

PART III
APPLICATIONS

INTRODUCTION TO APPLICATIONS

W.W. Holland

Part III, the largest section, of this book comprises short illustrative examples of the measures described in the first eight chapters. These are grouped together because it proved impossible to classify them under separate headings; the considerable overlap of the measures or techniques discussed will be apparent to readers.

Many of the examples in Part III are descriptions of the classic epidemiological approach to disease investigation. Some are simple descriptions of measures of incidence and prevalence of disease in a particular community, industry, or age group that enable health policy makers to base their decisions on a factual foundation at a local level aimed particularly at that community, industry, or age group, although such information may be applicable to other communities. Other examples describe a broader approach whereby epidemiological measures are used to determine an appropriate level of resource allocation for particular communities relative to others. Thus measures such as the standardized mortality ratios described by Graham can be used to determine relative health needs and hence appropriate distribution of resources throughout the 14 health service regions in England.

A further example of an approach which could be adapted for use in other countries is that described by Cayolla da Motta who details the development of a "summary indicator", which has been used for health planning purposes in Portugal. It includes typical indicators such as infant mortality, deaths without medical certification, and mortality rate for infectious diseases; the measures chosen to comprise a summary indicator for other societies may, of course, be entirely different.

Other examples describe various measures used to assess the outcome of care provided or of government policy on health matters. An example of the former is Jones's, Densen's, and McNitt's "Approach to the assessment of long-term care", and of the latter, "Abortion surveillance and policy liberalization" by Härö.

In Part II the chapters are divided according to the "approach" to measurement use. Chapter 5 covers the "strategic approach", Chapter 6 the "organizational approach", Chapter 7 the "service approach", and Chapter 8 the "natural history approach". Many of the examples can be classified in the same way, but there is considerable overlap.

Two examples of the strategic approach which provide measures for broad policy decision making have already been mentioned (Graham and

Cayolla da Motta). It is increasingly important to examine how epidemiological measurement can be used to establish national, and even perhaps international, policy in relation to resource allocation, particularly in times of resource limitation and ever-increasing costs. Hopefully, examples of the strategic approach will provide some guidance to countries where little attempt has been made to achieve equity both in resources provided and in accessibility to services.

The organizational approach looks at the information required for service planning, implementation, and assessment at typical "levels" of care in a health service, i.e., individual or direct, community or local, regional or district, national and international. Examples of this approach to measures can readily be drawn from throughout Part III. For example, a study drawing data from records of individual patients could be said to be at the "individual" level whereas use of mortality statistics for a particular condition comparing regions or countries could be regarded as the "regional" or "international" level. Maddox provides a specific example of the "community" or "local" level; he describes the Older Americans Resources and Services Programme, which attempts to use measures of functional status in the elderly to evaluate service systems and thus to make appropriate resource allocations.

The use of measurements to provide guidance on specific services for particular client groups or conditions are illustrated by, among others, Sharma on cholera, McIntosh on childhood accidents, Hetzel on endemic goitre and cretinism, and Weddell on the care of stroke patients.

The natural history approach describes how knowledge of the etiology of a disease can provide measures for use in prevention, cure or care of patients. Examples include community registers of myocardial infarction, and risk factors predisposing to chronic bronchitis.

In this book we attempt to draw examples from the work of people with varied experience from a diversity of health service organizations. Each example describes how measurements can be taken and how they can then be applied. The methods used are not complex, but often there are inherent problems in their use that epidemiologists should be aware of. Despite these problems, the examples illustrate how measurements should be used to provide the facts on which to base policy decisions. A word of warning is perhaps worthwhile before readers are tempted to place too much emphasis on a particular measure — a single index of health is as illusory as a single index of love!

EVALUATION OF LENGTH OF STAY IN HOSPITAL FOLLOWING SURGERY^a

M.W. Adler

INTRODUCTION AND OBJECTIVES

With the current popularity of community care and ever-increasing costs of hospital services there has been greater emphasis placed on the advantages of early discharge from hospital following operations. Until recently there has been no attempt to compare the effects of early discharge in a controlled situation. This study was designed to determine the effects of early discharge on the patient, his family, the community services and the hospital. Similar studies (2-4) have been designed since the start of this study.

METHODS

Patients undergoing surgery for inguinal hernia or varicose veins were randomly allocated into two lengths of postoperative stay, 48 hours or 6-7 days. Several aspects of both hospital and community care were investigated and differences were studied from the point of view of the patients, the family and the providers of care. Various aspects of hospital and community care were costed.

The study was performed in the Farnham and Frimley area, which is approximately 56 km south of London. A geographical area had previously been defined corresponding to the catchment area of the new "best buy" hospital being built at Frimley (5). The study population within this area comprised 222 000 people, for whom primary medical care was provided by 119 general practitioners.

The surgery for the study patients was undertaken by the three consultants normally working in the six hospitals and one shared registrar. No standard procedure was stipulated for preoperative preparation, anaesthetic or type of operation. The details of the different types of operation used are reported elsewhere (6, 7).

^a Example based on Waller et al. (1).

Clinical Outcome

The main variables in the clinical part of the study were the number and type of complications, recurrence rate, and length of patients' convalescence. Information on complications was collected until patients were seen at outpatient follow-up at about 6 weeks after discharge. Data on complications were collected by consulting or house surgeons, hospital and district nurses, and general practitioners. In all, 116 of the 117 short-stay patients received home visits from the district nurses compared to only 2 of the 107 long-stay patients. This resulted in more data being collected from the former group; the two were therefore not comparable. To achieve comparability, it was decided to look at complications between the two groups of patients, using all the reporting sources mentioned, but taking a cut-off point at 7 days after operation, the period that long-stay patients remained in hospital.

Recurrences were measured only for patients undergoing inguinal hernia surgery. In the varicose vein patients the extent of underlying damage to the venous system is of crucial importance in the risk of recurrence, and since it was impossible to measure such damage no attempt was made to study recurrences in these patients.

The date of return to work or normal activity (for housewives) could be collected from one or more sources (8): from the surgeon at outpatient follow-up, from the general practitioner who was responsible for certifying sickness absence, from the patient during an interview two weeks after the operation, and finally from routine sickness absence data.

Costs

The concept of cost used for making comparisons was that of social cost, which includes more than the financial costs to the producer (in this case the health service). Social cost may be defined as the real sacrifices made by all concerned as a result of a particular policy. In this study this, therefore, includes the costs to all the statutory service providers, the costs falling on the patient and his or her family, and the costs borne by the community which result from loss of economically valuable working time through illness and convalescence. These components of social costs are shown in Table 1.

Statutory services

Hospital costs are made up of two separate elements: shared and individual costs. Shared costs are those that can be divided equally between patients on the basis of length of stay regardless of diagnosis and treatment. The methodology used to construct daily costs was based on a comparative survey of hospital costing (9), which was considered preferable to use of average cost figures. The shared component of hospital stay was calculated for each of the study hospitals by computing a daily rate from the summary of hospital costs (10) for the year 1971-72, the financial year in which most of the patients in the study had their operation.

Table 1. Categories of social costs

	Type of cost	Components of cost
Monetary	Statutory services	Hospital
		General practitioners
		District nurses
Patient/household	Community	Home helps
		Increase in household expenditure
		Loss of productive time
Nonmonetary	Attitudes	Patients
		Household members
		General practitioners
		District nurses
	Additional assistance in the household	Changes in household activities
		Help from outside the household
	Disruption of the household	
	Effects on other patients	

Individual costs are those that depend on the type of case and so would differ between patients with minor and major conditions and between those with the same condition but experiencing different lengths of stay. Once again use was made of hospital cost returns but in addition costs were obtained by a work study carried out on a number of short-stay patients.

General practitioner, district nurse, and home help costs were calculated using average gross remuneration on existing salary scales.

Patient/household costs

The economic consequences of illness and treatment are not confined to the health service. The patient's household will be affected economically in a variety of ways (11). Details of these costs were obtained by personal interview with the patients and their families.

Community costs

Time off work, whether the patient has a paid job or is a housewife, results in the effects of that work being lost, whether it is in terms of cars produced or the provision of domestic services. This is a cost or resource loss to the community through its effect on the national product.

Theoretically, wages plus the employer's contributions measure the value of an employee's contribution to output, and wage rates, increased by 15% to incorporate contributions, and multiplied by number of days lost, have been

used to compute the morbidity component of the total social cost (12). The convalescence time of females was valued at female wage rates whether or not they were formally employed. This was done to avoid underrepresenting the economic loss of a housewife's services.

Attitudes

All patient attitudes were measured using Likert-type scales (13). The questionnaire consisted of statements with which patients were asked to agree or disagree on a five-point scale from "strongly agree" to "strongly disagree". Each patient also completed a semantic differential form about his or her self-image (14).

Fourteen days after the patient's operation the member of the household looking after the patient was asked what he or she thought about the practice of early discharge, particularly in relation to the burden imposed on the family and the worry it had caused.

General practitioners were asked to complete two questionnaires at the end of the study in an attempt to assess what they thought about early discharge. Similar information was obtained from each district nurse by a structured questionnaire administered by interview as soon as possible after her last visit to a short-stay patient.

Additional assistance, household disruption, and effects on other patients

Information about additional assistance and disruption in the household was collected by an interview administered in the patient's home 2 weeks after the operation.

Another possible consequence of early discharge is that other patients suffer through the loss of domiciliary services necessitated by their redeployment and attempts were made to calculate this.

RESULTS

Number of Patients Studied

Patients with either an inguinal hernia or varicose veins were entered into the study if they were aged 18–64 years inclusive. Patients with recurrent hernias were excluded. A total of 224 patients took part in the study. Table 2 shows the number of patients by length of stay, sex, and condition.

Complications

Tables 3 and 4 show the complications for the inguinal hernia and varicose vein patients recorded up to 7 days postoperatively. The difference in

Table 2. Number of patients, by sex, length of stay, and condition

	Short stay		Long stay		Total
	Male	Female	Male	Female	
Varicose veins	14	47	10	48	119
Hernia	54	2	46	3	105
Total	68	49	56	51	224

complications between the two groups of hernia patients was not statistically significant. There were four major complications amongst the short-stay varicose vein patients compared with none in the long-stay group, but this difference was not significant at a conventional level ($P = 0.065$). If the minor complications are included the difference between the two groups becomes statistically significant ($P = 0.003$ Fisher's exact test) (15). It was agreed that these four vein complications should be included although they were classified as minor, but the surgeons felt that they were in fact of little clinical importance.

Inguinal Hernia Recurrences

The other important clinical complication is that of recurrences. As mentioned before, this was only measured in hernia patients. The mean follow-up after operation for the two length-of-stay groups was 2.3 years. There was a total of six recurrences evenly divided between the two length-of-stay groups. After adjustment for the number of years at risk, the difference between the recurrence rates for the long-stay and short-stay patients was not significant.

These clinical results are discussed more fully elsewhere (6, 7).

Table 3. Recorded complications up to 7 days for inguinal hernia patients^a

Type of complication	Long stay (N = 49)	Short stay (N = 56)	Total (N = 105)
Wound infection	2	2	4
Chest infection	2 ^b	2 ^b	4
Haematoma	—	1	1
Stitch abscess	—	1 ^b	1
Scoline apnoea	1 ^b	—	1
Oedema of scrotum/penis	—	1	1
Total	5	7	12

^a $\chi^2_1 = 0.095$, $0.7 < P < 0.8$.

^b Noted in hospital in first 48 hours.

Table 4. Recorded complications up to 7 days for varicose vein patients

Type of complication	Long stay (N = 58)	Short stay (N = 61)	Total (N = 119)
Major:^a			
wound infection	—	2	2
haematoma	—	1 ^b	1
thrombophlebitis	—	1	1
Minor:			
rash, "plaster reaction"	—	2	2
persistent "oozing wound", no infection	—	1	1
upper respiratory tract infection	—	1	1
Total	0	8	8

^a $P = 0.065$ for major complications; $P = 0.0037$ for all complications.

