

## INTERNATIONAL STUDIES OF ILLNESS AND HEALTH SERVICES

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### THE PROBLEM OF MEDICAL DEMAND OUTSTRIPPING RESOURCES

No nation, however affluent, can afford to be prodigal with its resources, and particularly with health, because clinical advances in medical treatment, and social expectations for it, may increase even faster than the population, especially in South America. Moreover, as the advances of the clinical sciences are applied to young populations it will carry more of them into the degenerative diseases of middle and later life, with neither cure nor prevention and often only prolonging a handicap at the expense of consuming limited resources. Today, Bogota has four artificial kidney machines which, if they were running, would extend the lives of only a few score patients and each at an annual operating cost of the total education of a physician or of 200 auxiliary nurses.

All countries face the problem of rising costs of medical care and of competition from other services for a share of the gross national product. Furthermore, the pool from which persons with needed specialised talents are to be recruited cannot be freely expanded. Accordingly, shortages both in buildings and in manpower are an inevitable prospect, even in highly developed countries. If a country could give good care to most of its population most of the time and can give care to all persons whose need is important, it would fulfill a realistic goal.<sup>1</sup>

No country has yet either sufficient relevant social or clinical data or the skills of top management to deploy and use the limited resources to the maximum effect. Much planning today can only be guesswork.

Britain must provide a free and comprehensive system of medical care and social security in the very decades that new clinical developments are causing the institutions for delivering them—e.g., hospitals, public health and general practice—to be obsolescent in their traditional roles. Moreover, a national health service with norms of provision and standard patterns of organization offers few contrasts and is bound to be limited in experiment; so Britain is forced to look outside at equally healthy and developed countries where the supply of resources and scheme of distribution are different. In Sweden, the United States and England, the populations are much the same and in general die from similar diseases and at similar rates, but high expenditure of the gross national product is not concordant with low death rates. Neither are the different systems of payment in each country all that are related to the use of the services. Compared with England and Sweden, the United States spends the largest and most rapidly increasing proportion of the GNP on medical care. They also have the most doctors, the highest rate of individual contact with patients and a high tempo of activity through their fewer hospital beds (Table 1). Yet their morbidity and mortality rates are not as good as Sweden's, which has far fewer doctors, each of whom sees his patients only half as frequently as does a physician in the United States. Although the English rate of hospitalization is one-third less than the others, it is reducing its supply of hospital beds by one-fifth across the country. In the Liverpool region, of some two million population, the plan is to reduce the acute medical beds by one-third if not by half.

In the good old days when hospitals were merely concerned with custodial and nursing care and surgery was limited to the "40 minutes in and out" permitted by primitive anesthesia, little change occurred from year to year in what medicine could do, and this little could be

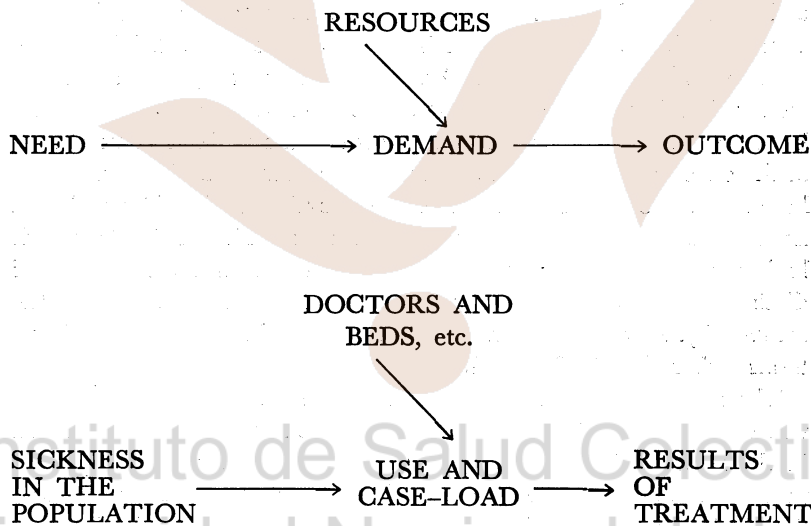
TABLE I. SUPPLY AND USE OF SHORT-STAY HOSPITALS AND DOCTORS IN THREE CULTURES<sup>1</sup>

