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PART I

AN ECONOMIST'S VIEW OF HEALTH AND MEDICAL CARE

1

The Contribution of Health Services to the American Economy

Victor R. Fuchs

INTRODUCTION

Good health is one of man's most precious assets. The desire to live, to be well, to maintain full command over one's faculties, and to see one's loved ones free from disease, disability, or premature death are among the most strongly rooted of all human desires. That is particularly true of Americans, who, on the whole, eschew the fatalism or preoccupation with the hereafter that is characteristic of some other cultures.

These sentiments are widely held. Therefore, is not the question—"What is the contribution of health services to the United States economy?"—presumptuous? Who can place a value on a life saved, on a body spared from pain, or on a mind restored to sanity? If not presumptuous, is not the question a foolish one, and likely to evoke an equally foolish answer?

When an economist enters an area such as health—so tinged with emotion, so enveloped in an esoteric technology and vocabulary—he runs a high risk of being either irrelevant or wrong. What, then, is the justification for such an inquiry? The principal one is the fact that the question of the contribution of health services is being asked and answered every day. It is being asked and answered implicity every time consumers, hospitals, universities, business firms, foundations, government agencies, and legislative bodies make decisions concerning

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the volume and composition of health services, present and future. If economists can help to rationalize and make more explicit the decision-making process, provide useful definitions, concepts and analytical tools, and develop appropriate bodies of data and summary measures, they will be making a contribution of their own to health and to the economy.

Plan of the Paper

This paper has limited objectives. It does not pretend to offer a measure of the contribution of health services. Even partial completion of such a task would require a major effort by a research team over a period of several years. Statistics are presented, but for illustrative purposes only.

My primary purpose here is to set out in nontechnical terms how the problem looks to an economist, to discuss definitions, concepts, and methods of measurement, to indicate sources of information, and to suggest promising research approaches. The paper offers a highly personal view of the problem rather than a synthesis of all points of view. Some discussion of relevant literature is included, but no attempt has been made to be exhaustive. Moreover, the scope is limited to the assigned topic and does not provide a general review of the health economics literature. An over-all survey of the field, through 1964, is available in Klarman [26]. In addition, useful bibliographies may be found in Mushkin [44], Wolf [79], and the proceedings of a 1962 conference at the University of Michigan on the economics of health and medical care [76].

First this paper will consider the meaning of "contribution." Then it will go on to discuss the inputs to health services, the outputs of health services (with special emphasis on health), and the contribution of health to the economy. It concludes with a brief summary and suggestions for research.

THE CONCEPT OF CONTRIBUTION

One frequently reads discussions of the contribution of an industry couched in terms of the number of jobs it provides, the volume of its capital investment, and the value of its purchases from suppliers. Such use of the term is ill-advised.

In economic terms the contribution of an industry to the economy should be measured in terms of its output (what does it provide for the economy?), not in terms of its input (what drains does it make

on the available supply of resources?). The fundamental fact of economic life is that resources are scarce relative to human wants. Despite a great deal of loose talk about automation and cybernetics, the desires for goods and services in this country and the world exceed the available supplies. Indeed, if this were not the case, no reason could be found to study the economics of health or the economics of anything else. Additional resources would be devoted to health up to the point where no health want would be unmet. That this cannot be done at present is obvious. The reason should be equally obvious. To devote more resources to health services, the people must be willing to forego some other good or service. To the extent of the unused capacity in the economy, some increase could be obtained without diversion from other ends. The extent of this unused capacity, however, relative to the total economy, is very small at the present time.

What is the output of the health industry? No completely satisfactory answer is available. One possible way to think about the problem is to distinguish three different kinds of output that flow from health services. They are health, validation services, and other consumer services.

Probably the most important of these, and certainly the one that has received the most attention, is the contribution of health services to health. However, to define the output of the health industry in terms of some ultimate utility, such as health rather than health services, runs counter to the general practice followed by economists in the study of other industries. For the most part, economists follow the dictum, "whatever Lola gets, Lola wants." They assume that consumers know what they want and know how to satisfy these wants. They further assume that goods and services produced under competitive conditions will be sold at a price which properly reflects (at the margin) the cost of production and the value to the consumer. The health industry, however, has certain characteristics, discussed by Arrow [8], Klarman [26], and Mushkin [45], which suggest that special treatment is required. In the present context, three important differences could be emphasized between the health industry and the "typical" or "average" industry.

Consumer Ignorance

Although expenditures for health services account for more than 6 per cent of all personal consumption expenditures, consumers are, for the most part, terribly ignorant about what they are buying. Very few industries could be named where the consumer is so dependent upon the producer for information concerning the quality of the product. In the typical case he is even subject to the producer's recommendation

concerning the quantity to be purchased. A recent report by the American Medical Association says flatly, "The 'quantity' of the hospital services consumed in 1962 was determined by physicians [4, vol. 1, p. 19]."

The question is even more complicated, as indicated in the following statement by J. Douglas Colman, president of the New York Blue Cross [5]:

> We must remember that most elements of hospital and medical care costs are generated by or based on professional medical judgment. These judgments include the decision to admit and discharge patients, the decision to order the various diagnostic or therapeutic procedures for patients, and the larger decision as to the types of facilities and services needed by an institution for proper patient care. For the most part, these professional judgments are rendered outside of any organizational structure that fixes accountability for the economic consequences of these judgments.

One reason for consumer ignorance is the inherent uncertainty of the effect of the service on any individual. How can the lay person be expected to know the value of a particular procedure or treatment, when in many cases the medical profession itself is far from agreed? Also, many medical services are infrequently purchased. The average consumer will buy many more automobiles during a lifetime than he will major operations. Therefore, he cannot develop the necessary expertise. Furthermore, the consumer is often not in a good position to make a cool, rational judgment at the time of purchase because he is ill, or because a close member of his family is ill. Finally, the profession does little to inform the consumer; in fact, it frequently takes positive action to keep him uninformed. This leads to the second important difference.

Restrictions on Competition

In some other industries where the possibilities for consumer ignorance are considerable, the consumer obtains protection through the competitive behavior of producers. If the producers are engaged in vigorous competition with one another, some of them, at least, will go out of their way to inform the consumer about the merits of their product and those of the competition. Also, middlemen, such as retailers, are usually involved, one of whose main functions is to provide information and dispel consumer ignorance. In the case of physicians' services (and this is the keystone to health services because of the dominant role of the physician in the industry) the reverse is true. In the first

place, severe restrictions on entry are assured through the medical profession's control of medical schools, licensing requirements, and hospital appointments. Advertising is forbidden and price competition is severely frowned upon. Critical comment concerning the output of other physicians is also regarded as unethical.

A good example of the conflict and confusion on this point can be found in the AMA report previously cited. First an extensive discussion of medical care in America is presented, and an attempt is made to identify it with the competitive free enterprise system. The report then goes on to say, "The Medical Care Industry has as its prime social goal the development and maintenance of optimum health levels [4, vol. 1, p. 9]." The authors apparently fail to realize the inconsistency of this statement with their attempt to place the industry in the context of a market system. In such a system, industries do not have "social goals." The goal of the individual firm is maximum profit (or minimum loss); the achievement of social goals is a by-product of the profit-seeking activities of individual firms and industries.