^b Noted in hospital in first 48 hours.

Statutory Service Costs

Table 5 shows the costs of the statutory services for inguinal hernia and varicose vein patients. These include shared, individual, and outpatient hospital costs as well as the costs of the domiciliary services.

Table 5. Social cost per case, summary

	Long stay (£)	Short stay (£)
Inguinal hernia (male):		
costs to statutory services	76.32	48.11
costs to patient and family	0.03	1.44
costs to community/loss of productive time	254.89	274.79
Total	331.24	324.34
Varicose vein (female)		
costs to statutory services	77.31	54.08
costs to patient and family	2.00	1.34
costs to community/loss of productive time	85.75	90.08
Total	165.06	145.50

Length of Convalescence

Both men and women in the short-stay group had a longer convalescence than those in the long-stay group, but the differences were not statistically significant. However, the differences between male and female patients were significant for both long-stay and short-stay groups. Since not all female patients were in full-time employment, the length of convalescence for women was compared by type of employment. It was found that housewives went back to their normal activities earlier than the women employed full-time and part-time, and it is therefore possible that the significant differences between male and female long-stay and short-stay patients were due to this. This view is substantiated by the fact that the length of convalescence between full-time working women and men was not statistically significant for either length-of-stay group. The cost to the community of this loss in productive time is also shown in Table 5.

In summary, the difference in social cost per case for male hernia patients was £6.90 but for female varicose vein patients was greater -- £19.56. The savings per case, particularly for male patients, are small, the savings accruing to the statutory services, which are similar for both conditions, being virtually offset by the longer convalescence. The savings per case are greater for females, but this is largely due to the comparable convalescence periods of the long-stay and short-stay patients.

Attitudes

Patients

Before admission there was no significant difference in score between the two groups of patients in relation to their attitude towards early discharge. However, at 5 days postoperative and at follow-up short-stay patients were significantly more in favour of the scheme than long-stay patients. At 14 days after the operation when patients were asked whether they would like to have stayed in hospital for a longer or shorter time, 65% of the short-stay patients, compared with 58% of the long-stay patients, were content with the period they spent in hospital. This difference is not statistically significant and would suggest that patients liked the type of care they experienced.

Household members

In contrast to the patients, the families of short-stay patients were less positive in their attitudes towards the policy of early discharge. This difference was statistically significant.

General practitioners

The great majority of general practitioners (89.7%) approved strongly or with some reservations of early discharge after surgery as a general policy. Of

the general practitioners who had looked after at least one short-stay patient, 65% said that it had no effect on their workload and 35% said that it had increased their workload.

District nurses

Altogether, 46 (92%) of the nurses who were interviewed said that their work pattern had not changed in any way; the other 4 (8%) felt that more work and time were involved as a result of changing visiting order and that visits to other patients were delayed.

Additional Assistance, Household Disruption, and Effects on Other Patients

There was a tendency for more short-stay female patients to report a change in the person carrying out certain activities such as shopping, cooking, cleaning, washing, and looking after children. The only significant difference, however, was for shopping. In addition, once patients had returned home significantly more short-stay female patients reported having outside help than did long-stay patients.

APPLICATIONS

Since the study did not incorporate an evaluation of change in policy, Hospital Activity Analysis (HAA) data have been examined to monitor any changes. The latest complete HAA report for Farnham and Frimley (the study area) is for 1975, which was two complete years after the end of the study. After reorganization of the United Kingdom National Health Service in 1974, this area became the West Surrey and North-East Hampshire Health District. In West Surrey/North-East Hampshire in 1975 the mean length of stay for inguinal hernia patients aged 15–64 years inclusive was 4.7 days and for varicose vein patients 3.5 days. This represents a reduction in the mean length of stay since 1970, the year prior to the start of the study, when the figures were 8.5 and 6.9 days, respectively.

A comparison has been made with the two adjacent health districts in Surrey, namely South-West and North-West Surrey, taking the years 1970 and 1975. Table 6 shows the change in mean duration of stay and acute beds per thousand for the three districts. In the study area the decrease in mean length of stay for inguinal hernia and varicose vein patients between 1970 and 1975 was statistically significant. A significant change was also found for South-West Surrey, but instead of a reduction the mean length of stay increased. In North-West Surrey a reduction in mean length of stay was found, but it was far less marked than in the study area and was not statistically significant for either of the two conditions. Even though the study area showed the largest reduction

Table 6. Mean duration of stay for inguinal hernia and varicose vein patients aged 15—64 years, inclusive, for the study area and two adjacent health districts

Health district	Mean duration of stay (days)				No. of acute beds per thousand population					
	Inguinal hernias		Varicose veins		1970	1975				
	1970	1975	1970	1975			Percentage change (1970 = 100%)	Percentage change (1970 = 100%)		
West Surrey/North-East Hampshire (Farnham/Frimley study area)	8.5	4.7	-44.7	6.9	3.5	-49.2	1.77	1.74	-	1.6
South-west Surrey	6.9	7.6	+10.1	6.7	7.3	+8.9	3.17	3.30	+4.1	
North-West Surrey	7.4	6.9	-6.7	5.9	5.1	-13.5	2.46	2.74	+11.3	
1970 versus 1975	Inguinal hernias: West Surrey/North-East Hampshire				$t = 13.85$		300 df			$P < 0.000001$
	South-West Surrey				$t = 2.48$		211 df			$P < 0.02$
	North-West Surrey				$t = 1.78$		203 df			$0.05 < P < 0.10$
	Varicose veins: West Surrey/North-East Hampshire				$t = 19.06$		347 df			$P < 0.000001$
	South-West Surrey				$t = 2.27$		330 df			$P < 0.05$
	North-West Surrey				$t = 1.11$		179 df			$0.2 < P < 0.3$
Analysis of variance between districts: inguinal hernias, 1970										
	inguinal hernias, 1975				$F_{2, 399} = 14.36$					$P < 0.001$
	varicose veins, 1970				$F_{2, 415} = 74.72$					$P < 0.001$
	varicose veins, 1975				$F_{2, 373} = 1.97$					$0.1 < P < 0.25$
					$F_{2, 481} = 134.63$					$P < 0.001$

in length of stay, the number of acute beds fell compared to the South-West and North-West Surrey districts, where there was an increase. This reduction in beds was extremely small (1%) compared with the very large reduction in mean length of stay for inguinal hernias (44%) and varicose veins (49%). This fall in acute beds between the years 1970 and 1975 is so small that it cannot really be accounted for by the implementation of an early discharge policy.

A one-way analysis of variance was performed to compare the mean lengths of stay for hernia and varicose vein patients in 1970 and 1975 by different health districts. For inguinal hernias the differences between districts were statistically significant for both 1970 and 1975. It is interesting to note that whereas the study area had the longest mean length of stay for inguinal hernias in 1970, this had changed to the shortest of all by 1975. There was no statistically significant difference in the mean length of stay for varicose vein patients in 1970 whereas there was in 1975. Once again, the study area changed from the longest mean length of stay to the shortest in this period.

It is extremely encouraging that early discharge has been implemented in the study area and that compared with two adjacent control areas its effects have been particularly marked (Fig. 1). Naturally, local factors such as shortage of adequate domiciliary services could account for the lack of change in the other areas. However, it is suggested that the research findings have played a part in changing clinical practice in the study area.

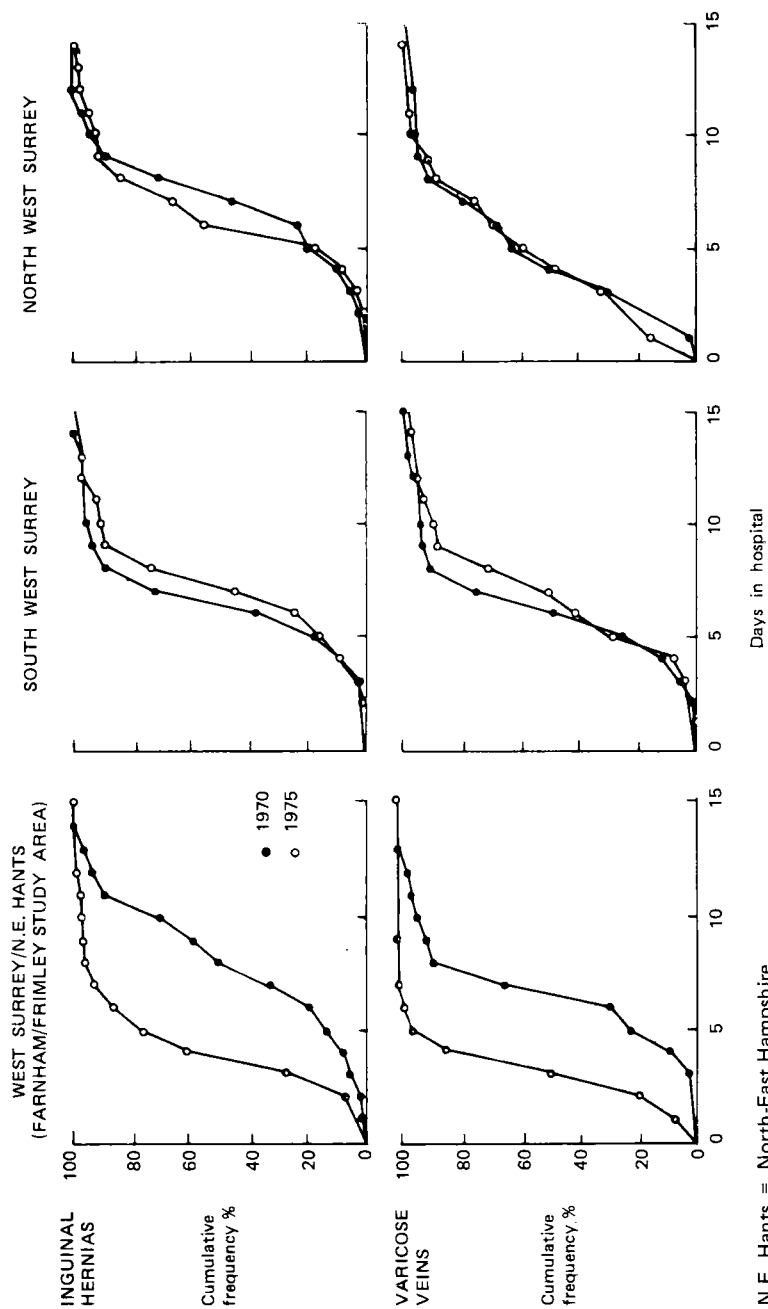
ACKNOWLEDGEMENTS

This work was carried out in conjunction with Mr A. Creese (health economist), Miss S. Thorne (social administrator), and Mrs J. Waller (social scientist). The study took place under the auspices of the Department of Community Medicine, St Thomas's Hospital Medical School, London. Part of this work was presented in an MD thesis for the University of London.

REFERENCES

1. Waller, J. et al. *Report on a randomized controlled trial of early discharge from hospital for patients with hernia or varicose veins*. London, Her Majesty's Stationery Office, 1979 (Monograph from the Department of Community Medicine, St Thomas's Hospital Medical School, London).
2. Echeverri, O. et al. In hospital or at home? A feasibility study. *International journal of health services*, 2: 101 (1972).
3. Gerson, L.W., & Berry, A.F.E. Psycho-social effects of home care: Results of a randomised controlled trial. *International journal of epidemiology*, 5: 159 (1976).

Fig. 1. Cumulative frequency for the time between admission and discharge for inguinal hernia and varicose vein patients aged 15—64 years, inclusive, in the study area and two adjacent health districts^a



^a N.E. Hants = North-East Hampshire.