	<i>Beds per 1,000 Popula- tion</i>	<i>In- patients</i>	<i>Average Days Stay</i>	<i>Staff Non-M.D. per 100 Days</i>	<i>Doctors per 100,000 Popula- tion</i>	<i>Doctor- Patient Contact per Year</i>
United States	3.7	134	8	241	137	5.3
England and Wales	4.4	82	15	—	127	4.7
Sweden	6.0	127	12	138	106	2.7

met by the simple resources. The administrator could proceed on the assumption that all provision must be good and equally so. He merely had to budget for a three per cent increase each year in each item of the old pattern. Today, even the most affluent nations cannot give the best care to every patient in need of it. Faced with conflicting priorities, the administrator must distinguish between what is necessity and what is luxury. He has to forsake the old yardsticks because historical trends may be actually misleading when both medicine and society are changing so rapidly. To be frank, what the medical planner is searching for today are the first fragments of information of each element of a system of the *input* into the scheme of medical care meeting the *needs* of the *illness* in society with the limited *services and skills* available to yield the most effective *outcome*. He dreams that such a systems analysis will offer continuous monitoring so that as disease and its control changes he can re-deploy his resources to another front in the spectrum of services. By such a system of intelligence he would be in command of the strategy in his campaign against disease in the community.

Formulation of Systems Analysis for Planning and Management

The formulation of the elements in the equation are very simple:



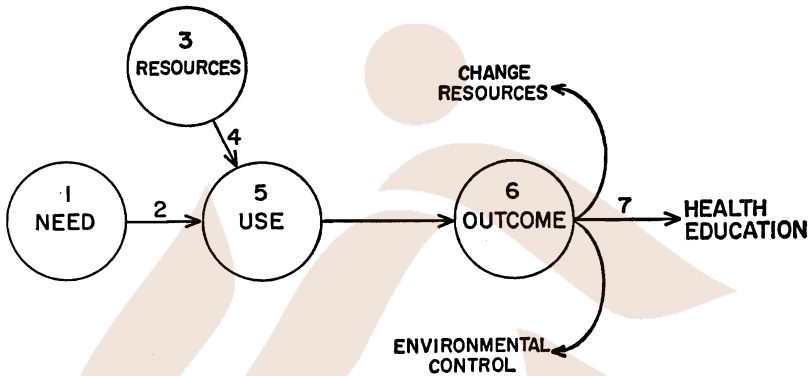
In the field of medicine, *need* is the illness in the community that

can be measured by the traditional epidemiology of death, disease and disability and as these relate demographically and economically to the population. These basic needs, however, become translated into felt needs only through a nexus of personal, cultural and social forces that include perception and knowledge about sickness, expectations for its relief and the attitudes between the public and the health professions, and between patient and therapist. It is out of this complex interaction between need and perception that the action may ensue as a *demand for the use* of a service. But the levels of use even in one country fluctuate in all dimensions with little rhyme and even less reason.<sup>2</sup> At the same time the data on use of services accumulates in the files of the agencies. It is usually collected primarily for accounting purposes, but in the absence of other straws in the wind it is unfortunately often used for planning. When these data record the clinical caseload being treated, they seldom include its severity or the investigations and the operations performed. Furthermore, that medical care is rarely related to populations defined by age, sex, social, industrial or geographic coverage. Thus the caseload as a service is not defined.

The information on *resources* is also readily available in most countries, but usually on an inventory, counting heads and beds, doctors, nurses and personnel on payrolls, and operating theaters in hospitals, and not in functional terms of activity and performance. The financial costs from the payrolls and materials consumed is accounted for by the agencies as in a good hotel service. The treasury can give the detailed costs of keeping a body in a hospital bed, but those costs bear no relationship at all to the value of the event to the patient. Some studies of the systems of medical care in some countries have given fragments here and there of the elements of the equation so far discussed, but none offers the results of the *outcome* of the system in the simple though basic terms of change in the expectation of life, or the follow-up of disability that may handicap the productivity of the worker for the community. Any cost-benefit analysis should be in social and disability terms rather than in financial.

The relationship of these elements in the simple equation is illustrated in Figure 1, along with the appropriate scientific skills concerned in their elucidation. In England, such skills are being developed as practical methods for the planning of health services, but they are still limited in their application to the one region of Liverpool. This Colombian exercise is the first comprehensive attempt to apply them to an entire nation.

**FIGURE 1. THE EFFECTIVE USE OF HEALTH RESOURCES TO MEET NEED FOR MEDICAL CARE.**



*Subject*

1. Sickness in the community.
2. Translation of need into use.
3. Resources available.
4. Activities of personnel and facilities.
5. Use of medical care for patients.
6. Outcome of medical care.
7. Priorities and policy.