Numerous arguments can be advanced in support of each of the restrictive practices followed by the medical profession. (Arrow's discussion [8] of the role of uncertainty in health is particularly relevant.) In the present context, these restrictive practices mean that an appraisal of the industry's output and performance by economists cannot be pursued using the same assumptions that would be appropriate in appraising the output of a more competitive industry.

The Role of "Need"

Health services are one of a small group of services which many people believe should be distributed according to need rather than demand (i.e., willingness and ability to pay). Other services in this category, such as education, police and fire protection, and sanitation are typically provided by government. For a time philanthropy and the generosity of physicians were relied upon to achieve this distribution for health services, but now increasing reliance is being placed on taxation or coverage in compulsory insurance schemes. If "need" is to be the criterion, however, a closer examination of the role of health services in filling that need seems in order.

If a person "demands" an article of clothing or a haircut or some other good or service, in the sense of being willing and able to pay for it, usually no special cause for concern or inquiry arises on the part of anyone else regarding either the need underlying the demand or whether the purchase will satisfy the need. However, if a service,

such as health, is to be provided to others on the basis of "need," then those paying for it would seem to have some right to inquire into the actual presence of "need," and an obligation to determine whether or how much the service actually satisfies the need. Because need is often the criterion for obtaining health services, much of the payment for these services is by a "third party." This means that the consumer has less incentive to make certain that the output (what he is getting) is truly worth the cost.

These characteristics of the health industry indicate why output cannot simply be equated with expenditures. However, that does not mean that economic analysis cannot be applied to this industry. On the contrary, precisely these special characteristics make the industry an interesting subject for economic analysis, both from the scientific and public policy points of view.

Total Versus Marginal Contribution

In studying the contribution of health services to health, the *total* contribution must be distinguished from the *marginal* contribution. The total contribution can be appraised by asking what would happen if no health services at all were available. The results would almost surely be disastrous in terms of health and life expectancy. A reasonably safe conclusion seems to be that the total contribution is enormous. A modern economy could not continue to function without some health services.

The marginal contribution, on the other hand, refers to the effects on health of a small increase or decrease in the amount of health services provided. To expect a small change in services to have a large effect on the level of health is, of course, out of the question. But that is not what is being measured. Rather, the question is, what is the relative effect on health of a small relative change in health services?

The reason this question is crucial is that changes are usually being made at the margin. Most decisions are not of the "all or nothing" variety, but involve "a little more or a little less." The goal of an economic system, in terms of maximum satisfaction, is to allocate resources in such a way that the last (marginal) inputs of resources used for each purpose make contributions that are proportionate to their costs.

HEALTH SERVICES

"Health services" can be defined as services rendered by:

1. Labor: personnel engaged in medical occupations, such as doc-

tors, dentists, and nurses, plus other personnel working directly under their supervision, such as practical nurses, orderlies, and receptionists.

2. Physical capital: the plant and equipment used by this personnel, e.g., hospitals and x-ray machines.

3. Intermediate goods and services: i.e., drugs, bandages, and purchased laundry services.

This definition corresponds roughly to what economists have in mind when they refer to the "health industry." Payment for this labor, capital, and intermediate input is the basis for estimating "health expenditures."

This definition seems satisfactory for the purposes of this paper, but some classification problems are worth mentioning. First, some health-related resources might or might not be included in health services, such as the provision of a supply of sanitary water. A second problem arises because a portion of the personnel and facilities in hospitals is used to produce "hotel services" rather than health. This paper will not exclude such inputs from health services, but will try to allow for them by showing that part of the output consists of other consumer services (see Figure 1-1 on p. 23).

One of the greatest problems concerns the unpaid health services that people perform for themselves and for members of their families. According to present practice in national income accounting, this labor input is not included in health services. Therefore, this "home" production must be treated as part of the environmental factors that affect health.

Approximately two-thirds of the value of health services in the United States represents labor input. Somewhat less than one-sixth represents input of physical capital, and the remainder represents goods and services purchased from other industries. These are all rough estimates. Information about the volume and composition of health services must be derived from a variety of official and unofficial sources. No census of the health industry compares to the census of manufacturing, trade, or selected services. As the importance of the health industry grows, the government may wish to consider whether a periodic census of health should be undertaken.

Present sources of information are of two main types: those that give information about expenditures for health services and those that report on one or more aspects of inputs of resources. A good example of the former is the material supplied by Reed and Rice [48]. A few problems arise when these data are used to measure inputs of health services. First, some of the items represent investment expenditures by

the health industry rather than payment for current services. Expenditures for construction and medical research are the most important ones in this category. No particular economic justification may be found for treating these as inputs in the year that the investment takes place. On the other hand, current input of capital may be understated to the extent that hospital charges do not include an allowance for depreciation and interest.

The expenditures shown for drugs, eyeglasses, etc. do not all represent payment for intermediate goods purchased from other industries. A substantial portion (probably about one-half) represents the labor services of pharmacists, opticians, and the like, and the services of the plant and equipment used by this personnel.

The net cost of health insurance represents output of the insurance industry. It may be thought of as an intermediate service purchased and resold by the health industry.

A final point concerns the failure of expenditures data to reflect contributed labor. This results in an underestimate of labor input, especially in hospitals.

Other sources of information on expenditures for health services include: the Office of Business Economics [67, 68, 69], detailed annual data on personal consumption expenditures for health services; the Social Security Administration [41], special emphasis on government spending for health services; the Public Health Service [71, 72], expenditures cross-classified with characteristics of the individual incurring the expense; the Health Information Foundation [6]; and the Bureau of Labor Statistics [62, 63].

The decennial population census [65] is an excellent source of information about labor inputs to health services. In addition to providing a complete enumeration of the number employed and their geographical location, numerous economic and demographic characteristics are described in considerable detail. With the aid of the 1/1000 sample of the 1960 census [66], comparisons may be made within the health industry and between health and other industries on such matters as education, earnings, age, sex, race, and hours of work. The labor input to health services may be defined as all persons employed in the health and hospital industry, plus those persons in medical occupations employed in other industries. Health employment, so defined, amounted to almost three million in 1960. This represented almost 5 per cent of total employment.

Another good source of data on labor input is provided by the Public Health Service [74]. This source is particularly useful for those in-

terested in such characteristics as physicians' type of practice, specialization, medical school, and location of practice.

Information on capital inputs to health services is more difficult to obtain. The annual guide book of *Hospitals* reports the book value of hospital plant and equipment [3]. This was given as 21.3 billion dollars in 1963. This figure is biased downward as a measure of present value because of the rise in prices of construction in recent decades. It is biased upward to the extent that hospitals have failed to make deductions for depreciation. This same source also provides useful data on labor input by type and size of hospital.

Some information on the capital inputs associated with the labor input of physicians can be gleaned from the reports of the United States Internal Revenue Service [75]. According to these reports, 163,000 returns were filed for unincorporated businesses under the heading of "physicians, surgeons, and oculists" in 1962. These returns showed business receipts of six billion dollars. They showed net rent paid of 250 million dollars (most of this represents payment for capital services) as well as depreciation charges of 190 million dollars. Some information for other types of health services, such as those provided by dentists and dental surgeons, is also available from the same source.

