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USE OF THE DELPHI METHOD FOR COLLECTION AND ANALYSIS OF SUBJECTIVE JUDGEMENTS: AN EXAMPLE FROM CENTRAL KALIMANTAN

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Sebagian besar daripada keputusan-keputusan yang penting dalam bidang pelayanan kesehatan harus didasarkan kepada pendapat individu yang subyektif, oleh karena data-data yang tepat dan model-model analitis tidak cukup tersedia. Metoda Delphi dapat digunakan maka data-data subyektif dapat dikumpulkan dan dianalisa secara sistematis, walaupun metoda tersebut sangat murah digunakan dan mudah dimengerti. Satu contoh daripada penggunaan metoda Delphi diberikan dalam naskah ini, mengenai persiapan-persiapan Pelita 3 Kesehatan di Kalimantan Tengah.

It is desirable that decision making in health services should increasingly be based on valid analytical models and accurately measured data. But even the most developed countries have not yet eliminated the need to use subjective judgements. Selection of the best interventions requires consideration of outputs as well as inputs, but the key outputs of health services are not yet amenable to objective measurement in common units. For example, it might be necessary to select strategy A or B in respect of cholera, where it is estimated that strategy A will prevent more cases, but result in a higher case fatality rate than B. In order to resolve this problem adequately, it is necessary to know the "trade-off" between cases and deaths-how many cases prevented are equivalent to one death prevented. But there is no objective way of answering questions of this type as yet.

In developing countries, the problems are even more difficult to resolve. Even the inputs data are incomplete and inaccurate. For example, what is the cost of cholera treatment, or the cost of health education aimed at reducing the incidence rate of cholera ? For even the simplest of statistics (such as the infant mortality rate) there is much doubt and confusion. For reasons of these kinds, there is no alternative but to use the subjective judgement (quesses, estimates) of experienced people. This being so, it is important that the subjective judgements are obtained and used in the best possible way. In this paper, one approach to the riqorous collection and analysis of judgements is described, and an example of its use in Indonesia given. This is called the Delphi method.

The Delphi method is, in fact, a large number of diverse techniques. The precise sequence of steps varies according to the type of problem being handled, and characteristics of the persons whose judgements are being used. However, all the techniques which may be called the Delphi method have the following characteristics :
Information is collected systematically from a group of individuals; information is exchanged between members of the group; individual's contributions are kept wholely or partly anonymous; a organiser facilities the flow of information, but avoids imposing his own views; long arguments or personal contacts between individuals are kept to a minimum; individuals are not coerced, but are encouraged to take note of views of others; individuals are given several opportu-

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nities to revise their views; the end product is a group judgement, which may be an average or a consensus.

In summary, the Delphi method consists of using a group of persons whose judgements are thought likely to be useful. Over a series of steps, each person gives his view, and has the opportunity to modify it as a result of listening to the views and arguments of others. This is little different from the normal practice in many offices, except that: is is more systematic: and personalities are, as far as possible, not allowed to affect the judgements.

This last point is very important. For example, junior staff are often afraid to express views which are different from those of their superiors. Again, meetings are often dominated by the strong personalities, who monopolise the discussion. The Delphi method helps to overcome difficulties of these kinds, so that views of others can be taken on merit, rather than according to who expresses them or how loud or often they are expressed.

AN EXAMPLE: PRIORITY SETTING IN KALIMANTAN

A simple example will illustrate typical steps of the Delphi method. Indonesia is currently drafting its third national develop ment plan, which will run rrom 1979 to 1983. The health component is being prepared using the methodology described in the WHO handbook "Health Programme Planning and Project Selection" (5), with minor modifications. An early step is listing of priorities of health problems which leads subsequently to steps such as objectives formulation, strategy specification, programme analysis, and so on.

Each of the 26 provinces was requested to prepare its own list of health problem priorities. Some used Delphi procedures, and others used the "linear (additive) model" approach recommended in the WHO handbook referenced above. The Delphi approach used in Central Kalimantan is described briefly below. The individuals whose views, were saught were a representative sample of the provincial health workers, from Chief Provincial Health Officer to health centre doctor.

METHODS AND MATERIALS

Below, a brief description is given of the main steps. Remember that these are the steps considered best for this particular exercise, but minor changes in the details might have been equally good. For other types of problems it might be better to have more or fewer opportunities for revision; to involve more or fewer persons; and so on.

