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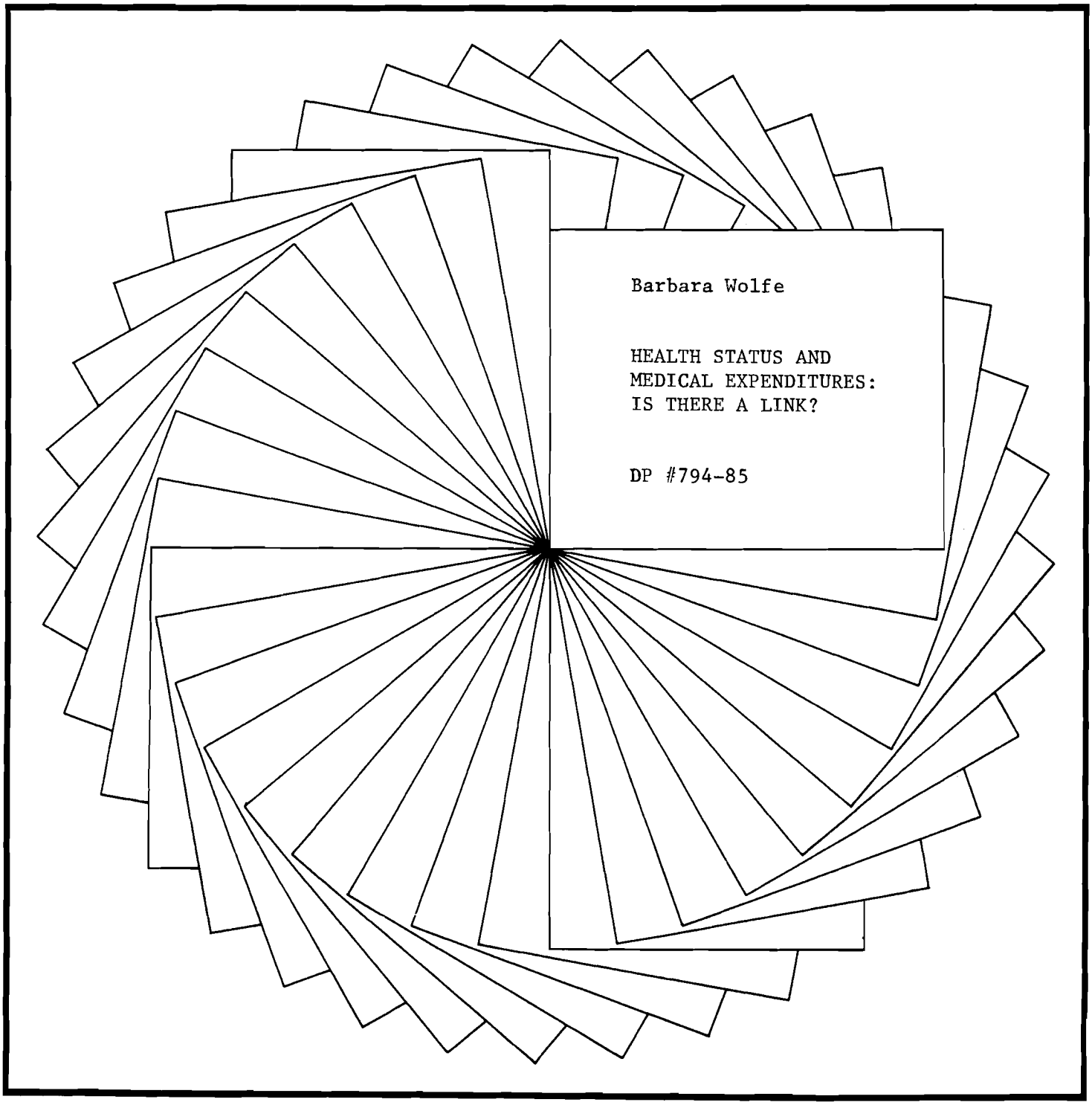

HEALTH STATUS AND MEDICAL EXPENDITURES: Is There a Link?

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ABSTRACT

Until now, cross national studies have not demonstrated a positive relationship between health care expenditures and improved health status, as measured by such indicators as age-adjusted mortality rates. It has therefore been argued that cutting expenditures will not have a negative effect upon health status. Using health and life-style data from the OECD for Germany, the United Kingdom, the Netherlands, France, Sweden, and the United States, this study finds that when one holds constant those changes in life style that have an impact upon health (e.g., smoking, drinking, traffic accidents, dangers on the job) and adjusts for inflation and population size, health care expenditures do bear a positive relationship to health status. This suggests that reductions in health care expenditures may well have some cost in terms of overall health.

Introduction

One of the most frequently noted relationships in recent studies of comparative health expenditures is the lack of a demonstrated relationship between medical expenditures and health status. For example, Andreano and Maxwell using recent data on the OECD countries demonstrate that there is no relationship between a ranking of health expenditures and indicators of health such as age-adjusted mortality rates [1,2]. The single recent exception to this is Maxwell's finding that the United Kingdom's low expenditures are associated with a smaller decline in infant mortality rates over the period 1950-1977 than countries with substantially greater expenditures. The general lack of a relationship is a part of the perception held by some that medical care expenditures are a luxury good with little marginal effect on health. A corollary of this view is the argument that cutbacks in health care expenditures are possible with little loss in effectiveness.

