



The Responsibility of the Individual

Author(s): John H. Knowles

Source: *Daedalus*, Vol. 106, No. 1, Doing Better and Feeling Worse: Health in the United States (Winter, 1977), pp. 57-80

Published by: The MIT Press on behalf of American Academy of Arts & Sciences

Stable URL: <https://www.jstor.org/stable/20024456>

Accessed: 23-01-2020 10:34 UTC

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at <https://about.jstor.org/terms>



JSTOR

American Academy of Arts & Sciences, The MIT Press are collaborating with JSTOR to digitize, preserve and extend access to *Daedalus*

JOHN H. KNOWLES, M.D.

The Responsibility of the Individual

THE HEALTH OF HUMAN BEINGS IS DETERMINED by their behavior, their food, and the nature of their environment. The first agricultural revolution occurred 10,000 years ago with the domestication of plants and animals. Nomadic hunter-gatherers settled around their flocks and fields. Nutrition improved, with a resultant fall in mortality and rise in birth rates. The population expanded, but its growth was checked periodically by crop failures and famine, tribal war over scarce resources, infectious disease now easily transmitted by air, water, and food among settled people, and the common practice of infanticide. The population was under 10 million people.

By 1750, the number of people in the world had grown to 750 million, by 1830 to one billion, by 1930 to two billion, by 1960 to three billion, and then to four billion today. This massive growth of population resulted from the fall in mortality rates attendant upon steadily increasing food supplies. Improved nutrition again increased birth rates and resistance to infectious disease. The greater availability of food also reduced the practice of infanticide.

The second agricultural revolution had begun in the eighteenth century; it included increased land use, extensive manuring to restore soil fertility, crop rotation, winter feeding, and the widespread cultivation of potatoes and maize. A massive increase in available food was extended still further by the Industrial Revolution of the nineteenth and twentieth centuries through mechanization, extensive irrigation, chemical fertilizers, and pesticides. The "Green Revolution" of the past thirty years further increased food production, and was based on genetic manipulations which produced hardier and more productive varieties of crops, responsive to the more intensive use of water and fertilizer.

More than half the reduction in mortality rates over the past three centuries occurred before 1900 and was due in nearly equal measure to improved nutrition and reduced exposure to air-and water-borne infection. The provision of safe water and milk supplies, the improvement in both personal and food hygiene, and the efficient disposal of sewage all helped to reduce the incidence of infectious disease. Vaccination further reduced mortality rates from smallpox in the nineteenth century and from diphtheria, pertussis, tetanus, poliomyelitis, measles, and tuberculosis in the twentieth century, although the contribution of vaccinations to the overall reduction in mortality rates over the past hundred years is small (perhaps as small as 10 per cent) as contrasted with that due to improved nutrition and reduction in the transmission of infectious disease.¹ An even smaller contribution has been made by

the introduction of medical and surgical therapy, namely antibiotics and the excision of tumors, in the twentieth century.

Over the past 100 years, infanticide has declined in the developed countries as changes in reproductive practice, such as the use of contraceptives, have been introduced to contain family size and reduce national growth rates of population, thus sustaining the improvement in health and standards of living. The population of England and Wales trebled between 1700 and 1850 without any significant importation of food. If the birth rate had been maintained, the population by now would be some 140 million instead of the 46 million it actually is. Changes in reproductive behavior maintained a rough balance between food production and population growth and allowed standards of living to rise. A similarly remarkable change in reproductive behavior occurred in Ireland following the potato famines of the eighteen-forties, and birth rates have been sustained voluntarily at a low level to this day in that largely Catholic country.

Improvement in health resulted from changes in personal behavior (hygiene, reproductive practices) and in environmental conditions (food supplies, provision of safe milk and water, and sewage disposal). Cartesian rationalism, Baconian empiricism, and the results of the Industrial Revolution led the medical profession into scientific and technical approaches to disease. The engineering approach to the human machine was strengthened by the germ theory of disease which followed the work of Pasteur and Koch in the late nineteenth century. The idea was simple, unitary, and compelling: one germ—one disease—one therapy. Population factors, personal behavior, and environmental conditions were neglected in such a pure model or paradigm of approach and were picked up by elements less powerful and perceived increasingly as marginal to health, i.e., politicians, state departments, and schools of public health. The medical profession hitched its wagon to the rising stars of science and technology. The results have been spectacular for some individuals in terms of cure, containment of disease, and alleviation of suffering; as spectacular in terms of the horrendous costs compounding now at a rate of 15 per cent annually; and even more spectacular to some because allocation of more and more men and women, money, and machines has affected mortality and morbidity rates only marginally. The problem of diminishing returns, if current trends continue, will loom as large and pregnant to the American people in the future as the mushrooming atomic cloud does today.

I will not berate the medical profession, its practitioners and its professors—they reflect our culture, its values, beliefs, rites, and symbols. Central to the culture is faith in progress through science, technology, and industrial growth; increasingly peripheral to it is the idea, vis-à-vis health, that over 99 per cent of us are born healthy and made sick as a result of personal misbehavior and environmental conditions. The solution to the problems of ill health in modern American society involves individual responsibility, in the first instance, and social responsibility through public legislative and private voluntary efforts, in the second instance. Alas, the medical profession isn't interested, because the intellectual, emotional, and financial rewards of the present system are too great and because there is no incentive and very little demand to change. But the problems of rising costs; the allocation of scarce national resources among competing claims for improving life; diminishing returns on health from the system of acute, curative, high-cost, hospital-based medicine; and increasing evidence that personal behavior, food, and the nature of the environment around us are the

prime determinants of health and disease will present us with critical choices and will inevitably force change.