*Science*

1. Epidemiologists.
2. Social scientists.
3. Statisticians. Manpower.
4. Operations research.
5. Clinical and medical management.
6. Surveys, medical statistics.
7. Health administration and education.

*Colombian Method*

1. Household interview and medical examination of population sample.
2. Variables of urban-rural, education and social class.
3. Inventory of health manpower, hospitals, clinics and facilities.
4. Activity studies of doctors, nurses and facilities.
5. Clinical case-load by disease and complication by patient characteristic.
6. Mortality statistics and evaluation.
7. The challenge of implementation.

**SOME INTERNATIONAL COMPARISONS**

Only in the past decade has international comparability been achieved in a few epidemiological studies, so comparisons of medical caseloads by a standardized method are still rare.<sup>3</sup> For many years, however, the routine inventory of health personnel and residential resources of beds has been collected by the World Health Organization and analyzed for each country (and it is salutary that these interesting data have been so ignored by health planners). A glance at the wide variations in provision of hospital beds and their use (Table 2) should provoke many nations to question their supply. Chile achieves a turnover of patients almost equal to England, but with only half the supply

TABLE 2. HOSPITAL PROVISION AND USE

	Per 1,000 Population	
	All Beds	Total Patients per Year
Ireland	20	
Sweden	14	140
Czechoslovakia	12	185
England	10	90
United States	9	150
U.S.S.R.	8	196
Israel	6	122
Portugal	5	50
Yugoslavia	4	70
Chile	5	85
Costa Rica	4.5	104
Colombia	3	50
Venezuela	3	
Peru	2.5	31
Honduras	2	35

TABLE 3. RESOURCES OF HEALTH PERSONNEL IN FIVE COUNTRIES

	United States (1963)	Per 100,000 Population				Ja- maica (1964)
		Sweden (1962)	England and Wales (1963)	Yugo- slavia (1962)	Colombia (1963)	
Doctor	145	104	119	77	50	26
Dentist	56	71	27	15	23	5
Other dental	67	111	0.5	12	10	3
Pharmacist	63	32	51	18	8	16
Midwife, etc.		23	36	44		20
Registered nurse	294	500	238	65	6	112
Other nurse	341	500	223	108	21	4
Laboratory	36		6	12		5
X-ray	39	3	10	3		1
Physiotherapy	29	31	13	3		1
Ratio						
Doctors to 1 Dental	1	.6	4	3	1.5	3
Nurses to 1 Doctor	4.5	12	4	2	.5	3

TABLE 4. PERSONS IN CONTACT WITH HEALTH WORKER IN PAST TWO WEEKS

	Chester	Per 1,000 Population		Colombia*
		Chittenden	Smederevo	
Doctor	150	160	140	60
Urban	160	150	180	90
Rural	150	160	110	30
Nurse	70	20	70	2
Pharmacist	30	10	10	10
Other	90	70	40	10

\* Not age-standardized.

of beds. Another glance at the supply of health personnel should provoke even more questions (Table 3). The United States enjoys the highest rate of staffing in almost all categories, yet it is eager for more manpower. However, the public in Chester, England, and Smederevo, Yugoslavia, saw their doctor almost as often as patients in Chittenden, Vermont, and a nurse over three times as often (Table 4). Patients in Chester consulted the pharmacist twice as often as in Vermont—or in Colombia, which, however, had only one-sixth the supply. The ratio of the different strata in the hierarchy of medical skills by years of training produces different profiles for each country (Figure 2). Colombia is upside down to the United States and England. Top heavy with “colonels” and with so few pairs of female hands, how can one run a war, or a factory or a health service? Colombia has more trained dental staff than England, but less than ten per cent auxiliary nurses and only three per cent trained nurses. The investment in the education of one dentist would train perhaps a hundred nursing aides. It is still only in the Scandanavian countries that one sees a series of small pyramids of skills in each branch of the health professions. Although Jamaica has only half the supply of doctors as Colombia, it is in better balance of ratios of doctors to dentists and to nurses. That may contribute to its better performance in control of sickness.

Such an inventory of “heads” on the payroll does not tell their weekly hours of work in contact with patients or in administration, teaching or study. Neither does it describe the level of professional activity being performed. These were attempted in the Colombian study where young girls with a few months training in intravenous infusions save the lives of dehydrated infants. By contrast, highly skilled nurses in England still work as waitresses, clerks, messengers and cleaners.

