ERRATUM

Erratum to: Two-tailed approximate confidence intervals for the ratio of proportions

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Erratum to: Stat Comput (2014) 24:65–75
DOI 10.1007/s11222-012-9353-5

The authors apologize for the errors made in the article which appeared in *Statistics and Computing* (2014) 24:65–75. Some of these are of slight importance, but one error is quite substantial.

The less important errors are:

– Page 65, left column, line 11: where it says "… (3) the best methods among …" it should say "…(3) the best method among …".
– Page 73, left column, line 11: where it says "… the expression (19) …" it should say "… the expression (18) …".
– Page 74, left column, line 25: where it says "… working out p_{iE} one gets …" it should say "… working out p_{1E} one gets …".

But the most outstanding error is in Sect. 4, comprising all the text between expressions (15) and (20) inclusive, which occurs when the explicit formula of the CI about the relative risk is being deduced from the optimal method ZA1. The error originates in the fact that the estimators for the unknown proportions p_i used in the said method are $p_{1A} = $ Min $\{1; (x_2 + x_1\rho)/n\rho\}$ and $p_{2A} = $ Min$\{1; (x_2 + x_1\rho)/n\}$,

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as is indicated in expression (12) of the paper. However the estimators in expression (15) of the paper do not correspond to the first ones: they correspond to another version of these that yields a method that behaves a good deal more badly. As a result, all the text between expressions (15) and (20) inclusive in the paper should be replaced by the text that appended here (below). It can be seen that the new first expressions in (15), (16) and (17), as well as the new expression (18), are the same as those in the paper, except for an error that is contained in the expression (17) in the paper. The replacement text is:

$$
\begin{cases}
p_{1A} = \frac{x_2+\rho x_1}{n\rho}, & p_{2A} = \frac{x_2+\rho x_1}{n} & \text{if } \rho_1 = \frac{x_2}{n-x_1} \le \rho \le \rho_2 = \frac{n-x_2}{x_1} \\
p_{1A} = 1, & p_{2A} = \frac{x_2+\rho x_1}{n} & \text{if } \rho < \rho_1 = \frac{x_2}{n-x_1} \\
p_{1A} = \frac{x_2+\rho x_1}{n\rho}, & p_{2A} = 1 & \text{if } \rho > \rho_2 = \frac{n-x_2}{x_1},
\end{cases}
\tag{15}
$$

from which it can be deduced that the test statistic for procedure ZA will be:

$$
\begin{aligned}
z_{ZA}^2 &= \frac{(\bar{p}_2 - \rho\bar{p}_1)^2}{\rho^2 \frac{p_{1A}q_{1A}}{n_1} + \frac{p_{2A}q_{2A}}{n_2}} \\
&= \begin{cases}
\frac{nn_1n_2(\bar{p}_2-\rho\bar{p}_1)^2}{(x_2+\rho x_1)\{(n_1-x_2)+\rho(n_2-x_1)\}} & \text{if } \rho_1 \le \rho \le \rho_2 \\
\frac{n^2n_2(\bar{p}_2-\rho\bar{p}_1)^2}{(x_2+\rho x_1)\{(n-x_2)-\rho x_1\}} & \text{if } \rho < \rho_1 \\
\frac{n^2n_1(\bar{p}_2-\rho\bar{p}_1)^2}{(x_2+\rho x_1)\{(n-x_1)\rho-x_2\}} & \text{if } \rho > \rho_2.
\end{cases}
\end{aligned}
\tag{16}
$$

Making $z_{ZA}^2 = z_{\alpha/2}^2$, the CI sought (ρ_L, ρ_U) is given by the solutions to the equations:

$$\begin{cases} x_1 \left\{ nn_2 \bar{p}_1 - z_{\alpha/2}^2 (n_2 - x_1) \right\} \rho^2 - \left\{ 2nx_1x_2 + z_{\alpha/2}^2 (n_1x_1 + n_2x_2 - 2x_1x_2) \right\} \rho \\ \quad + x_2 \left\{ nn_1 \bar{p}_2 - z_{\alpha/2}^2 (n_1 - x_2) \right\} = 0, & \text{if } \rho_1 \leq \rho \leq \rho_2 \\ \left(n^2 n_2 \bar{p}_1^2 + z_{\alpha/2}^2 x_1^2 \right) \rho^2 - \left[2n^2 \bar{p}_1 x_2 + z_{\alpha/2}^2 x_1 (n - 2x_2) \right] \rho \\ \quad + x_2 \left\{ n^2 \bar{p}_2 - z_{\alpha/2}^2 (n - x_2) \right\} = 0, & \text{if } \rho < \rho_1 \\ x_1 \left\{ n^2 \bar{p}_1 - z_{\alpha/2}^2 (n - x_1) \right\} \rho^2 - \left[2n^2 \bar{p}_2 x_1 + z_{\alpha/2}^2 x_2 (n - 2x_1) \right] \rho \\ \quad + \left(n^2 n_1 \bar{p}_2^2 + z_{\alpha/2}^2 x_2^2 \right) = 0, & \text{if } \rho > \rho_2, \end{cases} \tag{17}$$

where $x_i \neq 0$ and $n - x_i \neq 0$ because the data have been increased by 0.5. Hence the first step is to determine the two solutions for the first equation in expression (17):

$$(\rho_L, \rho_U) = \frac{nx_1x_2 + \frac{z_{\alpha/2}^2 (n_1x_1 + n_2x_2 - 2x_1x_2)}{2} \pm z_{\alpha/2} \sqrt{n^2 x_1 x_2 (a_1 - n \bar{p}_1 \bar{p}_2) + \left\{ \frac{z_{\alpha/2}(n_2x_2 - n_1x_1)}{2} \right\}^2}}{x_1 \left\{ nn_2 \bar{p}_1 - z_{\alpha/2}^2 (n_2 - x_1) \right\}} \tag{18}$$

If the two solutions obtained (ρ_L, ρ_U) verify that $\rho_1 \leq \rho_L < \bar{R} < \rho_U \leq \rho_2$, the problem is ended. Otherwise, one or two of the boundaries may fail. If the boundary that fails is ρ_L, one must obtain the smaller of the two solutions in the second equation of expression (17):

$$\rho_L = \frac{1}{x_1 \left\{ \frac{nn_2}{n_1^2} + \frac{z_{\alpha/2}^2}{n} \right\}} \left\{ x_2 \frac{n}{n_1} + z_{\alpha/2}^2 \left(\frac{1}{2} - \frac{x_2}{n} \right) \right. $$
$$\left. - z_{\alpha/2} \sqrt{\frac{n^2}{n_1^2} \frac{x_2 y_2}{n_2} + \frac{z_{\alpha/2}^2}{4}} \right\}. \tag{19}$$

but if $\rho_L < 0$, it should be $\rho_L = 0$. If the boundary that fails is ρ_U, one must obtain the solution $\rho > \bar{R}$ in the third equation of expression (17):

$$\rho_U = \frac{1}{\frac{x_1}{x_2} \left\{ \frac{nx_1}{n_1} - \frac{z_{\alpha/2}^2}{n} (n - x_1) \right\}} \left\{ x_1 \frac{n}{n_2} + z_{\alpha/2}^2 \left(\frac{1}{2} - \frac{x_1}{n} \right) \right. $$
$$\left. + z_{\alpha/2} \sqrt{\frac{n^2}{n_2^2} \frac{x_1 y_1}{n_1} + \frac{z_{\alpha/2}^2}{4}} \right\}. \tag{20}$$

but if $\rho_U < \bar{R}$, it should be $\rho_U = +\infty$.