Most individuals do not worry about their health until they lose it. Uncertain attempts at healthy living may be thwarted by the temptations of a culture whose economy depends on high production and high consumption. Asceticism is reserved for hair-shirted clerics and constipated cranks, and everytime one of them dies at the age of 50, the hedonist smiles, inhales deeply, and takes another drink. Everyone is a gambler and knows someone who has lived it up and hit 90 years, so bad nurture doesn't necessarily spell doom. For others, a genetic fatalism takes hold: Nature—your parents' genes—will decide your fate no matter what you do. For those who remain undecided, there is always the reassuring story—and we all know it—of someone with living parents who has led a temperate, viceless life and died of a heart attack at the age of 45. As for stress, how about Winston Churchill at the age of 90! And he drank brandy, smoked cigars, never exercised, and was grossly overweight! Facing the insufferable insult of extinction with the years, and knowing how we might improve our health, we still don't do much about it. The reasons for this peculiar behavior may include: (1) a denial of death and disease coupled with the demand for instant gratification and the orientation of most people in most cultures to living day by day; (2) the feeling that nature, including death and disease, can be conquered through scientific and technologic advance or overcome by personal will; (3) the dispiriting conditions of old people leads to a decision by some that they don't want infirmities and unhappiness and would just as soon die early; (4) chronic depression in some individuals to the extent that they wish consciously or unconsciously for death and have no desire to take care of themselves; and (5) the disinterest of the one person to whom we ascribe the ultimate wisdom about health—the physician.

Prevention of disease means forsaking the bad habits which many people enjoy—overeating, too much drinking, taking pills, staying up at night, engaging in promiscuous sex, driving too fast, and smoking cigarettes—or, put another way, it means doing things which require special effort—exercising regularly, going to the dentist, practicing contraception, ensuring harmonious family life, submitting to screening examinations. The idea of individual responsibility flies in the face of American history which has seen a people steadfastly sanctifying individual freedom while progressively narrowing it through the development of the beneficent state. On the one hand, Social Darwinism maintains its hold on the American mind despite the best intentions of the neo-liberals. Those who aren't supine before the Federal Leviathan proclaim the survival of the fittest. On the other, the idea of individual responsibility has been submerged to individual rights—rights, or demands, to be guaranteed by government and delivered by public and private institutions. The cost of sloth, gluttony, alcoholic intemperance, reckless driving, sexual frenzy, and smoking is now a national, and not an individual, responsibility. This is justified as individual freedom—but one man's freedom in health is another man's shackle in taxes and insurance premiums. I believe the idea of a "right" to health should be replaced by the idea of an individual moral obligation to preserve one's own health—a public duty if you will. The individual then has the "right" to expect help with information, accessible services of good quality, and minimal financial barriers. Meanwhile, the people have been led to believe that national health insurance, more

doctors, and greater use of high-cost, hospital-based technologies will improve health. Unfortunately none of them will.

More and more the artificer of the possible is “society”—not the individual; he thereby becomes more dependent on things external and less on his own inner resources. The paranoid style of consumer groups demands a fight against something, usually a Big Bureaucracy. In the case of health, it is the hospitals, the doctors, the medical schools, the Medicaid-Medicare combine, the government. Nader’s Raiders have yet to allow that the next major advances in the health of the American people will come from the assumption of individual responsibility for one’s own health and a necessary change in habits for the majority of Americans. We do spend over \$30 billion annually for cigarettes and whiskey.

The behavior of Americans might be changed if there were adequate programs of health education in primary and secondary schools and even colleges—but there aren’t. School health programs are abysmal at best, confining themselves to preemphory sick calls and posters on brushing teeth and eating three meals a day; there are no examinations to determine if anything’s been learned. Awareness of danger to body and mind isn’t acquired until the mid-twenties in our culture, and by then patterns of behavior are set which are hard to change. Children tire of “scrub your teeth,” “don’t eat that junk,” “leave your dingy alone,” “go to bed,” and “get some exercise.” By the time they are sixteen, society says they shall have cars, drink beer, smoke, eat junk at drive-ins, and have a go at fornication. If they demur, they are sissies or queer or both. The pressure of the peer group to do wrong is hardly balanced by the limp protestations of permissive parents, nervously keeping up with the Joneses in suburban ranch houses crammed with snacks and mobile bars.

The barriers to the assumption of individual responsibility for one’s own health are lack of knowledge (implicating the inadequacies of formal education, the all-too-powerful force of advertising, and of the informal systems of continuing education), lack of sufficient interest in, and knowledge about, what is preventable and the “cost-to-benefit” ratios of nationwide health programs (thereby implicating all the powerful interests in the health establishment, which couldn’t be less interested, and calling for a much larger investment in fundamental and applied research), and a culture which has progressively eroded the idea of individual responsibility while stressing individual rights, the responsibility of society-at-large, and the steady growth of production and consumption (“We have met the enemy and it is us!”). **Changing human behavior involves sustaining and repeating an intelligible message, reinforcing it through peer pressure and approval, and establishing clearly perceived rewards which materialize in as short a time as possible. Advertising agencies know this, but it is easier to sell deodorants, pantyhose, and automobiles than it is health.**

What is the problem? During the nineteenth and early twentieth centuries, communicable disease was the major health problem in the United States. In 1900, the average life expectancy at birth was 49.2 years. By 1966, it had increased to 70.1 years, due mainly to marked reduction in infant and child mortality (between birth and age 15). By mid-century, accidents were by far the leading cause of death in youngsters, and the majority of accidents were related to excessive use of alcohol by their parents, by adults generally, and even occasionally by themselves. While 21 years were added to life expectancy at birth, only 2.7 years were added to it at age 65—the remaining life expectancy at age 65 being 11.9 years in 1900 and 14.6 in 1966. The marked increase in life expectancy at birth was due to the control and eradication

of infectious disease, directly through improved nutrition and personal hygiene, and environmental changes, namely, the provision for safe water and milk supplies and for sewage disposal.

Today, the major health problems in the United States are the chronic diseases of middle and later age, mainly heart disease, cancer, and strokes. Death and disability in middle age is premature and potentially preventable. For those under 44 years, the leading causes of death are accidents, heart disease, cancer, homicide, and suicide. For those under 25 years, accidents are by far the most common cause of death, with homicide and suicide the next leading causes. Of the roughly 2 million deaths in the United States in 1969, 50 per cent were due to heart disease (40%) and strokes (10%); 16 per cent to cancer; and 8 per cent to accidents (6%), homicide (1%), and suicide (1%). But death statistics tell only a small part of the story. For every successful suicide, an estimated ten others, or 200,000 people, have made the attempt. For every death due to accidents, hundreds of others are injured, and many of those are permanently disabled. Over 17 per cent, or 36 million people, have serious disabilities limiting their activities.