Various explanations have been offered for the lack of finding a positive relationship between expenditures and health. One is that health care expenditures are not highly related to health care needs such as life threatening or disabling illness [3,4] but instead to variations in per capita income [5].

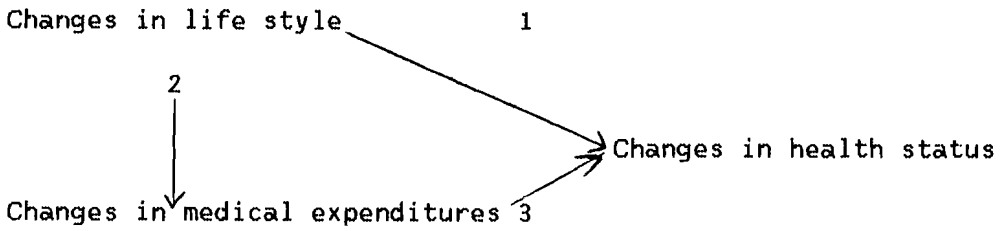
A related theory, used to explain the relationship between health expenditures, per capita income, and health status, is that of "supplier -induced demand" (see e.g., 6,7,8). Basically this theory says that when there are more physicians they (1) each treat fewer patients, so, in order to augment their incomes they (2) provide some medical care whose expected benefit does not exceed expected cost but contributes to physicians' income. This lower effectiveness of marginal health care spending is consistent with the lack of a relationship between numbers of physicians per 1000 in the population and health status or between expenditures on medical care linked to physicians and health status.

A related approach used to explain this puzzle is Fox's medicalization theory [9]. People in more developed countries lack the family and social networks that characterize earlier societies; they are more geographically mobile, more secular, and have less-stable relationships. Medical providers therefore take on an additional role providing social support, spending more time with the worried well. In these roles the M.D. may not be very effective, i.e., in treating psychologically based physical illness. (And the measure of output--physical health status--may be inappropriate.) Illich goes much further and suggests negative causality: more health care leads to dependence, and this in turn leads to a decline in health [10]. Thus, in this view, more medical care leads to poorer health, not better health.

These aggregate impressions are surely inconsistent with evidence that certain categories of health care have a positive influence on health. These categories include various forms of prevention (e.g., well-baby care, care for pregnant women) and medically treatable problems (e.g., hernia, broken bones, infections, etc.). They are also inconsistent with evidence that there has been some equalizing of health status via equalizing of medical services (which has reduced nonwhite and high-risk infant and prenatal mortality rates). (See, e.g., [11], and references therein). These aggregate impressions are, however, consistent with other within-country findings of a limited link between greater health care and health status [12,13,14].

Hypothesized Link Between Medical Expenditure and Health Status

How can these different perspectives be reconciled? Is there a link between greater medical expenditures and improved health status? In this paper we suggest that there is in fact a link: that greater medical expenditures are related to better health status. To find this link we must (1) identify <u>real</u> increases in medical expenditures and (2) account for negative life-style changes which both reduce health status and increase medical care utilization. A simple path model to illustrate this hypothesis is:



We begin with changes in life style that are considered as exogenous, though related to changes in income and, possibly, prior utilization of health care. Negative changes in life style are expected to lead to negative changes in health status; positive changes in life style to positive changes in health status. However, changes in life style also result in changes in the demand for medical services and hence in medical expenditures. Thus, negative changes in life style lead to health deterioration—illnesses—and an increase in demand for medical care. More medical care, therefore, is required to counter life-style changes that result in negative health consequences (path 2). Once this fact is recognized, we argue that the direct effect (path 3) from more medical expenditures to changes in health status is positive. That is, if we control for the effects of life-style changes on medical expenditures and health status, we will find a positive link between increases in medical expenditures and changes in health status.

Some recent cross-country data collected by OECD allow us to explore these phenomena. We begin by presenting evidence on health status and life-style changes. Then we turn to health expenditures and finally we link the three together.

CROSS-COUNTRY COMPARISONS

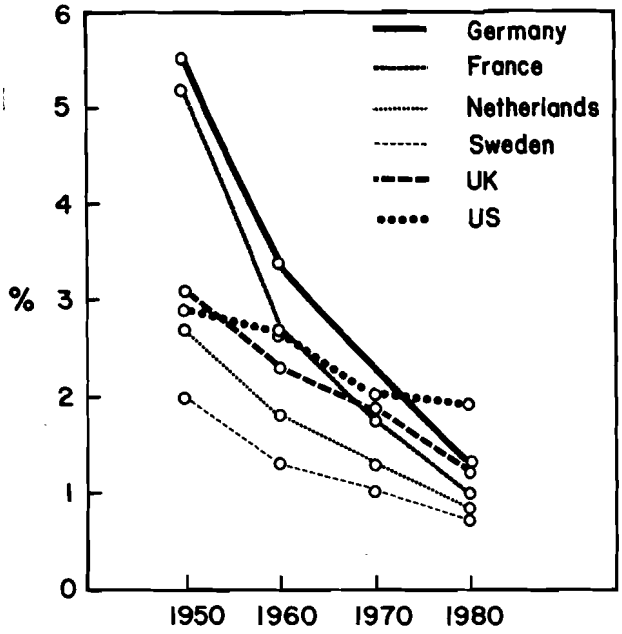
Dramatic changes have occurred in health status—as measured by life expectancy and mortality rates—in the last few decades, in nearly all developed Western countries. These sizeable improvements represent a significant increasing rate of health improvement after much slower rates [15]. Figures 1-3 on Graph 1 chart these events.

