The Royal Statistical Society

Letter from the President to the Lord Chancellor regarding the use of statistical evidence in court cases

The Lord Chancellor,
Lord Chancellor's Department,
Selborne House,
54-60 Victoria Street, London SW1E 6QW

23 January 2002

Dear Lord Chancellor,

I am writing to you on behalf of the Royal Statistical Society to express the Society's concern about some aspects of the presentation of statistical evidence in criminal trials.

You will be aware of the considerable public attention aroused by the recent conviction, confirmed on appeal, of Sally Clark for the murder of her two infants. One focus of the public attention was the statistical evidence given by a medical expert witness, who drew on a published study to obtain an estimate of the frequency of sudden infant death syndrome (SIDS, or "cot death") in families having some of the characteristics of the defendant's family. The witness went on to square this estimate to obtain a value of 1 in 73 million for the frequency of two cases of SIDS in such a family. This figure had an immediate and dramatic impact on all media reports of the trial, and it is difficult to believe that it did not also influence jurors.

The calculation leading to 1 in 73 million is invalid. It would only be valid if SIDS cases arose independently within families, an assumption that would need to be justified empirically. Not only was no such empirical justification provided in the case, but there are very strong reasons for supposing that the assumption is false. There may well be unknown genetic or environmental factors that predispose families to SIDS, so that a second case within the family becomes much more likely than would be a case in another, apparently similar, family.

A separate concern is that the characteristics used to classify the Clark family were chosen on the basis of the same data as was used to evaluate the frequency for that classification. This double use of data is well recognised by statisticians as perilous, since it can lead to subtle yet important biases.

For these reasons, the 1 in 73 million figure cannot be regarded as statistically valid. The Court of Appeal recognised flaws in its calculation, but seemed to accept it as establishing "... a very broad point, namely the rarity of double SIDS" [AC judgment, para 138]. However, not only is the error in the 1 in 73 million figure likely to be very large, it is almost certainly in one particular direction - against the defendant. Moreover, following from the 1 in 73 million figure at the original trial, the expert used a figure of about 700,000 UK births per year to conclude that "... by chance that happening will occur every 100 years". This conclusion is fallacious, not only because of the invalidity of the 1 in 73 million figure, but also because the 1 in 73 million figure relates only to families having some characteristics matching that of the defendant. This error seems not to have been recognised by the Appeal Court, who cited it without critical comment [AC judgment para 115]. Leaving aside the matter of validity, figures such as the 1 in 73 million are very easily misinterpreted. Some press reports at the time stated that this was the chance that the deaths of Sally Clark's two children were accidental. This (mis-)interpretation is a serious error of logic known as the Prosecutor's Fallacy[1] . The jury needs to weigh up two competing explanations for the babies' deaths: SIDS or murder. The fact that two deaths by SIDS is quite unlikely is, taken alone, of little value. Two deaths by murder may well be even more unlikely. What matters is the relative likelihood of the deaths under each explanation, not just how unlikely they are under one explanation.

The Prosecutor's Fallacy has been well recognised in the context of DNA profile evidence. Its commission at trial has led to successful appeals (R v. Deen, 1993; R v. Doheny/Adams 1996). In the latter judgment, the Court of Appeal put in place guidelines for the presentation of DNA evidence. However, we are concerned that the seriousness of the problem more generally has not been sufficiently recognised. In particular, we are concerned that the Appeal Court did not consider it necessary to examine the expert statistical evidence, but were content with written submissions.

The case of R v. Sally Clark is one example of a medical expert witness making a serious statistical error. Although the Court of Appeal judgment implied a view that the error was unlikely to have had a profound effect on the outcome of the case, it would be better that the error had not occurred at all. Although many scientists have some familiarity with statistical methods, statistics remains a specialised area. The Society urges you to take steps to ensure that statistical evidence is presented only by appropriately qualified statistical experts, as would be the case for any other form of expert evidence.

Without suggesting that there are simple or uniform answers, the Society would be pleased to be involved in further discussions on the use and presentation of statistical evidence in courts, and to give advice on the validation of the expertise of witnesses.

Yours sincerely

Professor Peter Green,
President, Royal Statistical Society.

Cc: David McIntosh, President, Law Society.

---

[1] Balding DJ & Donnelly P, Criminal Law Review, October 1994