Premature death and disability are far too common. For the 178,000 people between the ages of 45 and 64 years who died of heart disease in 1969, 1.2 million (or 3 per cent of the 40.5 million people in this age group) were chronically disabled because of heart disease.² For the over 30,000 people who died of cirrhosis of the liver in 1969—a disease related directly to excessive ingestion of alcohol together with poor nutrition—as many as 10 million people suffer from alcoholism and varying degrees of malnutrition. Twenty-six million Americans, 11 million of whom receive no federal food assistance, live below the federally defined poverty level, a level which does not support an adequate diet.

The control of communicable disease depended as much (or even more) on broad changes in the environment attendant upon economic development (improved housing and nutrition, sanitary engineering for safe water supplies, and sewage disposal) as it did on the individual's knowledge and behavior (need for immunization, personal hygiene, and cooperation with case finding). However, control of the present major health problems in the United States depends directly on modification of the individual's behavior and habits of living. The need for improved nutrition remains unchanged. The knowledge required to persuade the individual to change his habits is far more complex, far less dramatic in its results, far more difficult to organize and convey—in short, far less appealing and compelling than the need for immunization, getting rid of sewage, and drinking safe water. Even the problems of immunizing the population in contemporary America are difficult, however—witness the failure to eradicate measles ten years after the technical means became available.

Studies by Breslow and Belloc³ of nearly 7,000 adults followed for five and one-half years showed that life expectancy and health are significantly related to the following basic health habits:

- 1) three meals a day at regular times and no snacking;
- 2) breakfast every day;
- 3) moderate exercise two or three times a week;
- 4) adequate sleep (7 or 8 hours a night);
- 5) no smoking;
- 6) moderate weight;
- 7) no alcohol or only in moderation.

A 45-year-old man who practices 0-3 of these habits has a remaining life expectancy of 21.6 years (to age 67), while one with 6-7 of these habits has a life expectancy of 33.1 years (to age 78). In other words, 11 years could be added to life expectancy by relatively simple changes in habits of living, recalling that only 2.7 years were added to the life expectancy at age 65 between 1900 and 1966. Breslow also found that the health status of those who practiced all seven habits was similar to those 30 years younger who observed none.

A large percentage of deaths (estimates up to 80 per cent) due to cardiovascular disease and cancer are "premature," that is, occur in relatively young individuals and are related to the individual's bad habits. Heart disease and strokes are related to dietary factors, cigarette smoking, potentially treatable but undetected hypertension, and lack of exercise. Cancer is related to smoking (oral, buccal, lung, and bladder cancer) and probably to diets rich in fat and refined foodstuffs and low in residue (gastrointestinal and perhaps breast and prostatic cancer) and to the ingestion of food additives and certain drugs, or the inhalation of a wide variety of noxious agents. Certain occupational exposures and personal hygienic factors account for a small but important fraction of the total deaths due to cancer. Theoretically, all deaths due to accidents, homicide, and suicide are preventable.

Stress appears to play a critical role in disease. The stress of adjusting to change may generate a wide variety of diseases, and change is the hallmark of modern society. It is known that the death rate for widows and widowers is 10 times higher in the first year of bereavement than it is for others of comparable age; in the year following divorce the divorced persons have 12 times the incidence of disease that married persons have. People living in primitive societies insulated from change have low blood pressures and blood cholesterol levels which do not vary from youth to old age. Blood pressure and cholesterol tend to rise with age in our culture and are thought to be a prime cause of heart attacks and strokes. Studies indicate that up to 80 per cent of serious physical illnesses seem to develop at a time when the individual feels helpless or hopeless. Studies on cancer patients have revealed lives marked by chronic anxiety, depression, or hostility and a lack of close emotional ties with parents—significantly greater than in a control group.

Despite the well-known hazards of smoking, per-capita consumption of cigarettes is expected to increase in 1975-76 after having been relatively stable between 1963—when the Surgeon General sounded the warning against smoking—and 1973, at 211 packs annually per person over 18 years. Some 15 per cent of boys and girls under 18 years smoke cigarettes. Cigarette production is increasing at about 3.5 per cent per year due to population growth and to a marked increase in smoking in teenage girls, which has risen from 8 to 15 per cent in the past several years. If cigarette smoking were to be eliminated entirely, a 20 per cent reduction in deaths due to cancer would result (based on the assumption that 85 per cent of lung cancer is causally related to cigarette smoking). If all contributing environmental factors and personal bad health habits were eliminated, it is possible that cancer could be virtually eliminated as a cause of death. This would increase the average life expectancy at birth by 6 to 7 years, and at age 65 by 1.4 years for men and 2.1 years for women. The use of averages gives an erroneous impression, however, for one out of six people die of cancer. The elimination of cancer would mean that one out of six people would live 10.8 years longer.

Bad nutritional status (of the too-much-fat-intake-resulting-in-obesity type) can

predispose the individual to heart attacks, strokes, cancer of the gastrointestinal tract, diabetes, liver and gall-bladder disease, degenerative arthritis of the hips, knees, and ankles, and injuries. It is estimated that 16 per cent of Americans under the age of 30 years are obese, while 40 per cent of the total population, or 80 million Americans, are 20 or more pounds above the ideal weight for their height, sex, and age. Over 30 per cent of all men between 50 and 59 years are 20 per cent overweight and 60 per cent are at least 10 per cent overweight.