Figure 1 presents infant mortality as a percentage of live births from 1950 to 1980 for six countries: the United States, the United Kingdom, West Germany, France, the Netherlands, and Sweden. All show continuous declines over the period. Germany and France had much higher rates in 1950 and show the most dramatic reductions. Sweden and the Netherlands have the lowest rates throughout the three decades. All six countries have quite similar rates in 1980 as contrasted with 1960, when Germany and France had approximately two-and one-half times the rate of Sweden. Although the U.S. rate fell substantially from 2.9 to 2.0, it has the highest rate of the six countries as of 1980. (The prenatal mortality rate--not presented in a figure--shows an even greater rate of decline for all six countries over the period, with patterns similar to infant mortality rates; Germany also had the highest rate as of 1950, but by 1980 had a rate below that of the United States, United Kingdom and France. Similarly, the United States had the highest prenatal mortality rate as of 1980 among these six countries).

Figure 2 provides life expectancy at birth by sex for the same six countries for the period 1950 to 1980. All show increasing life expectancies over the period. Among women, there is an increase of approximately six years over the period, while among men the increase is approximately five years. Three of the six countries had an <u>increase in the rate of increase</u> (a steeper slope) of both men's and women's life expectancies in the last decade (from 1970 to 1980): Germany, the Netherlands and the United States. By 1980, United Kingdom had the shortest life expectancy for women compared to the fourth-highest among the six countries in 1950.

Figure 1

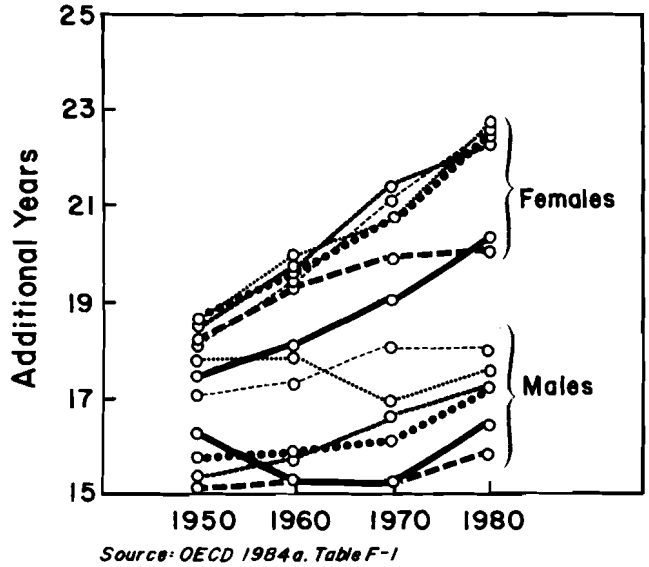
Infant Mortality as % of Live Births



Source: OECD 1984a Table F-2

Figure 3

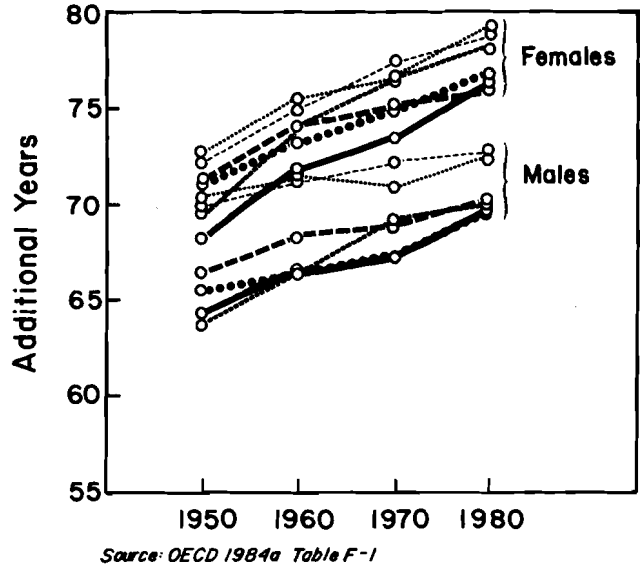
Life Expectancy at age 60



Source: OECD 1984a. Table F-1

Figure 2

Life Expectancy



Source: OECD 1984a Table F-1

Sweden and the Netherlands had the longest life expectancy for men over the 30-year period, although their rate of increase is below the other four countries.