One important source of information about inputs of equipment and intermediate goods that has not received much attention is the quinquennial Census of Manufactures [64]. The latest one provides considerable data on shipments by manufacturers of drugs, ophthalmic goods, dental equipment and supplies, ambulances, hospital beds, and many other health items.

Real Versus Money Costs

One problem in measuring inputs that has already been alluded to in connection with volunteer labor is the need to distinguish between "real" and "money" costs. The person who is not an economist usually thinks of the cost of health services in money terms; when more money has to be spent, costs are said to be rising. This approach is readily understandable and for some purposes useful and proper. The analysis of many problems, however, requires a stripping away of the money veil and an examination of "real" costs. The real cost to society of providing health services, or any other good or service, consists of the labor and capital used in the industry, plus the cost of producing the intermediate goods and services. For instance, if the workers employed in a given hospital are unionized, and they negotiate a large increase in wages, the money costs of that hospital clearly rise, other factors

remaining unchanged. But the real cost of that hospital service has not changed at all.

In a perfectly competitive market economy, money costs usually provide a good measure of real costs. But in the health industry, with its curious mixture of philanthropy, government subsidies, imperfect labor markets, and contributed labor time, concentration on money costs alone may frequently be misleading. Good decisions about the allocation of resources require information about the real costs involved.

One important element of real cost is often overlooked, namely, the time of the patient. When the patient is ill, the value of this time (measured by alternative opportunities) may be very low. But, in calculating the costs of periodic medical examinations and routine visits, omitting this cost would be a mistake [9].

HEALTH SERVICES AND HEALTH

Any attempt to analyze the relationship between health services and health runs headlong into two very difficult problems. The first concerns the definition and measurement of levels of health, or at least changes in levels. The second involves an attempt to estimate what portion of changes in health can be attributed to health services, as distinct from the genetic and environmental factors that also affect health. Therefore, the question of definition and measurement of health levels is next on the agenda, while the second problem is examined below.

What is Health?

Definitions of health abound. Agreement is hard to find. The oft-quoted statement of the World Health Organization [80] is framed in positive (some would say Utopian) terms: "A state of complete physical and mental and social well-being." Others, e.g., Ffrangcon Roberts [49], simply stress the absence of, or the ability to resist, disease and death.

A few points seem clear. First, health has many dimensions—anatomical, physiological, mental, and so on. Second, the relative importance of different disabilities varies considerably, depending upon the particular culture and the role of the particular individual in that culture. Third, most attempts at measurement take the negative approach. That is, they make inferences about health by measuring the degree of ill health, as indicated by mortality, morbidity, disability, et

cetera. Finally, with respect to health, as in so many other cases, detecting changes in health is easier than defining or measuring absolute levels.

Indexes of Health

The most widely used indicators of health levels are those based on mortality rates, either age-specific or age-adjusted. The great virtues of death rates are that they are determined objectively, are readily available in considerable detail for most countries, and are reasonably comparable for intertemporal and interspatial comparisons.

Health experts rely heavily on mortality comparisons for making judgments about the relative health levels of whites and nonwhites in the United States, or of smokers versus nonsmokers, and for other problems. A recent survey of health in Israel [23], for example, concluded:

> The success of the whole system of medicine in Israel is best judged, not by an individual inspection of buildings or asking the opinions of doctors and patients, but by an examination of the health statistics of the country. Infant mortality is about the same as in many European countries, and life expectancy is equal to, or better than, most.

The tendency in recent years has been to dismiss mortality as a useful indicator of health levels in developed countries because very little intranational or international variation occurs. These reports of the demise of mortality indexes are premature.

Differences within the United States are still considerable. The most important differential is race, but even considering rates for whites only, the age-adjusted death rate (average 1959–61) in the highest state is 33 per cent greater than in the lowest; the highest infant mortality rate is 55 per cent above the lowest; and the death rate for males 45–54 in the worst state is 60 per cent higher than in the state with the lowest rate.

Comparing the United States with other developed countries, the differences are even more striking, as shown in Table 1-1. For males 45–54 (a critical age group from the point of view of production), the United States has the highest rate of any country in the Organization for Economic Cooperation and Development (OECD), a rate which is almost double that of some of the other countries. Such gross differences surely present a sufficient challenge for scientific analysis and for public policy.

Another argument that seems to underlie the objections to mortality indexes is that age-adjusted death rates (and average life expectancy)

TABLE 1-1

Indexes of Death Rates in OECD Countries Relative to the United States, Average 1959–61

Country	Age-adjusted Death Rate[a]	Infant Mortality	Mortality Males 45–54	Mortality Females 45–54
United States	100	100	100	100
White	96	88	94	87
Nonwhite	138	164	155	220
Iceland	78	62[c]	62	81
Netherlands	82	63	57	65
Norway	82	74[c]	54	58
Sweden	86	63	52	69
Greece	86	155	56	64
Denmark	90	85[c]	59	78
Canada	92	107	76	79
Switzerland	94	83	67	75
France	96	105	89	83
Italy	98	166	74	77
Belgium	102	113	82	79
United Kingdom	103	87	76	85
Spain	104[b]	178	75[b]	84[b]
West Germany (excluding Berlin)	107	129	77	84
Luxembourg	107	122	96	89
Ireland	109	118	74	105
Austria	110	142	87	87
Japan	115	127[c]	83	102
Portugal	131	328	84	84

Sources: For age-adjusted death rate, mortality males 45–54 and mortality females 45–54, see, for the United States, U.S. Public Health Service, *Vital Statistics of the United States, 1959, 1960, 1961* (deaths), and U.S. Bureau of the Census, *1960 Census of Population, Volume 1, Characteristics of the Population*, Part 1, United States Summary (population). For OECD Countries, see World Health Organization, *Annual Epidemiological and Vital Statistics, 1959, 1960, 1961*. Data for Luxembourg are from United Nations, *Demographic Yearbook, 1960, 1961*.

For infant mortality rate, see United Nations, *Demographic Yearbook, 1961*, Table 17.

[a] Age-adjustment is by the "indirect" method. For each country, U.S. age-specific death rates were applied to the actual population distribution and the result was divided into the actual number of deaths to obtain the mortality ratio, i.e., the age-adjusted death rate in index number form.

[b] 1957–59 average.

[c] 1958–60 average.

have been relatively stable in the United States for the past decade. The real costs of health services have increased over this period, and medical science has certainly made some progress; therefore, one may

assume that some improvement in health levels occurred that was not captured by the mortality indexes.

This type of reasoning begs the question. Possibly the increase in health services has not resulted in improved health levels and the scientific advances of recent years have not had much effect on health. An alternative explanation is that changes in environmental factors in these years have had, on balance, a negative effect on health, thus offsetting the favorable effects of increases in services and medical knowledge. The latter explanation seems to be a very real possibility. Health services do not operate in a vacuum, nor can they be regarded as being matched against a "health destroying nature" that remains constant over time. An apt aphorism attributed to Sigerist states that "each civilization makes its own diseases [42]."

Most of the suggestions for new and better indexes of health involve combining morbidity and mortality information. An excellent discussion of some of the problems to be encountered, and possible solutions, may be found in Sullivan [58]. One particularly intriguing approach, suggested by Sanders [52], consists in calculating years of "effective" life expectancy, based on mortality and morbidity rates. Such an index would measure the number of years that a person could expect to live and be well enough to fulfill the role appropriate to his sex and age. This approach could be modified to take account of the fact that illness or disability is a matter of degree. The years deducted from life expectancy because of disability should be adjusted by some percentage factor that represents the degree of disability. The determination of these percentage weights is one of the most challenging research problems to be faced in calculating a health index.