4. **Russell, I.T. et al.** Day care surgery for hernias and haemorrhoids: a clinical, social and economic evaluation. *Lancet*, 1: 844 (1977).
5. **Clarke, M. & Bennett, A.E.** Problems in the measurement of hospital utilization. *Proceedings of the Royal Society of Medicine*, 64: 795 (1971).
6. **Adler, M.W.** Randomised controlled trial of early discharge for inguinal hernia and varicose veins. *Annals of the Royal College of Surgeons of England*, 59: 251 (1977).
7. **Adler, M.W.** *A randomised controlled trial of early discharge for inguinal hernia and varicose veins*. MD thesis, University of London, 1977.
8. **Adler, M.W. et al.** A randomised controlled trial of early discharge for inguinal hernia and varicose veins. Some problems of methodology. *Medical care*, 12: 541 (1974).
9. **Mason, A. et al.** *Disease costing in hospitals, 1974*. MRC/DHSS Epidemiology and Medical Care Unit, Northwick Park Hospital, England.
10. **South-West Metropolitan Regional Hospital Board.** *Cost returns 1972*. London, 1972.
11. **Abel-Smith, B.** *Value for money in health services*. London, Heinemann, 1976.
12. **Rice, D.P.** *Estimating the cost of illness*. Washington, DC, US Department of Health, Education, and Welfare, 1966.
13. **Likert, R.** A technique for the measurement of attitudes. *Archives of psychology*, No. 140 (1932).
14. **Osgood, C.E. et al.** *The measurement of meaning*. Chicago, University of Illinois Press, 1951.
15. **Fisher, R.A.** *Statistical methods for research workers, 14th ed.* Edinburgh, Oliver & Boyd, 1970.

CHANGES IN RESPONSE TO SYMPTOMS OF ILLNESS IN SWEDEN AND THE USA^a

R.M. Andersen & B. Smedby

INTRODUCTION

Comparable national social surveys have documented differences in people's reporting of and response to a standardized list of symptoms of illness in Sweden and the USA. These studies suggest that characteristics of the health service system may, in part, account for the observed differences.

A basic premise of the present study is that social characteristics can be directly linked to illness behaviour. Social characteristics may influence illness behaviour either directly or by structuring the health service system which in turn influences individual behaviour. The social norm with which the study is concerned is that "medical care is a right of all persons in the society regardless of their ability to purchase services". The strength of this norm in Sweden and the USA in 1964 was examined, and also the change that took place in the USA between 1964 and 1971.

One operational measure of the right to medical care is the proportion of medical care services paid for by government, voluntary insurance or other sources apart from the patient or his family. In the interval between the two studies in the USA, the proportion of total charges paid for by various third parties increased. The Medicare legislation, which provided increased government financing for the elderly, and the Medicaid bill, which increased government support for low-income groups, were largely responsible for this increase. In 1964 it appeared that the Swedish system came closer to supporting the social norm of the right to medical care regardless of ability to pay than did the USA either in 1964 or 1971. However, in 1971 the situation in the USA was closer to that of Sweden than in 1964.

^a This paper is based on Andersen, R.M. & Smedby, B. Changes in response to symptoms of illness in the United States and Sweden. *Inquiry*, 12 (2), supplement, pp. 116–127 (1975). Condensed from the original version published in *Inquiry*. Copyright © 1975 by the Blue Cross Association, USA. All rights reserved.

DATA AND METHODS

The data used for the study came from national surveys of the population conducted in 1964 in Sweden and 1964 and 1971 in the USA. For all three surveys the sample for this analysis was restricted to noninstitutionalized persons aged 16 years or over. The interview response rate in Sweden was 90% and 1933 persons provided complete interviews. The two USA studies were based on area-probability samples. In 1964 the interview response rate was 83% with interviews completed in 2367 families comprising 7803 individuals. In 1971 the response rate was 82% and the final sample consisted of 3765 families comprising 11 619 individuals.

The interviews covered the health experience of each respondent for the calendar year. As part of the interview, a check list of 15 symptoms was used; these symptoms, selected because they are commonly experienced and understood, represent a fairly wide range of somatic and psychosomatic conditions. They were worded and translated to maximize similar understanding by laymen in both countries. For each symptom the respondent was asked if he had experienced the symptom during the previous calendar year; if a positive answer was given further questions determined whether a physician had been consulted in response to the symptom. Reporting of, and response to, symptoms of illness were thought to give a reasonable operational definition of illness behaviour and constituted the dependent variables for this study.

In addition to data from the three population studies, the judgements of a panel of 40 physicians about the probable need to see a physician in response to each symptom were also used. For each of three different age groups (16–44, 45–64, and 65 years and over) members of the panel were asked to estimate the proportion of people with each of the symptoms who needed to see a physician, i.e., “had a medically significant condition”. The mean estimate for each symptom then provided some norms for judging the medically-defined appropriateness of the actual behaviour exhibited by the populations. It should be remembered that people with symptoms who actually saw the physician were not necessarily the individuals that the doctors would have judged as needing medical care. However, on a group basis, one can assume that those groups who most closely approximate the physicians’ estimates include more individuals who behave appropriately than do the groups whose scores deviate more from the physicians’ judgements.

The population’s response and the physicians’ judgements have been incorporated into a single summary measure called the symptom–response ratio. This ratio is based on the difference between the actual number of symptoms for which a visit to the physician was made and the physician estimates of the number of people with that symptom who *should* have seen the physician for that symptom. The computational formula for the index is $(A - E)/E$, where A is actual number of visits for symptoms and E is physician estimates of the number of visits there “should be” for those symptoms. A “minus” score indicates fewer people with symptoms were seeing a physician than judged necessary. A “plus” score indicates a greater proportion were seeking care than had a medically significant condition. Thus, for example, a score

of -0.10 indicates that the population's response was 10% below that judged to be appropriate, while a score of $+0.10$ suggests the population's use of physicians is 10% above that judged to be necessary.

RESULTS

It was thought that both the number of symptoms reported and the proportion of perceived symptoms for which a doctor was seen would increase with greater third-party coverage of medical care expenses. Also the symptom-response ratio was expected to be higher in Sweden than in the USA and move in a positive direction in the USA from 1964 to 1971 as a result of more comprehensive coverage of expenses for physician services for the elderly through Medicare and for low-income groups through Medicaid.

The findings of the study were that symptom reporting was higher in Sweden in 1964 than in the USA in either 1964 or 1971. The mean number of symptoms reported per person was 2.0 in Sweden compared with 1.5 and 1.6 for the two periods in the USA. Furthermore, the proportion of the population reporting a specific symptom in Sweden was equal to or greater than the proportion reporting a given symptom in the USA for 11 of the 15 symptoms. Symptom reporting appeared to increase in the USA between 1964 and 1971; not only did the mean increase by one-tenth of a visit, but the proportion reporting a given symptom in 1971 was equal to, or greater than, the proportion reporting the same symptom in 1964 for 14 of the 15 symptoms. Further analysis showed that this general pattern held for all age groups.

Table 1 shows that the proportion of symptoms for which a physician was seen (the response rate) did increase in the USA between 1964 and 1971. A total of 50% of the reported symptoms resulted in physician consultation in the latter period in the USA compared with 46% in both Sweden and the USA in 1964. The USA rate in 1971 exceeded the earlier USA rate for 11 symptoms and the Swedish rate for 10 symptoms.

Further analysis showed that the elderly in Sweden saw a physician for more of their symptoms than did those under 65 years. This was not the case in the USA in 1964, but by 1971 the response rate for those 65 years and over was considerably higher than it was for any other age group.

It was also shown that the consultation rate was similar for all income groups in Sweden. In 1964 the response rate in the USA increased with income but in 1971 the response rate for low-income groups exceeded that for the population as a whole. The relative response rates for the elderly and low-income groups did appear to increase as benefits became more extensive.

The symptom-response ratios given in Table 2 indicate that people in each population tended to see a physician less often than the panel of physicians judged appropriate. Overall, the population response was 13% less than that judged appropriate in Sweden, 12% less in the USA in 1964, and 5% less in 1971. Thus the expectation that the ratio would be more positive in the system with the most comprehensive benefits was not supported,

Table 1. Percentage of population seeing a physician for reported symptoms of illness in Sweden and the USA and estimated proportion that need to see a physician according to physician panel judgements^a

Symptom	Percentage seeing a physician			Percentage that should see a physician according to physician panel
	Sweden	USA		
	1964	1964	1971	
Sore throat or running nose with a fever as high as 38°C (USA, 100°F) for at least 2 days	36	58	54	36
Frequent backaches	32	45	49	40
Diarrhoea for 4 or 5 days	38	49	46	44
Feeling tired for weeks at a time for no special reason	54	43	51	47
Frequent headaches	34	40	47	48
Waking up with stiff or aching joints or muscles	35	31	37	50
Repeated indigestion or upset stomach	52	44	37	52
Any infections, irritations or pains in the eyes or ears	47	57	64	54
Sudden feelings of weakness or faintness	63	54	59	57
Cough any time during the day or night that lasted for 3 weeks	59	47	51	59
Pain or swelling in any joint during the day	48	50	49	59
Abdominal pains for at least 2 days	50	56	63	61
Repeated pains in or near the heart	63	55	62	71
Shortness of breath even after light work	53	46	54	73
Unexplained loss of more than 5 kg (USA, 10 lb) in weight	50	56	59	75
Proportion of all reported symptoms for which a physician was seen	46	46	50	—

^a From Andersen, R.M. & Smedby, B., 1975.

Table 2. Symptom-response ratio by symptom in Sweden and the USA^a

Symptom	Symptom-response ratio ^b		
	Sweden	USA	
	1964	1964	1971
Sore throat or running nose with a fever as high as 38°C (USA, 100°F) for at least 2 days	-0.01	+0.60	+0.47
Frequent backaches	-0.18	+0.13	+0.23
Diarrhoea for 4 or 5 days	-0.14	+0.12	+0.05
Feeling tired for weeks at a time for no special reason	+0.14	-0.10	+0.08
Frequent headaches	-0.28	-0.16	-0.02
Waking up with stiff or aching joints or muscles	-0.29	-0.37	-0.26
Repeated indigestion or upset stomach	-0.01	-0.15	-0.28
Any infections, irritations or pains in the eyes or ears	-0.12	+0.07	+0.20
Sudden feelings of weakness or faintness	+0.08	-0.06	+0.05
Cough any time during the day or night that lasted for 3 weeks	-0.01	-0.19	-0.13
Pain or swelling in any joint during the day	-0.24	-0.15	-0.16
Abdominal pains for at least 2 days	-0.18	-0.09	+0.03
Repeated pains in or near the heart	-0.12	-0.24	-0.13
Shortness of breath even after light work	-0.28	-0.37	-0.26
Unexplained loss of more than 5 kg (USA, 10 lb) in weight	-0.34	-0.28	-0.18
All symptoms	-0.13	-0.12	-0.05

^a From Andersen, R.M. & Smedby, B., 1975.

^b The computational formula for the index is $(A - E)/E$, where A is actual number of visits for symptoms and E physician estimates of the number of visits there should be for those symptoms. A resulting plus score indicates more people saw the physician than the panel judged necessary. A minus score suggests fewer people saw the physician than the panel thought appropriate.

though the ratio did move in a positive direction as the benefit structure became more comprehensive in the USA.

Further analysis showed that the symptom-response ratios for every age group in the low-income population in the USA moved much closer in 1971 to the level for the population as a whole than they had been in 1964. A similar change in those aged 65 years and over in the USA took place in the low-income and middle-income categories. The high-income group of those aged 65 years and over, however, overshot the normative mark and moved to a score of +0.12 by 1971. It should also be noted that the scores for the low-income groups of all

ages in Sweden were closer to that for the total Swedish population. The same was true for low-income and middle-income groups aged 65 years and over. As in the USA in 1971, the high-income group aged 65 years and over in Sweden appeared to be over-utilizers. In general, the findings seemed to support the belief that as a system becomes more comprehensive the symptom—response ratio for the elderly and low-income groups will become more like the ratio for the rest of the population.

