5 SD for HbA_1 measured by electrophoresis (mean 6·30% (SD 0·75%)) is 10·05%, representing an increment of 59·5%. It might be expected that more patients would have an increment of >35·3% by one test than had an increment of >59·3% by a second test when the two tests are so similar (that is, the main part of HbA_1 is HbA_{1c}).

If like was compared with like, however, the reported differences in the proportions of diabetic patients classified as having poorly controlled disease would largely disappear. Thus the 5 SD limit of 5·44% for HbA_{1c} represents an increment of 1·35 times the mean concentration in the non-diabetic reference population. For HbA_1 measured by electrophoresis, 1·35 times the reference population mean is 8·51% or 2·95 SD. Inspection of figure 2 in the paper allows the proportion of the population inside this limit for HbA_1 measured by electrophoresis to be estimated by addition of the numbers in the first two boxes to half the number in the third box (2-4 SD). This yields a figure of 0·25, which is indistinguishable from that for HbA_{1c}. The total relative frequency for HbA_1 measured by electrophoresis, however, seems to be not 1·0 but something less; therefore this estimate would have to be confirmed by a reworking of the original data.

We suggest that a more acceptable way of undertaking comparisons under circumstances such as these might be to work solely in terms of multiples of a measure of central location of the reference data (mean, median, or mode); such an approach has been used successfully for many years in antenatal screening, in which α fetoprotein and human chorionic gonadotrophin concentrations are measured as multiples of the median. The choice of which multiple to use as a limit is arbitrary, but if multiples of the mean values corresponding to 3 SD and 5 SD for HbA_{1c} are used the cut off points approximate to 1·20 and 1·35 times the mean respectively.

In summary, therefore, we suggest that if the data were reanalysed and like was compared with like then the reported difference in the proportion of patients categorised as having poorly controlled disease would probably disappear. If this was the case the conclusions reached would be very different. Points three to five of the paper's clinical implications would need to be withdrawn and a statement to the effect that there was little difference between the methods substituted. Use of multiples of the SD is an inappropriate method of comparing methods of measuring glycated haemoglobin when coefficients of variation in the control population are different between the methods. Thus the guidelines from the European IDDM Policy Group should also be reconsidered as this was the source of this inappropriate method of comparison.[2]

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1 Kilpatrick ES, Rumley AG, Dominiczak MH, Small M. Glycated haemoglobin values: problems in assessing blood glucose control in diabetes mellitus. *BMJ* 1994;309:983-6. (15 October.)
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Authors' reply

EDITOR,—Susan Standing and Richard Taylor suggest that use of a fixed biological variation to express SD may help in the comparison of methods of measuring haemoglobin A_1 (HbA_1) that have different imprecisions. This may be simplified further as the imprecision of the assay affects only the spread of results: it does not affect either the mean glycated haemoglobin concentration in a reference population or the median value in a diabetic population. Thus it would seem more useful to avoid problems with the imprecision of assays by eschewing the use of the SD in favour of comparison of a diabetic patient's result with the mean non-diabetic value.

In a situation analogous to that used in screening for Down's syndrome and for neural tube defects, a diabetic patient's result could be expressed as a multiple of the mean value (MoM) in non-diabetic people. If this is applied to our study the median diabetic HbA_1 value measured by high performance liquid chromatography was 1·46 MoM—that is, 46% higher than the non-diabetic mean, which is similar to the value of 1·48 MoM found when electrophoresis was used. As with Standing and Taylor's suggestion, however, this method of comparison still leads to discrepancies when HbA_1 is compared with haemoglobin A_{1c} (HbA_{1c}): even when the same patients and high performance liquid chromatography instrument were used to measure both HbA_1 and HbA_{1c} the median HbA_{1c} value implied poorer glycaemic control at 1·57 MoM. As a guide, the group who were intensively treated in the diabetes control and complications trial had a median HbA_{1c} value of approximately 1·40 MoM while the value in the conventionally treated group was 1·80 MoM.[1]

Thus, while comparisons of two methods of measuring either HbA_1 or HbA_{1c} that use the MoM may be valid, comparisons of HbA_1 with HbA_{1c} remain problematic. S Bulusu reinforces the need, recognised by the British Diabetic Association, for more standardisation in measurements of glycated haemoglobin. The errors in the accuracy and imprecision of assays introduced by both haemoglobin variants and abnormal fetal haemoglobin concentrations are well known,[2,3] but most methods of analysis remain affected.

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1 Diabetes Control and Complications Trial Research Group. The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. *N Engl J Med* 1993;329:977-86.
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Identifying relevant studies for systematic reviews

EDITOR,—Carl Counsell and Hazel Fraser make a useful point when they describe the different methods of identifying trials used by the Cochrane Stroke Review Group: electronic searches, review of cited papers, searches of registers of trials, and communication with individual people and organisations.[1] We have also used several methods to identify randomised controlled trials for a project that entails meta-analyses of randomised trials of treatment of multiple myeloma.[2] Of the 123 trials identified, 29 were identified from registers of trials, 28 through personal contacts, 20 from published abstracts, 18 from published papers, 15 by computer assisted searches of the literature, and 13 through mentions in a publication. This shows the wide range of sources used to compile the initial list of trials. Among the trials that were identified by personal contact with the trialists was the Italian M-80 study, which, although relevant to two prior reviews,[3,4] had not been identified previously because it was neither published nor included in a widely available register of trials.

We strongly recommend, therefore, that anyone conducting a systematic review should use as many search strategies as possible to identify, and subsequently collect data from, all relevant randomised controlled trials.[5]

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De inertia urbanorum

First law of thermodynamics applies

EDITOR,—Ronald Williams states that it follows from Newton's second law that a car that accelerates three and a half times as fast as his car uses three and a half times as much energy.[1] This is wrong: the relevant law of physics is not Newton's second but the first law of thermodynamics—"energy can be neither created nor destroyed." A car moving at 60 mph (96·5 km/h) has gained the same amount of energy from the combustion of the fuel used by its engine regardless of how long it has taken to reach that speed; hence the energy used by the engine is the same. This assumes that the efficiency of the engine is the same and disregards friction and air resistance. These factors might work either way in a practical case.

Another way of getting the same result is to realise that the more powerful car travels a shorter distance during the acceleration period and to apply the definition of work done, which is force multiplied by distance. The more powerful car engine applies a force three and a half times greater for a distance three and a half times smaller, so it does the same amount of work.

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1 Williams R. De inertia urbanorum. *BMJ* 1994;309:1741-5. (24-31 December.)

Author's reply

EDITOR,—I am ashamed to say that C J Squire is correct: the energy required for a given operation depends on the work done rather than the force used. The fact that it is many years since I read a physics textbook does not excuse my elementary mistake. Even if the fuel consumption in these two instances was identical—which is improbable, as more energy is likely to be wasted as heat and sound, if not also as friction, by the faster accelerating engine—my slower car will have travelled three and a half times as far in reaching 60 mph, which in terms of fuel is still a distinct ecological advantage.

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