Stats made easy

Odds are . . .

What's the difference between risks and odds?

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Odds are… different from risks! To understand odds ratios, we first need to tease out what is meant by odds (for those who are not already familiar with placing bets at the race track). Risks will be familiar to most readers and range from zero to one, whereas odds run from zero to infinity, and, as shown below, diverge dramatically from risks for common events.

Consider the results shown in the table below left from a randomised trial comparing simple advice to stop smoking with more intensive nursing support for smoking cessation. We will focus on the top line, which represents the control group given simple advice, and it shows that 695 people were continuing to smoke and 15 had quit when assessed a year later.

In the control group, the risk of continuing to smoke is the number who still smoke divided by the total of smokers and quitters, or 695/(15+695), which is 0.98. The odds that this group will continue to smoke are calculated as the number who still smoke divided by the number who quit, or 695/15 which is odds of 46.3 to one that they will still smoke. The odds of continuing to smoke are far higher than the risk because the quitters group is much smaller than the total.

However, if we consider those who stay off smoking, the risk of being a quitter is 15/(15+695), which comes to 0.0211, while the odds of being a quitter are 15/695, which is

quite similar, at 0.0216. This is because the proportion of quitters is small and it makes little difference whether 15 is divided by the total of 710 (to calculate the risk of quitting) or by 695 (to give the odds of quitting).

Can you work out (from the second row in the table) the risks and odds of quitting and smoking in the nurse intervention arm of the trial?

Next time, I will discuss the risk ratios and odds ratios that could be reported from this trial.

REFERENCE
Hollis JF, Lichtenstein E et al. Annals Intern Med 1993; 118: 521-5.

Answer: In the nurse intervention arm, the risk of still smoking is 1918/1997 = 0.960, while the odds of still smoking are 1918/79 = 24.3 to one. For quitters, the risk is 79/1,997 = 0.0396 and the odds are 79/1,918 = 0.0412.

Quit results

	Number of quitters	Number still smoking	Total
Control group	15	695	710
Nurse intervention	79	1,918	1,997

Risks and odds

Risk	Risk	Odds	Odds (to 1)
99/100	0.99	99	99:1
98/100	0.98	49	49:1
95/100	0.95	19	19:1
90/100	0.90	9	9:1
80/100	0.80	4	4:1
67/100	0.67	2	2:1
50/100	0.50	1	Evens
33/100	0.33	0.5	1:2
20/100	0.20	0.25	1:4
10/100	0.10	0.11	1:9
5/100	0.05	0.053	1:19
2/100	0.02	0.0204	1:49
1/100	0.01	0.0101	1:99

Risk = odds / (odds + 1)
Odds = risk / (1 − risk)