Qualitative expressions of probability: is there any real misunderstanding?

Str,—I have read with great interest the paper by Shaw and Dear. 1 I think that this paper in fact addresses a very important and often neglected subject; I have however some misgivings about its results and their conclusions.

The question of whether expressions of probability used in the paper are obviously vague, but in real life they can be better defined by the context in which they are used, by the way words are uttered, by gestures, and a single facial expression. In prior and subsequent communications on the same subject, etc. I do not think that a physician, speaking to a mother, would say only ‘Your baby is jaundiced, and will probably need phototherapy’ (statement 1), and vanish. Judging an isolated statement is not representative of interpreting a real communication, so the conclusion that the use of these words can produce misunderstandings might stem from the other artificial study context, and might not be warranted.

I am surprised that doctors differ in a systematic way from mothers in the interpretation of the same expressions of probability used. These expressions are taken from everyday language, and have no specialised meaning in medicine. The differences between doctors and mothers may be due to a lack of figurative expressions. In particular, doctors could be more accustomed to the use of scales and to probability axioms. Using a point scale as in the paper, it is natural to think that something having 0–3 (30%) probability to happen receives a ‘3’ score, something having 0–8 probability an ‘8’ score, etc. This requires a knowledge of the axiom that probability can assume values between 0 and 1 only, and this would not be so ‘natural’ among mothers and people. In fact, Shaw and Dear report that the more educated mothers behave more similarly to doctors than the less educated mothers do. So, the problem could not lie in different interpretation of the same expressions, but rather in different ability to use the scale (that is, an artefact).

Finally, although I agree that in important decisions verbal expressions are to be avoided, I am not convinced that using numerical expressions of probability per se would resolve the problem. In fact, both doctors and lay people are used to making frequent inhuman numerical estimates of probability and important principles of quantitative inference.

After reading the Shaw and Dear paper, I carried out a small experiment: I asked 12 mothers of healthy neonates in our ward to answer the following written question: ‘If the probability that a neonate undergo phototherapy for jaundice is 45%, do you think it more likely that he will undergo phototherapy or not?’. I obtained only four correct answers. I’m not claiming that this small sample dismisses the use of numerical probability expressions altogether, but it raises the possibility that this is used in numerical communication the context may be important, and the ‘message sent’ may differ from the ‘message received’.

So, in the absence of further evidence, I suspect that numerical expressions of probability also do not convey information unambiguously between doctors and mothers. The question remains open.


Dr Shato and Dear comment:
Dr Gagliardi has raised some valid points concerning our recent paper, which prompt us to make the following further observations.

The first point we wish to make is that we are in full agreement. Visual communica tion is a complex process which is sensitive to context and that rarely, if ever, does an entire message hang on a single word. Nevertheless, the communication of probabilistic information must inevitably make use of either quantitative or qualitative expressions of probability and we defy anyone to avoid them altogether. Our aim was to show that a single qualitative expression of probability may mean quite different things to different people and to suggest that the accuracy of communication might be increased by eliminating as far as possible these differences. We certainly encourage the pursuit of clarity by the use of other aids to communication and of repeated explanation, although the temptation to amplify the meaning of one vague term by the addition of another should be avoided, as making the parents to ‘play back’ what they have understood is a useful technique that many doctors employ.

Dr Gagliardi’s second point concerned the systematic difference in the interpretation of expressions between mothers and doctors. We think that his explanation for the difference is quite plausible, but whatever the cause of the difference it is its existence that matters in the present context and it is merely another reminder of the problems inherent in the use of qualitative expressions of probability.

Dr Gagliardi’s third point is supported by evidence from a small experiment. Perhaps it loses in the translation but the statement employs a relatively complex construction which could confuse. It also makes use of a percentage which we deliberately avoided because percentages are relatively familiar to many people as those who use them regularly might assume. The choice of numerical representation of probability statements is very important and the experience is that scores are more widely comprehended than percentages. If Dr Gagliardi had presented his subjects with the following statement he would surely have reported a higher level of comprehension: ‘Out of 20 jaundiced babies, nine will need treatment with phototherapy but the remaining 11 will not’.