FIGURE 2. HEALTH MANPOWER, PER 10,000 POPULATION AND YEARS OF TRAINING

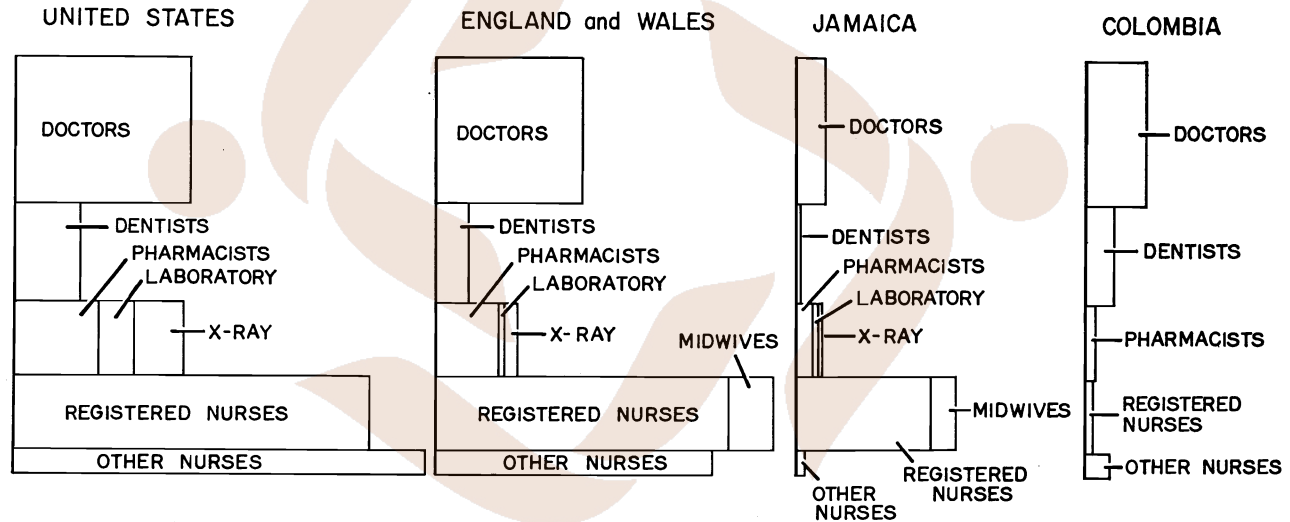




TABLE 5. HOSPITAL INPATIENTS IN FIVE SOUTH AMERICAN COUNTRIES

	<i>Per 10,000 Population in 1964</i>				
	<i>Costa Rica</i>	<i>Chile</i>	<i>Colombia</i>	<i>Honduras</i>	<i>Peru</i>
Percent covered	100	86	85	85	90
Tuberculosis	9	23	6	7	13
Other infection	64	29	34	19	15
Gastroenteritis	93	27	22	21	11
Nutritional	24	3	10	5	1
Early infancy	15	16	4	1	3
Pneumonia and bronchitis	45	41	14	11	11
Other respiratory	37	58	24	9	2
Strokes	3	4	2	1	1
All heart	16	15	7	4	5
All cancer	15	11	5	5	5
Appendicitis	10	18	6	3	7
Hernia and obstruction	18	16	15	6	7
Peptic ulcer	6	4	4	3	7
Accidents	95	52	42	35	35
Abortion	43	61	30	16	83
Total delivery	316	249	153	88	
Total patients	1006	787	485	309	295
Total beds	45	43	27	20	25

TABLE 6. MALES IN SHORT-STAY HOSPITALS WITH COMMON MEDICAL CONDITIONS, IN THREE AREAS

	<i>Per 10,000 Population</i>		
	<i>Liverpool</i>	<i>Uppsala</i>	<i>New England</i>
Coronary	30	48	56
Bronchitis	28	8	25
Pneumonia	26	13	34
Stroke	12	17	21
Diabetes	6	17	8
Asthma	3	19	6

The mere count of hospital beds does not describe their caseload of medical conditions even when subdivided by clinical specialty. Furthermore, when the clinical diagnosis is recorded it is sometimes possible to ignore age and sex groups as in nutritional diseases of infancy, strokes and abortions. But one cannot even speculate on the wide variations shown in the common diagnoses listed in Table 5. Hospitalization for appendicitis is six times more common in Chile than in Honduras. Accidents in Costa Rica are twice as often in hospital as in the four other Central American countries.