Figure 3 shows life expectancy at age 60 by sex for the same six countries for the same 30 year period. For women, five of the six countries show substantial increases in life expectancy at age 60 over the entire period; the single exception is the United Kingdom. Germany lags behind the others but has shown large increases especially since 1970. The pattern for men is less regular. Only the United States and France show continuously increasing life expectancy for men at age 60 over these 30 years. Relative rankings among the six countries are nearly the same in 1980 as 1950 except that Germany is second lowest rather than third highest.

The overall picture that emerges from these health status figures are (1) as of 1980, health status was highest in the Netherlands and Sweden; (2) in terms of improvement in health status, Germany and France did best, while (3) for two of the three measures of life expectancy—at birth and at age 60—the United Kingdom showed the smallest improvement.

These improvements in life expectancy are thought to be caused by changes in life style (and to some extent by improvements in medical care). These changes include (to varying degrees among the various countries) greater exercise, less tobacco consumption, less problem drinking, increased job safety, better and less invasive diagnostic tools, organ transplants, new drugs, and so forth. But, just as the rate of improvement in health status differs over these six countries, so do the changes in life style and medical care.

This evidence can now be compared with evidence on aspects of life style that may be associated with health status and longevity. More specifically, the relationship between changes in health status and changes in health-related aspects of life style can illuminate the role of health care expenditures. If the countries with the smallest increases in life expectancy had the least improvement in life style, then we have some evidence that medical care is partly used to counter the negative effects of unhealthy life styles. We turn now to some dimensions of life style thought to influence health status and the "need" for medical care.

Figure 4 (graph 2) presents tobacco consumption per person fifteen years or older in these same six countries from 1960 to 1980 [16,17]. The U.S. rate is for persons 20+, so it is probably lower relative to the other countries than indicated here. By the end of the period, the United States had the lowest rate of consumption. The U.K. and Swedish consumption rates are constant over the period, although the U.K. rate is one-and-one-half times that of Sweden. The other three all show increases over these two decades, especially Germany, which has a 59% increase comparing 1980 to 1960. The Netherlands is the highest as of 1980 but had a smaller rate of increase (32.5%) than Germany.

Figure 5 presents a proxy for troublesome consumption of alcohol--liver cirrhosis mortality rates by sex for the six countries for 1960 and 1980. Two countries stand out in terms of substantial rates of increase among men and women--Germany and Sweden.

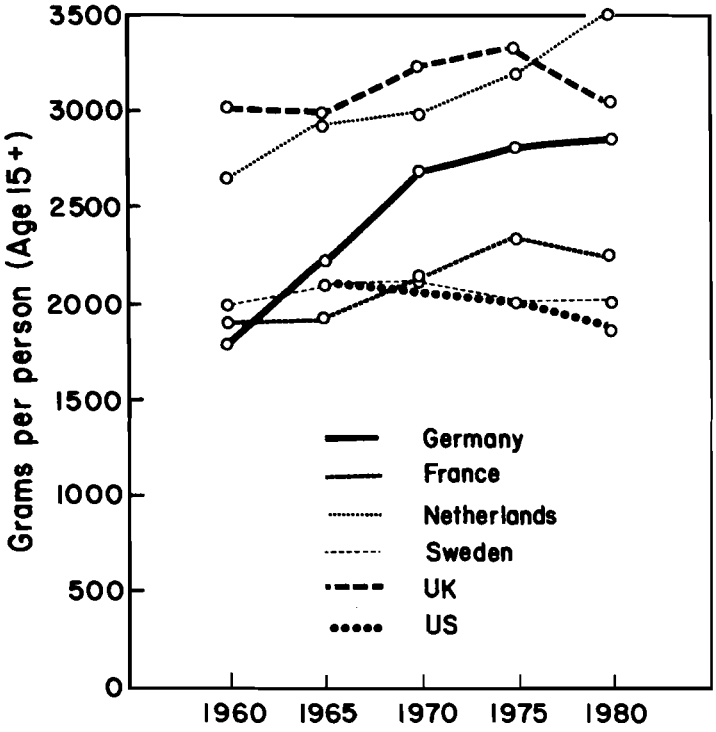
The Netherlands and the United Kingdom are lowest in both years for both sexes, the United States is intermediate, with only a small rate of increase. France is highest in both years for both sexes but shows the only declining rate (that for females) of the six countries.

Figure 6 [16] presents the number of persons per 100,000 population injured in road accidents--a relative indicator of riskiness of automobile travel as well as life-style indicator. Presumably this reflects both laws and enforcement of drinking and driving regulations, speed limits, road conditions etc. along with alcohol consumption or life style. The data clearly differentiate between these countries; Sweden, with its strict driving-and-drinking law, is far lower than the other five in all years from 1960 through 1980. The Netherlands is next lowest in most years. It has a less strict law, with sporadic but severe enforcement. The United States and Germany have the highest rates and little enforcement of drinking-and-driving laws; Germany has little enforcement of speeding laws. (As an indicator of riskiness these data must be interpreted with some caution since injuries per 1000 miles of vehicle traffic would be preferable to injuries per 100,000 population as a measure).

One additional change over the period is a shift in the nature of employment--generally from blue-collar jobs to white-collar jobs and from relatively risky jobs to relatively safe jobs.