APPLICATION

This study applied the method of measuring need by the reporting of symptoms in the population. It shows the difficulty, however, of interpreting this measure of need. The study provided evidence that the threshold of perception and of response to symptoms drops as social norms legitimate the idea that medical care is a right and provide the means to attain that care.

One concern about increasing a population's access to medical care is that it will result in an excessive increase in the presentation to care providers of "trivial" and "nonserious" complaints. This study did not indicate undue presentation of less serious symptoms as the benefit structure became more comprehensive. While the increased coverage of medical care does not appear, at least from the experience of this study, to overemphasize less serious symptoms, neither does it appear to ensure that people with the most serious symptoms receive care. To significantly increase the proportion of people in greatest need who seek medical care, considerably more false positives will have to be tolerated. How to screen out the "worried well" while encouraging the unresponsive sick is a problem of health service systems today.

THE CONCEPT OF HEALTH IN COMMUNITY DENTISTRY^a

Inkeri Barenthin

INTRODUCTION

Although there is no universally accepted definition of health, it is generally agreed that it is not only the opposite of disease but something positive and enjoyable, contributing to wellbeing. This point has received little attention in dentistry. Those responsible for planning community dental care have to choose between different alternatives, and the choices they make greatly depend on their attitude to dental health. The traditional "objective" dental indexes do not include any aspect of the patient's "subjective" dental wellbeing. In this paper an attempt was made to combine objective and subjective criteria in a model to be used as a tool in planning community dental health; this was mainly to help planners understand the implications of different alternatives when they allocate their limited resources to adult dental health programmes. The applicability of the model was tested in a dental survey.

THE MODEL

The same difficulties are encountered in attempts to evaluate a person's dental wellbeing as in evaluation of general wellbeing. It is simplest to do what is customary in everyday life and accept the person's own judgement on his state of health but this has many methodological weaknesses and only describes the situation at a particular point in time. Many people who are satisfied with their teeth at one time will in future have a far worse dental status because of poor dental health habits. Laymen cannot be expected to make a dental prognosis or to know what kind of dental status will be satisfactory in the future.

^a This Example is an abbreviated version of an article (1) originally published in the *Journal of public health dentistry* and is reproduced here by kind permission of that journal. Reference may be made also to Barenthin (2).

Dentists and patients often differ in what they think is good dental health. The dentist may not approve of the dental status of many patients who consider their teeth to be in good condition. The patient may consider even the worst dentures (according to dental or "objective" criteria) to be quite satisfactory. Traditional dental indexes, such as decayed, missing, or filled (DMF) teeth, periodontal index (PI), and gingival index (GI), are useful for measuring certain biological phenomena, but do not take into account how the phenomena are perceived by the individual whose dental health is being evaluated.

A person's future dental health is greatly dependent on his present dental habits, which thus constitute, together with the present dental health status, a basis for a dental prognosis.

Resources, traditions and ambitions in relation to delivery of dental care vary greatly between communities. Dental conditions which may be unacceptable to one community must be accepted in another because there is no means to treat them. One way to get around these differences is to group dental observations into three categories: optimum, acceptable, and unacceptable dental status, depending on the community in question.

In the model presented in Table 1 the dentist's judgement of the dental health level (objective criterion) is shown vertically and the patients' own judgements of their own dental wellbeing (subjective criterion) horizontally. The upper horizontal division in the table refers to dental habits which can be assessed from information received from the dentist and/or patients.

Table 1. A model combining dental health status (vertically), dental health habits and patients' satisfaction (horizontally)

Dental status according to dentist's assessment	Dental habits satisfactory		Dental habits unsatisfactory	
	Person satisfied	Person dissatisfied	Person satisfied	Person dissatisfied

Optimum

Acceptable

Unacceptable

When each patient in the population considered is allocated to his proper "compartment", the distribution in the different compartments gives a picture of the dental health situation in the population and demonstrates the nature of the dental problems in the community. It is likely that the majority of people will fall into a few compartments, and some may even be empty. When allocating resources to different adult dental health programmes the planner may ask, referring to the model, "What is the purpose of the programme?", i.e., "Which compartments command most attention and what should be the goal of the planned change?". Depending on the criterion chosen, the planner

allocates resources to programmes which attempt to move people from lower to higher compartments, or left from "dissatisfied" to "satisfied" categories or, as in the case of dental health education, from "unsatisfactory dental habits" to "satisfactory dental habits". Combined movements, i.e., left and up are possible goals, as well as no movement at all, i.e., trying to prevent people from moving into lower compartments.

In order to study how the theoretical model fits a real-life situation it was tested in a small-scale dental survey. The survey was conducted in a simple way to see whether the model could be used even when survey resources are limited (1).

METHODS

Hållnäs is a rural district in the commune of Tierp in central Sweden. Its population of 1608 persons is relatively old (26% aged 65 years and over and only 14% under 15 years). No dentist works full-time in the area. A dentist from a neighbouring district comes once a week mainly to treat schoolchildren.

In August 1974 all the inhabitants aged 15 years and over (1321 persons) were invited to a routine health examination including chest X-ray, blood-tests, etc. Appointment hours were given in geographical sequence, i.e., with their order depending on the location of the household. Altogether 1044 persons (79%) turned up. The author recorded the dental health status of the 398 people who came in the first week. No prior notice of the dental investigation was given but it was added to the routine health examination. Once there, no one refused the dental examination. No dental chair was installed; the examination was done in good daylight with the help of a mouth-mirror and explorer.

The dental examination consisted of an inspection and interview. The inspection procedure was based mainly on the recommendations of the WHO manual (3).^a The condition of the oral mucosa and gingiva was recorded, as in the basic survey in the manual, and denture possession and denture repair requirements as in the WHO International Collaborative study. The hierarchical method described by Poulsen & Horowitz (4) was used for dental caries assessment. Oral cleanliness was ranked according to the oral hygiene index (OHI-S). The author then interviewed the patients about their satisfaction with their teeth or dentures, their tooth-brushing habits, and their visits to the dentist.

^a A revised edition of this manual, including procedures for the concurrent estimation of treatment needs and oral health status, was published in 1977.

RESULTS

Because it was decided that the examination should be simple and inexpensive, no dental X-rays were taken and consequently no one could be classified as having optimum dental health. Instead, the model was abbreviated to include only two classes — acceptable and unacceptable dental status — depending on the result of the dental inspection. The status was considered acceptable if the following conditions were met: no mucosal disease, no periodontal disease (no conspicuous change of colour of gingival tissues noted at first glance and no periodontal pocket), no need for dentures or denture repair, no untreated dental caries exceeding the severity zone 1 (untreated caries permitted on pit and fissure surfaces of posterior teeth). Edentulous persons were regarded as having acceptable dental health if they had, and used, full dentures classified as satisfactory. Altogether, 179 persons qualified for the acceptable group. The rest, 219 persons, had an unacceptable dental health status.

Most participants had no trouble saying if they were satisfied with their teeth or if they had dental problems; 329 persons were satisfied and 69 were not.

Dental health habits were considered to be satisfactory if the following conditions were met: tooth-brushing at least once a day, dental check-ups at least every 2 years, and OHI-S less than 1.2. Since dental habits are used in the model for prognostic purposes and the future dental health of edentulous persons cannot be essentially changed by preventive dental habits, these 134 people were classified as having satisfactory dental habits. Altogether, 227 persons qualified for this group. The rest, 171 persons, were classified as having unsatisfactory dental habits.

Table 2 shows the abbreviated model with the results of the survey inserted.

Table 2. Results of the study in Hällnäs inserted in the abbreviated model

Dental status according to dentist's assessment	Dental habits satisfactory		Dental habits unsatisfactory		Total
	Person satisfied	Person dissatisfied	Person satisfied	Person dissatisfied	
Acceptable	113	20	41	5	179
Unacceptable	72	22	103	22	219
Total	185	42	144	27	398

APPLICATION

As expected, the majority of participants fell into a few compartments representing challenges of different kinds for the community dental health

planner. With a distribution like that in Table 2 the planner may decide to give priority, when allocating new resources, to people who have an unacceptable dental health status and who are not satisfied with this condition. When taking a closer look at these groups the planner may find, as was the case in Hållnäs, that old and badly fitting dentures were often to blame for dissatisfaction. This indicates what type of dental care is required.

The benefit of restorative dental treatment is greater when invested in people with good dental habits. The planner must be aware that people with unsatisfactory dental habits require more resources; restorative treatment should be combined with educational efforts. The model is no substitute for judgement by the planners, nor does it provide a simple guide to priorities, but it helps planners realize the existence of and complexities in different value systems. Dental need and resources may vary from community to community and each community has to plan a strategy to meet its own needs. There are no universally applicable "best" sets of criteria.

REFERENCES

1. **Barenthin, I.** The concept of health in community dentistry. *Journal of public health dentistry*, 35: 177 (1975).
2. **Barenthin, I.** Dental health status and dental satisfaction. *International journal of epidemiology*, 6: 73 (1977).
3. **World Health Organization.** *Oral health surveys: basic methods*. Geneva, 1971 (Second ed., 1977).
4. **Poulsen, S. & Horowitz, H.S.** An evaluation of a hierarchical method of describing the pattern of dental caries attack. *Community dentistry and oral epidemiology*, 2: 7 (1974).

A SUMMARY INDICATOR OF HEALTH STATUS IN THE MUNICIPALITIES AND DISTRICTS OF PORTUGAL FOR HEALTH PLANNING PURPOSES^a

L. Cayolla da Motta

INTRODUCTION

During the “diagnosis of the situation” phase of the health sector for the fourth development plan for Portugal (1974–79) it was decided to develop a summary indicator in order to establish priorities for health interventions in all the main administrative areas of the country.

The main administrative areas are the 18 *distritos* (districts) of the mainland plus the four districts of the adjacent islands of the Azores and Madeira. These are the main politicoadministrative divisions of the country with populations of between 300 000 and 1 500 000. They are further subdivided into 304 *concelhos* (municipalities), 274 on the mainland and 30 on the adjacent islands.

For development purposes the country has been divided into four regions, plus two more corresponding to the Azores and Madeira archipelagos, respectively. Some of the regions on the mainland are subdivided into “littoral” and “interior” subregions.

When preparing the development plan for the health sector in 1971–72 it was thought advisable to develop a hierarchical order of regions, districts and, within each district, of the municipalities according to their health situation and health needs. This would facilitate the selection of priorities for health intervention in relation to available health resources.

Health indicators already available had shown that there were appreciable differences in the health situation and health resources between various geographical and administrative areas of the country. However, a single summary indicator would make the task of establishing intervention priorities easier. It was recognized that such a summary indicator could only be based on a few simple health indicators available at the most peripheral level, i.e., the municipality. Although this fact might limit the usefulness of such an indicator it

^a This investigation was initially carried out by F. Galvão de Melo, Maria do Rosário Giraldes, and L. Cayolla da Motta in the Health Planning Department, Secretariat of State for Health, Ministry of Social Affairs, Lisbon, Portugal. Readers may refer also to the following publications: Galvão de Melo et al. (1) and Tavares Santos et al. (2).

was thought to be worthwhile to develop it in order to have a standard and more rational basis for intervention than the former "impressions", or a set of disparate indicators.

Development of a summary health indicator was initially done for the two periods 1960–63 and 1968–70 for the 22 districts of the country (Tables 1–2).

Calculations were repeated later on for the period 1971–73, for the same 22 districts including all the 304 municipalities of the mainland and the adjacent islands of the Azores and Madeira, although two of the nine indicators previously used had to be changed for reasons explained below. This last study is being used for the priority interventions of a new development plan for the period 1977–80, which was prepared when the former plan had to be interrupted and changed after April 1974.