To know what a hospital is doing, its caseload needs to be described by the same epidemiological criteria as used in mortality rates, i.e., by age, sex and preferably social class or other population characteristics. Moreover, the complications or associated clinical diagnoses should be included to give some clue on the severity of the condition. A ten per cent sample is often adequate, as in England, where the caseload of the Liverpool region has been compared on the standard British Hospital In-Patient Enquiry basis with a one per cent sample of New England Hospitals and a 100 per cent sample of the Uppsala region of Sweden.<sup>4</sup> Even in such similar areas, the hospitals are used at quite different rates for common medical conditions (Table 6). New England hospitals have almost twice as many men with strokes and coronary heart disease as do the Liverpool hospitals.

Possibly, one country treats more of the less severe cases in hospital than do the others. The gallbladder and the appendix, however, can only be removed once, yet these rates vary by 700 per cent and 160 per cent in men in the three regions (Table 7). Even a usually visible lump

TABLE 7. MAJOR ABDOMINAL OPERATION IN SHORT-STAY HOSPITALS IN THREE AREAS, MALES

	<i>Per 10,000 Population</i>		
	<i>Liverpool</i>	<i>Uppsala</i>	<i>New England</i>
Total abdominal operations	93	130	168
Hernia inguinal	26	35	49
other	4	4	8
Appendix	23	32	20
Hemorrhoids	9	4	7
Gallbladder	3	21	10
Peptic ulcer	10	11	7
Other	18	23	67

TABLE 8. MAJOR GYNECOLOGICAL OPERATION IN SHORT-STAY HOSPITALS IN THREE AREAS

	<i>Per 10,000 Population</i>		
	<i>Liverpool</i>	<i>Uppsala</i>	<i>New England</i>
Total gynecological operations	76	141	172
D. and C.	25	79	65
Abdominal hysterectomy	14	8	31
prolapse repair	14	7	11
Salpingo-oophorectomy	4	6	11
Other	19	34	54

TABLE 9. MEAN DURATION OF STAY FOR SELECTED COMMON CONDITIONS, IN THE AGE AND SEX GROUP IN WHICH THEY MOST COMMONLY OCCUR

	Sex	Age	Liverpool 1962	Uppsala 1964	New England 1962	Ja- maica 1967
Varicose veins	F	45-64	21.3	8.0	11.6	
Tonsils and adenoids	M	5-14	4.4	4.1	1.6	2.5
Acute appendicitis without complications	M	5-14	10.9	4.7	5.9*	3
Hernia	M	65+	18.1	9.0	8.3	3
Hemorrhoids	M	45-64	12.6	5.9	6.1	8
Gallbladder	F	65+	17.2	14.5	16.3	
Fibroid	F	45-64	20.5	9.0	12.0	8

\* All acute appendicitis, with and without complications.

in the groin is repaired almost twice as often in New England as in Liverpool.

Swedish women have almost twice as many gynecological operations as their British sisters, but still less than American females (Table 8)—surely a fertile field for a curious anthropologist to explore and shed some light on such rituals.

The tempo of activity on the hospital ward must differ considerably between each of these developed countries because the length of stay for standard surgical procedures is so different. Such common repair operations may be used as "tracers" in the rate of turnover of beds in hospital and they can indicate the productivity or output of the resources invested (Table 9). Despite having more doctors than Uppsala, and more nurses than New England, the Liverpool hospitals usually take twice as long to discharge similar surgical patients.

These simple international comparisons of the different caseloads, their rates and hospital tempo of activity provide the basis for further exploration. They open up avenues for further study by each of the medical, social and operational methods indicated in Figure 1.

#### LIMITATIONS OF INTERNATIONAL COMPARISONS

Even in such developed areas as New England, Sweden and Britain, practicing a similar brand of Western medicine, the border-lands between sickness, welfare or crime are not distinct. Often the frontier between emotional and social sickness and sin is not clear. Thus medi-

cine and society can differ in their approach to the juvenile delinquent or the middle-aged alcoholic. Again in such aging societies the downward spiral of chronic disease leads to loss of wage-earning, poverty and isolation, and the infirm old gentleman today can be viewed as a dirty old outcast tomorrow. (But whether they are medical or social casualties, such clients are a burden on society one way or another.)

International comparisons are fraught with more difficulties when they turn to Yugoslavia or countries like those in South America, going through the industrial revolutions that other countries passed through over half a century ago. Moreover, the rate of their change is so much faster as they jump within a decade or so from mule to jet plane, or from rural or city slum to skyscraper. The rural peasants forsake their villages for the regional or national capital city, bypassing what might have been market towns. Such migration is selective and increases the gap between overall rural poverty with its meager frontier medicine and the industrial prosperity of the cities with their modern hospitals concerned with cancer and strokes.

