

## AN "ARTIFICIAL PRACTICE" AS A TOOL FOR RESEARCH INTO GENERAL PRACTICE

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**T**HERE is difficulty in establishing general practice as one of the medical sciences. This is because the problems presented by general practice involve a number of factors which are not easily controlled. The purpose of this article is to describe the construction of a device which allows observation with more control than is possible under the normal conditions of general practice.

The unit of work in general practice is the item of service and the events which take place during an 'item' are produced by three interacting variables, the patient, his disease, and the doctor. An explanation of the phenomena of general practice as a whole must be related in some way to the sum of all the items of service. These in turn must be explained in terms of the three variables. In experimental science a problem of this type is approached by holding one variable constant and altering another, while observations are made on the effect on the third. In general practice it is not easy to do this since two of the variables, the patient and the disease, are not open to artificial extraneous control.

If observations are made by one practitioner (a constant *vis-à-vis* his patients and their diseases) one experimental condition is satisfied. The only way to deal with the relationships of patients and diseases is to submit their separate components to measurement sufficiently often to allow statistical assessment.

These considerations form the theoretical background to the construction of the artificial practice.

### Construction of the artificial practice

The practice must be small enough to allow detailed investigation of the patients in it and large enough to present a fair selection of medical work. A whole practice was too large for the available resources and personnel. A sampling process was employed to select the individuals for the experiment. Random sampling was not

practical, although this might have been more satisfactory. The artificial practice was allowed to select itself.

On the first day of the field work the first patient at the surgery was asked if she would be prepared to help in the trial. The nature of the investigation was explained and she was given the tests described below. When she had completed the tests the next patient to attend was asked to co-operate. The remainder of the patients were admitted in the same way. As the trial progressed, people who had been tested earlier would follow a new entrant. When this happened the next patient who had not hitherto been selected was asked to help. There were five refusals to co-operate. About ten people failed to complete one or other of the tests.

All practices can be divided into two groups; an adult group who take the initiative in making a demand for medical attention and a dependent group composed of children whose needs are controlled by the adult group. Throughout this work the adult group is called the demand forming population (D.F.P.).

The artificial practice consists of a D.F.P. selected as described above and the children dependent upon it.

The conventional work load of the real practice is about six items per head of practice population, or eight per head of D.F.P. in a year. It was decided that the size of the D.F.P. of the artificial practice should be about 500 in order to give at least 4,000 items of service for full analysis. The work load proved to be higher.

Each of the 500 adults was selected by the procedure described above. At the selection interview the following information was obtained: age, sex, occupation, social class, marital status and family size, the number of children on the real practice list; age at the end of formal education and educational attainment. Height, weight and transverse chest measurements were made to allow calculation of the Rees-Eysenk index (an index of body build). Intelligence was measured by the Raven progressive matrices and personality was measured by the Maudsley personality inventory. Notes were made of histories of psychiatric disorder and of childhood stress disorders in dependent children. Housekeeping standards were assessed at a later interview.

Those observations allow a subject to be classified objectively according to age, sex, personality, intelligence and social adaptability. These are some of the variables which form a 'patient' and which in addition to disease may be relevant to the genesis of demand for medical care. They were chosen because previous work has shown that they are related to the demand for late call services (Jacob, 1963).

Each subject was given a card with a number to present at every patient/doctor contact made in the calendar year following the selection interview. The card was presented whether the service required was personal or for a dependent child. At the end of a year he was withdrawn from the artificial practice. Each item of service in the survey year was recorded in detail, but the description of this part of the investigation will be left to a later article.

Twenty-one people were unable to complete the year because they died or were removed from the practice list through change of address or after giving notice to the executive council.

The experiment allows analysis of the medical services required by a group of people in a year under the following experimental conditions:

1. Observations were made by one practitioner—a constant.
2. The variables associated with each individual in the D.F.P. have been measured.

This allows the relationships between the types of people in the D.F.P. and their disease patterns to be studied in detail.