Excessive use of alcohol is directly related to accidents and to liver disease (cirrhosis) as well as to a wide variety of other disorders, including vitamin deficiencies, inflammation of the pancreas, esophagus, and stomach, and muscular and neurologic diseases. Alcohol is a strong "risk factor" in cancer of the mouth, pharynx, larynx, and esophagus. More than 50 per cent and probably nearer to 75 per cent of all deaths and injuries due to automobile accidents are associated with the excessive use of alcohol. Alcoholism in one or both parents is significantly associated with home injuries to children (more than 50 per cent in some studies). The prevalence of "heavy-escape" drinkers in the United States has been estimated at 6.5 million people (5.4 per cent of total adult population), and the figures for those who use alcohol chronically and excessively range up to 10 million adults. Teenage drinking is now nearly universal. A study of high school students revealed that 36 per cent reported getting drunk at least four times a year (remember, 15 per cent smoke!). An increased frequency of cancer of the mouth, pharynx, larynx, and esophagus is seen in those who both smoke and drink and is less frequent, but still significantly higher than normal, in those who only smoke or only drink.

Dietary factors play a major role in cardiovascular disease and cancer. The major variable, as deduced from studies of migrant populations, seems to be fat content. For example, cancer of the large bowel as well as that of the breast and prostate is much more common in the United States than in Japan, and seems to be related to the difference in fat intake. The American derives 40 to 45 per cent of his calories from fat, whereas the Japanese obtains only 15 to 20 per cent of his calories from that source. Japanese descendants living in the United States have an incidence of bowel cancer similar to that seen in native Americans. Although the mechanism has not been established, it would appear that high fat intake (usually with resultant obesity) predisposes the American to both cancer and cardiovascular disease. Data from a long-term study of cardiovascular disease in Framingham, Massachusetts, indicate that each 10 per cent reduction in weight in men 35-55 years old would result in a 20 per cent decrease in the incidence of coronary disease. A 10 per cent increase in weight would result in a 30 per cent increase in coronary disease.⁴

The incidence of cancer of the colon and rectum in Americans both white and black is 10 times the incidence estimated for rural Africans. The removal of dietary fiber and a high intake of refined carbohydrates typical of diets in developed countries such as the United States result in a slowed transit time of food through the intestines. This is thought to facilitate the development of cancer, along with such diseases as diverticulitis, appendicitis, and even hemorrhoids. Prudence would dictate a reduction in fat and refined carbohydrates (and therefore increased fiber content) in the American diet. High-carbohydrate diets typical in the American culture also lead to dental caries, and may, over time, increase the risk of acquiring diabetes.

Knowledge of cancer and evidence for its multiple causes have increased to the point where the statement can be made with confidence that over 80 per cent of

human neoplasms depend either directly or indirectly on environmental factors. The term "environmental factors" includes cancer-provoking substances or carcinogens in the food and the drugs we ingest, the air we breathe, the water we drink, the occupations we pursue, and the habits we indulge. There are three major groups at high risk of cancer: (1) those with known host factors such as genetic and other congenital defects and immunologic-deficiency diseases; (2) those with exposure to environmental contaminants known to produce cancer; and (3) those with certain demographic characteristics which reflect as yet unknown carcinogenic factors such as place of residence or migration.⁵

The familial occurrence of cancer is a well-known phenomenon. A significant two to four times excess occurrence in relatives of patients has been noted in cancer of the stomach, breast, large intestine, uterus, and lung. Increased familial incidence has also been noted in leukemia, brain tumors in children, and sarcomas. Individuals with hereditary deficiencies of the immune system of the body develop malignant diseases of the blood vessels and lymphatic system. Acquired immunodeficiency also leads to the development of cancer. When patients with kidney transplants are given drugs over a long time to suppress the immune system in order to prevent rejection of the grafted kidney, cancer of the lymphatic system (lymphoma of the reticulum-cell-sarcoma type), frequently confined to the brain, and cancer of the skin develop in a significant proportion of the patients. Women who have had genital herpes (herpes simplex virus 2) have an increased incidence of cancer of the cervix of the uterus and constitute a high-risk population. People with pernicious anemia with associated gastritis develop cancer of the stomach at five times the rate of the normal population. Cirrhosis is associated with an increased incidence of cancer of the liver. Patients with diabetes have two times the incidence of cancer of the pancreas as normal individuals. The presence of gallstones and kidney stones increases the risk of developing cancer in the respective organs. Single episodes of trauma have been implicated in cancer of the bone, breast, and testicles. Chronic irritation of a skin mole may lead to cancerous degeneration, called malignant melanoma.

Environmental factors include tobacco, alcohol, radiation, occupation, drugs, air pollutants, diet, viruses, and other organisms, and sexual factors. The evidence on cigarette smoking is incontrovertible. It greatly increases the risk of lung cancer as well as cancer of the mouth, pharynx, larynx, esophagus, and urinary bladder. The incidence of cancer in cigarette smokers is higher in urban than rural dwellers, suggesting that air pollutants are additional major causative factors. Occupational exposure to asbestos fibers results in lung cancer, but here again the incidence is higher in those who smoke. Alcohol as a carcinogenic agent in malignancy of the mouth, larynx, esophagus, and liver (in association with cirrhosis) has been noted. A major long-term effect of radiation is cancer. Radiologists are ten times more likely to die of leukemia than are physicians not exposed to x-rays.

The list of drugs known or thought to be carcinogenic also continues to expand. Studies have shown that post-menopausal women given estrogens (so-called "replacement therapy" to diminish menopausal complaints and advertised to "keep women feminine") are five to fourteen times more likely to develop cancer of the uterus (endometrial cancer) than post-menopausal women not given the drug. (Other factors known to be associated with uterine cancer such as obesity, high blood pressure, never having borne a child, and age were not significant variables in these studies.) The risk increased with dosage size and duration of estrogen therapy. Other studies

have shown beyond a doubt that the daughters of women given diethylstilbestrol (DES) during pregnancy are at higher risk of developing a rare form of cancer of the vagina. Despite this knowledge, DES is still being given to pregnant women to prevent spontaneous abortion. Most astounding has been the discovery of over 100 cases of liver tumors in women taking oral contraceptive pills. Most of the tumors were benign, but some showed cancerous degeneration and others ruptured with hemorrhage into the abdomen. Many carcinogenic agents incite the disease only many years after the initial exposure (e.g., atomic-bomb radiation) or after prolonged use, so it is not known whether an epidemic of liver tumors will ultimately develop in oral-contraceptive users. (The "pill" also causes a small but significant risk for heart attacks in users.) Long-term epidemiologic research is needed to establish knowledge necessary for control programs, but there is sufficient knowledge now to suggest that we should sharply restrict the use of many drugs.