The Impact of Health Services on Health

Writing this section would be more appropriate for a physician than for an economist, since the relation between health services and health is a technical question best answered by those whose training is in that technology. All that is intended here is to record some impressions by an outsider who has reviewed a minute portion of the literature from a particular point of view.

The impact of health services on health depends upon two factors: (1) How effective are the best-known techniques of diagnosis, therapy, et cetera? (2) How wide is the gap between the best-known techniques ("treatment of choice") and those actually used across the country? The latter question has been reviewed extensively in medical literature under the heading "quality of care" [7]; it will not be discussed here.

A useful introduction to the first question is provided in Terris [61].

The belief that an important relationship exists between health services and health is of long standing. Reliable evidence to support this belief is of much more recent origin. For thousands of years sick people sought advice and treatment of physicians and surgeons, but many of the most popular remedies and courses of treatment of earlier centuries are now known to have been either harmful or irrelevant.

If this is true, how can one explain the demand for health services that existed in the past? Two possible explanations seem worth noting; they may even continue to have some relevance today. First, doctors probably received a great a deal of credit that properly belonged to nature. The body itself has great healing powers, and most people who successfully consulted physicians would have recovered from or adjusted to their illness without medical intervention. Second, and probably more important, is the intensive need "to do something" that most people have when faced with pain and the possibility of death.

In more recent times, the value of health services for certain illnesses has been established with considerable certainty; but broad areas of doubt and controversy still remain. The following discussion considers a few examples of each type.

Infectious disease is an area where medical services are demonstrably effective. Although the decline of some infectious diseases (e.g., tuberculosis) should be credited in part to environmental changes such as improved sanitation, the important role played by improvements in medical science cannot be downgraded. For many infectious diseases the health service is preventive rather than curative and "one-shot" rather than continuous. Such preventive services do not occupy a large portion of total physician time, but the results should nevertheless be included in the output of the health industry.

Examples of the control of infectious disease through immunization are: diphtheria [51], tetanus [33, 34], and poliomyelitis [4, vol. 3, chap. 4]; chemotherapy is effective in tuberculosis [4, vol. 3, chap. 7] and pneumonia [29]. The decline in mortality from these causes has been dramatic, and some correlation can be observed between changes in the rate of decline and the adoption of specific medical advances. For example, during the fifteen-year period 1935 to 1950, which spanned the introduction and wide use of sulfonamides and penicillin, the United States death rate from influenza and pneumonia fell at a rate of more than 8 per cent per annum; the rate of decline was 2 per cent per annum from 1900 to 1935. In the case of tuberculosis, considerable progress was made throughout this century, but the relative rate

of decline in the death rate accelerated appreciably after the adoption of penicillin, streptomycin, and PAS (para-aminosalicylic acid) in the late 1940's, and of isoniazid in the early 1950's.

Even more dramatic examples are the death rate patterns of syphilis and poliomyelitis, where the introduction of new forms of treatment for the former and immunization for the latter were reflected very quickly in precipitous drops in mortality. To be sure, the diseases mentioned have not been eliminated. Partly for sociocultural reasons, the incidence of syphilis has actually increased in recent years. In other cases, modern treatments of choice are losing their effectiveness because of the development of resistant strains of microorganisms.

The situation with respect to the noninfectious diseases is more mixed. Some examples of demonstrable effectiveness are the following: replacement therapy has lessened the impact of diabetes [37], dental caries in children are reduced by fluoridation [53, 81], and medical care has become increasingly successful in treating trauma [18]. The diagnostic value of the Papanicolaou test for cervical cancer is established [24, 17], and the incidence of invasive cancer of this site was reduced in the 1960's, presumably due to medical treatment during the preinvasive stage disclosed by the test. Also effective is the treatment of skin cancer [27].

Less heartening are the reports on other cancer sites. The five-year survival rate for breast cancer (the most common single organ site of malignancy in either sex) is typically about 50 per cent. Moreover, a review of the breast cancer literature found such striking uniformity of results, despite widely differing therapeutic techniques, that the author was prompted to speculate whether such end results record therapeutic triumphs or merely the natural history of the disease [30]. Some writers stress the importance of prompt treatment for cancer; others question whether elimination of delay would dramatically alter survival rates.[1] The problem of delay itself is complex, and not simply attributable to ignorance or lack of access to health services: "Physicians with cancer are just as likely to delay as are laymen [59]."

Heart disease is another major cause of death where the contribution of health services to health leaves much to be desired. Despite the contributions of surgery in correcting congenital and rheumatic cardiac defects [57] and the decline in recurrence rates of rheumatic fever [78],

[1] In May 1971 several reports presented at the American Cancer Society's Second National Conference on Breast Cancer indicated that early detection and treatment resulted in considerable improvement in survival rates for women with breast cancer. (See *The New York Times,* May 19, 1971, p. 30.)

apparently no curative treatment has been found for rheumatic fever [2, 28]. The treatment of coronary heart disease is only partially effective [12]. The value of antihypertensive drugs in preventing early death in case of malignant hypertension seems assured, but these drugs may be harmful in nonmalignant hypertension [15].[2] The value of anticoagulants in reducing complications and mortality with acute myocardial infarction has been questioned by recent reports [2, 31].

Definitive therapy is still not available for widespread afflictions such as cerebral vascular disease [13], and rehabilitation results indicate that only the more severely ill may benefit from formal therapy (the others seem to recover spontaneously) [35]. No cure is known for schizophrenia. The tranquilizing drugs and shock therapy have had a significant impact in shortening hospital stay, yet they do not seem to lower rehospitalization rates below those achieved with other methods [38].

Health services have always been assumed to be very valuable in connection with pregnancy, but a recent study of prenatal care reveals little relation to prevention of pregnancy complications or prevention of early pregnancy termination, except in uncomplicated pregnancies of thirty weeks' gestation and over [54]. The latter cases do not clarify whether the medical care component of prenatal care, as distinct from nutritional and other components, deserves the credit.

Innovations in health services are not limited to improvements in drugs, surgical techniques, or other technological changes. Research concerning the effects on health of group practice [55, 56], intensive care units [32, 73], and special arrangements for neonatal surgery [19] has yielded encouraging results with respect to these organizational innovations. In other cases, results have been disappointing, e.g., multiple screening [82], periodic medical examination of school children [83], and cancer control programs differing in duration, intensity, and cost [39].

This very brief review indicates that no simple generalization is possible about the effect of health services on health. Although many health services definitely improve health, in other cases even the best-known techniques may have no effect. This problem of relating input to output is one of the most difficult ones facing economists who try to do research on the health industry. They must gain the support and advice of doctors and public health specialists if they are to make progress in this area.

[2] Research results published in 1970 indicate a much more favorable prospect regarding drug therapy for nonmalignant hypertension.