### Work load of the artificial practice

An analysis of the work load of the artificial practice is a necessary preliminary. The artificial practice consists of 830 people and has a demand forming population of 479. Seven thousand two hundred and four items of service were observed. This is equivalent to a work load of 8.68 items of service per year in conventional terms; or 15.04 items per head of D.F.P. When the total individual demand is studied in the form of a graph (figure 1) it is apparent that there is wider variation between individual needs than is apparent from the conventional expression. Moreover it becomes evident that a relatively small 'high demand' group is responsible for a disproportionate amount of work (figure 2).

This means that the conventional work load rate is an unsatisfactory figure to be used in the study of the genesis of medical demand. An alternative expression is required.

Figure 1 indicates that a D.F.P. may be divided into any number of sub-groups based on demand for medical attention. The total work in a practice is the sum of all the work to each sub-group and this is contained in the expression  $T = \sum_1^x m_1 n_1$  where  $T$  = the total items of service,  $x$  = the number of sub-groups,  $m_1$  = the mean number of items to each sub-group and  $n_1$  = the number of patients in each sub-group. This is a more satisfactory method of expressing work load since it includes differences in patients and gives some indication of the constitution of the practice. It is also valid if the

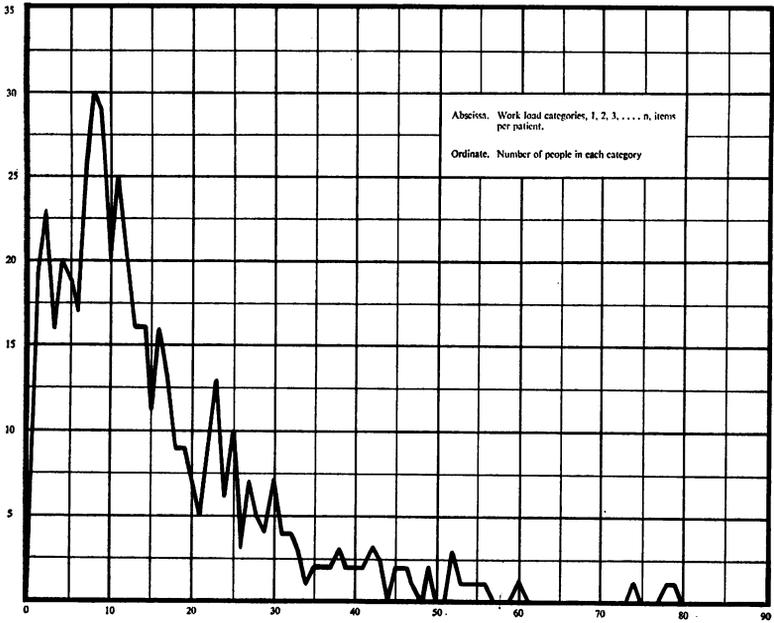


Figure 1  
Division of D.F.P. of artificial practice into work load categories

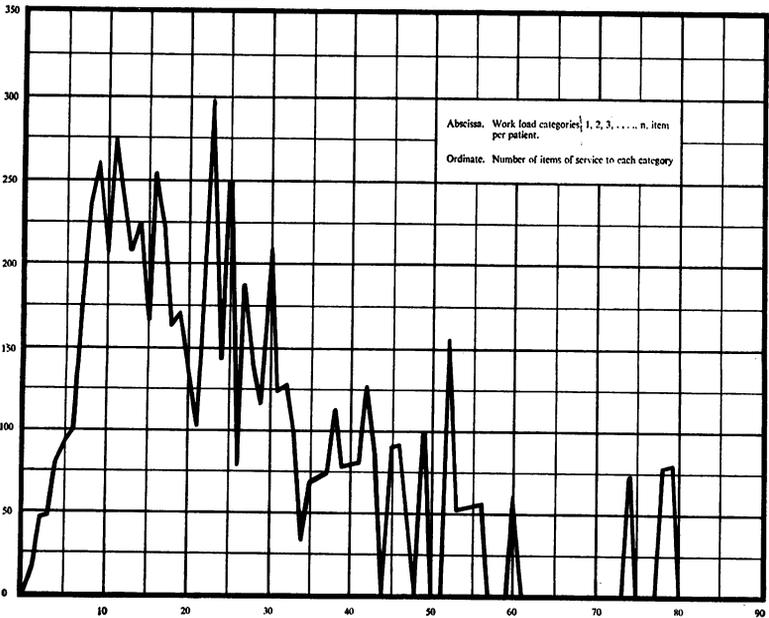


Figure 2  
Distribution of work load of D.F.P. among the separate work load categories

categorization of the patients is made from a diagnostic classification. It is valid only for a given practice and hence I call it the 'special equation'.