Sexual factors (both hormonal and behavioral) play a role in the causation of cancer of the breast and uterus (cervix and body of the uterus), penis, prostate, and testis. Cancer of the cervix occurs much more frequently in women who have had many sexual partners beginning at an early age, who come from a lower socioeconomic status, and who have had infection with Herpes simplex virus type 2, which is transmitted venereally. Celibate women are at very low risk, although they are at high risk for cancer of the breast. Cancer of the penis occurs in those who have poor penile hygiene and are uncircumcised in infancy (circumcision after the age of two years does not protect against the disease).

Attempts to prevent disease and improve and maintain health involve multifaceted strategies and expertise from many disciplines. Fundamental to any and all such attempts is sufficient empirical knowledge, i.e., knowledge gained through observation and trial-and-error experimentation that allows the advocate to convey his information with sufficient conviction to change the behavior of his audience. Although a great deal of information is available, the whole field of preventive medicine and health education needs far more fundamental research and long-term field experimentation. The biological and epidemiological effects of a wide variety of pollutants, the cost-benefit ratios of many available screening services, the influence of financial sanctions on changing health behavior, the use of the mass media and their effect on cognition and behavior, the long-term effects of various therapeutic regimens on the morbidity and mortality of individuals with asymptomatic high blood pressure, the long-term effects of marked reduction of fat in the diet on the incidence of cancer and heart disease, the influence of personal income on the development of cancer and coronary disease (the death rate from both lung cancer and coronary disease is significantly lower for the affluent than for the poor) are all examples of problems that need study. These problems demand for their solution the participation and integration of the disciplines of the biological sciences, the behavioral and social sciences (social, psychology, economics, cultural anthropology, political science), and public health (epidemiology and biostatistics).

It is a sad fact that of a total annual national expenditure on health of \$120 billion, only 2 to 2.5 per cent is spent on disease prevention and control measures, and only 0.5 per cent each for health education and for improving the organization and delivery of health services. The national (federal) outlay for environmental-health research is around 0.25 per cent of total health expenditures. These relatively meagre expenditures speak for the lack of interest in fields that rationally demand a much heavier

commitment. The support of fundamental biomedical research has also flagged alarmingly in the past several years. The basic biological mechanisms of most of the common diseases are still not well enough known to give clear direction to preventive measures.

Strategies for improving health must include the incorporation of preventive measures into personal health services and into the environment, and individual and mass educational efforts.⁶ For example, in dealing with the health problem of heart attacks, preventive measures would include screening for high-risk factors (high blood pressure, elevated blood cholesterol and fat levels, overweight, cigarette smoking, stress, and family history) and making available emergency services and measures for rapid transit to hospital-based coronary-care units; environmental measures would include altering food supply to reduce the intake of fat (i.e., those substances that raise blood cholesterol) and encouraging experiments in reducing work-related stress; and individual and mass educational efforts would include encouraging the use of screening examinations, the cessation of smoking, the maintenance of optimal weight with a balanced, low-fat diet, and obtaining regular exercise. Carrying out such a strategy involves many variables—convincing the doctor to play his pivotal role (and most medical educators and physicians are singularly uninterested in prevention), altering financing mechanisms to provide incentives to use preventive services (and most health insurance is, in fact, “disease insurance” which does not cover health education and preventive measures), and stimulating public as well as private efforts to exercise restraint on advertising and to exert positive sanctions for dissemination of health information through the mass media.

The health catastrophe related to automobile accidents presents a different type of problem. Here, personal-health services include availability of rapid transportation and first aid, emergency medical services, and definitive acute-care services in regional general hospitals; environmental measures would relate to road and highway construction (including lighting, warning signs, speed limits, safety rails), and the design and construction of automobiles for safety; and educational measures would include driver training, relicensing with eye examination, avoidance of alcohol and other drugs before driving, and reduction of speed. Which of these efforts will produce the most benefit at least cost? An interesting answer was provided during the oil-embargo energy crisis which necessitated reductions in speed limits and in the use of vehicles. The result in California was a 40 per cent reduction in death rates from automobile accidents during the month of February, 1974, as contrasted with the previous February. Accidents on the New Jersey Turnpike dropped by one-fifth from 1973 to 1974, and fatalities were down by almost one-half, the lowest figure since 1966. Meanwhile, many people won't change their habits and wear seat belts, stop drinking, or reduce speed—and are annoyed with the restrictions on their freedom when someone tries to make them.

Dental health involves the personal services of the dentist and dental hygienist, the environmental measures of fluoridation of water supplies and the dietary restriction of refined carbohydrates, and the educational measures of prudent dietary habits, brushing the teeth, and visiting the dentist regularly. Where is the greatest benefit-cost ratio to be found? There is unequivocal evidence that fluoridation of water supplies will reduce dental caries by as much as 60 per cent. It is safe and inexpensive, costing only 20 cents a year per person to prevent dental decay in children. Fluoridation of water supplies began about 1950. By 1967 over 3,000 communities

with some 60 million people had adopted fluoridation. But the pace of change has slowed considerably, and the majority of people still lack fluoridated water due to fears of poisoning and resistance to what is perceived as an encroachment on their freedom. This highest benefit-cost dental-health program is still unavailable to the majority of Americans. Personal dental services are unavailable to large segments of our population and qualify as a luxury item.

