Epidemiology with R

Errata

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Chapter 1

Typos

Negative line numbers refer to lines counted from the bottom of the page.

page	line	change from	to
11	−11	clsses	classes
15	3	capilatized	capitalized
18	−7	function	functions
22	−18	commnds	commands
26	−15	RStudioyou	RStudio you
34	−21	`"matage"] ) ma[`	`"matage"] ) ; ma[`
49	−6	10.9%	10.6%
56	−17	is	are
65	−10	coincides	coincide
70	12	...differ 1 cm in weight	...differ 1 cm in height
82	11	have	has
91	−9	log_b	$\log_b$
95	1	$\mathrm{d}t$	h (both occurrences)
97	6, 7	$(1/D_1 + 1/D_2)$	$\sqrt{1/D_1 + 1/D_2}$
97	19	as	
122	−6	condutors	conductors
124	17	depends	depend
140	−21	agerange	age range
148	148	or	nor
154	17	as above	as on p. 146
155	−13	6.15	6.16
164	−12, −11	$\beta_1 x_1$	β_1
165	21	from either the model or	from this model as it was from
210	−19	is the probability of	the probability is of
210	5	variable	variables

Chapter 2

Errors

This is a list of the more serious mistakes in the book. And the correction of them.

2.1 Forgetting the null

p. 53 ff, in section 3.1.6, "*Tests and p-values*" there is an omission in computing the p-values because the standard errors are not computed under the null as it should be. So, on p. 55 the paragraph in lines −19–−11 should read:

In the calculations above we used the Wald test, using the parameter estimate and the standard error of it—we computed the standard error assuming the parameter being equal to the estimate ($\hat{\pi} = 0.16$), but by the definition of the p-value we should really use the null-value of the prevalence, $\pi = 0.1$ in the calculations.

It can be shown (two of these formulae were already mentioned above) that:

$$\text{s.e.}(\hat{\pi}) = \sqrt{\pi(1-\pi)/n}, \quad \text{s.e.}(\log(\hat{\pi})) = \sqrt{(1-\pi)/(n\pi)}, \quad \text{s.e.}(\text{logit}(\hat{\pi})) = \sqrt{1/(n\pi(1-\pi))}$$

so we can compute the standard errors under the null for these transformations and derive the "correct" p-values (as well as the Wald p-values)—the code is just translating the formulae to code with π equal to either `p0` (0.10, null value) or `phat` (0.16, estimated value):

```
> n <- 100 ; phat <- 16 / n ; p0 <- 0.1
> par0 <- c(p0   , log(p0  ), logit(p0  ))
> parE <- c(phat, log(phat), logit(phat))
> names(parE) <- c("p", "log(p)", "logit(p)")
> se0 <- c(sqrt(p0 * (1 - p0) / n),
+          sqrt((1 - p0) / (n * p0)),
+          sqrt(1 / (n * p0 * (1 - p0))))
> tt0 <- (parE - par0) / se0
> pval0 <- 2 * pnorm(abs(tt0), lower.tail = FALSE)
> seW <- c(sqrt(phat * (1 - phat) / n),
+          sqrt((1 - phat) / (n * phat)),
+          sqrt(1 / (n * phat * (1 - phat))))
> ttW <- (parE - par0) / seW
> pvalW <- 2 * pnorm(abs(ttW), lower.tail = FALSE)
```

```
> round( cbind(parE, seW, ttW, pvalW,
+              par0, se0, tt0, pval0), 3 )
            parE   seW   ttW pvalW   par0   se0   tt0 pval0
p          0.160 0.037 1.637 0.102  0.100 0.030 2.000 0.046
log(p)    -1.833 0.229 2.051 0.040 -2.303 0.300 1.567 0.117
logit(p) -1.658 0.273 1.976 0.048 -2.197 0.333 1.617 0.106
```

We see that the hand-calculation of the Wald-tests (column `pvalW`) gives the same as the model-based (with considerably more effort), and that the formally correct tests (`pval0`) (purely coincidental) swaps p-values between the transformed and untransformed scales.

In the column `pval0` using the normal approximation to the distribution of $\log(\hat{\pi})$ (rather than that of $\hat{\pi}$), we have a p-value for the hypothesis of 0.117 instead of 0.046, and when using the logit, a p-value of 0.106. These p-values are not dramatically different, but adherers to the religion of the 5% significance level will draw different conclusions depending what transformation is chosen. Using the log-scale will make them conclude that the observed prevalence is compatible with a theoretical prevalence of 10%, using the prevalence-scale will make them conclude that it is not. Using the Wald-tests (the column `pvalW`) just reverses the dilemma, and moreover makes the logit transformation a candidate for true indecision. Unfortunately there is nothing in the scriptures that provides guidance as to which scale to use, only a recommendation to forsake the Wald test. The latter is however only possible in simple situations as this, with more elaborate models it is not. The proper test in such circumstances would be the likelihood-ratio test, see p. 60.