When the work loads of several practices are to be compared a new parameter must be introduced; the effect of the practitioner. The special equation can be modified by making this effect an operator as follows:

$$T = V \sum_1^x m_i n_i$$

since the practitioner may either increase or decrease the observed work load. This is the 'general equation'. In investigations conducted in a given practice the special equation is sufficient.

Work load studies involving more than one practice indicate that the conventional work load per practice varies between two and nine items of service per year (Logan and Cushion, 1953; Taylor, 1955).

In consequence the D.F.P. of the artificial practice was divided into two main groups: a perimean group whose work load is nine or less items in the observation year and a suprimean group who require more than nine items of service in the observation year. The expression 'mean' was used because the original observations by Taylor and Logan were made on practice means. Neither of these groups are homogeneous and work which is in preparation indicates that there are over ten sub-groups. For present purposes the two groups described above are sufficient. The relative proportions of the two groups as percentages of the D.F.P. of the artificial practice are shown in figure 3.

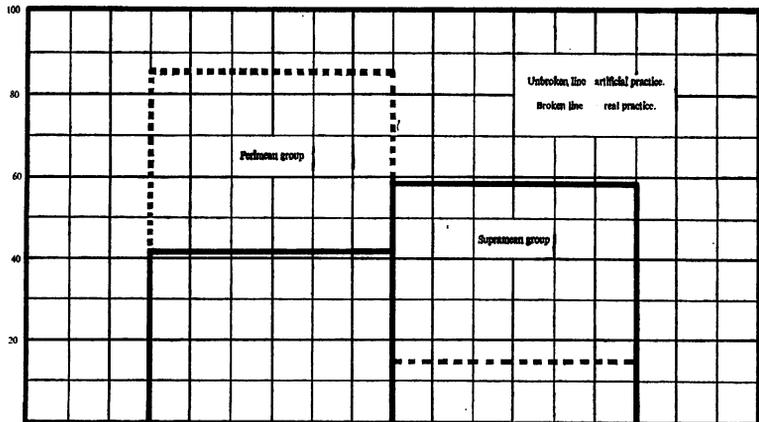


Figure 3  
Composition of real and artificial practices

**Calculating the composition of the D.F.P. of the real practice from information obtained from the artificial practice and the special equation**

The artificial practice consists of people who have been drawn from the real practice and a comparison of the work loads of the two practices is valid. The real practice had a mean number of 4,167 in 1964 and a mean D.F.P. of 3,075. The total work load in 1964 was 24,549 items of service giving a conventional rate of 5.89 items per patient or 7.98 items per head of D.F.P. This is less than the corresponding rates for the artificial practice. This difference means that the artificial practice must have a bigger proportion of high demand cases in the D.F.P.; a result of the method of selection. Since both practices have the same general practitioner, V can be disregarded and the special equation can be used.

The 'T' of the real practice is 24,549 (from direct observation). The size of the D.F.P. is 3,075. This figure is obtained from an age/sex register. The problem is to find the size of the perimean and suprimean groups in the real D.F.P. This can be done by the following simultaneous equation:

In the special equation  $T = \sum_1^x m_i n_i$ ,  $x=2$  (perimean and suprimean groups).  $n_1 = \text{unknown}$  and  $n_2 = \text{unknown}$   
 $m_1 = 5.39$  (from the artificial practice).  $m_2 = 21.9$  (from the artificial practice).

