hh2) <- c("cableYes", "cableNo")
> colnames(hh2) <- c("computerYes", "computerNo")
> addmargins(hh2)
```

```
         computerYes computerNo  Sum
cableYes         238        376  614
cableNo          176        210  386
Sum              414        586 1000

> chisq.test(hh2, correct = FALSE)

        Pearson's Chi-squared test

data:  hh2
X-squared = 4.5621, df = 1, p-value = 0.03269
```

5.3 Corrections to Chi-Square Tests

6 Chapter 11: Regression with Complex Survey Data