

to recover. All that one can say is that it is likely that many fail to achieve their full potential in adult life. Recent studies have shown that concentration of care on labour and the first weeks of life, which are the most dangerous times in the life of the baby, has paid dividends. By using continuous monitoring for all women, fetal death during labour can be eliminated. Equally, the provision of intensive care for sick babies immediately after birth has resulted in a dramatic improvement in their prognosis. Recognition of these facts has persuaded countries such as France to introduce comprehensive programmes for perinatal care. It seems a tragedy that a country like Britain that has led the world in perinatal research should now decide to cut back on her maternity services. Surely the health of mothers and babies should be one of our major priorities.

#### Better use of resources

Just as there is a need to ensure that advances in the care of mothers and babies are maintained, so there is room for making better use of available resources. The progressive improvement in the socioeconomic status and health of the community has been reflected in a change in obstetric practice. Not only are pregnant women healthier but their obstetric performance has improved—they have shorter labours and fewer complications during pregnancy. This should imply that their need for hospital care is less but while recognising that hospital remains the safest place to have a baby, it is now no longer necessary for a mother to stay there for up to 10 days after the delivery.

Experience from units with a high patient-bed ratio has shown that many women with good home circumstances can leave hospital within a few hours of delivery. Although the system requires adequate domiciliary midwifery service backup, it is not only cost-effective (when obstetric beds cost about £20 a day), but it is also desired by modern women.

#### Five minutes as a witness

It would be unrealistic to suggest that, after initial savings achieved by such measures, further economic cutbacks are likely to result in anything but a serious decline in the quality of obstetric care. The question we must ask is whether we are wise, as a nation, to give way to the demands of social and political expediency by investing so completely in a policy for improving the lot of the physically and mentally handicapped, yet apparently neglecting the needs of the next generation. The contribution that the NHS will make to the future welfare of the country depends on the selection of the right order of priorities for the next 10 years. Thus it is reasonable to propose that setting up in-depth review of the maternity services should be within the remit of the Royal Commission.

The DHSS has made a start on this important exercise but their proposals need to be examined more critically and in detail. Maternity and midwifery are examples of services that, in recent years, have made valuable contributions to the health of the country and, as such, do not merit the lowest position on the list of priorities.

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## Statistics at Square One

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### XVIII—Correlation

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When two or more series of observations are made it is often found that the observations in one series vary correspondingly with those in the other. The two may increase in parallel, for instance, or decrease in parallel, or as one goes up the other may go down proportionally. This relationship is called correlation. We would say, for example, that the height of children is on the average correlated with age. Since one increases with the other the correlation is called positive. In contrast there is a negative correlation, on the average, between the age of adults and the speed at which they run 100 metres.

The words "on the average" should be noted. In biology we rarely meet examples of perfect correlation, because the sources of the observations, living organisms and their products, vary from one to another and from time to time. Consequently, when we measure the degree of correlation between two sets of

observations, we generally find that part of the relationship consists in a true correlation and part consists in random variation due to a multitude of indeterminate causes.

#### Correlation coefficient

The symbol used to denote the coefficient of correlation, as it is called, is  $r$ . The correlation to be discussed here, and to which this coefficient applies, is limited to what is called "straight line" correlation. This means that the relationship between the two variables can be expressed graphically by a straight line. Fortunately this is a common feature of correlation in biology. If a curved line is needed to express the relationship, other and more complicated measures of the correlation must be used.

The correlation coefficient is measured on a scale that varies from +1 through 0 to -1. Complete correlation between two variables is expressed by 1. When one variable increases as the other increases the correlation is positive; when one decreases as the other increases it is negative. Complete absence of correlation is represented by 0. Fig 18.1 gives some graphical representations of correlation.

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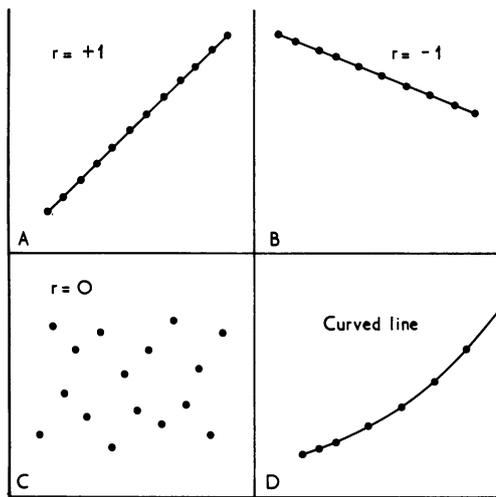


FIG 18.1—Correlation illustrated.

### Scatter diagrams

When an investigator has collected two series of observations and he wants to see whether there is a relation between them, it is best to construct a scatter diagram first. The vertical scale represents one set of measurements and the horizontal scale the other. If one set of observations consists of experimental results and the other consists of a time scale or observed classification of some kind, it is usual to put the experimental results on the vertical axis. These represent what is called the "dependent variable." The "independent variable," such as time or height or some other observed classification, is measured along the horizontal axis, or base line.