This gives the simultaneous equation

$$\begin{aligned} 24,549 &= 5.39n_1 + 21.9n_2 && \dots\dots\dots 1. \\ 3,075 &= n_1 + n_2 && \dots\dots\dots 2. \end{aligned}$$

$n_1 = 2,592$  people = size of perimean group  
 $n_2 = 483$  people = size of suprimean group

This result means that 15.7 per cent of the D.F.P. of the real practice is responsible for 43 per cent of the *total* work of the real practice.

**Discussion**

There is a dearth of factual knowledge about the factors which produce the demand for general medical care (Titmuss, 1965). This situation is serious from a scientific as well as an operative point of view. The advance of general practice as an academic discipline depends on an understanding of the complex relationship which exists between a patient, his disease and his attendant. This information can be obtained only by studying the relevant phenomena in an objective manner.

Investigations into the work load of many practices have been carried out since the introduction of the N.H.S. The most notable result has been the observation that the work load varies from two

to nine items of service per patient per year. In terms of human effort this means a wide practice variation (Lees and Cooper, 1963). This variation has excited some comment and it has been postulated that it is to be explained by differences in attitudes and working methods of the practitioners under observation (Fry, 1964; Platt, 1964).

Little is known about differences between general practitioners, but the available information does not support this hypothesis. Recent work indicates that medical students form a highly selected homogeneous section of the population and although they can be divided into four groups on graduation it seems that those who are destined to become sufficiently interested to help with research in general practice either individually or as members of groups are likely to be drawn only from two of the sub-groups (Walton *et al.*, 1964). A more recent survey indicates that differences between observing practitioners account for only 18 per cent of the inter-practice variation observed in a study designed to measure the incidence of psychiatric disorder (Shepherd *et al.*, 1964). Since psychiatry is probably the least objective branch of medicine it seems safe to assume that the practitioner contribution to overall practice variation would be less.

It has been noted that practices in northern England have higher work loads than practices in southern England (Logan and Cushion, 1953) and that Scotland has higher rates than England (Stevenson, 1964). This indicates that population differences may be more important than practitioner differences and that the demand in a given practice depends on the constitution of the population composing it.

In the experimental situation described in this article it has been possible to compare the work loads of two groups of people who have standardized medical attention. Although the artificial practice was drawn from the real practice it had a higher work load. This difference in work load can be explained by the difference in the relative size of the supramean group in the two populations (figure 3).

In the real practice the supramean group is equivalent only to 16 per cent of the D.F.P. but this small group contributes 43 per cent of the total work of the practice. This means that the work load of a practice depends on a small proportion of the population.

The real practice has a high work load of 5.9. The average work load of practices in southern England is about 4. A reduction of the work load of the real practice to this figure would be obtained if the supramean group were reduced to eight patients. This involves a change in 16 per cent of the D.F.P.

To postulate a similar reduction in work load using the 'different doctor' hypothesis would mean a difference in working method equivalent to 30 per cent if the higher figure is used as a standard, or 50 per cent if the lower. This implies that doctors vary more than their patients; an unlikely situation.

The analysis has been made using two population sub-groups. This is an over-simplification. It seems likely that there are many sub-groups in the population which contribute in different ways to the general demand for medical care. With a multiplicity of such groups it would probably require even less than the calculated 16 per cent difference in population type to produce the wide variation in medical demand which has been observed. Further investigation along these lines will only be possible when a better knowledge of the sub-groups is obtained. It is expected that the artificial practice will give some of this information. It would appear, however, that these population studies are as relevant to general practice as the study of orthodox general medicine.

#### Summary

The construction of an artificial practice, a device for studying the variables concerned in producing the demand for medical care, is described. The work load of the artificial practice has been analysed. Two equations have been evolved from the figures; a special equation which is applicable in any practice to express the work load in terms of patient demand and a general equation applicable to compare the work load between practices in terms of patient demand, and the effect of the doctor. The special equation has been used with information obtained from the artificial practice to calculate the constitution of the real practice. The observations have been used as a basis to advance the hypothesis that population differences are more important than doctor differences in the production of different work load patterns.

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