The following table shows the favorite leisure activities for adults over the age of 50. Calculate the marginal distributions, and answer the following questions.

	Dance	Sports	TV	Total
Men	2	10	8	20
Women	16	6	8	30
Total	18	16	16	50

40%

60%

36% 32% 32%

Of those who like dance, what percent are men? 2/18 0.11 11%

Of those who are men, what percent like dance? 2/20 10%

Explain how these questions are different.

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To make a little more sense of Simpson's paradox, let's look at the following example. In a certain hospital there are two surgeons. Surgeon A operates on 100 patients, and 95 survive. Surgeon B operates on 80 patients and 72 survive. We are considering having surgery performed in this hospital and living through the operation is something that is important. We want to choose the better of the two surgeons.

We look at the data and use it to calculate what percentage of surgeon A's patients survived their operations and compare it to the survival rate of the patients of surgeon B.

- 95 patients out of 100 survived with surgeon A, so 95/100 = 95% of them survived.
- 72 patients out of 80 survived with surgeon B, so 72/80 = 90% of them survived.

From this analysis, which surgeon should we choose to treat us? It would seem that surgeon A is the safer bet. But is this really true?

What if we did some further research into the data and found that originally the hospital had considered two different types of surgeries, but then lumped all of the data together to report on each of its surgeons. Not all surgeries are equal, some were considered high-risk emergency surgeries, while others were of a more routine nature that had been scheduled in advance.

Of the 100 patients that surgeon A treated, 50 were high risk, of which three died. The other 50 were considered routine, and of these 2 died. This means that for a routine surgery, a patient treated by surgeon A has a 48/50 = 96% survival rate .

Now we look more carefully at the data for surgeon B and find that of 80 patients, 40 were high risk, of which seven died. The other 40 were routine and only one died. This means that a patient has a 39/40 = 97.5% survival rate for a routine surgery with surgeon A.

Now which surgeon seems better? If your surgery is to be a routine one, then surgeon B is actually the better surgeon. However if we look at all surgeries performed by the surgeons, A is better. This is quite counterintuitive. In this case the lurking variable of the type of surgery affectsthe combined data of the surgeons.

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A: $\frac{95}{100} = 95\%$

B: $\frac{72}{80} = 90\%$

50 High
47 lived 94%

50 Routine
48 lived 96%

40 − 33 85%

40 − 39 97.5%

No homework!