Serum immunoglobulins in acute lymphoblastic leukaemia

Str,—Serum immunoglobulin concentrations in normal children increase with age, as Jackson et al have confirmed. 1 Many investigators of the immune status of children with acute lymphoblastic leukaemia have reported low concentrations of immunoglobulins after treatment has been recommenced. Treatment may be done to the ‘masking’ effect of the intrinsic variation in concentrations with age when interpreting results from groups of these children. 2 Jackson et al. 1 concluded that their data on papers to endotoxin core glycolipid argue: ‘Furthermore, total IgG concentrations were not significantly reduced in children with acute lymphoblastic leukaemia, suggesting that the reduction in specific antibody was not a reflection of the total immunoglobulins in concentrations. 3 From the preceding sentences of that paragraph, this statement appears to refer specifically to children with acute lymphoblastic leukaemia on treatment. However their own data suggest that IgG concentrations during continuing treatment are lower than those in controls (p<0.05; their analysis). Age related data might show an even greater discrepancy.

The importance of anti core glycolipid antibodies titre before treatment started, they use in their argument the observation that total IgG concentrations are not significantly reduced yet, on the other hand, allure to antibodies to anti core glycolipid antibodies titres at diagnosis despite the lack of a significant difference in these specific antibodies between patients with acute lymphoblastic leukaemia and controls. This is useful to detract from their hypothesis that pre-existing and/or treatment induced abnormalities of the immune system may result in abnormally low titres of anti core glycolipid antibodies in some patients, but could they clarify their argument?


Dr Jackson, Parton, Shortland et al comment: We acknowledge the queries raised in Dr Reid’s letter. First, while it is true that the total IgG fell to just significant concentrations in children with acute lymphoblastic leukaemia on maintenance chemotherapy the total IgG concentration in children with acute lymphoblastic leukaemia as a whole were not significantly decreased. However, the specific antitoxincore glycolipid IgG was significantly reduced in this group of patients as a whole, and more significantly reduced in those on maintenance chemotherapy. Indeed, we also found total IgG was the least affected immune component in this group of patients. Therefore we feel that these antitoxin antibodies are specifically depressed in children with acute lymphoblastic leukaemia.

Secondly, although there are variations in publications of total immunoglobulin concentrations in children with acute lymphoblastic leukaemia the specific anti core glycolipid antibodies were consistently reduced in our study at diagnosis. Furthermore, concentrations of anticore glycolipid antibodies at

diagnosis correlated significantly with the number of pyrexic episodes experienced during subsequent treatment. Such a relationship could not be detected for total immunoglobulins.

We accept that there are large variations in the distribution of immunoglobulins in children suffering from acute leukaemia, but feel our data suggests a functional importance of specific anti core glycolipid antibodies in this disease.


Relative occurrence of neuroblastoma and Wilms' tumour in ethnic subgroups in the West Midlands Health Authority Region

Str.-There have been several reports commenting on the apparent rarity or indeed absence of neuroblastoma cases in Zaire and surrounding African countries.

This discussion has importance not only in assessing the aetiological significance of the observation for the countries concerned but also for studies of the relative rates of cancers in immigrant populations of other countries. Such studies have been revealing in adult cancers—for example, Japanese immigrants to the USA now show the spectrum of disease endemic to the American lifestyle rather than maintaining the pattern seen in their native country. The implication of these studies is that, in adult cancers, most of which are carcinomas, environmental as opposed to genetic factors are more important in the aetiology.

Similar studies are rare in paediatric 'solid' tumours but are important because childhood tumours (being typically embryonal or tumours of the central nervous system, with carcinomas occurring as only 3% of cases) may have different causes.