Environmental Factors and Health

One of the factors contributing to the difficulty in reaching firm conclusions about the relationship between health services and health is the importance of environmental factors. Some environmental changes are biological, involving the appearance and disappearance of bacteria, viruses, and other sources of disease. Many environmental variables are related to economics in one way or another. Some are tied to the production process, e.g., the factors associated with occupation. Others are part of consumption, e.g., diet and recreation. Major attention has frequently been given to income, partly because many other environmental factors tend to be highly correlated with real income, both over time and cross-sectionally. Examples include housing, education, urbanization, drinking, and the use of automobiles.

The prevailing assumption, in some cases with good evidence, has indicated that an increase in real per capita income has favorable implications for health, apart from the fact that it permits an increase in health services. This assumption for the United States at present, except for infant mortality, may reasonably be questioned. This country may have passed the peak with respect to the favorable impact of a rising level of living on health. This is not to say that some favorable elements are not still associated with a higher income, but the many unfavorable ones may outweigh them.[3]

After a period of neglect of environmental factors by medical researchers, the tendency in recent years has been to overemphasize the favorable aspects of rising income levels. For example, the American Medical Association recently stated, "Medical science does not seek major credit for the improvements in the health levels during the past twenty-five years. Certainly, our standards of living and higher educational levels have contributed substantially to the betterment of the health level in the United States [4, vol. 3, p. ix]." Although modesty is becoming, the Association provides no evidence to support this statement, and the chances are good that it is wrong.

Altendorfer [1] was able to show some slight negative association between age-adjusted death rates and income across cities in the United States in 1940, but the adjustment for the effect of color was crude, and no allowance was made for the correlation between health services and income. The question at issue here is the relation between

[3] See "The Production of Health, an Exploratory Study" by Auster, Leveson, and Sarachek below.

income and health, not of the fact that higher income permits a higher rate of utilization of health services.

Some preliminary work suggests that education is indeed favorable to health, but by far the largest share of the credit for improvement in health levels over the past twenty-five years probably should go to what economists call improvements in technology—better drugs, better medical knowledge, better diagnostic techniques, et cetera. Cross-sectional regressions across states, for instance, reveal a positive relation between income and mortality for whites, except in the case of infant mortality.

Death rate patterns in countries where the level of income is far below that of the United States should also cause one to question the level of living argument. In Table 1-2, death rates for five European countries in 1960 are compared with rates for the United States in 1960 and 1925. The latter date was included because, in 1960, these five countries were at a level of real per capita income roughly comparable to that of the United States in 1925 [16].

The table shows that the over-all age-adjusted death rates for the European countries are very similar to those for the United States, and far below the level of the United States in 1925. The European crude rates tend to be higher because of the larger proportion of older people in Europe. Despite this bias, the crude rates for tuberculosis and influenza and pneumonia (two causes where the rise in income levels has been alleged to be particularly important) are also much closer to the United States in 1960 than to the United States in 1925. One explanation worth investigating is that the European countries enjoy a medical technology that is similar to that of the United States in 1960, and that changes in medical technology have been the principal cause of the decrease in the United States death rate from 1925 to 1960.

One possible reason for the effect of income levels on health having been overestimated is that investigators often find a very high correlation between income and the health status of individuals. The tendency has been to assume that the latter was the result of the former, but some recent studies of schizophrenia [43] and bronchitis [40] suggest that the causal relationship may run the other way. Evidence shows that illness causes a deterioration in occupational status (from a skilled job to an unskilled job and from an unskilled job into unemployment). The evidence relates to the decline in occupational status from father to son (where the latter is a victim of the disease) and also within the patient's own history.

Even though research on the relation between health services and

TABLE 1-2

Comparison of 1925 and 1960 U.S. Death Rates with 1960 Rates in Selected European Countries
(per 100,000 population)

	Age-adjusted Death Rate (All Causes)[a]	Crude Death Rate (All Causes)	Crude Death Rate, Tuberculosis (All Forms)	Crude Death Rate, Influenza and Pneumonia[b]
1925				
United States	1,683.3	1,170.0	84.8	121.7
1960				
United States	945.7	945.7	5.9	32.9
England and Wales	926.8	1,150.2	7.5	70.1
France	926.8	1,136.2	22.1	48.1
West Germany (excluding Berlin)	983.5	1,136.8	16.2	43.8
Netherlands	766.0	762.1	2.8	26.6
Belgium	1,002.4	1,244.7	17.1	36.5

Sources: For 1925 U.S. data, see U.S. Bureau of the Census, *Historical Statistics of the United States*, series B114–128, B129–142, A22–33. For U.S. age-specific death rates in 1960, see U.S. Department of Health, Education and Welfare, Public Health Service, National Vital Statistics Division, *Vital Statistics of the United States, 1960*, Vol. 2, Part A, Table 1-C. For 1960 European data on population distribution, influenza and pneumonia deaths 1959–61, total populations 1959–61, and total deaths 1960 in West Germany and Belgium, see World Health Organization, *Annual Epidemiological and Vital Statistics, 1959, 1960, 1961*, Table 4. Other crude death rates in 1960: United Nations, *Demographic Yearbook, 1961*, Table 17.

[a] Age-adjustment is by the "indirect" method. For each country the U.S. age-specific death rates in 1960 were applied to the actual population distribution and the result was divided into the actual number of deaths to obtain the age-adjusted death rate index. This was multiplied by the U.S. crude death rate in 1960 to obtian the age-adjusted death rate.

[b] 1959–61 average used instead of 1960 rates because of influenza epidemic in 1960.

health would seem to be primarily the responsibility of those with training in medicine and public health, the long experience that economists have had with environmental variables like income, education, and urbanization suggests that a multidisciplinary approach would be most fruitful.

OTHER CONTRIBUTIONS OF HEALTH SERVICES

The effect of health services on health probably represents their most important contribution. However, two other types of output are worth noting—validation services and other consumer services.

Validation Services

One type of output that is not directly related to improvements in health can be traced to the fact that only a physician can provide judgments concerning a person's health status that will be widely accepted by third parties. This type of output is designated "validation services" in Figure 1-1. One familiar example is the life insurance examination. This examination may have some favorable impact on the health of the examinee, but it need not do so and is not undertaken primarily for that purpose. The insurance company simply wants to know about the health status of the person concerned. In obtaining and providing that information, the physician is producing something of value, but it is not health.

Other examples include a physician's testifying in court, providing information in a workmen's compensation case, or executing a death certificate.

The validation role of physicians is probably much broader than in these sharply defined cases. Consider the following situation: A person feels ill; he has various aches, pains, and other symptoms. He complains and looks for sympathy from family, friends, neighbors, and coworkers. He may seek to be relieved from certain responsibilities or to be excused from certain tasks. Doubts may arise in the minds of persons around him. Questions may be asked. Is he really ill? Is he doing all that he can to get well? A visit, or a series of visits, to one or more doctors is indicated. The patient may not have the slightest hope that these visits will help his health, and, indeed, he may be correct. Nevertheless, the service rendered by the physician cannot be said to result in no output. The visit to the doctor is a socially or culturally necessary act. The examination, the diagnosis, and the prognosis are desired by the patient to provide confirmation to those who have doubts about him. Only the professional judgment of a physician can still the doubts and answer the questions.

