Solution to Exercise 1: Introduction to R software: basics

Key points:

a. R is both a language and an environment of computing
b. Anything and everything can be assigned to an object
c. Object names are case-sensitive
d. A vector is a one-dimensional object of like elements
e. A matrix is a two-dimensional table (another object) of like elements
f. Vectors can be bound to matrices

Task

In analogy to the calculation of the odds ratio, write an R script **`e_ex01_rr.r`** ***that calculates the relative risk from two proportions (thus not ratio of incidence rates, but ratio of two prevalence proportions) for a study used in Altman's textbook. It has the isolation of*** **Helicobacter pylori** ***as the outcome and the history of an ulcer in the mother as the exposure. We use the following set-up of notations:***

Exposure	Outcome		Total
	Ill	Healthy	
Yes	A	B	A+B
No	C	D	C+D
Total	A+B	B+D	A+B+C+D

The data provided by Altman in table 7.2 (page 59) are as follows:

Mother with a history of ulcer	*H pylori* isolated		Total
	Yes	No	
Yes	6	16	22
No	112	729	841
Total	118	745	863

The relative risk is calculated by:

```
R = (A/(A+B))/(C/(C+D))
```

The standard error of the $\log_e R$ is:

$se = SQRT(1/A-1/(A+B)+1/C-(1/(C+D))$

The 95% CI is thus:

$95\%CI = \exp(\log_e R \pm 1.96*se)$

Solution:

The solution for the `e_ex01_rr.r` is a straight forward modification of the `e_ex01_or.r`:

```
# Complete 2 by 2 table from
# A, B, C, D and calculate relative risk with Wolf CI

A <- 54
B <- 89
C <- 60
D <- 245

AB <- c(A, B, A+B)
CD <- c(C, D, C+D)
ABCD <- rbind(AB, CD)
rtot <- abcd[1,]+abcd[2,]
tab <- rbind(ABCD, rtot)
colnames(tab) <- cbind("Ill", "Healthy", "Total")
rownames(tab) <- rbind("Exp+", "Exp-", "Total")
names(dimnames(tab)) <- c("Exposure", "Status")
se <- sqrt(1/A-1/(A+B)+1/C-1/(C+D))
rr <- (tab[1,1]/tab[1,3])/(tab[2,1]/tab[2,3]); rr
rr.ci.lower <- exp(log(rr)-1.96*se)
rr.ci.upper <- exp(log(rr)+1.96*se)

print(tab)
cat("\nRR:", round(rr, digits=3), "\n95% CI:", round(rr.ci.lower,
digits=3), round(rr.ci.upper, digits=3), "\n")
```

The result is:

```
      Ill Healthy Total
Exp+    6      16    22
Exp-  112     729   841
Total 118     745   863

RR: 2.048
95% CI: 1.013 4.14
```