INFORMATION POINT:

Odds ratio

The odds ratio is one of a range of statistics used to assess the risk of a particular outcome (or disease) if a certain factor (or exposure) is present. The odds ratio is a relative measure of risk, telling us how much more likely it is that someone who is exposed to the factor under study will develop the outcome as compared to someone who is not exposed.

Odds are a way of presenting probabilities, but unless you know much about betting you will probably need an explanation of how odds are calculated. The odds of an event happening is the probability that the event will happen divided by the probability that the event will not happen. For example, consider Table 1 showing the outcome variable dependent or independent feeding for those who eat more or less than ¾ of served food (data extracted from Table 2 of Westergren *et al.* (2001)).

The probability of dependent feeding in those who eat ≤ ¾ of served food is $59/92 = 0.641$, whilst the probability of independent feeding in those who eat ≤ ¾ of served food is $33/92 = 0.359$. So the odds of dependent feeding in those who eat ≤ ¾ of served food is $(59/92)/(33/92) = 1.79$. Notice this can more easily be calculated as a number in the group who experience the event divided by number in the group who do not experience the event, that is $59/33 = 1.79$. If the odds are greater than one then the event (dependent feeding in this example) is more likely to happen than not. If the odds are less than one then the event is less likely to happen than not.

We can also calculate the odds of dependent feeding in those who do not eat ≤ ¾ of served food as $17/44 = 0.386$.

An odds ratio is used to compare the odds for two groups, in the same way that the relative risk is used to compare risks. An odds ratio is calculated by dividing the odds in group 1 by the odds in group 2. For example, the odds ratio (OR) for dependent feeding those who do (group 1) and those who do not (group 2) eat ≤ ¾ of served food is

$$\text{OR} = (59/33)/(17/44) = 4.63$$

This odds ratio is greater than one, indeed the 95% confidence interval for the odds ratio is (2.17, 9.97) so does not include an odds ratio of one (See *Journal of Clinical Nursing* 1999, 8, 618 for an Information Point on Confidence Intervals). Thus we would conclude that those who eat ≤ 3/4 of served food are at significantly increased risk of dependent feeding. A further example of the calculation and interpretation of the odds ratio is given by Bland & Altman (2000).

Table 1 Association between amount of food eaten and whether feeding is dependent or independent. (Westergren *et al.* (2001))

Feeding		Dependent	Independent	Total
Eats ≤ ¾ of	Yes	59	33	92
Served food	No	17	44	61
	Total	76	77	153

The odds ratio is used extensively in the healthcare literature. However, few people have a natural ability to interpret odds ratios, except perhaps bookmakers. It is much easier to interpret relative risks. In many situations we will be able to interpret odds ratios by pretending that they are relative risks because, when the events are rare, risks and odds are very similar. Indeed even when events are quite common, as in our example, the odds ratio and the relative risk will be very similar provided the odds ratio is close to 1. The odds ratio may be a misleading approximation to relative risk if the event rate is high (Deeks (1996) and Davies *et al.* (1998)).

Since the odds ratio is difficult to interpret, why is it so widely used? First, odds ratios can be calculated for case-control studies whilst relative risks are not available for such studies. Second, if we use an analysis method that corrects for confounding factors, such as logistic regression, this will report results as odds ratios. For example, in the preceding Westergren *et al.* article, Table 5 shows odds ratios resulting from a logistic regression, a process that has adjusted the odds ratios to allow for the simultaneous effect of the other variables. Third, odds ratios are a common way of presenting the results of a meta-analysis –

a statistical analysis for combining the results of several studies, used within systematic reviews.

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References

Bland J.M. & Altman D.G. (2000) The odds ratio. *British Medical Journal* **320,** 1468.

Davies H.T.O., Crombie I.K. & Tavakoli M. (1998) When can odds ratios mislead? *British Medical Journal* **316,** 989–991.

Deeks J. (1996) Swots corner: what is an odds ratio? *Bandolier,* **3** (3), Issue 25, 6–7.

Westergren A., Karlsson S., Andersson P., Ohlsson O., Hallberg I.R. (2001) Eating difficulties, need for assisted eating, nutritional status and pressure ulcers in patients admitted for stroke rehabilitation. *Journal of Clinical Nursing* **10**, 257–269.