METHOD

The summary health indicator (SHI) is only one of several ways to determine the relative health status of the different regions, districts, and municipalities of the country, according to their main health characteristics and needs.

The SHI was developed from the few health indicators available in municipalities; each of the component single indicators was weighted according to a ponderation coefficient. This coefficient was established by consensus between researchers from the Health Planning Department after consultation with various experts from the different Portuguese health services.

The ponderation coefficients are intended to translate, not only the relative health significance and susceptibility to health intervention within a limited period of each available indicator, but also its reliability in any particular local situation. The scale of values for the coefficients rose from 1 (least significant as a health indicator susceptible to intervention) to 5 (most significant as a health indicator of situations susceptible to successful intervention within the time period of the development plan).

The number and type of health indicators chosen were severely restricted by their availability at the most peripheral level for which information was sought, i.e., the municipality. The following indicators and respective ponderation coefficients were selected for the elaboration of the SHI for the periods 1960–63 and 1968–70:

<i>Indicator</i>	<i>Coefficient</i>
Maternal mortality rate	5
Infant mortality rate	5
1–4 years mortality ratio	4
Respiratory tuberculosis mortality rate (B1 of the seventh (1955) revision of the ICD (3))	4
Gastritis and enteritis mortality rate (B104 of the seventh revision of the ICD)	5

<i>Indicator</i>	<i>Coefficient</i>
Infectious and parasitic diseases mortality rate (except for tuberculosis and enteritis) (B3–B17 of the seventh revision of the ICD)	5
Pneumonia mortality rate (B31 of the seventh revision of the ICD)	3
Percentage of deliveries without health assistance	3
Percentage of deaths without medical certification	2

The nine indicators chosen from the few that were available were thought to give a significant picture of the health situation of the respective populations at both municipality and district level, and also to provide, if somewhat crudely, some measure of the local needs for health resources. For the latter, indicators used were the percentage of deliveries without assistance (indicative of the need for midwives and nurses) and percentage of deaths without medical certification (a simple measure of medical coverage). Other available indicators were not used, either because of lack of reliability, or because their trend operated in a different direction to that of the majority of indicators available at the local level (this was true for the 50 years and over mortality ratio).

Because the selected basic indicators were calculated by different methods and had different health significance, they had to be converted into “conventional values” before being weighted and added together to form the SHI. Conventional values (CV), arbitrarily chosen using a conversion scale with an upper limit of 20, were obtained by the following formula:

$$CV = (I - A) \times \frac{20}{B - A}$$

where CV = conventional value of the health indicator

I = health indicator

A = the greatest full number \leq minimum value of each indicator

B = the smallest full number \geq maximum value of the same indicator.

According to this formula the highest CV corresponds to the worst relative health situation, accepting the assumptions already made. Conversely, the lowest values correspond to the best relative health situations. A relative improvement in the health situation of any area over a particular time would correspond to a lowering of the respective CV of its health indicators.

Finally, the SHI for each area was determined as the weighted average of the nine CVs derived from the nine single health indicators initially chosen. This average was obtained dividing the sum of the product of each conventional value by the ponderation coefficient of the respective health indicator by the sum of the ponderation coefficients.

At first the SHIs were only calculated for the 22 districts (main administrative areas) of the country and the six development planning areas for the periods 1960–63^a and 1968–70 in order to study the change in their health status in the 1960s. Average values of two groups of three consecutive years, 10 years apart, were used in order to minimize any annual oscillations that were sometimes appreciable in the smaller peripheral areas.

^a The year of 1961 was disregarded in this first group because of unusual peaks for most of the available indicators; 1963 was used instead.

Table 1. Summary indicator of the health situation in metropolitan

Regions and districts	Infant mortality rate (coefficient of ponderation 5)		Maternal mortality rate (coefficient of ponderation 5)		Percentage of deliveries without medical assistance (coefficient of ponderation 3)		Mortality rate, 1-4 years age group (coefficient of ponderation 4)	
	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value
CONTINENT	75.4	9.18	1.08	7.20	53.6	12.38	51.9	7.64
Northern Region	91.8	13.00	1.00	6.66	68.2	16.17	91.7	14.56
<i>Coastal subregion</i>	91.1	12.83	0.81	5.40	64.6	15.23	82.1	12.89
Viana do Castelo	72.3	8.46	1.14	7.60	79.0	18.98	57.7	8.65
Braga	89.4	12.44	0.70	4.67	79.1	19.01	102.0	16.36
Porto	95.5	13.86	0.80	5.33	53.9	12.45	78.0	12.18
<i>Inland subregion</i>	94.9	13.72	1.90	12.00	83.0	20.02	112.4	18.16
Vila Real	89.8	12.54	1.43	9.53	83.0	20.00	122.4	19.91
Braganza	102.4	15.47	2.33	15.53	82.9	19.99	98.1	15.68
Central Region	68.9	7.67	0.91	6.06	62.7	14.74	48.2	6.99
<i>Coastal subregion</i>	63.1	6.31	0.86	5.73	56.6	13.15	39.2	5.42
Aveiro	76.7	9.48	0.96	6.40	60.7	14.22	57.8	8.67
Coimbra	54.0	4.19	0.63	4.20	51.4	11.80	23.1	2.63
Leiria	49.4	3.12	0.91	5.07	54.8	12.69	31.7	4.12
<i>Inland subregion</i>	76.6	9.46	0.97	6.46	70.9	16.87	58.8	8.84
Viseu	74.6	1.89	0.85	5.67	77.3	18.54	73.1	11.83
Guarda	86.4	11.74	0.96	6.40	76.3	18.28	56.6	8.45
Castelo Branco	70.3	7.99	1.22	8.13	52.3	12.04	36.1	4.89
Lisbon Region	56.1	4.68	1.06	7.06	19.0	3.38	19.0	1.81
<i>Coastal subregion</i>	57.7	5.06	1.04	6.93	13.3	1.89	17.6	1.67
Lisboa	55.7	4.59	1.11	7.40	10.9	1.27	15.8	1.36
Setúbal	64.8	6.71	0.80	5.33	21.7	4.08	25.1	2.98
<i>Inland subregion</i>	49.9	3.24	1.13	7.53	40.2	8.89	24.4	2.85
Santarém	49.9	3.24	1.13	7.53	40.2	8.89	24.4	2.85
Southern Region	69.1	7.71	2.08	13.86	41.8	9.30	20.2	2.12
<i>Alentejo subregion</i>	70.8	8.11	1.85	12.33	45.9	10.37	20.5	2.17
Portalegre	67.5	7.34	1.04	6.93	44.4	9.98	17.1	1.58
Evora	65.0	6.76	2.46	16.40	38.3	8.40	19.4	1.98
Beja	77.3	9.62	1.90	12.67	52.9	12.19	23.5	2.70
<i>Algarve subregion</i>	65.0	6.76	2.64	17.60	31.7	6.68	19.8	2.05
Faro	65.0	6.76	2.64	17.60	31.7	6.68	19.8	2.05
ISLANDS	92.0	13.05	0.99	6.60	39.2	8.63	49.8	7.27
Azores	96.4	14.07	1.01	6.73	39.2	8.63	36.4	4.94
Angra do Heroísmo	121.7	19.97	1.08	7.20	31.7	6.68	43.9	6.25
Ponta Delgada	90.7	12.70	0.98	6.53	38.2	9.37	38.1	5.24
Horta	60.3	5.66	1.03	6.87	67.6	16.02	13.7	0.99
Madeira	86.8	11.84	0.96	6.40	39.2	8.63	67.2	10.30
Funchal	86.8	11.84	0.96	6.40	39.2	8.63	67.2	10.30

^a Data from Portugal, National Institute of Statistics demographic yearbooks for 1960, 1962, 1963.

^b Except tuberculosis.

^c For 1962 and 1963 only.

Portugal, by region and district, for the period 1960–63^a

Mortality rates per 100 000 population for the following diseases:								Percentage of total deaths without medical certification ^c (coefficient of ponderation 2)		Summary health indicator	
Tuberculosis (coefficient of ponderation 4)		Infectious and parasitic diseases ^b (coefficient of ponderation 5)		Pneumonia (coefficient of ponderation 3)		Gastritis and enteritis (coefficient of ponderation 5)					
Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Position
36.0	12.54	16.5	10.00	89.8	8.65	61.2	5.22	5.3	3.55	8.5	—
41.9	14.85	20.6	13.28	138.2	16.15	126.2	12.10	5.6	3.73	12.2	—
41.8	14.81	21.1	13.68	141.1	16.60	108.0	10.17	1.0	0.67	11.6	—
36.1	12.58	17.6	10.88	102.3	10.59	55.6	4.62	4.2	2.81	9.38	15
35.4	12.31	18.7	11.76	121.3	13.53	132.0	12.72	1.6	1.07	11.73	18
54.2	19.68	23.4	15.52	162.2	19.87	108.7	10.36	0.3	0.20	12.50	20
24.9	8.19	18.1	11.28	122.2	13.67	190.9	18.96	22.1	14.7	14.3	—
28.5	9.60	16.2	9.76	129.7	14.83	200.0	20.00	26.1	17.49	14.35	22
19.7	6.15	20.8	13.44	111.4	12.00	178.1	17.61	16.4	10.99	14.32	21
27.4	9.17	14.9	8.72	76.0	6.51	60.7	5.16	9.7	6.46	7.8	—
31.5	10.78	17.9	11.12	80.5	7.20	44.9	3.48	1.7	1.13	7.3	—
33.6	11.60	22.2	14.56	114.1	12.42	68.9	6.14	0.5	0.34	9.57	17
31.0	10.58	15.0	8.80	63.7	4.60	27.3	1.62	3.2	2.14	5.57	4
29.4	9.96	15.3	9.04	54.4	3.16	30.8	1.99	1.6	1.07	5.75	5
22.1	7.09	11.0	5.60	70.4	5.64	80.8	7.29	19.3	12.85	8.4	—
20.4	6.43	13.3	7.44	92.8	9.11	107.3	10.10	9.9	6.63	9.12	14
24.9	8.19	9.9	4.72	60.3	4.08	82.1	7.43	25.6	17.15	8.87	13
22.2	7.13	8.6	3.68	45.1	1.72	39.0	2.86	29.4	19.4	6.72	10
43.9	15.64	15.6	9.28	62.5	4.41	20.9	0.94	0.3	0.20	5.1	—
49.7	17.91	15.9	9.52	61.7	4.29	18.8	0.72	0.4	0.27	5.8	—
49.0	17.64	17.2	10.56	63.6	4.59	15.5	0.37	0.3	0.20	5.79	6
52.2	18.89	11.2	5.76	54.6	3.19	30.6	1.97	0.6	0.40	5.80	7
21.5	6.86	14.3	8.24	65.7	4.91	28.9	1.79	0.1	0.07	5.1	—
21.5	6.86	14.3	8.24	65.7	4.91	28.9	1.79	0.1	0.07	5.11	1
23.9	7.80	11.8	6.24	55.2	3.28	29.0	1.80	4.1	2.73	6.4	—
23.5	7.64	12.0	6.40	57.6	3.65	29.5	1.5	4.0	2.66	6.4	—
19.7	6.15	11.9	6.32	54.3	3.15	36.0	2.54	0.7	0.47	5.19	2
20.6	6.51	12.4	6.72	43.8	1.52	26.8	1.57	2.2	1.47	6.21	8
28.3	9.53	11.7	6.16	70.8	5.70	27.1	1.60	7.7	5.16	7.31	11
24.9	8.19	11.3	5.84	50.0	2.48	27.9	1.69	4.2	2.80	6.5	—
24.9	8.19	11.3	5.84	50.0	2.48	27.9	1.69	4.2	2.80	6.48	9
24.9	8.19	16.5	10.00	79.0	6.98	154.5	15.10	0.8	0.54	9.3	—
31.3	10.70	20.8	13.44	83.2	7.62	133.0	12.83	0.9	0.60	9.7	—
32.5	11.17	28.1	19.28	84.5	7.83	175.5	17.33	0.3	0.20	12.01	19
34.6	12.00	19.4	12.32	86.5	8.14	134.4	12.97	1.0	0.67	9.51	16
16.4	4.86	11.6	6.08	67.8	5.24	41.8	3.16	1.9	1.27	5.51	3
16.9	5.05	11.2	5.76	73.8	6.17	180.8	17.89	0.6	0.40	8.8	—
16.9	5.05	11.2	5.76	73.8	6.17	180.8	17.89	0.6	0.40	8.78	12