We have reviewed all cases of neuroblastoma and Wilms' tumour (252 and 175 respectively) occurring in the West Midlands Health Authority Region (WMHAR) during the period 1957–86, as part of the data collection of the West Midlands Regional Children's Tumour Research Group (WMRCHR). All cases are subject to review of the histology material by specialist paediatric pathologists in order to confirm the diagnosis.

Included in this review is an investigation of the ethnic origin of the patients. The

Relative occurrence of neuroblastoma and Wilms' tumour by ethnic group in the WMHAR

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<thead>
<tr>
<th></th>
<th>White</th>
<th>Afro-Caribbean</th>
<th>Asian</th>
<th>Other</th>
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<td>Wilms' tumour</td>
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<td>10</td>
<td>4</td>
<td>252</td>
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<td>Wilm's tumour</td>
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<td>8</td>
<td>5</td>
<td>1</td>
<td>175</td>
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*Other=Chinese/Japanese/mixed.
Tests of proportions: (1) Afro-Caribbean for neuroblastoma compared with Afro-Caribbean for Wilms' tumour: p<0.01; and (2) Asian for neuroblastoma compared with Asian for Wilms' tumour: p>0.05.

WMHAR contains a relatively large number of immigrants of Afro-Caribbean and Asian extraction, although exact childhood population figures are not available. Confirmation of ethnic group of each patient was obtained from the hospital casenotes or by communication with the general practitioner. Where these sources were unhelpful, examination of the family name of the patient indicated Asian origin and the presence of a sickle cell test provided further evidence of Afro-Caribbean origin.

The results shown in the table show that, in our 30 year series, neuroblastoma was indeed rare in Afro-Caribbean with only two cases seen (0.8%). By comparison, neuroblastoma was proportionally five times more common in the Asian group (4.0%). Furthermore, during the same time period there were eight cases (4.6%) of Wilms' tumour in Afro-Caribbean children, proportionally slightly more than were seen in Asian children (2.9%). The results for Wilms' tumour may be seen as a control in that they confirm that cases diagnosed in black children are successfully ascertained by the Registry.

As insufficient population data are available for children by ethnic group breakdown, we are limited to expressing these results as a proportion. This difficulty in producing specific population standardised data is thus not only a problem for Third World countries but also for UK registries.

The fact that neuroblastoma is rare in our series of Afro-Caribbean children resident in the West Midlands suggests that genetic rather than environmental factors may be contributing to its aetiology. However, further, more detailed comparisons will depend upon the provision of accurate data such as that of Dr Massabi et al., and on the availability of more specific population data.

Reduced sweating in Laron's dwarfism

Str.—We have recently shown that adult patients with growth hormone deficiency have a reduced sweat secretion rate when compared with age matched controls. Their sweating was correlated to the serum concentration of insulin like growth factor 1 (IGF-1). The question remains, however, as to whether growth hormone itself directly influences the sweat glands, or whether its action is mediated through IGF-1.

We have examined sweating in a 22 year old man with Laron's dwarfism (height: 124-2 cm, Tanner stage of puberty 3). He presented with highly raised serum growth hormone values (8.38 IU/l) and unmeasurable serum IGF-1.

He had a sweat secretion rate of 24.9 mg/30 minutes as measured with the pilocarpine iontophoresis test. After treatment with subcutaneous injections of biosynthetic growth hormone for four days (3 IU/day, Genotropin, Kabivitrum) the measurement of serum IGF-1 and the sweat test were repeated. IGF-1 was still undetectable and the sweat secretion rate did not increase (23.6 mg/30 minutes). Both sweat secretion values are much lower than the lowest reference value for a group of 18 to 40 year old healthy men (median: 112-7, range: 59.2-259.9 mg/30 minutes, n=17) as well as for a group of healthy boys in puberty (median: 110-3, range: 49.3-202.4 mg/30 minutes, n=39).

Thus our observation is in agreement with the hypothesis that the effect of growth hormone on sweating is mediated through IGF-1.

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