Conceptually, it is useful to subdivide preventive medicine into three classes: primary prevention and the measures employed to prevent disease, such as vaccination against measles; secondary prevention, that is, the early detection of disease so that active therapeutic intervention can be employed to cure or arrest the progress of the disease—examples are the detection of high blood pressure or the use of mammography to detect cancer of the breast; and tertiary prevention, which comprises those measures that will slow the progress or avoid the complications of established (chronic) disease—an example is the education of the patient with diabetes in the nature of the disease and its treatment: insulin administration, diet control, exercise, urine testing, and care of the feet. Well-conceived programs of patient education can reduce the rate of hospital readmission due to decompensation or complications of the disease by as much as 50 per cent. The statement is frequently made that if one wants to lead a long and healthy life, develop a chronic disease and take good care of it! This has to be tempered by the knowledge obtained at the McMaster University Medical Center at Hamilton, Ontario: ambulatory patients are unlikely to take more than 50 per cent of the medications prescribed for them. Nor does the degree of compliance have anything to do with how much the patient knows about his disease.

All three forms of prevention require the organization of personal health services, reinforced by environmental measures and mass education. The most good can be obtained, relative to the cost, where large populations can be reached over time, e.g., school, hospital clinic, place of work, or the doctor's office. The providers of personal health services are attuned largely to acute, curative medicine in a "complaint-responsive" system geared to the individual, and they have not assumed responsibility for health maintenance in population groups. Health (i.e., disease) insurance has solidified the behavior of both producers and consumers in such a way that neither is interested in, or rewarded for, health-maintenance efforts. A successful long-term strategy for improving and maintaining health must place equal responsibility on individual producers and individual consumers—and substantial change in the behavior of both will be required before health is improved measurably in the United States. At the moment the producers are flagellated to a fare-thee-well and studiously avoid the subject, while the consumers recognize only rights, not responsibilities.

Preventive medicine can concentrate on special disease problems (heart disease, cancer) or on special population groups largely based on age (pregnant women, school children, industrial workers). Special disease problems present a good point of departure. Their discussion exemplifies some of the complexities of developing adequate programs, both from the standpoint of needed knowledge and that of changing behavior:

Immunization against infectious disease: Vaccines are available against smallpox, mumps, rubella (German measles), measles, diphtheria, pertussis (whooping cough), tetanus, and poliomyelitis. The benefit-cost ratio favors vaccination for measles, rubella, poliomyelitis, diphtheria, pertussis, and mumps. Mumps is a minor public

health problem but the ease of combining mumps vaccine with those against measles and rubella into one "shot" adds a small advantage at insignificant cost. Despite the high benefit-cost advantage of measles-rubella and poliomyelitis vaccination, the percentage of the population protected against these diseases waxes and wanes. We have not eradicated measles ten years after the technical means were made available. There was a resurgence of measles between 1969 and 1971, and, in 1974, 40 per cent of children in the critical age between 1 and 4 were not immunized against measles, and 44 per cent were unprotected against rubella. Recent declines in levels of immunization against poliomyelitis are also cause for alarm and for renewed efforts. Inadequacies in the delivery system and in the behavior of the population at large—based on everything from lack of information to superstition—are obvious, and it is not easy to improve the delivery system or change the behavior of people. Here again, more intensive research is needed on the factors that influence compliance with public health programs.

Smallpox vaccination presents an interesting and valuable lesson. By 1968, the "costs" of vaccination outweighed the benefits and included 8,024 complications, of which 152 were major, including 9 deaths (1 per million vaccinations); the last cases of smallpox in the United States were reported in 1949. Because risk of acquiring the disease is now so small and the costs of vaccination so large relative to the benefits, the United States Public Health Service and the Academy of Pediatrics recommended that routine smallpox immunization be terminated. Perhaps revaccination for hospital employees is worthwhile, but even here the risk of exposure to the disease imported from another country is minimal. Worldwide obliteration of the disease is, in fact, at hand. Recommending against smallpox vaccination is a fine example of terminating a once vital program when the costs exceed the benefits.

Venereal disease: Sexual activity seems to have increased in the United States. A marked rise in the incidence of gonorrhea and syphilis began in 1957, and the trend has continued to the present. Nearly 900,000 cases of gonorrhea and 25,000 cases of syphilis were reported in 1974. Officially reported cases represent the absolute minimum numbers affected. The Public Health Service estimated 2,700,000 new cases of gonorrhea and 80,000 new cases of syphilis in 1974. More recently, herpes virus has been added to the roster of venereal diseases, and there is evidence that hepatitis virus can be transmitted among homosexuals (the virus is present in saliva and semen). Recent surveys have indicated that asymptomatic infection with gonorrhea exists in 1 to 5 per cent of various groups of young women, thereby maintaining a substantial reservoir of infection with which to sustain the disease at epidemic levels. Control of such epidemics is extremely difficult and includes: (1) sex education in high school (effectively prevented by horrified parents in many school districts); (2) screening of sexually active women for gonorrhea and syphilis, with treatment of the individual and active case-finding for the contacts of the individual (far too few doctors and hospital clinics and emergency wards are organized or even interested in this—and contacts don't like to be investigated!); and (3) massive public education. When the "V.D. Blues" was shown over WNET-New York several years ago, thousands thronged the clinics with the belief they had the disease. Several weeks later, attendance figures were down again. If the message is not sustained, a change in behavior will not be sustained. The issue is not just the public health problem. In 1974, there were 600,000 births to teenagers, the majority of which were illegitimate, a doubling of the figure from 1965; nearly all were unplanned and unwanted.

Increased efforts are required to control venereal disease (which would also decrease the number of illegitimate births), and a number of programs have been successful. The long-range benefits justify the costs, but the most effective ways and the most favorable benefit-cost ratios are known only theoretically. If the President of the United States declared a National V.D. Eradication Week each year, giving detailed instructions to providers and consumers, could we eliminate the disease? Or would the President be thought daft or offensive and voted out of office? Should failure to be screened annually for venereal disease be punishable by imprisonment? How many policemen and prisons would then be necessary, and would the benefits justify the costs? If the President is to use his precious time for health matters, why not give detailed instructions on heart disease, cancer, stroke, and accidents which are far more costly to our society? But then, the American people are tired of restraints on their freedom and they want a treat, not a treatment. Turn the President off! The dilemma remains: How do we maintain individual freedom and still achieve desirable social ends? How do we change behavior and reinforce individual responsibility?

