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Graphical presentation of relative measures of association

Relative measures of association, such as hazard ratio, odds ratio, and risk ratio, are often used to convey comparative information in medicine and public health. Graphical presentation of such ratios is common practice in technical papers. However, there are two crucial features that must be taken into account when presenting ratios in graphical format: (1) the baseline value for a ratio is 1; and (2) ratios are expressed on a logarithmic rather than arithmetic scale.

Szklo and Nieto[1] have nicely summarised these two conditions using three examples of ratios with values of 0·5 and 2·0 (figure). Part A uses a baseline of zero and an arithmetic scale. The visual impression given is that the risk ratio of 2·0 is four times larger than the ratio of 0·5. Part B is correct in using a baseline of 1 but wrong in using an arithmetic scale, which gives the impression that the ratio of 2·0 is twice that of the ratio 0·5. In reality, risk ratios of 2·0 and 0·5 are identical in magnitude but work in opposite directions. Part C shows the correct presentation, using a baseline of 1 and a logarithmic scale.

We reviewed the 2008 issues of several peer-reviewed general medical journals: the *British Medical Journal (BMJ)*, the *Journal of the American Medical Association (JAMA)*, *The Lancet*, and the *New England Journal of Medicine (NEJM)*. Inclusion criteria were articles (original, special, or review) that included graphical representation of any relative measure of association. There were 132 articles in total, most of which used forest plots to visualise relative measures of association. Of this total, 46 (35%) used graphs that failed to meet at least one of the above-mentioned conditions. However, there were significant differences between the four journals. Of the 29 *JAMA* articles reviewed, none failed to meet the quality criteria and all presented the data correctly. Of the 23 *BMJ* articles, four did not meet correct representation standards. On the other hand, in both *The Lancet* and the *NEJM*, more than half the articles had incorrect representation (22 of 41 articles in *The Lancet* and 20 of 39 in the *NEJM*).

As Tufte[2] has observed, the purpose of graphics is to "reveal data", but they must "avoid distorting what the data have to say". Perhaps it is time for peer-reviewed journals to include among their reviewers experts in graphical presentation alongside statisticians and epidemiologists.

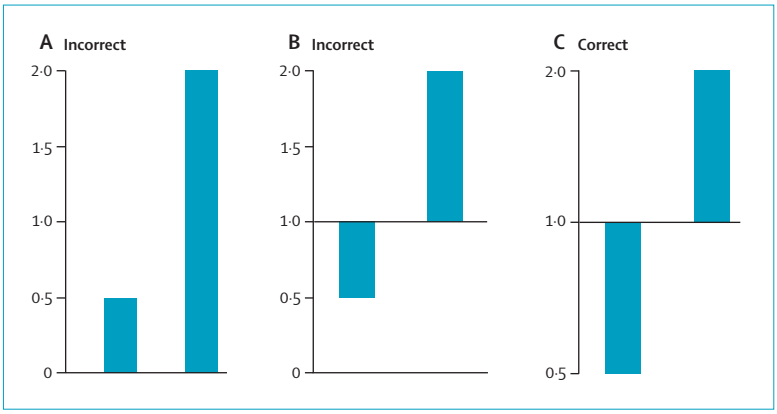

Figure: **Graphical presentation of risk ratios of 0·5 and 2·0, considering baseline and scale**

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We declare that we have no conflicts of interest.

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