The validation service type of output should not be confused with another type of problem that arises in measuring the output of health services—namely, that advance knowledge about the effect of health services on health is sometimes difficult to obtain. This problem is similar to the "dry hole" situation in drilling for oil. That is not to say that the work done in drilling dry holes results in no output. Rather, when the drilling operation is viewed in its entirety, some success will be noted as well as some failures. All those who participate in the drilling operation are considered to be sources of the output. Similarly,

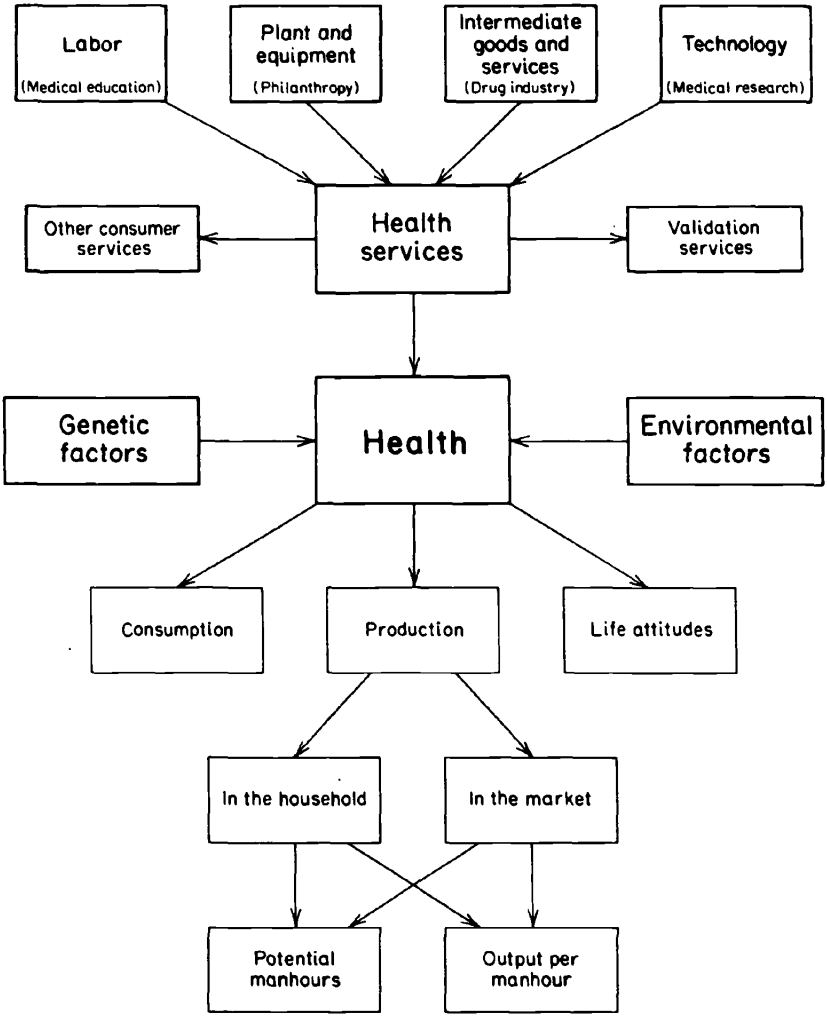

FIGURE 1-1
A Schematic View of the Economics of Health

if a surgeon operates on ten people and only six are helped, one should not say that no output occurred in the other four cases, if one could not determine in advance which cases could be helped and which could not. The output consisted of improving the health of six people, but this output was the result of a production process which encompassed the ten operations.

Other Consumer Services

The outstanding example of other consumer services produced by the health industry is the so-called "hotel" services of hospitals. Those hospital activities that directly affect health are difficult to separate from those that are equivalent to hotel services, but the latter clearly are not insignificant. One way of getting some insight into this question would be to study the occupational distribution of health industry employment. A very significant fraction consists of cooks, chamber maids, porters, and others who are probably producing "other consumer services [48]."

In mental hospitals and other hospitals providing long-term care a major proportion of all costs is probably associated with producing consumer services other than health. The fact that these other consumer services would have to be provided somehow, either publicly or privately, if the patients were not in the hospital is often neglected in discussions of how total hospital costs are inflated by the presence of people who are not really ill. Possibly some of these consumer services are actually produced more inexpensively in a hospital than on the outside. This point comes to the fore in New York City, now grappling with the problem of housing and feeding patients who have been discharged from mental hospitals not because they are cured, but because the new drugs mean they no longer need to be confined to an institution.

Some of the services rendered by nurses outside hospitals also bear little relation to health, but nevertheless they may have considerable value to consumers. This type of service is likely to grow in importance with the increase in the number of elderly people with income who are seeking companionship and help with their daily chores.

The failure of mortality indexes to decline with increased expenditures for health services in recent years has led some people to conclude that mortality no longer measures health levels properly. But if most of these increased expenditures have gone for health services that largely produce "other consumer services" rather than health, a great deal of the mystery is removed.

HEALTH AND THE ECONOMY

An increase in health has two potential values for individuals—consumption and production. Good health is clearly something consumers desire for itself. (That they do not put an overriding value on health is also abundantly clear from the figures on smoking, drinking, overeating, fast driving, et cetera.) To the extent that health services lead to better health, they make a contribution to the economy comparable to that of any industry producing a good or service wanted by consumers.

In addition, better health may contribute to the productive capacity of the economy. It may do this, first, by increasing the supply of potential man-hours through a reduction in mortality and decrease in time lost because of illness and disability. Second, better health may increase production by improving productivity, that is, increasing output per man-hour.

Beyond its potential direct contribution to production and consumption, better health probably has important indirect effects on the economy. These indirect effects occur through the changes in life attitudes which may accompany changes in health. When the average life expectancy in a country is only thirty or thirty-five years, attitudes toward work and saving, for instance, may be different from those in countries where life expectancy is fifty or seventy-five years. When infant mortality rates are very high, attitudes toward birth control are likely to be different from those in countries where mortality rates are low. Indeed, the idea of progress itself may be intimately bound up with the health levels of the population and the rate of change of these levels.

Health and Production

A substantial literature is now available which attempts to measure the impact of changes in health levels on the productive capacity of the economy [26, pp. 162–72]. The principal approach is to ask how many more people are available for work as a result of a decrease in death rates, and what potential or actual production can be attributed to this increased supply of manpower. The capitalized value of the increase at a given point in time can be obtained by summing the value of future potential production represented by the lives saved. Current earnings patterns are usually used with or without adjustment for future increases in earnings per man, and with future earnings discounted at some appropriate interest rate.

The details of calculating the value of lives saved vary greatly from one investigator to another, but one result is common to all: the value

of a man (in terms of future production potential) is very different at different ages. Table 1-3 shows some calculated values for United States males at three different discount rates based on average patterns of earnings and labor force participation rates in 1960.