Step 1, Task description: Objectives were precisely described, with emphasis on the meaning of priority. For example, the concept of cost/effectiveness was explained, and participants were reminded of the principal variables affecting it-such as incidence rates, availability of technologies, and duration and degree of disability or pain.

Step 2, individuals initial views: Without discussion, participants ranked 37 health problems according to their own views of priority.

Step 3, disputed rankings and first revisions: Eight groups of five participants were formed, so that each group was as heterogeneous as possible. Each group focused upon health problems of importance where there were large disagreements, as follows.

Health problems were eliminated if ranked 20 or over by all five participants; Further problems were eliminated if there was a range of less than 10 between the highest and lowest of the five participants' rankings. For the average of 11 health problems remaining, each group was given one hour for discussion, followed by an opportunity for individuals to change their views. Finally, each group computed average ranks for the 37 health problems.

Step 4, health problem discussion groups: The averages for the eight groups were compared; and by consideration of variability, and brief general discussion, nine health problems were identified as needing detailed discussion. For each of these, problem discussion groups were formed. Each participant was free to joint the group of his

choice, according to his interest and know ledge. Each problem group prepared and presented a short report on appropriate ranking, together with justification.

Step 5, individuals final views: Each participant individually and anonymously gave his final views on rankings for the 37 health problems.

RESULTS

This process lasted 1 ½ days, and produced the rankings shown in table 1. The

Table 1. Results Of Priority Setting, Central Kalimantan.

Health problem	Median ranking	Mean ranking	Variability of participants' ranks	
			Standard deviation	Coefficient of variation
Diarrhoel illnesses	2	2	0.8	39
Cholera	2	2	1.1	55
Tuberculosis of lungs	3	2	0.9	43
Malaria	3	3	0.8	25
Whooping cough	9	10	4.4	43
Typhus/Paratyphus	8	10	5.8	57
Neonatal tetanus	9	10	5.1	50
Diptheria	9	11	4.8	44
Filariasis	10	11	5.3	48
Protein-Calorie Malnutrition	12	12	4.0	33
Vitamin A deficiency	13	13	5.1	39
Leprosy	12	13	6.3	49
Endemic goitre	15	13	4.9	38
Anaemia	15	14	5.7	41
Gonorrhoea	16	17	7.1	42
Pregnancy/birth/postpartum	14	17	8.1	48
Hookworm	18	18	5.9	33
Other tetanus	19	19	7.2	38
Upper respiratory tract	23	20	11.1	55
Lower respiratory tract	22	21	12.0	57
Syphilis	20	22	5.5	25
Eye infections	24	23	6.4	28
Tooth & mouth illnesses	23	23	5.8	25
Ascaris	24	24	8.0	33
Skin illnesses	24	24	6.9	29
Viral hepatitis	23	25	8.0	32
Measles	25	25	7.8	31
Paralytic poliomyelitis	26	25	7.8	31
Accidents, poisoning, etc.	26	26	6.5	25
Chickenpox	29	27	5.1	19
Dengue haemoragic fever	31	27	6.5	24
Meningocus encephalitis	33	30	7.0	23
Mumps	32	31	5.3	17
Yaws	32	32	7.7	24
Mental illnesses	31	33	5.0	15
Cardio/cerebrovascular illnesses	32	33	4.6	14
Schistosomiasis	37	35	2.8	8

variability of rankings from the 40 participants is shown for each health problem, expressed as standard deviation and coefficient of variation. Variability fell sharply from initial to final rankings (from a mean of 69 percent to 35 percent, for the coefficient of variation). The participants were strongly encouraged to report their honest personal opinions-the aim was not to produce a consensus. But, in fact, the variablility is so low that a virtual consensus was achieved. In discussion afterwards, the participants were unanimously of the opinion that the average ranks were acceptable to them, and represented a valid and extremely useful statement of priorities. Note also that there were beneficial side-effects to this exercise. For example, the participants had the opportunity to learn about the Delphi method itself, which can simply applied to many other health tasks. And the participants thought that the results were not only relevant to the next national development plan-they were immediately relevant to a variety of strategic and tactical problems.

DISCUSSION

The Delphi method was used in Central Kalimantan, in place of the method suggested in the WHO Handbook (4). It will be useful to assess this alternative method, since so doing will illustrate some of the advantages of the Delphi method. The linear (additive) model approach which was used to assist preparation of Pelita 2 as well as in several provinces for Pelita 3, consists of analysis of data of the types shown in table 2.