Figure 4

Tobacco Consumption

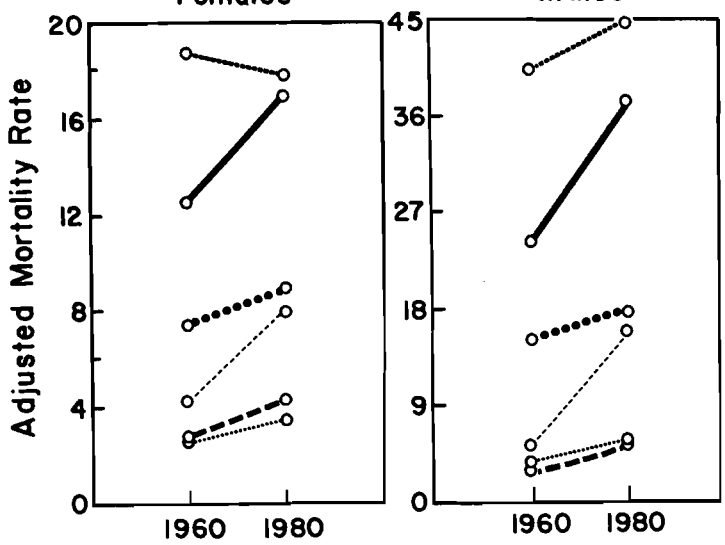


Source: OECD a. Table F-8

For U.S. Persons 20+, Health United States 1983.

Figure 5

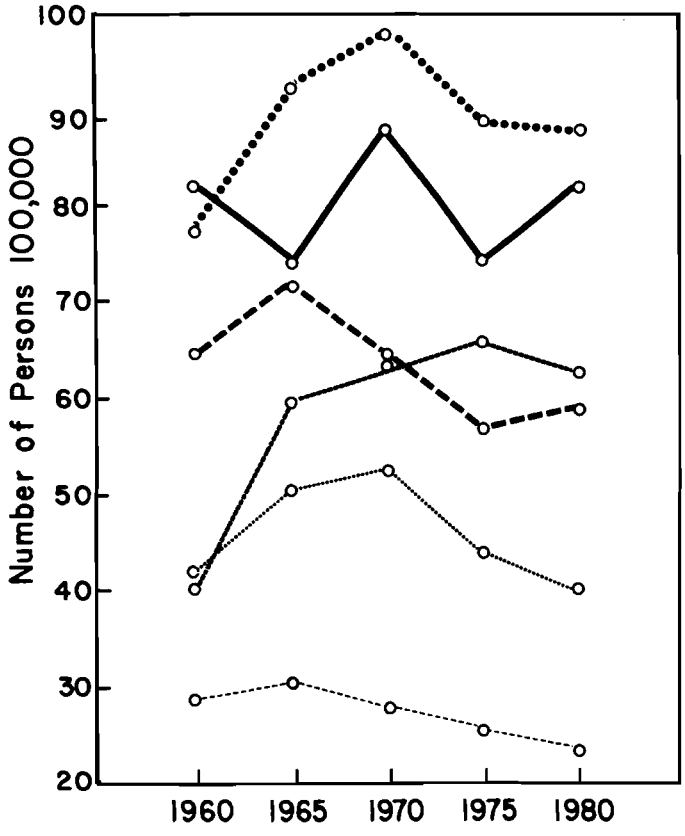
Liver Cirrhosis Mortality Trends



Source: OECD 1984 a, Table F-10

Figure 6

Number of Persons Injured in Road Accidents

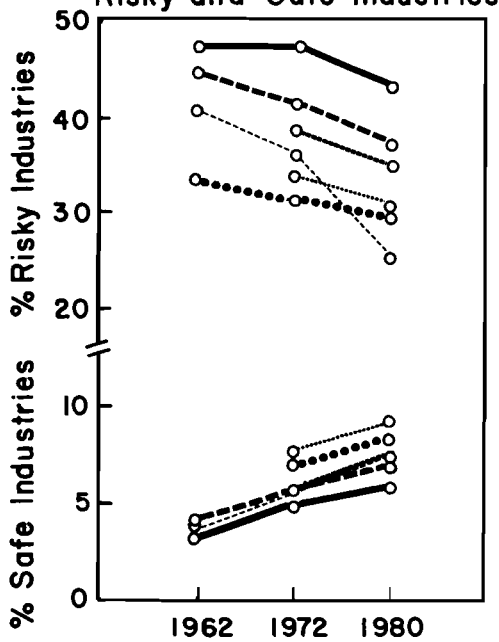


Source: OECD 1984 a. Table F-4.

Figure 7

Industry of Employment

"Risky" and "Safe" Industries



Source: OECD Labor Force Statistics 1962-1982

Risky = Those with injury ratio > 10 per 100 workers per year

Safe = Those with injury rates < 2.5 per 100 workers per year

See U.S. Bureau of the Census 1983, Table 733.

Figure 7 [18] presents the percentage of the labor force in risky industries (in the upper panel) and the percentage in safe industries (in the lower panel).* All countries had similar experiences—a shift away from risky industries and toward safe industries.

Sweden had the largest decline in percentage employed in risky businesses over the 1962 to 1980 period; Germany had both the highest percentage employed in risky industries and the least in safe ones over the entire period, with the difference worsening compared to other countries.