High blood pressure: It is estimated that some 24 million Americans have hypertension. Nationwide surveys in 1971 showed that nearly half of those afflicted didn't know it, and only one-sixth (4 million people) were receiving adequate therapy (rest and judicious exercise, diet to reduce weight and restrict salt, reduction or avoidance of stress, and drug therapy)—this in the face of the fact that high blood pressure is the primary cause of 60,000 deaths a year and is a significant causative factor in the more than 1,500,000 heart attacks and strokes suffered annually by Americans. Screening surveys allow us to estimate that 30 per cent of the roughly one million blacks in New York City have hypertension—a disease more prevalent among blacks than whites and associated with a particularly malignant course. Approximately 1,250,000 excess deaths occur in hypertensives (blood pressure greater than 160 mm Hg systolic, 95 mm Hg diastolic) between the ages of 35 and 64 years over a 10-year period as contrasted with a comparable group with normal blood pressure. Within this age group are another 11 million persons with borderline hypertension (between 160/95 and 140/95) among whom an estimated 500,000 excess deaths occur over the 10-year period.

It is obvious that hypertension is a massive public health problem with tremendous costs, emotional and financial, to the American people. It is easy to measure the blood pressure, so why not just do it and treat the cases found? First of all, we lack sufficient knowledge to carry out the program with conviction. We should be unwilling to bear the considerable costs of detecting and then treating perhaps 10 to 15 million people (recognizing that as many as 50 per cent of them won't follow instructions anyway) to justify unknown, or at best uncertain, benefits. For example, it is known that detection and treatment of those with diastolic pressure above 115 mm Hg reduce morbidity and mortality. It is not known whether those with milder degrees of hypertension (diastolic pressure 95 to 110 mm Hg) will benefit from treatment. In the absence of this information (and long-range studies are currently being conducted by the Veterans Administration), the costs cannot be justified, and the mass screening of millions of people is simply not worth the effort. Assuming that it was worth the effort, we would then face the knotty problems of public education and compliance with therapeutic regimens, to say nothing of the need for new facilities and manpower-training programs. The balance of costs and benefits must be known, and this requires further research.

In the meantime, maintaining the ideal weight, restricting the use of salt and alcohol, ceasing to smoke, and exercising regularly will do much to maintain vascular tone and reduce the morbidity and mortality from heart attacks and probably also hypertension. But how many of us are willing to do these things? There is good news. In 1972, government and private agencies began a coordinated program to educate the public about the disease. Over the next three years the number who didn't know they had the disease decreased from 49 per cent to 29 per cent and the numbers receiving adequate therapy doubled, from 4 to 8 million people. There are still, however, 5 million others who know they have the disease and won't do anything about it.

Breast cancer: Cancer of the breast is the leading cause in women of death from cancer. There were 33,000 deaths and 90,000 new cases in 1974. This incidence is increasing rapidly in black women, although it remains more frequent—and it is also still increasing—in white women. Clinical examination and mammography (an x-ray technique enabling one to “see” into the breast tissue) in selected age groups have not given sufficiently clear-cut results in terms of early detection and reduction in mortality to warrant a massive national expansion of screening procedures. Further research into costs and benefits in various age groups using a variety of techniques of detection is needed, and some is already being done. One study of women aged 40 to 64 showed that mammography and clinical examination reduced the short-term mortality by one-third. Just as important, 35 per cent of those offered the examination declined to participate in the program. And bear in mind that mammography carries with it the hazard of radiation damage to the individual if done too frequently.

Cancer of the cervix of the uterus: This cancer can be detected in the pre-invasive stage of the disease and cured by surgery and/or radiation. The widespread use of cervical smears is probably justified. I say “probably,” because it still isn't known how many cases of pre-invasive cancer (also called cancer-in-situ) will become “invasive,” meaning malignant and life threatening. Therefore rigorous benefit-cost analysis is not available as yet. Present evidence suggests that screening of adult women at two-year intervals is worth the effort (an example of secondary prevention). A major problem is that those most susceptible, i.e., black women, who suffer the disease at twice the incidence of white women, are least likely to use the available screening services. Here, lack of education, financial barriers, inaccessibility of services, early onset of sexual activity in teenage girls, and multiple births all play a role and have to be contended with if a campaign of prevention is to be effective. Jewish women are most apt to use available services, but least apt to develop the disease. This is thought to be due to their better education and personal hygiene, later onset of sexual activity, and fewer births. In addition, circumcision in Jewish males is thought to prevent the accumulation of a carcinogen under the foreskin that would otherwise be transmitted to the female through intercourse.

Multiphasic screening: The above are examples of diseases where specific interventions and the questions surrounding them offer a variety of strategies for improving health, while calling for a far larger national commitment to research. In principle, the use of an automated series of tests on the blood, urine, and stool, combined with examination of sputum and cervical secretions and various other procedures (x-rays, blood-pressure measurement, proctoscopy, electrocardiogram) should be effective primary and secondary preventive measures. Economies of scale and convenience would seem to offer the best way to improve and maintain health. Here again, not enough is known of the costs and benefits to launch a national

program with any degree of conviction—the conviction needed to enhance participation and sustain a long-term effort. Effectiveness must be established before one worries about efficiency and availability, which have nothing to do with whether the procedure is harmful or helpful (both psychologically and physically) to the patient.

Even when all is known, compliance or participation of the target population is still difficult to obtain in our “free” society. In one study conducted by the Kaiser-Permanente Medical Foundation, 65 per cent of a study group agreed to participate in multiphasic screening in each of seven years—which means that 35 per cent did not (and remember, 50 per cent of patients will not take medications as prescribed). After 7 years, there was an insignificant overall effect on the health of those who participated. A control group which did not undergo screening suffered 400 deaths during the 7-year period, of which only 60 (15 per cent) were judged to be “potentially postponable” through specific preventive-medicine measures. Much more research is needed to identify those age-specific measures of detection and prevention that have acceptable costs for the benefits obtained.