Table 2. Summary indicator of the health situation in metropolitan

Regions and districts	Health indicators		Infant mortality rate (coefficient of ponderation 5)		Maternal mortality rate (coefficient of ponderation 5)		Percentage of deliveries without medical assistance (coefficient of ponderation 3)		Mortality rate, 1-4 years age group (coefficient of ponderation 4)	
	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value
CONTINENT	57.6	5.03	0.75	5.00	33.4	7.12	24.7	2.91		
Northern Region	71.2	8.00	0.65	4.33	44.5	10.01	39.9	5.55		
<i>Coastal subregion</i>	70.0	7.92	0.51	3.40	38.2	8.37	43.3	6.14		
Viana do Castelo	57.0	4.89	0.42	2.80	63.8	15.03	31.1	4.02		
Braga	73.2	8.67	0.44	2.93	52.0	11.96	57.9	8.68		
Porto	70.5	8.04	0.57	3.80	26.4	5.30	39.1	5.41		
<i>Inland subregion</i>	77.1	9.58	1.41	9.40	77.9	18.69	31.0	4.00		
Vila Real	79.1	10.04	1.58	10.53	81.7	19.68	54.7	8.13		
Braganza	73.7	8.78	1.10	7.33	71.4	17.00	42.1	5.93		
Central Region	55.5	4.54	0.68	4.53	41.3	9.18	23.3	2.65		
<i>Coastal subregion</i>	53.0	3.96	0.55	3.67	31.7	6.68	21.4	2.33		
Aveiro	66.6	7.13	0.68	4.53	32.4	6.86	32.2	4.21		
Coimbra	43.4	1.72	0.36	2.40	36.8	8.01	13.8	1.01		
Leiria	38.3	0.54	0.53	3.53	25.3	5.02	14.9	1.20		
<i>Inland subregion</i>	59.6	5.50	0.88	5.87	56.4	13.10	25.8	3.10		
Viseu	62.0	6.06	0.76	5.07	65.9	15.57	35.9	4.85		
Guarda	65.2	6.80	0.96	6.40	60.7	14.22	16.7	1.51		
Castelo Branco	48.4	2.89	1.09	7.27	30.8	6.45	17.0	1.57		
Lisbon Region	41.0	1.17	0.72	4.80	10.4	1.14	9.9	0.33		
<i>Coastal subregion</i>	41.8	1.35	0.73	4.87	7.8	0.47	9.9	0.33		
Lisboa	43.2	1.68	0.72	4.80	6.9	0.23	9.5	0.26		
Setúbal	40.4	1.03	0.77	5.13	11.2	1.35	11.4	0.59		
<i>Inland subregion</i>	36.6	0.14	0.64	4.27	23.7	4.60	10.1	0.37		
Santarém	36.6	0.14	0.64	4.27	23.7	4.60	10.1	0.37		
Southern Region	51.7	3.66	1.65	11.00	27.4	5.56	10.1	0.37		
<i>Alentejo subregion</i>	51.5	3.61	1.69	11.27	32.4	6.86	10.3	0.40		
Portalegre	52.4	3.82	1.87	12.47	26.8	5.41	9.9	0.33		
Evora	44.9	2.07	2.01	13.40	26.0	5.20	8.7	0.12		
Beja	56.4	4.75	1.29	8.60	41.7	9.28	11.9	0.68		
<i>Algarve subregion</i>	52.2	3.77	1.58	10.53	17.2	2.91	9.6	0.28		
Faro	52.2	3.77	1.58	10.53	17.2	2.91	9.6	0.28		
ISLANDS	67.5	7.34	0.82	5.47	28.2	5.77	37.9	5.20		
Azores	66.1	7.01	0.84	5.60	28.8	5.93	27.4	3.38		
Angra do Heroísmo	58.0	5.13	1.10	7.33	27.3	5.54	19.7	2.04		
Ponta Delgada	71.0	8.16	0.68	4.53	25.9	5.17	34.1	4.54		
Horta	54.4	4.29	1.26	8.40	50.8	11.65	18.1	1.76		
Madeira	69.1	7.71	0.79	5.27	27.4	5.56	50.3	7.36		
Funchal	69.1	7.71	0.79	5.27	27.4	5.56	50.3	7.36		

^a Data from Portugal, National Institute of Statistics demographic and health statistics for 1968, 1969, 1970, and Statistical Service of the Internal Administration Ministry, Portugal.

^b Except tuberculosis.

^c Data for 1968 and 1970 only since 1969 values are doubtful.

Portugal, by region and district, for the period 1968–70^a

Mortality rates per 100 000 population for the following diseases:								Percentage of total deaths without medical certification (coefficient of ponderation 2)		Summary health indicator	
Tuberculosis (coefficient of ponderation 4)		Infectious and parasitic diseases ^b (coefficient of ponderation 5)		Pneumonia (coefficient of ponderation 3)		Gastritis and enteritis (coefficient of ponderation 5)					
Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Conventional value	Value	Position
19.7	6.15	9.9	4.72	87.4	8.28	32.6	2.19	3.2	2.13	4.76	—
17.5	5.29	12.5	6.80	122.8	13.76	56.3	4.70	2.4	1.60	6.61	—
19.0	5.88	13.5	7.60	129.5	14.80	50.6	4.08	0.3	0.20	6.47	—
16.7	4.98	7.8	3.04	93.6	9.24	36.0	2.54	0.6	0.40	4.89	12
13.4	3.68	13.5	7.60	126.6	14.35	67.7	5.90	0.5	0.33	7.07	20
22.3	7.17	14.6	8.48	138.1	16.14	45.2	3.52	0.2	0.13	6.50	19
11.4	2.90	8.5	3.60	95.7	9.56	79.3	7.13	7.9	5.27	7.54	—
12.6	3.37	7.9	3.12	100.6	10.32	88.0	8.06	11.9	7.94	8.63	22
9.5	2.15	9.5	4.40	88.3	8.42	66.4	5.77	13.6	9.19	7.18	21
16.0	4.70	9.3	4.24	83.2	7.63	29.9	1.90	7.0	4.67	4.59	—
16.2	4.78	10.9	5.52	98.6	10.01	24.1	1.28	0.6	0.40	4.21	—
17.3	5.21	13.7	7.76	145.8	17.33	34.6	2.40	0.0	0.00	6.09	17
16.5	4.90	9.0	4.00	69.9	5.56	16.5	0.48	1.0	0.67	3.02	5
14.3	4.04	9.1	4.08	64.0	4.65	18.0	0.64	0.8	0.53	2.64	2
15.8	4.63	7.1	2.48	62.9	4.48	37.5	2.70	15.5	10.33	5.20	—
14.5	4.12	9.5	4.40	80.6	7.22	55.3	4.59	6.3	4.20	5.92	16
18.0	5.64	5.4	1.12	53.0	2.94	29.4	1.84	19.0	12.67	5.17	13
15.6	4.55	4.7	0.56	42.2	1.27	14.9	0.31	27.9	18.61	3.89	10
29.0	9.80	9.3	4.24	64.6	4.74	14.3	0.24	0.1 ^c	0.07	3.07	—
32.8	11.29	10.1	4.88	65.7	4.91	14.3	0.24	0.1 ^c	0.07	3.31	—
33.5	11.56	10.9	5.52	68.6	5.36	13.1	0.12	0.0 ^c	0.00	3.46	6
30.5	10.39	6.9	2.32	55.0	3.26	18.7	0.71	0.1 ^c	0.07	2.88	3
13.6	3.76	6.3	1.84	60.6	4.12	14.2	0.23	0.2 ^c	0.13	2.09	—
13.6	3.76	6.3	1.84	60.6	4.12	14.2	0.23	0.2 ^c	0.13	2.09	1
13.5	3.72	5.8	1.44	51.1	2.65	14.7	0.29	2.4	1.60	3.50	—
13.1	3.57	5.1	0.88	50.9	2.62	13.7	0.18	1.4	0.93	3.50	—
11.5	2.94	6.2	1.76	56.4	3.47	12.2	0.02	0.2	0.13	3.62	8
11.7	3.02	4.1	0.08	34.5	0.08	12.2	0.02	1.1	0.73	2.99	4
15.4	4.47	5.2	0.96	60.5	4.11	15.8	0.40	2.5	1.67	3.82	9
14.3	4.04	7.6	2.88	51.6	2.73	17.2	0.55	4.2	2.80	3.56	—
14.3	4.04	7.6	2.88	51.6	2.73	17.2	0.55	4.2	2.80	3.56	7
12.6	3.37	13.6	7.68	78.0	6.82	63.1	5.42	1.7	1.13	5.62	—
20.5	6.47	16.1	9.68	73.4	6.11	46.9	3.70	3.1	2.07	5.82	—
27.1	9.06	19.0	12.00	64.8	4.77	27.1	1.60	2.1	1.40	5.79	15
18.6	5.72	16.8	10.24	75.4	6.42	66.6	5.79	4.1	2.73	6.25	18
14.0	3.92	7.4	2.72	84.3	7.80	14.0	0.21	2.0	1.33	4.50	11
4.1	0.04	10.9	5.52	83.0	7.60	80.5	7.26	0.1	0.07	5.50	—
4.1	0.04	10.9	5.52	83.0	7.60	80.5	7.26	0.1	0.07	5.50	14

For these first two calculations the conversion scale had a maximum value of 20. Later, when the SHI was determined for the period 1971–73 and for all the 304 municipalities of the country, the upper limit was changed to 100 in order to achieve better discrimination between relative positions and so avoid some clustering of positions found in the first study.

In this last determination of the SHI for 1971–73 two of the health indicators were changed. Instead of the 1–4 years mortality ratio the more recently available mortality rate for the same age group was used instead; this was considered more significant because it reflected the level of risk. Also infant mortality used in the 1960–63 and 1968–69 determinations had to be replaced by the mortality rate for the under 1 year age group because there are no data on birth by residence at the municipality level. This last rate is somewhat unreliable but had to be used if the 304 municipalities were to be included.

The indicators used for the 1971–73 period and their respective ponderation coefficients were as follows:

<i>Indicators</i>	<i>Coefficient</i>
Maternal mortality rate	5
< 1 year mortality rate	5
1–4 years mortality rate	4
Respiratory tuberculosis mortality rate (B5 of the eighth (1965) revision of the ICD (4))	4
Enteritis mortality rate (B4 of the eighth revision of the ICD)	5
Infectious and parasitic diseases mortality rate (except for tuberculosis and enteritis) (B1–B3, B7–B18 of the eighth revision of the ICD)	5
Pneumonia mortality rate (B32 of the eighth revision of the ICD)	3
Percentage of deliveries without health assistance	3
Percentage of deaths without medical certification	2

For the 1971–73 period 100 was the highest value used on the conversion scale for the reasons stated above. The CV was determined according to the formula:

$$CV = (I - A) \times \frac{100}{B - A}$$

where the symbols have the same meaning as those given above.

The SHI for 1971–73 was obtained in the same way as before.

After determination of an SHI for an area a “relative health position” (RHP) was allocated to it according to a scale: one scale was used for 1960–63 and 1968–70 and a different one was used for 1971–73.