Based on these data of life-style changes, we would expect (1) a decline in life expectancy in Germany due to the increase in tobacco consumption over the years 1960 to 1980 and a somewhat smaller decline in the Netherlands due to a similar but smaller increase in tobacco consumption;(2) a decrease in female life expectancy in Sweden due to the large increase in problems with alcoholism as measured by the death rate from cirrhosis of the liver but partially offset by declining risks in work; (3) shorter life expectancy in 1970 than 1960 or 1980 due to road accidents in the United States, West Germany, and the Netherlands; and (4) improvement in mortality rates/life expectancy in the United States due to the reduction in tobacco consumption.

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* These are defined according to injury rates per 100 full-time workers within the Unites States in 1975 and 1981. The risky industries are mining, construction, and manufacture. The safe industries are finance, insurance, and real estate.

Returning to Figure 3 on life expectancy at age 60 we find some of these expected patterns: (1) the German male life expectancy decreased from 1960 to 1970 (but increased after 1970); the Netherlands male life expectancy also decreased between 1960 and 1970 and remained below its 1960 (and 1950) level as of 1980; (2) female life expectancy in Sweden at age 60 did not decrease, but increased; (3) life expectancy among men as of age 60 was lower in 1970 than 1960 or 1980 in West Germany and the Netherlands, and (4) United States life expectancy did increase as predicted. The rate of increase in life expectancy at birth in Sweden levelled off over the period (Figure 2), suggesting that the reduction in job riskiness may have dominated the increase in problems with alcohol.

These rough correspondences suggest a link between changing life style and changing health status. We next explore the links between changing medical expenditures and changing health status to provide evidence on the direct and indirect links (2 and 3) in our simple path model presented above.

We turn first to changing medical expenditures over the same time period.* Figure 8 presents one measure of the growth in health expenditure --the percentage of GNP spent on health. The United Kingdom stands out as having a much lower expenditure rate and lower rate of growth (except perhaps over the period 1970 to 1975). Germany and Sweden show the most dramatic increase and have the greatest expenditures as of 1979.

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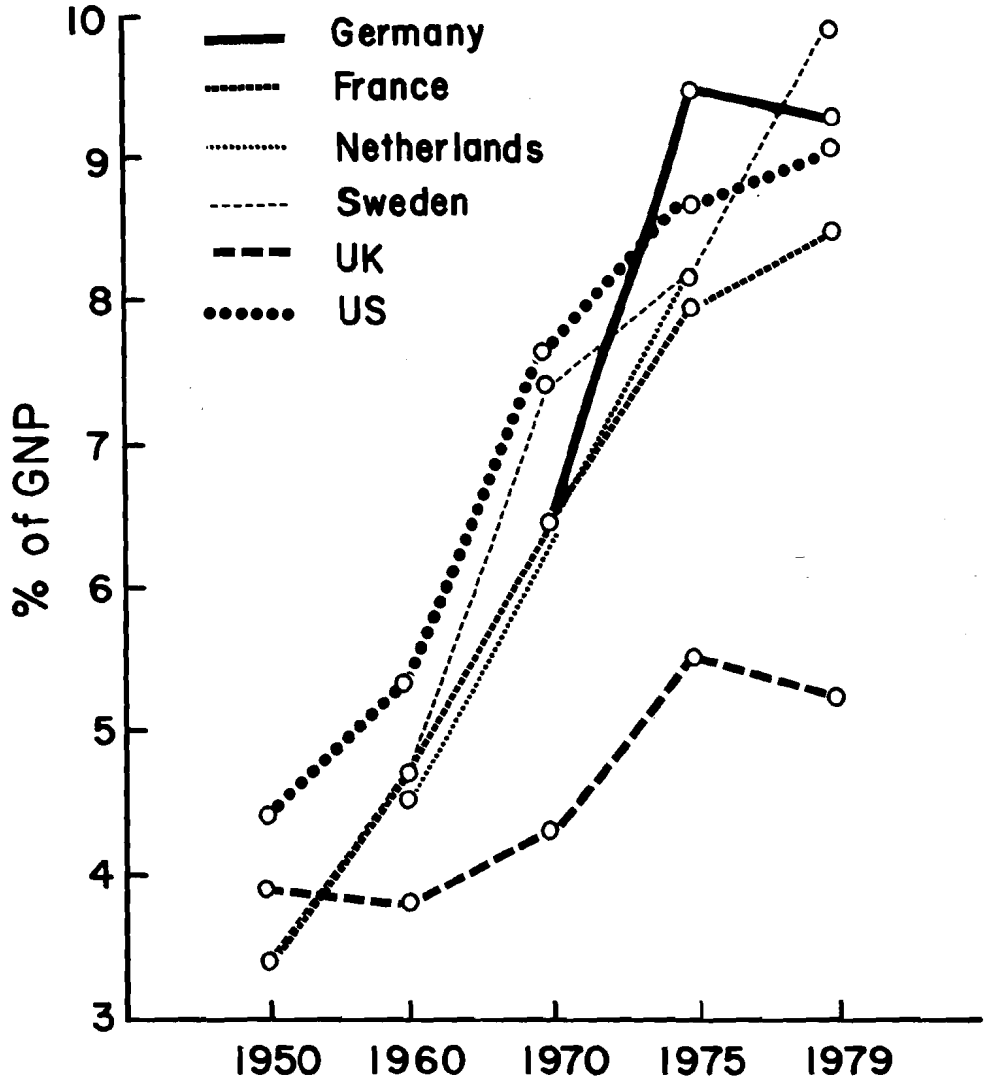
* It might be preferable to use medical care expenditures rather than percentage GNP or GDP on medical care, as our basis of comparison. This is in column 1 of Table 1, which shows Germany with the lowest annual rate of increase, the United Kingdom in the middle of the six countries, and France highest, followed by the Netherlands. Only the United States and France are ranked in the same order in the nominal and real rankings of expenditure increases. Alternatively we could convert each national currency to U.S. dollars by using the exchange rate in each year. When this is done, the nominal growth rates are 17.5 France; 8.3 Germany; 12.5 the Netherlands; 13.2 Sweden; 16.2 United Kingdom and 11.9 United States, so that the Netherlands and United Kingdom change their relative ranking and the "picture" differs considerably from the price-and-population-adjusted growth rates.

