

MARKS

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1. Suppose you are writing an article for a consumer magazine based on a survey of the magazine’s readers on the reliability of their household appliances. Of 13,376 readers who reported owning Brand C dishwashers, 2,942 required a service call during the past year, whereas 192 service calls were reported over the same period by 480 readers who owned Brand D dishwashers. Describe an appropriate variate to measure the reliability of a brand of dishwasher, and use its values to assess Brands C and D on the basis of the survey information.

One measure of brand reliability is the *proportion of dishwashers needing a service call*.

For Brand C: proportion is $(2,942/13,376) \times 100 \approx 22\%$;

For Brand D: proportion is $(192/480) \times 100 \approx 40\%$.

With an appreciably *lower* proportion needing service calls in the past year, Brand C appears to be *more* reliable than Brand D.

However, the much *smaller* number of responses from Brand D owners makes *40%* a *less precise* estimate of the corresponding population proportion than the *22%* for Brand C.

A matter of concern in both cases is the *non-probability* method of selecting the sample.

C (maybe)

More reliable brand

MARKS

4

(2, 2)

2. Bicycle riding has become more popular; is it also getting safer? In the U.S. during 1988, 24,800,000 people rode a bicycle at least six times and 949 people were killed in bicycle accidents. In 1992, there were 54,632,000 riders and 903 bicycle fatalities.
 - (a) Calculate and compare the death rates in the two years; comment briefly.
 - (b) Although the data come from the *same* government publication, we suspect that some change in the measuring system took place between 1988 and 1992 that makes the data for the two years not directly comparable. Explain briefly why we should be suspicious.

(a) The death rates are: 1988: $\frac{949}{24.8} \approx 38.3$ per million;
 1992: $\frac{903}{54.632} \approx 16.5$ per million.

38.3 per million	(a)
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1988 death rate

Answer: the rate is lower in 1992, by a factor of about 2.3.

16.5 per million	(a)
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1992 death rate

- (b) We should be suspicious because the data indicate a *substantial decrease* in the death rate over a relatively *short* time period (4 years), when there were no *major* changes involving bicycle safety.

A clue to the matter may be the *definition* of bicycle riding – *at least 6 times* in 1988, only *riders* in 1992; this is a *measuring* issue.