In the first two periods when the CV was below 20, the relative position of each of the 22 districts of the country was obtained by two methods: ranking them in serial order – from first or best position, which was occupied by the district of Santarém, both in 1960–63 and 1968–70, to 22nd, or worst, position (occupied by the district of Vila Real in both periods) (Table 3); or by putting them in one of four classes described as “better”, “average plus”, “average minus”, and “inferior” positions (Table 4).

Table 3. Evolution of the summary health indicators and of the relative health positions of the districts of Portugal from the period 1960–63 to the period 1968–70

Region	Districts (by regions)	1960–63 values		1968–70 values		Differences between 1968–70 and 1960–63 values of:	
		SHI ^a	RHP ^b	SHI ^a	RHP ^b	SHI ^a (%)	RHP ^b
North	Viana do Castelo	9.36	15	4.89	12	47.57	-3
	Braga	11.73	18	7.07	20	39.72	+2
	Porto	12.50	20	6.50	19	48.00	-1
	Vila Real	14.35	22	8.63	22	39.86	-
	Braganza	14.32	21	7.18	21	49.86	-
Centre	Aveiro	9.57	17	6.09	17	36.36	-
	Coimbra	5.57	4	3.02	5	45.78	+1
	Leiria	5.75	5	2.64	2	54.08	-3
	Viseu	9.12	14	5.92	16	35.08	+2
	Guarda	8.87	13	5.17	13	41.60	-
Lisbon	Castelo Branco	6.72	10	3.89	10	42.11	-
	Lisboa	5.79	6	3.46	6	40.24	-
	Setúbal	5.80	7	2.88	3	50.34	-4
	Santarém	5.11	1	2.09	1	59.10	-
	Portalegre	5.19	2	3.62	8	30.25	+6
South	Evora	6.21	8	2.99	4	51.85	-4
	Beja	7.31	11	3.82	9	47.74	-2
	Faro	6.48	9	3.56	7	45.06	-2

^a Summary health indicator.

^b Relative health position.

“Better” and “average plus” positions were below the average SHI for the country, which was 8.70 for 1960–63 and 4.85 for 1968–70. “Average minus” and “worst” positions were above these averages for both periods.

For the period 1971–73, when the CV scale was enlarged in order to obtain a more discriminating distribution for the districts and particularly for the municipalities, only seven relative positions were established. The SHI values for each of these positions were, from “best” to “worst”, as follows:

<i>Position</i>	<i>SHI value</i>
1	< 10
2	10–14
3	15–19
4	20–24
5	25–29
6	30–34
7	≥ 35

RESULTS

The results are shown in Tables 1–4 and in Fig. 1–3. These results were used with other data for the diagnosis of the health situation of Portugal and for the establishment of priorities in the preparation of the last two development plans for the health sector.

Tables 1 and 2 and Fig. 1 and 2 show the weighted SHIs for selected districts and planning regions of the country and their respective rank and RHPs for the two periods 1960–63 and 1968–70. These results show clearly the change in the RHPs for those areas over a period of about 10 years.

Tables 3 and 4 summarize the change in RHP for the 22 districts during the 1960s.

The results of the investigation for the period 1971–73,^a for use in preparation of the new development plan, in which a larger scale for the conventional values was devised (0–100) are shown in detail in Table 5^b for the regions and 22 districts of the country, and also for its 304 municipalities. In Fig. 3 the RHPs for this period are shown for the 22 districts, the main administrative areas of the country.

Because of the different indicators and scales used for calculation of the CV for each health indicator, the SHIs and their RHPs for 1971–73 cannot be compared with those for 1960–63 and 1968–70. However, it is believed that a comparison of the respective RHPs of the districts and planning regions is still partly valid for between 1960–63 and 1971–73.

It is intended to repeat the calculations using the same available local health indicators and an identical conversion scale to ascertain the CVs for each of the single health indicators used, for all the periods considered from 1960 onwards. This would enable a more valid comparison and a better study of change over time in the relative health position of the main administrative areas of Portugal.

^a A similar study is being made for 1973–75, but the results are not yet available.

^b This table is omitted on account of its length. Copies are available from L. Cayolla da Motta, Health Planning Office, Avenue Alvares Cabral, 25, Lisbon 2, Portugal.

Table 4. Relative positions of the districts of Portugal according to their summary health indicators (SHI) for the periods 1960–63 and 1968–70

Classes in accordance with the SHI in 1968–70 Classes in accordance with the SHI in 1960–63		Positions above Portugal's average		Positions below Portugal's average	
		Better	Average plus	Average minus	Worst
Positions above Portugal's average	Better	Coimbra Leiria Santarém	Portalegre Horta		
	Average plus	Setúbal Evora	Castelo Eranco Lisboa Beja Faro		
Positions below Portugal's average	Average minus			Viana do Castelo Aveiro Viseu Guarda Funchal	Ponta Delgada
	Worst			Angra do Heroismo	Braga Porto Vila Real Braganza

CONCLUSION

The limitations and inconvenience of the methods used for determining the RHPs of the regions, districts, and municipalities of Portugal for preparation of development plans in the health field are well known. Several criticisms can be made; for instance, of the accuracy and significance of some of the indicators chosen, especially at the most peripheral level (some municipalities have less than 10 000 inhabitants); or of the rationale of mixing such a variety of indicators.

However, the indicators used were those most easily available at district and municipality level both in 1970 and 1960. More sophisticated health indicators could not be developed for a study which had to be performed in a short

Fig. 1. Relative health positions (RHPs) for districts of Portugal according to their summary health indicators, 1960–63

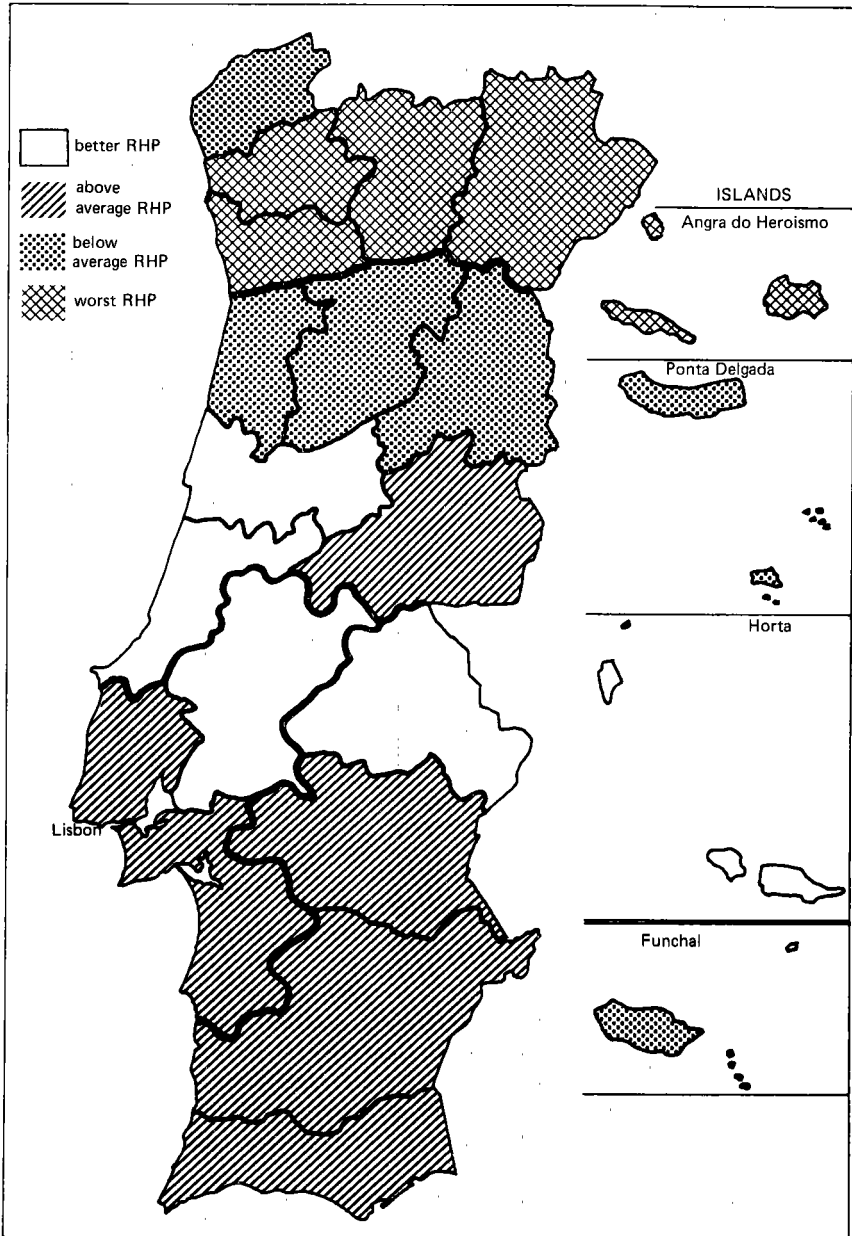


Fig. 2. Relative health positions (RHPs) for districts of Portugal according to their summary health indicators, 1968–70