Figure 8

Total Health Expenditure as % of GNP



Source: Maxwell (1981) Table 3-3

This frequently cited measure of expenditures on medical care suggests a more rapid rate of improvement in health status in Germany, Sweden, and the Netherlands; a less rapid rate in the United Kingdom. However, some of this increase is accounted for by an increasing population and increasing number of elderly who generally use more medical care.

All six countries have experienced steady aging of the population. Sweden and Germany have the greatest increase in percentage of population 65+ over 1950 to 1980 and the greatest percentage of elderly as of 1980. The United States and the Netherlands have a substantially lower percentage of elderly over the entire period, though their number is increasing. Based on these data, we would expect the greatest increase in demand for medical care in Sweden and Germany, followed by the United Kingdom. These medical expenditures are not likely to show up as improvements in health status. If today 20% of the population are 65+ but yesterday--with the same technology, and environment--15% of the population were 65+ (and this change reflects only changing birth rates) we would expect demand for medical care to be higher today simply because increasing age is associated with declining health and therefore greater need for medical care.

But we would not expect to see any change in health status as measured by age-sex adjusted mortality rates. These population data then suggest that the real rate of increase in medical expenditures as a percentage of GNP has been smaller in Sweden and Germany than first suggested. That is, some of the increase simply reflects the changing age structure. We now adjust health expenditures for population increases and also deflate nominal health expenditure by the GDP deflator for 1960 to 1981, in order to get an estimate of the real rate of expenditure increases*.

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* We take expenditure on medical care in 1960 and 1981, and use the GDP price index, 1975 = 100, to put these expenditures in real terms. Then we divide these expenditures by the population in 1960 and 1981 respectively. We then estimate real compounded average annual rate of increase from 1960 to 1981 in nominal terms, real terms, and real terms adjusted for population size.

These figures, presented in Table 1, suggest again a lower rate of health expenditure increase in the United Kingdom; they highlight a more rapid rate of increase in France than any of the other five countries, followed by Sweden, then Germany and the Netherlands (Column 5). Thus, they differ from the simple picture of Figure 3 by presenting the increase in real expenditures, including the more rapid rate of increase in France. These are the rates that we should analyze to see if there is a tie between medical expenditures and improved health status.

Table 1

Rate of increase in medical expenditure, 1960-1981

	Compd.annual rate of increase	Rate of increase	Compd. annual rate of increase		Compd. Annual rate of increase
	Nominal terms	GDP inflator	Real terms	Population increase	Real terms adjusting for population
	(1)	(2)	(3)	(4)	(5)
France	15.8	7.1	8.7	.8	7.9
Germany	10.9	4.4	6.5	.5	6.0
Netherlands	14.5	7.6	6.9	1.0	5.9
Sweden	14.2	7.0	7.2	.5	6.7
U.Kingdom	13.8	9.1	4.7	.3	4.4
United States	11.9	5.2	6.7	1.15	5.6

Source basic data, OECD 1984a.

Now we turn back to our health indicators, where we find a picture rather consistent with our expectations: (1) the rate of decrease in infant mortality rates (Figure 1) is greatest for France from 1950 to 1980; (2) Sweden has the lowest rate throughout the period; whereas (3) Germany has the second greatest decline and the Netherlands has the second lowest rate throughout the three decades.

In terms of male life expectancy at birth (Figure 2), the United Kingdom shows the smallest increase, France the greatest, and Germany the second greatest increase, whereas Sweden and the Netherlands have the longest life expectancy at birth, with Sweden's rate increasing more over the period. In terms of female life expectancy at birth, France also shows the largest increase over the period (from next to last among the six to third), Germany has the next largest increase, moving from lowest to overtake the United Kingdom, and women in the Netherlands have the longest life expectancy in 1980.

Turning to life expectancy at age 60 (Figure 3), again France shows the greatest increase---for both men and women; and the United Kingdom shows the smallest increase (females) or lowest life expectancy (males). Sweden experienced a large increase in female life expectancy as did the Netherlands and the United States.