In developed countries the control of birth and death has produced a remarkably similar and static pattern of morbidity and mortality common to all since the 1950's. In South America, this pattern with high risks of death postponed until well into middle-age and later life is enjoyed only by the elite oligarchy and the small but growing middle-class in the towns. The potentials of preventive medicine and the sanitary sciences have not yet reached the masses of the population and particularly the vulnerable babies, so that in Colombia, one-third of all deaths are of babies less than twelve months old, and half of all deaths are of children under five years of age. To meet such infant wastage, birth rates are naturally high, with a fatalistic attitude to survival at least in infancy, if not at all ages (Table 10). Each country has its own traditional and cultural values of life and death, and these can vary by age and social group. In Britain, it is the elderly who are neglected. They are the unwanted generation and the first impoverished leisured class in British history—and it is the over-65's who consume half the bed days in British acute general hospitals.

Although half of all deaths are in young children in Colombia, only ten per cent of infant boys are admitted into hospital beds, and, curiously, only four per cent of girls (Table 11). Yet they die from the very diseases that might be prevented by medical treatment even if this has been delayed almost to the terminal stages of dehydration or malnutrition. By contrast the main cause of death from age 15 to 44 appears

TABLE 10. LIMITATIONS OF HOSPITALS IN REDUCING DEATH RANK IN CAUSES OF DEATH, COLOMBIA, 1965

Age	First	Second	Rank Third	Fourth
1-4	Gastroenteritis*	Pneumonia*	Bronchitis*	Nutrition*
5-14	Accidents, except motor	Gastroenteritis*	Other infections*	Pneumonia*
15-24	Homicide	Accidents, except motor	Suicide Cancer	Motor accidents Tuberculosis
25-44				
45-64	Cancer	Heart	Stroke	All violence
65+				

\* May be affected by primary prevention and medical treatment although the background depends on nutrition, material education and sanitation. All other conditions are fatal immediately or within some months or the arterial pathology precedes symptoms by decades.

TABLE 11. AGE DISTRIBUTION IN POPULATION, IN HOSPITAL AND DEATHS IN COLOMBIA, 1964

Age Group	Population %	Inpatients		Deaths %
		Male	Female	
-1 year	3.6	10.2	4.2	32.0
1-4	14.0	10.4	4.5	14.3
5-14	29.0	12.2	5.0	5.0
15-24	18.0	15.6	30.2	4.0
25-44	22.0	10.7	45.7	9.1
45-64	10.0	16.2	7.3	10.3
65-74	2.0	4.4	1.6	8.1
75+	0.8	2.1	0.8	11.0

to be homicide, and indeed fatal accidents and suicide fill the top four fatal causes as violent deaths. Over age 45, the pattern of mortality is dominated by cancer and arterial disease as in the developed countries (Table 10). Medical care and hospital treatment can have little effect on such sudden deaths or those preceded by silent decades of arterial pathology. Yet it is the adult males who consume over two-thirds of hospital admissions. It would seem that the hospital resources in South America, although dominating the financial budget of all health services, can make little impact on the outcome of disease control in terms of improvement in death rates (as in Britain too; but Colombia has the opportunity of dramatic savings in infant deaths that is denied to Britain).

If death and survival have a different meaning in communities where the risks are so different, then sickness and disability probably carry different meanings also. The perception of malaise may be as different as its expression or the expectation of enjoying rude health and fitness. It may be premature to use a questionnaire of perceived sickness and expressed symptoms for comparisons between such different cultures. With much the same morbidity in Vermont and Chester, one would expect about the same number, 120 and 110 per 1,000 population, to report limitation of activity in the past two weeks, but not that the Americans should say they took to bed for twice as long. The samples may have been too small because it is also difficult to understand that a middle-aged Englishman should say his activity was limited for three weeks in the year in contrast to one week in Vermont, although both spent only two days in bed. But the differences in the standardized rates for Yugoslavia are even more puzzling in the feasibility pilot stage of exploring such new fields.

#### SUMMARY

These studies can only be the beginning of the beginning. It is too early to consider international comparisons. At the same time, all systems of medical care in all countries are in difficulties and the scientific skills for tackling them are only being developed in some pieces in some countries and other bits in a few others, and rarely are all the disciplines combining together even in a single country. This Colombian project is the first test-bed for most of the methods to be applied together on a national basis. Moreover, for the first time in one country sufficient information is available to make logical decisions for the effective deployment of limited health resources with the possibility of measuring the results of such health planning from year to year.

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