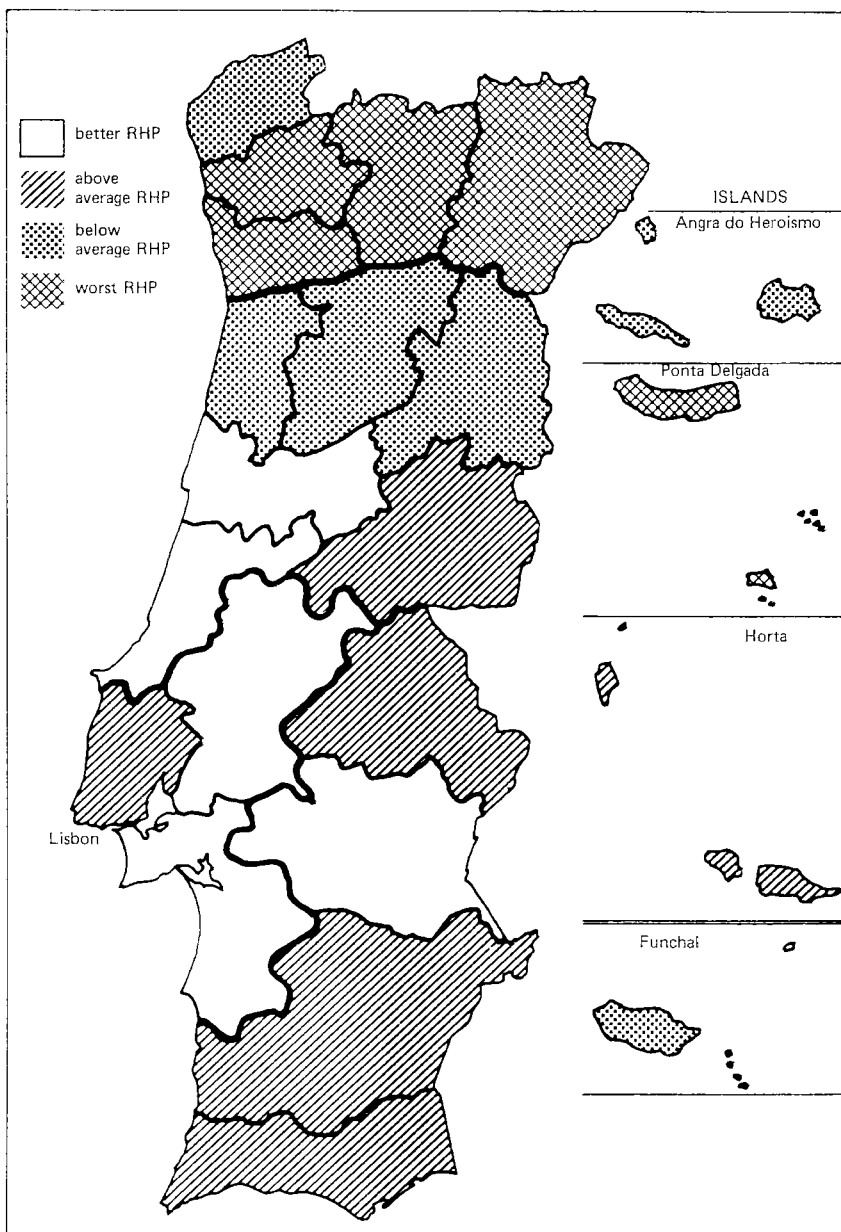
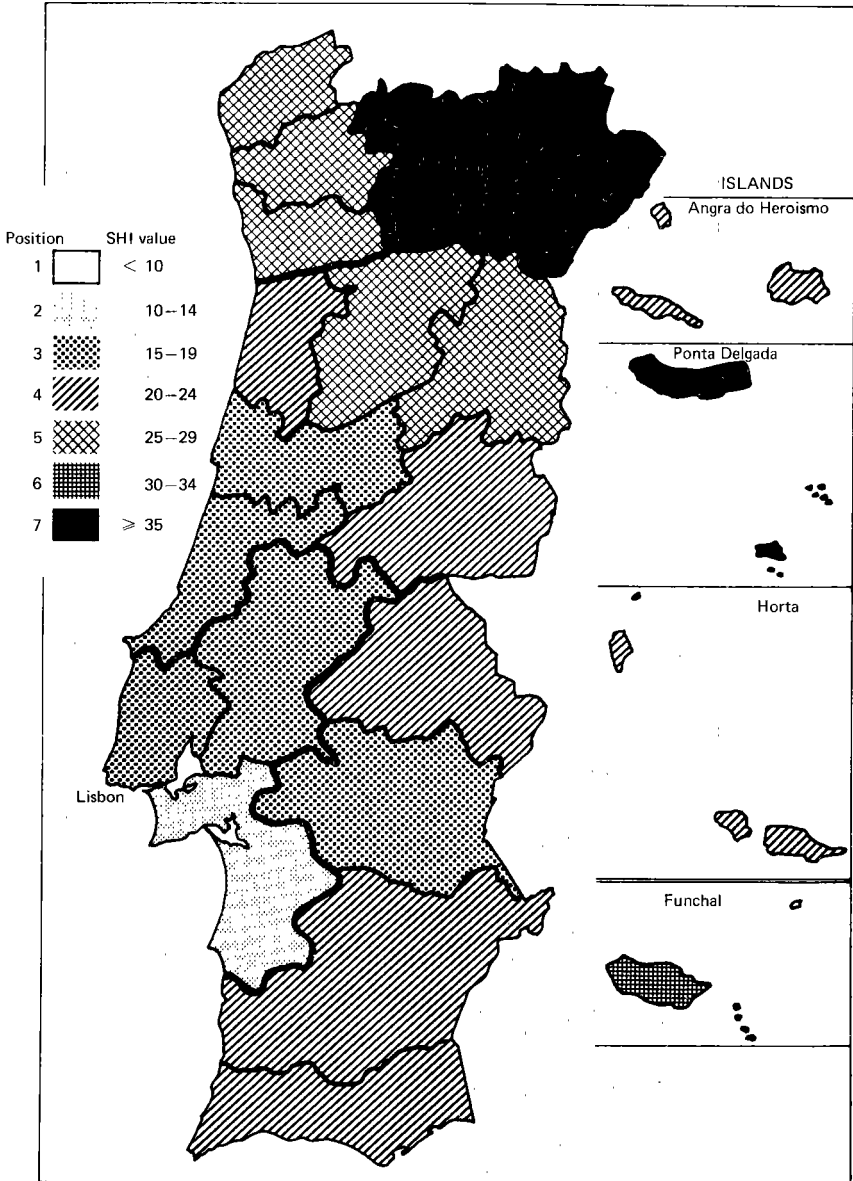


Fig. 3. Relative health positions (RHPs) for districts of Portugal according to their summary health indicators, 1971–73



time. Among the indicators available preference was given to those considered more likely to reflect, even if indirectly and perhaps crudely, either the health status and the primary health care of the population (i.e., mortality rates for infants and the 1–4 years age group, enteritis, tuberculosis, pneumonia, and other communicable diseases, and the maternal mortality rate), or the health personnel coverage of the areas (i.e., proportions of deliveries without health assistance and of deaths without proper medical certification).

In the circumstances, it was thought that this method would be acceptable as a quick and rough estimate of the RHPs of different areas of the country and the changes over time since 1960, for priority setting in preparation of a development plan. It should also be remembered that the ponderation coefficients allocated to each of the single health indicators chosen were determined by impression alone, although the values finally agreed on were reached by consensus among representatives from the different health services.

Despite all these shortcomings, the results obtained were considered “reasonable” and in accordance with what is known about the general health status of different areas of the country. The results have also been useful and, together with other data, have contributed to better priority setting in the most recent development plan for Portugal.

REFERENCES

1. **Galvão de Melo, F. et al.** *Trabalhos Preparatórios do IV Plano de Fomento – Relatório Preliminar do Sector da Saúde e Assistência. Vol. 2* [Preparatory work of the Fourth Development Plan – Preliminary report of the Department of Health and Welfare, Vol. 2]. Lisbon, Gabinete de Estudos e Planeamento do Ministério da Saúde e Assistência [Office of Studies and Planning of the Ministry of Health and Welfare], 1971, revised and updated November 1976 by L. Cayolla da Motta, M. Anita Tavares Santos, M.R. Giraldes, & L. Medina.
2. **Tavares Santos, M. Anita et al.** [*Summary indicator of the health situation in 1971–73 by district and by municipality.*] Lisbon [Office of Studies and Planning of the Ministry of Health], 1976.
3. **World Health Organization.** *Manual of the international statistical classification of diseases, injuries, and causes of death, 1955 revision.* Geneva, 1957.
4. **World Health Organization.** *Manual of the international statistical classification of diseases, injuries and causes of death, 1965 revision.* Geneva, 1967.

VIRAL HEPATITIS^a

J. Červenka

COHORT STUDIES OF VIRAL HEPATITIS MORBIDITY, 1957–1976

Introduction and Methods

Cohort studies of viral hepatitis (types A and B) morbidity in 4 million children aged 0–14 years took place in Czechoslovakia between 1957 and 1976. All children born between 1954 and 1976 were included in the cohort analyses. Morbidity from viral hepatitis was studied in different age cohorts using the measure number of cases per 100 000 for each age-specific population.

Results

A shift of morbidity from viral hepatitis towards the older age groups was found, particularly in the second decade of the study, i.e., 1967–76 (Fig. 1).

Detailed information about the dynamics of spread of viral hepatitis throughout the different age groups was obtained.

Application

Information from this type of cohort analysis could be used for epidemiological prognosis and for health planning, for example, to determine hospital bed needs and the level of supply of gamma-globulin.

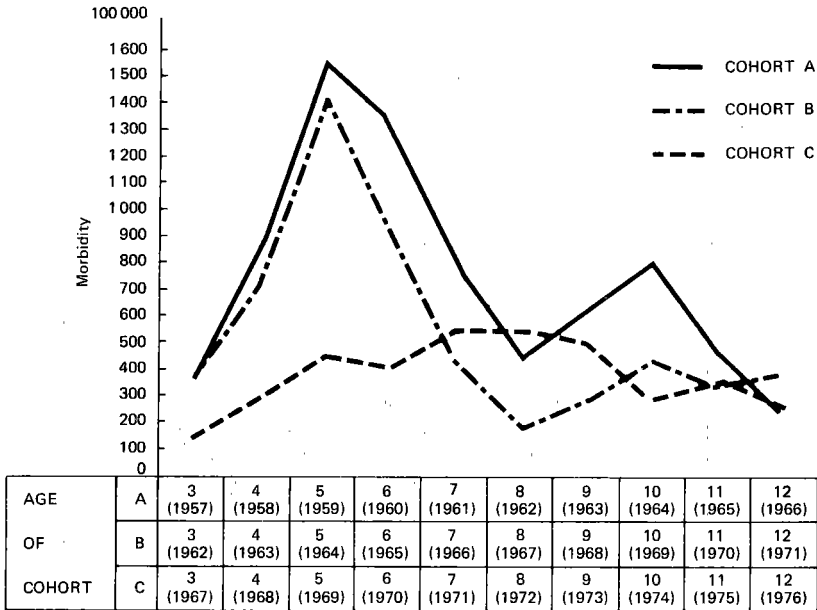
PROTECTIVE EFFECT AGAINST HEPATITIS OF GAMMAGLOBULIN

Introduction and Methods

A controlled field trial of the protective effect of gammaglobulin was performed in 185 389 schoolchildren aged 7 years in Czechoslovakia. Gamma-globulin was administered to 96 667 children at the end of June 1964 (seasonal

^a Example based on Červenka (1) and Červenka & Masár (2).

Fig. 1. Morbidity in three cohorts of children in Czechoslovakia aged 3–12 years, 1957–76^a



^a Cohort A, children born in 1954; cohort B, children born in 1959; cohort C, children born in 1964.

minimal disease incidence) and 88 722 children received a placebo. The number of viral hepatitis cases per 100 000 population which had occurred by 30 June 1965 was the measure used to compare the morbidity difference in protected and unprotected children.

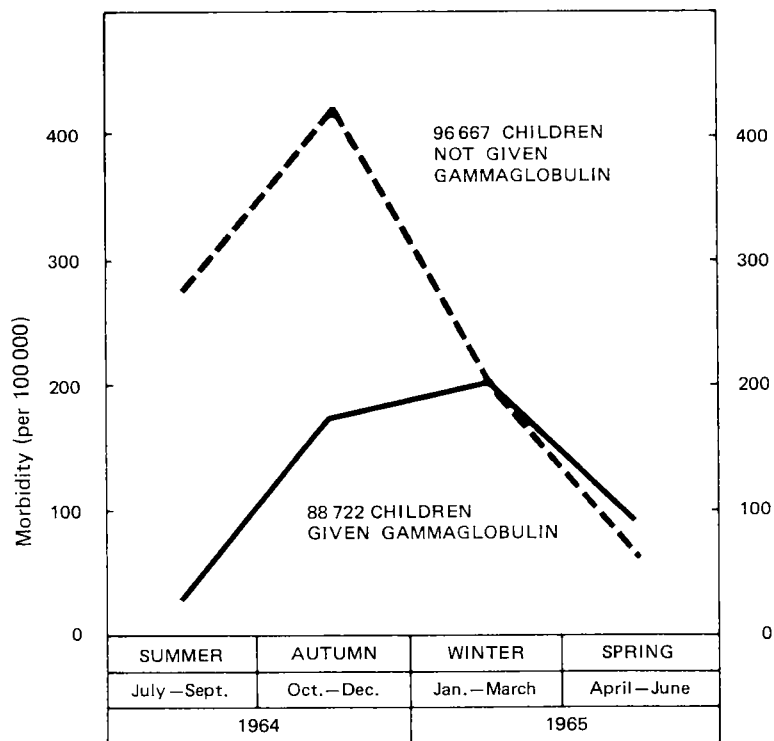
Results

A highly significant difference in morbidity was found between those protected with gammaglobulin and those who received a placebo (Fig. 2).

Application

This study provides evidence of how decision making can be improved by use of epidemiological measures.

Fig. 2. Morbidity in children aged 7 years from infectious hepatitis in Czechoslovakia; by calendar quarters, July 1964 – June 1965



REFERENCES

1. Červenka, J. [Follow-up of viral hepatitis morbidity in Czechoslovakia.] *Bratislavské Lekárske Listy*, 5: 531–540 (1973).
2. Červenka, J. & Masár, I. In: *Beiträge zur Hygiene und Epidemiologie der Virus hepatitis* [Papers on health and epidemiological aspects of viral hepatitis]. Leipzig, Barth, 1971, p. 96.