The principal implication of the age-value profile is that the economic return (in production terms) from saving a life is not the same at all ages. Different kinds of health programs and different kinds of medical

TABLE 1-3
Age-Value Profile of United States Males in 1960
Estimated from Discounted Future Earnings

	Discount Rate		
Age	4.0 per Cent per Annum (A)	7.2 per Cent per Annum (B)	10.0 per Cent per Annum (C)
0	$32,518	$14,680	$ 8,114
10	48,133	29,361	21,047
20	68,363	52,717	45,023
30	81,300	70,515	64,697
40	73,057	67,365	64,012
50	54,132	52,406	51,363
60	30,285	29,853	29,570
70	9,395	9,395	9,395
80	2,465	2,465	2,465
90	0	0	0

Note: The indicated discount rates were applied to the following earnings:

Age	Annual Earnings
0–14	$ 0
15–24	1,201
25–34	4,582
35–44	5,569
45–54	5,327
55–64	4,338
65–74	1,386
75–84	493
85 and over	0

No discounting was applied *within* ten-year age groups and no allowance was made for future increases in real earnings or for life expectancy. Also, no deduction was made for additional consumption attributable to decreased mortality, and no earnings were imputed for males not in the labor force.

Source: U.S. Bureau of the Census, *1960 Census of Population*, Occupational Characteristics, Table 34.

research are likely to affect various age groups differently; therefore, wise planning should give some consideration to these matters. For example, accidents accounted for only 6.6 per cent of all male deaths in the United States in 1960, but accounted for 12.8 per cent of the economic cost of these deaths as measured by age-value profile B in Table 1-3. On the other hand, vascular lesions accounted for 9.5 per cent of all male deaths, but only 5.7 per cent of the economic cost of these deaths.

Table 1-4 shows how the age-value profile can be used to calculate the economic value (in production terms only) of the United States, using the 1960 death rate instead of the 1929 rate, or of lowering the United States rate in 1960 to the Swedish rate in 1960. In the former comparison, the greatest savings in number of lives were for infants and ages seventy-five to eighty-four, but the greatest gain from a production point of view was from the reduction in the mortality rate for men thirty-five to forty-four. The United States–Swedish comparison highlights the current importance and potential of the forty-five to fifty-four age group.

Most studies that attempt to place a value on a life saved (or on the cost of premature death) discuss the question of whether some deduction from discounted future earnings should be made for the future consumption of the individuals whose lives are saved. The arguments for and against are usually framed in terms of whether the value being measured is the value to society including the individual or excluding him. A slightly different way of looking at this problem could be suggested. Consider someone contemplating whether a certain expenditure for health services is worthwhile for him in terms of its expected benefits. He is highly unlikely to think that his own future consumption must be subtracted to calculate the benefits. Many collective decisions might be listed concerning the allocation of resources to health in the same way. Who will be the beneficiary of these additional services is not known. Each person, therefore, will tend to evaluate the potential benefits in much the same way that he would a decision concerning his own expenditures for health; i.e., he will see no reason for deducting consumption, since he may be the one who will benefit from the expenditure. *Ex post* he may reason that saving someone else's life did not do him any good, but in advance of the event and in the absence of knowledge concerning who the beneficiary will be, the full value of the discounted earnings seems the appropriate basis for valuation.

Better health can increase the number of potential man-hours for production by reducing morbidity and disability, as well as by reducing

TABLE 1-4

Saving in Lives and Economic Value Accruing from
(a) the Actual Reduction in Death Rate of U.S. Males from 1929 to 1960 and
(b) a Hypothetical Reduction of the 1960 U.S. Rate to the Level of Sweden

Age	U.S. Male Population 1960 (Thous.)	Death Rate* (per Thousand) U.S. 1929	U.S. 1960	Sweden 1960	Number of U.S. Deaths (Thous.) at U.S. Rate 1929 (1)	at U.S. Rate 1960 (2)	at Swedish Rate 1960 (3)	Lives Saved (Thous.) Actual Col.1-Col.2 (a)	Hypothetical Col.2-Col.3 (b)	Economic Value of Lives Saved (Millions of $) Based on (a)	Based on (b)
Under 1	2,090	79.8	30.1	19.1	166.8	62.9	39.9	103.9	23.6	1,525	347
1–4	8,240	6.5	1.2	1.0	53.6	9.9	7.8	43.7	2.1	834	39
5–14	18,029	2.0	0.6	0.5	36.1	10.8	9.0	25.3	1.8	743	53
15–24	11,906	3.7	1.5	1.0	44.1	17.9	11.9	26.2	5.9	1,381	314
25–34	11,179	5.1	1.9	1.2	57.0	21.2	13.4	35.8	7.8	2,524	552
35–44	11,755	7.8	3.7	2.0	91.7	43.5	23.5	48.2	19.9	3,247	1,346
45–54	10,093	13.9	9.7	5.1	140.3	97.9	51.5	42.4	46.4	2,222	2,433
55–64	7,537	26.7	22.7	14.1	201.2	171.1	106.3	30.1	65.6	899	1,958
65–74	5,116	57.6	48.3	38.2	294.7	247.1	195.4	47.6	51.2	447	481
75–84	2,025	126.8	99.6	98.2	256.8	201.7	198.9	55.1	4.5	136	11
85 and over	362	256.0	208.4	236.0	92.7	75.4	85.4	17.3	−9.3	0	0
Total	88,331	16.2	10.8	8.4	1,435.0	959.4	743.1	475.6	219.5	13,958	7,533

Sources: For U.S. death rates, 1929, see U.S. Bureau of the Census, *Historical Statistics of the United States*, series B123–154; for 1960, see U.S. Public Health Service, *Vital Statistics of the United States, 1960, 1961*, Table 1C. For data on U.S. population, see U.S. Bureau of the Census, *1960 Census of Population*, U.S. Summary, General Characteristics, PC(1) 1B, Tables 45 and 46. For Swedish death rates, see *Annual Epidemiological and Vital Statistics, 1959, 1960, and 1961*, Table 4.

* Three-year average centered on year indicated.

mortality. Some estimate of the potential gains to the economy from this source can be obtained from data collected periodically as part of the National Health Survey. In 1964, approximately 5.5 workdays per person were lost for health reasons by those currently employed [70]. Additional loss was contributed by those persons who would have been employed except for reasons of health.

Health and Productivity

Common sense suggests that better health should result in more production per man, as well as more men available for work. Unfortunately, very little research has been done to provide a basis for estimating the magnitude of this effect. Company-sponsored health programs would seem to offer an excellent opportunity for the study of this question, but not much has been done. In one investigation of what executives *thought* were the results of their company's health program, "less absenteeism" was mentioned by 55 per cent of the respondents, "improved employee health" was mentioned by 50 per cent, but "improved productivity on the job" was mentioned by only 12 per cent of the respondents [47].

A number of studies have examined company health programs [10, 14, 20, 46], but their emphasis is on turnover rates, accident rates, absenteeism, and Workmen's Compensation insurance premiums rather than on output per man-hour. Whether this is because the latter effect is small or because it is difficult to measure is not clear. Many of the studies suffer from failure to consider other relevant variables along with the presence or absence of a company health program. Also, these studies do not clarify whether the benefits of company health programs should be attributed to improvements in health. For example, absenteeism and medical expenses may be lowered because of better controls rather than because of any change in health.

One special aspect of company health programs is the periodic health examination, much favored by those interested in preventive medicine. The basic notion is that if diseases or other injurious conditions are discovered early enough the chances for arrest or cure are greatly enhanced. An extensive literature exists on this subject, reviewed by Roberts [50], but, unfortunately, the studies do not clearly establish the economic value of such examinations. Roberts lists several values served by such examinations, but concludes that both public health service activities and personal health practices have much more effect on health than do periodic examinations.

