ROYAL STATISTICAL SOCIETY

DATA | EVIDENCE | DECISIONS

This document was prepared for the RSS Science Journalism Programme with assistance from Professor David Spiegelhalter and David Walker. It is not intended to be a prescriptive statement on what journalism students ought to know about statistics, rather, it is a guide to what those visiting media colleges might like to cover.

A dozen rules of thumb for journalists

Numbers are compelling, but treacherous. They can make a story, but they are also open to misunderstanding and manipulation. Caution and a preparedness to check and check again should be a journalist's watchwords

1. You come across a number in a story or press release. Buyer beware. Before making it your own, ask who cooked it up. What are their credentials? What is their pitch? Do we have alternative evidence; what numbers are they not showing us; why this number, now? If the number comes from a study or research, has anyone reputable said the work is any good?

2. Sniff around. Do the numbers refer to a whole group of people or things or just a sample of them? If it's a sample, are the people being questioned or the things being referred fairly representative of the wider group? Say a company is claiming something applies to the population at large. If they mean it is a sample of the population, beware. A panel of internet users, say, that the company goes back to time and again may not be representative–not everyone uses the internet. Organisations use samples based on their own mailing lists, or on people who have received a free sample of their product, and the samples may be biased.

3. More probing. What questions were the sample asked? Wording can hugely influence the answers you get. In a jobs survey, our understanding of what it means to 'be employed' may differ; likewise in a crime survey our sense of what is 'violent'. The public's understanding may not correspond with the survey researcher's. Might a pollster's choice of words have led people into giving a particular and slanted response?

4. A single number is often used to sum up a group, the *average*. But different averages measure different things. Here are some definitions. The *mean* is extremely sensitive to highs and lows: Bill Gates coming to live in the UK would push up mean wealth. The *median* tells us, for example, the income of a person at the midpoint –half the population get less, half more. Comparing earnings, the *mode* tells us the salary most people earn.

5. Editors like a sure thing, but with numbers can be uncertain. We need to be sure the number on offer is not just due to chance. With a sample, check the *margin of error*, usually plus or minus 3 per cent. A poll saying 52 per cent of people are in favour of something is not a definitive statement: it could be 49 per cent. Uncertainty is inevitable when you are using a sample, so reputable polling companies state the margin of error around their

confidence a sample does represent the wider population. Remember the margin of error tells us only about the sampling, not whether the right questions were asked appropriately.

6. Beware league tables, except in sports reports. Manchester United is higher than Chelsea for a simple and genuine reason: the side has collected more points. With hospitals or schools, a single score is unlikely to be a valid basis for comparing one with another. A teaching hospital may have a worse score, but only because sicker patients are referred to it. Comparisons between universities or police forces are unreliable if the scores fall within margins of error. Midshires scores 650 on the ranking and Wessex 669: they could be performing at the same level or their respective positions could be reversed.

7. The numbers show a big increase or sharp decrease. Yet a single change does not mean a trend. Blips happen often. Peaks and troughs go away, so we have to ask whether a change in the numbers is just a recovery or return to normal after a one-off rise or fall. This is what statisticians refer to as 'regression to the mean'. The numbers may come from a survey, such as ONS figures for household spending or migration. Is the change being recorded bigger than the margin of error?

8. After a controlled experiment (such as a trial of a new drug, based on a randomly chosen group, some of whom don't know they are getting a placebo), researchers are more confident in saying that a causes b. The numbers may show an association between two things, say obesity and cancer. But a correlation is not the same as saying obesity causes cancer. The connection may be spurious and explicable by a third or background factor. If children's use of mobile phones is associated with later behavioural disorders, the connexion could be the parents, and the way *their* behaviour affects both things. If the numbers do suggest an association, we have to try to assess whether it is plausible, on the back of other evidence. Finding a link may stimulate further study, but ought not itself to be the basis for action, let alone some new government policy. Recommendations for changing daily behaviour such as eating should not be based on speculative associations between particular food and medical conditions.

9. A question to pose of any number is 'out of how many?' Some events are rare --such as the death of a British child of junior school age. That's why they are news, but that's also why they have to be put in context. Noting scarcity value is part of good reporting, which tells us about an event's significance. The meaning of an event for an individual or family has to be distinguished from its public importance.

10. Billions and millionths are hard to grasp. We take in figures better if they are human scale. One comparison is between a number and the whole UK. Another is to capture the effect of an event or behaviour on an individual. Colourful comparisons can make risk intelligible: the risk of dying while being operated on under a general anaesthetic is on average the same as the risk of being killed while travelling 60 miles on a motorbike.

11. Good reporting gives a balanced view of the size of the numbers being reported. Better to focus on the most likely number rather than the most extreme, for example in stories about

the effects of a flu pandemic. ‘Could be as high as’ points to an extreme; better to say ‘unlikely to be greater than’. Think about how your audience will perceive a number.

12. Risk is risky. ‘Eating bacon daily increases an individual’s lifetime risk of bowel cancer by 20 per cent.’ Another way of saying that is: out of 100 people eating a bacon sandwich every day one extra person will get bowel cancer. Using the first without noting the second tells a story that is both alarmist and inaccurate. If the information is available, express changes in risk in terms of the risks experienced by 100 or 100,000 people.

Endnote:
Guides and pointers on how to get the best out of stats and data abound. RSS getstats has resources. The switch from print to digital brings opportunities to present numbers more dynamically and imaginatively, for example in scatter plots. Graphics can show a trend. Stacked icons in graphs can show effects on 100 people. The same rules of thumb apply whatever the medium: is the graphic clear; does it tell the story that is in the text. A pretty picture is not necessarily informative.