The terms "independent" and "dependent" are apt to puzzle the beginner because it is sometimes not clear what is dependent on what. His confusion is a triumph of common sense over misleading terminology, because often enough each variable is dependent on some third variable, which may or may not be mentioned. It is reasonable, for instance, to think of the height of children as dependent on age rather than the converse. But consider a positive correlation reported by Russell *et al*<sup>1</sup> between mean tar yield and nicotine yield of certain brands of cigarette. The nicotine liberated is unlikely to have its origin in the tar: probably both vary in parallel with some other factor or factors in the composition of the cigarettes. The yield of the one does not seem to be "dependent" on the other in the sense

that, on the average, the height of a child depends on his age. In such cases it often does not matter which scale is put on which axis of the scatter diagram. However, if the intention is to make inferences about one variable from the other, the observations from which the inferences are to be made are usually put on the base line.

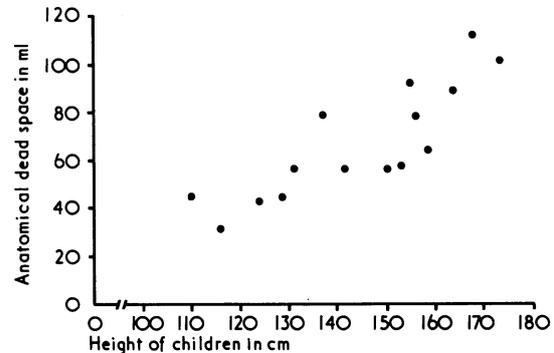


FIG 18.2—Scatter diagram of relation in 15 children between height and pulmonary anatomical dead space.

In practice the dots in a scatter diagram generally lie neither in a single straight line nor equidistant on either side of a central line but in a roughly elliptical area. For example, Kerr<sup>2</sup> has shown that the "anatomical dead space" in the lungs of normal children is positively correlated with age. In other words, the older the child the larger is this space. Dr Green, a paediatric registrar (Part I), has measured the pulmonary anatomical dead space (in ml) and height (in cm) of 15 children, and prepared the scatter diagram shown in fig 18.2. Each dot represents one child, and it is placed at the point corresponding to the measurement of the height (horizontal axis) and the dead space (vertical axis). He now inspects the pattern to see whether it seems likely that the area covered by the dots centres on a straight line or whether a curved line is needed to go through its centre. In this case Dr Green decides that a straight line can adequately describe the general trend of the dots. His next step will therefore be to calculate the correlation coefficient.

### References

- <sup>1</sup> Russell, M A H, *et al*, *British Medical Journal*, 1975, **3**, 71.
- <sup>2</sup> Kerr, A A, *Thorax*, 1976, **31**, 63.

### Do apples contain a natural diuretic?

I do not know of one and cannot find it in any of the reference books on toxicants naturally occurring in foods. The scientists at a major firm that makes apple juice and at a fruit research station tell me that nothing has ever appeared in print on the diuretic properties of apples and apple juice. The only information that may be relevant is a small newspaper article reporting that an apple diet, used in Switzerland, lowers blood pressure (I have not yet seen this in a scientific journal). Apples have a very low sodium content, and if the patients lost weight this could be an additional explanation.

### Is there any place for ultrasonics in treating Menière's disease?

Ultrasonic irradiation of the labyrinth for Menière's disease was first introduced by Arslan<sup>1</sup> in 1953 and its value is well established. It is indicated for patients not responding to medical treatment in whom there is useful residual hearing. The operation was originally designed for purely destructive purposes, but it also helps the hydro-

dynamics of the endolymph system. The surgical equipment required is complicated and requires a high degree of maintenance. Various techniques have been used including irradiation of the lateral semicircular canal, vestibule, and oval window by Arslan<sup>2</sup> and the round window by Kosseff.<sup>3</sup> The results of operation are continually improving and Arslan claims that attacks of vertigo persist in only 10% of patients when in experienced hands and with up-to-date equipment. Facial paralysis which has been an initial complication has been reduced to 0.5%. In the experience of Angell James<sup>4</sup> in Britain, who has irradiated 415 cases of Menière's disease, including many difficult and problem cases, vertigo was relieved in 85%, tinnitus relieved in 70%, and caloric responses abolished in 78%. There had been some further reduction in hearing in 40%, and total loss of hearing had occurred in 2%. In less experienced hands results have unfortunately been less satisfactory.<sup>5</sup>

- <sup>1</sup> Arslan, M, in *Proceedings of the Fifth International Congress of Oto-rhino-laryngology*, 1953, ICS No 2, p 429. Amsterdam, Excerpta Medica, 1955.
- <sup>2</sup> Arslan, M, *Journal of Laryngology and Otolaryngology*, 1970, **84**, 131.
- <sup>3</sup> Kosseff, G, Wordsworth, J H, and Dudley, P F, *Archives of Otolaryngology*, 1967, **86**, 535.
- <sup>4</sup> Angell James, J, *Archives of Otolaryngology*, 1969, **89**, 95.
- <sup>5</sup> Morrison, W W, *Management of Sensorineural Deafness*, p 163. London, Butterworths, 1975.