A thorough economic analysis of the costs and benefits of company

For Swedish death rates, see *Annual Epidemiological and Vital Statistics, 1959, 1960, and 1961*, Table 4.
* Three-year average centered on year indicated.

health programs and periodic health examinations is needed. Such an analysis should pay special attention to all the real costs of these programs, including, for example, the time demanded of the examinees. It should also attempt to distinguish between those benefits which are realized through improvements in health and those which are unrelated to health.

Health and Consumption

In contrast to the substantial number of studies that look at the economic value of health in terms of production, very little information is available concerning its value as an end in itself (consumption). Klarman has suggested that one way of approaching the problem would be to observe the expenditures that people are willing to incur for the elimination of nondisabling diseases or the expenditure incurred by those not in the labor force [26, p. 64].

Many people in the public health field greatly overestimate the value that the consumer places on health. The health literature frequently seems to read as if no price were too great to pay for good health, but the behavior of consumers indicates that they are often unwilling to pay even a small price. For example, surveys have shown that many people do not brush their teeth regularly, even when they believe that brushing would significantly reduce tooth decay and gum trouble [22, 25]. Smokers who acknowledge the harmful effects of smoking refuse to stop [60], and a group of executives whose obesity was called to their attention by their physicians took no action to correct a condition which is acknowledged to be injurious to health [77]. Some cases (mostly communicable diseases) may be noted where the social consumption value of health is greater than the private consumption value because of important external effects. The examples cited, however, do not fall into this category.

One of the problems that should be squarely faced in framing a social policy for health services is that people differ in the relative value that they place on health, just as they differ in the relative value that they place on other goods and services. Any system which attempts to force all people to buy the same amount of health services is likely to result in a significant misallocation of resources.

Health and Life Attitudes

This is another area where one can do little more than say that research would be desirable. Many people have speculated about the effect of changes in health levels on attitudes toward work, saving,

birth control, and other aspects of behavior, but not much evidence has been accumulated. One interesting question concerns the ability of various populations to perceive changes in health levels. A study of low-income Negroes in Chicago revealed very little awareness that a significant decline in infant mortality had actually occurred [11]. This suggests that changes in life attitudes, if they are related to changes in health levels, probably occur only after a lag.

CONCLUSION

The principal line of argument in this paper may be stated briefly: health services represent the combined inputs of labor, capital, and intermediate goods and services used by the health industry. Their contribution to the economy must be measured by the output of this industry, which takes three forms: health, validation services, and other consumer services. Of the three, health is probably the most important. The problem of measuring changes in health levels is examined and the relationship between health services and health is discussed. Measuring the latter is greatly complicated by the fact that health depends upon environmental factors as well as health services. Most of the studies treat rising income as favorable to health, but some reasons are presented for questioning the validity of this assumption for the United States at present. The economic importance of changes in health levels flows, first, from the importance of health as a consumption goal in itself and, second, from the effect of health on production. This effect can take two forms—changes in potential man-hours and changes in output per man-hour. Changes in life attitudes attributable to changes in health levels also may indirectly affect the economy.

Throughout the paper the need for additional research on each of these concepts and relationships has been stressed. Many of the studies cited have also dealt at length with the question of needed research. The best stimulus to good research is a good example; exhortation is a poor substitute. Nevertheless, this paper will conclude with a few comments on possible points of departure for research.

One promising line of inquiry would be to capitalize on the fact that health services in this country and abroad are produced and financed under a bewildering array of institutional arrangements. Important differences may be found with respect to the ownership and control of facilities, the organization of medical practice, the pricing of health services, the remuneration of health personnel, and many other aspects

of industrial organization. A basic question to be asked in each case is, "What are the implications of these differences for health and for the economy?"

Another potentially fruitful area of work concerns the advances in medical technology which are the principal source of productivity gain for this industry. The American Medical Association has compiled a list of "significant advances and technological developments" for the period 1936–62, by specialty, based on the response of knowledgeable physicians to a mail survey [4, vol. 3, pp. 4–12]. The same source presents a list of thirty important therapeutic agents now in use that have been introduced since 1934 [4, vol. 3, pp. 3–14]. Both could provide a useful departure for research on the costs and benefits of medical research as well as for studies of innovation and diffusion similar to those that Mansfield [36] and Griliches [21] have developed for other parts of the economy.

The introduction to this paper argued that one of the principal reasons for wanting to know something about the contribution of health services to the economy is to be able to make better decisions concerning the allocation of resources to health. These decisions are increasingly made by government and are implemented in the form of subsidies for hospital construction, medical education, and even medical care. This suggests that one line of fruitful research might be developed as follows:

1. The question of health versus other goals must be considered. Although lip service is often paid to the notion that health is a goal to be desired above all else, the most casual inspection of human behavior provides ample refutation of this proposition. Viewed as a source of consumer satisfaction, good health is often shunted aside in favor of the pleasure to be derived from objects of expenditure and other patterns of behavior. Although the path to better health is frequently portrayed in terms of more hospitals, more doctors, and more drugs, most people have the potential of improving their own health by their own actions. Ignorance may be cited to explain the failure of people to take these actions, but this is manifestly untrue in many cases (e.g., doctors continue to smoke). Furthermore, "ignorance" frequently means nothing more than that people have not taken the time or trouble to obtain readily available information about health.

Health also contributes to the economy through production, but alternative ways of increasing output are available. To cite two important ones, resources allocated to increasing health could be allocated to increasing the stock of physical capital, or to increasing the rate of

technological change through research and development. Anyone arguing for greater investment in health to increase production should be prepared to show that the return to investment in health is greater than the return to alternative forms of investment.

2. Once a decision has been made regarding the allocation of resources for health relative to other consumer goals and alternative forms of investment, a second allocation decision is required to divide resources among health services and alternative routes to better health. For instance, expectant mothers may benefit from frequent visits to a board-certified obstetrician, but they may also benefit from a better diet, or from not having to work during the last months of pregnancy, or from having someone to help them with their other children.

One can think of health problems where the environmental factors are of negligible importance and health services can make the difference between life and death. However, many situations also exist where both the environment and health services have a role to play and, given a fixed amount of resources to be used for health purposes, knowing the relative contributions (at the margin) of each is important for an efficient allocation of resources.

3. The third and most detailed level of decision making concerns the allocation of resources among various types of health services. More doctors, more nurses, more hospitals, more dentists—in short, more of everything—is needed. Given the decision about resources available for health and the allocation of these resources among health services and other health factors, however, one must have some notion about the contribution (again at the margin) of various types of health services. The absence of such knowledge probably means that public decisions concerning increases of these services can be made only on an arbitrary basis. The argument that the various health resources must be increased in fixed proportion is refuted by the evidence from other countries where health systems are successfully using doctors, nurses, hospital facilities, and other health inputs in proportions that differ strikingly from country to country as well as from those used in the United States.

One final note of caution seems to be in order. Whatever research approach is pursued, and whatever questions are attacked, economists must become familiar with health institutions and technology. The practice of medicine is still more an art than a science. The intimate nature of the relationship between patient and doctor, the vital character of the service rendered, and the heavy responsibilities assumed by medical personnel suggest the dangers inherent in reducing health care

to matters of balance sheets, or supply and demand curves. Economics has something to contribute to health problems, but it should proceed as the servant of health, not its master.

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