Table 2 Inputs Data For The Linear (Additive) Model

Health problem	Variables relevant to priority					
	V_1	V_2	.....	V_j	.....	V_n
P_1	X_{1l}	X_{12}	.....	X_{1j}	.....	X_{1n}
P_2	X_{21}	X_{22}	.....	X_{2j}	.....	X_{2n}
.	.	.		.		.
.	.	.		.		.
.	.	.		.		.
P_i	X_{il}	X_{i2}	.....	X_{ij}	.....	X_{in}
.	.	.		.		.
.	.	.		.		.
.	.	.		.		.
P_m	X_{ml}	X_{m2}	.....	X_{mj}	.....	X_{mn}

The x_{ij} data are, in some cases, objective (such as incidence rates); and, in other cases, a subjective scaling (such as ease of involving the community in intervention activities, measured as scale points from 1 to 5). The approch consists of calculating an overall priority score for each health problem (say, o_i) as a linear combination of the x_{ij} data.

Usually, the variables are differentially weighted, so that some of them will contribute more to the overall priority score than others.

Thus the standard model is : $o_i = \sum_j a_j \cdot x_{ij}$, where coefficient aj is the differential weight for variables j.

Piot and Deboeck (1975) use a refinement of this model. They recommend that criteria should be specified for each variable; and that a health problem is considered to meet a criterion of priority if its x_{ij} value exceeds the criterion value. Thus, the basic x_{ij} data are translated to integer variables x_{ij} according to these rules.

If $x_{ij} > b_j$, then $x_{ij} = 1$
if $x_{ij} < b_j$, then $x_{ij} = 0$

where bj are criterion values. Thus the implicit model is : $o_i = \sum_j a_j . x_{ij}$

This kind of approach has several disadvantages compared with the Delphi approach. For example, the aj value are exceedingly difficult to obtain with consistency. This reflects the mathematical statement that the model assumes independence of the aj values when in fact they are probably not independent. Other problems include the difficulty of obtaining the x_{ij} data; and the danger of an impression of spurious accuracy resulting from many arithmethic calculations (where in fact there are many important subjective judgements involved).

The Delphi method attempts direct estimation of the o_i values. Its value lies in its conceptual soundness and simplicity, and its practicability. As a result of these characteristics, it is easy to ensure that large numbers of staff can participate equally in the planning process, and that they will be satisfied with the results. This being so, health workers will have a better understanding of goals and procedures to achieve them, and a stronger desire to see the plans implemented since their views have been the major source data. Participation of many persons is not only important in a psychological sense, however; it is also likely to improve the accuracy of the final decision. Several controlled experiments verify this latter view (2,4).

Thus, the Delphi method is easily applicable to large numbers of health problems. For example, the health centre doctor could use it to set targets for the following year, and take into account the views of community leaders as well as other health centre staff. It could be used to estimate statistics (such as infant mortality rate) where another survey would be very expensive, and yet suffer from all the difficulties and unreliability of previous attempts. It could be used in a research institute, to design a five year research programme and allocate tasks between resea chers. There are very few decisions where the Delphi method would not help, since most of them have to be based largely on subjective judgments.

Once a person has taken part in a Delphi application, he will have no difficulty in understanding it and using it himself. In addition, there are several papers and books which describe applications. Some are very simple (1,4), while others describe use of much more sophisticated analytical techniques (2). Thus, the Delphi method may be described as" an appropriate technology for decision making" (3). It relies on use of local resourses (the judgments of experienced people), it is simple, it is very cheap, and it builds on the normal procedures used in the developing country rather than suggesting a revolutionary change. For these reasons it is an innovation which it is feasible to introduce widely and quickly in all parts of the health service.

SUMMARY

Most of the important decisions in health services must be based on subjective judgements, because there are too few accurate data and valid models for their analysis. The Delphi method allows judgements to be collected and analysed systematically, and is cheap and easy to use. An example is given of its use to assist preparation of Pelita 3 in Central Kalimantan.

REFERENCES

J. Bright (ed), 1968: "Technological forecasting for industry and government", Prentice-Hall.

D. Hindle, 1975: "An efficient procedure for

amalgamating committee members' value judgements", Operational Research Quarterly, Vol. 4 (ii).

D. Hindle, 1976: "An appropriate technology for decision making", WHO symposium on Field Operational Research, Health Services Research and Development Institute, Surabaya.

H.A. Linstone and M. Turoff (eds), 1975: "The Delphi Method: techniques and applications", Addison-Wesley.

M.A. Piot and G.J. Deboeck, 1975: "Health programme planning and project selection", WHO (mimeo).