Forensic Science Regulator
Overseeing Quality

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Dear Colin

Reporting Analytical Results against Legal Limits – Drug Driving

I write to seek the views of the Statistics and Law Group on an issue related to the comparison of analytical results to legal limits. I am seeking views on the validity of approaches which have been discussed but I am not in a position, as a non-statistician, to judge their relative merits.

Unfortunately, the background is somewhat complex. I will try and summarise it briefly.

Blood Alcohol Analysis
When the offence of "drink driving" was introduced (see s5 Road Traffic Act 1988) the Forensic Science Service (FSS) developed an analytical method for alcohol in blood and an approach to reporting the results.

In relation to the reporting of results the FSS determined that the standard deviation of its method was less than 2%. It rounded the figure to 2% and decided that for any analytical result under 100mg/dL it would assume the standard deviation equated to 2mg/dL.

The FSS was frequently quoted as stating its approach to reporting was to deduct three standard deviations from the analytical result as there was a 99.7% probability of the true alcohol concentration falling with three standard deviations, on either side, of the analytical result. This should mean the probability of the true result being below the figure quoted was about 0.15%.

As a result the FSS would report an analytical result of 87mg/dL as not less than 81mg/dL. As the legal limit was 80mg/dL this established the lowest analytical result at which a prosecution would be mounted as 87mg/dL.

The above description is not entirely accurate as the FSS reported a result which was the mean of four measurements. I understand that this means it should have used the standard deviation of the mean which, on the figures above would have been 1mg/dL for reporting purposes. The probability of an analytical result of 87mg/dL being obtained from a sample where the true concentration was less than 81mg/dL was therefore vanishingly small.

The FSS, if not all of its reporting officers, understood the statistics behind its methods as is clear from its training materials and the probabilities quoted within them.

Blood Drug Analysis
When the new offence of "drug driving" was introduced (see s5A Road Traffic Act 1988) a decision was taken to try and adopt an approach to reporting which was similar to that taken for blood alcohol analysis. The method has not been able to incorporate four measurements but labs are conducting either two or three analyses.

When the methods were developed it became clear (as was expected) the uncertainty in drugs analysis was far higher than in alcohol analysis. The expanded uncertainties to provide 99.7% coverage probability (the terminology in the methods has been updated to reflect modern practice but the essence is the same) range from 20-45%.

For example, morphine has a legal limit of 80µg/L and an expanded uncertainty of 25%. As a result it has been determined that a laboratory obtaining an analytical result of 108µg/L could report this figure as being not less that 81µg/L, with a probability of 99.7%. Thus 108µg/L has, for morphine, become the lowest analytical result at which a person will be reported as above the limit.

Question
The above discussion illustrates that the higher uncertainties in drugs analysis mean that there is a far larger difference between the legal limit and the level at which a prosecution can be maintained than is the case in "drink drive" cases. This means that there may be drivers with very significant drug concentrations who are not going to be prosecuted.

This has led to a question as to alternative means of assessing the results which reduces the difference between the limit and the positive reporting level. Rather than the generation of a "not less than" figure might it be possible to address a different question?

It appears that the most favourable hypothesis for the defence is that the true drug concentration in the blood is exactly at the legal limit. Might it be possible to ask the question "what is the probability of obtaining the analytical result if the sample was at the legal limit ?"

If such an approach is valid would it reduce the level at which a sample could be reported as above the legal limit?

I would be grateful for the views of your Group.

Yours sincerely

Dr Gillian Tully

cc.   Prof Peter Diggle – President of the Royal Statistical Society