The limited evidence on distribution of medical care expenditures that is available is weakly consistent with these measures of health status: France spent a greater proportion of medical care dollars on ambulatory care than Germany, the Netherlands,or the United States until very recently, while of these four countries, the Netherlands spends the highest proportion on institutional care.

The institutional care dollars (i.e., hospitals and nursing homes) serve those with illnesses and those unable to care for themselves, whereas ambulatory care includes preventive care, such as care for pregnant women and well babies. The latter expenditures may have bigger payoffs in terms of health status, particularly in reducing infant mortality rates.

These patterns then are roughly equivalent with the adjusted rate of increase in health expenditures. France stands out both in terms of the most rapid rate of increase in expenditures and improvement in health status as captured by infant mortality rates and life expectancy. The United Kingdom also stands out--but at the opposite end of the continuum, with the lowest rate of increase in expenditures and smallest improvement in the health status indicators. The better performance of the French is also consistent with life-style changes--a decline in alcohol problems among women (as measured by the liver cirrhosis mortality rates, Figure 5), and a relatively low rate of increase in tobacco consumption(Figure 4). The French performance is not consistent with the increase in road accident injuries (Figure 6). The United Kingdom's lowest rate of increase in health expenditures is consistent with its relatively poor performance in terms of changing health status, but this may be offset somewhat by some relative improvement in life style, such as a recent decline in tobacco consumption, low rate of increase in alcohol problems, and a decline in road accident injuries.

Table 2 provides an overview of the expected effects of medical expenditures and life-style changes. It and the analyses above suggest a more

positive association between aggregate medical expenditures and improvements in health status than other cross-national studies have found. The clues to finding this correspondence were (1) adjusting medical expenditure increases for inflation and population size; and (2) taking into account life-style changes. The association is closer than it appears from looking only at the percentage of GNP spent on medical expenditures and health status--but it is far from a perfect correlation. Part of the discrepancy may reflect the distribution of medical expenditures and utilization within a country, the type of care supplied, supplier-induced demand, and more generally, life styles--nutrition, exercise, shelter, etc. Nevertheless the analysis does suggest that holding down medical expenditures has some cost in terms of overall health.

Table 2, Overview of expected effects of medical expenditure and life-style changes

Change	Countries with most positive performance	Countries with least positive performance
Rate of increase in medical expenditures	France most improvement; Sweden second most improvement	U.K. least improvement
Tobacco consumption	U.S. most improvement Sweden and U.K. little change	Germany most decline (increase in consumption); Netherlands second most decline
Alcohol problems	France most improvement females; Netherlands, U.K., U.S. little change, males	Germany and Sweden most increase, females and males
Motor vehicle accidents	Sweden and U.K. most improvement	France and U.S. increasing risk
Job risk	Sweden, most decline in risk	Germany, smallest improvement
Aging	U.S. and France smallest increase in elderly	Sweden and Germany most increase in elderly
Prediction	France greatest improvement, though reduced by increased risk of motor vehicle accidents	U.K. least improvement, though helped by relative improvement in life style in terms of alcohol use and motor vehicle safety.

Conclusion

If we assume that, in the aggregate, life-style changes are exogenous--are independent of changes in medical expenditures--then a decision to increase medical expenditures is expected to lead to some improvement in health status. Similarly, smaller increases are expected to lead to smaller health status improvements. This says nothing about whether money is better spent influencing life style, including risks at work, or medical expenditures. Nor does it say whether efforts to redistribute medical care dollars, or to increase medical care effectiveness would lead to greater improvements in health status. This analysis, however, calls into question the findings of those researchers who state that there is no demonstrated relationship between medical expenditures and health status. And in doing so it argues that there are costs in terms of foregone health status improvements to reducing medical care expenditures. There is a link between medical expenditures and health status but, to find it, it is necessary to identify real increases in medical expenditures and control for other factors affecting health status. For now, it appears there are some costs--as well as benefits in freeing resources for other uses--to reducing the rates of growth of health expenditures.

REFERENCES

1. Andreano R. An overview of the economics of health services: An international perspective in the industrialized countries In La Reforma Sanitaria en Espana: A Debate (Edited by Luch Martin E.L.), pp.111-124. Madrid, 1984.

2. Maxwell, R. Health and Wealth, Lexington Books, Lexington, Mass. 1981.

3. Abel-Smith B. An International Study of Health Expenditure. Public Health Papers No. 32. World Health Organization, Geneva, 1967.

4. Hart J. T. The inverse care law. Lancet 27 1971.

5. Newhouse J. P. Medical-care expenditure: a cross-national survey. Journal of Human Resources 12, 115-25, 1977.

6. Evans, R. G. Suppler-induced demand: Some empirical evidence and implications. In The Economics of Health and Medical Care (Edited by Perlman M.) pp. 162-173. Macmillan, New York, 1974.

7. Fuchs V. R. and Kramer M. S. Determinants of expenditures for physicians services in the United States, 1948-68. National Bureau of Economic Research Occasional Paper No. 117, New York, 1972.