Screening tests can detect serious and correctable defects in school children, and here there are very favorable benefit-cost ratios. Once detected, however, an inadequate system of health services may prevent necessary action. We should not launch mass surveys if we are unwilling or unable to take care of what we find. This is particularly true of those most vulnerable and in need, namely, children in impoverished, inner-city areas. An OEO Youth Health Program in Boston reported in 1968 that 354, or 31 per cent, of 1,191 youths examined had “one or more medical conditions requiring more definitive diagnostic and/or treatment services.” Ninety per cent needed some form of dental care. In Washington, D.C., more than one-quarter of a largely black population of children ages 6 months through 3 years were anemic; in another group, ages 4 through 11 years, one-quarter failed a comprehensive vision screening examination. Twenty per cent of all the children had evidence of middle-ear disease, and 7 per cent of those between 4 and 11 years had hearing loss in the speech frequencies—enough to interfere with learning. In both the Boston and the Washington studies, the detection of such gross health problems led neither to adequate follow-up and treatment, nor to the implementation of large-scale programs of detection and prevention. If such programs had been launched, the system of health services would have been swamped. Nonetheless, the highest long-range benefits will accrue in programs geared to the needs of impoverished, inner-city children.

Specific programs can be structured according to age groups or to the geographic location of “captive populations” (doctor’s office, hospital clinics, work location, public health departments, school systems). Both approaches are important, and they frequently overlap. Such programs are constrained by the availability of manpower, technical facilities, financing mechanisms, and the participation and compliance of the producer, as well as of the recipient population. Those most in need are frequently those least educated and most inaccessible in terms of distance or ability to communicate (remember, between 20 and 40 per cent of our population is functionally illiterate). There is a lack of conviction on the part of both purveyors and recipients about the long-range value of such services when compared with their costs. The latter are more accurately perceived in terms of time, convenience, and money.

An example of the range of preventive procedures that might be utilized in middle-aged adults (36 to 64 years old) is presented in Table I. Clearly if every adult in

TABLE I

PREVENTIVE MEDICINE PROCEDURES: MIDDLE-AGE ADULT

<i>Procedure</i>	<i>Detection-Prevention-Treatment-Implications</i>
History	Symptoms, environmental exposures, habits, mental status
Height and weight	Obesity, malnutrition, metabolic disease
Blood pressure	Hypertension
Electrocardiogram	Heart disease; baseline for future
Vision (including pressure measurement-tonometry)	Myopia of aging; glaucoma
Spirometry	Breathing disorders: bronchitis, emphysema
Physical examination including dental	Span of physical abnormalities
Breast examination	Cancer (also occurs rarely in males)
Rectal examination	Cancer of rectum and prostate
Sigmoidoscopy	Cancer of rectum and colon
Pelvic examination	Cancer of vagina, cervix, uterus, and ovary
Laboratory Examinations:	
Multiphasic Screening	
Blood cholesterol & triglycerides	Heart disease
Sugar	Diabetes
Uric acid	Gout, heart disease, kidney disease
SGOT	Liver disease
Hemoglobin-hematocrit	Anemia (nutrition, cancer, iron deficiency)
Urea nitrogen	Kidney disease
Creatinine	Kidney disease
Urine examination	Bladder and kidney infection or disease; cancer
VDRL	Syphilis
Tuberculin test	Tuberculosis
Gonococcal culture (usually females)	Gonorrhea
Pap smear (females)	Cancer of cervix of uterus
Stool guaiac	Occult blood in stool: bowel cancer
Mammography (females)	Cancer of breast
Chest x-ray	Cancer, emphysema, tuberculosis of lung, heart disease
Tetanus and diphtheria boosters	Infectious disease
Counseling: Health Education	
Nutrition	Heart disease, cancer, liver disease
Smoking	Cancer, heart and lung disease
Alcohol and drugs	Liver disease, accidents
Contraception	Family planning, mongolism
Exercise	Heart disease, vascular disease
Sleep	General health, accidents
Accidents	Alcohol, orthopedic problems
Mental status	Male and female menopause, work, stress
Abortion	Genetic disease; maternal health

the United States between the ages of 36 and 64 years (66 million people) were to have the complete "works" listed in Table I, the costs would far exceed the benefits and the health-delivery system would collapse. Furthermore, there is no assurance that a clean bill of health won't get dirty the day after you've seen the doctor. The number of people who have dropped dead or developed incurable cancer within weeks or months of being told that "all systems are go" attests to this. It must also be noted that technology, automated and computerized, can never be substituted for the judgment, the support, or the reassurance of the compassionate and wise physician.

So what do I do at the age of 50 years? I see my physician once a year for a general history and physical examination (including blood pressure, rectal-prostate exam), chest x-ray, hematocrit, stool test for blood, blood sugar and cholesterol tests, height and weight, immunizations when needed. My wife does the same, plus breast and pelvic examination. We both get regular moderate exercise, sleep eight hours a night, keep trim, and enjoy the odd cocktail. I will continue to have difficulty wrestling with seat belts and to be incensed with the pollution of my ears when the damned buzzer won't go off until I plug the belt in.

Mental illness and mental retardation: These present special problems for preventive-medicine efforts. Here social, cultural, and genetic factors all play decisive roles and lead to the difficulties of structuring rational programs. Schizophrenia is an extremely serious public health problem. Nearly one million episodes of patient care were estimated to have taken place in 1971 in outpatient and inpatient facilities. The incidence of the disease is estimated to be somewhere between 50 and 250 cases per 100,000 population. Further estimates tell us that somewhere between 28 and 140 cases will occur during the lifetime of each thousand newly born individuals. With over 3 million new births in the United States in 1973, that means that something like 84,000 to 320,000 new cases of schizophrenia will appear during the lifetime of that group. The cause of the disease remains unknown, but strong evidence has turned up for genetic predisposition. There is a 10 per cent chance of schizophrenia developing in offspring if one parent has the disease; this jumps to 40 per cent if both parents are affected. The risk is sufficiently high to justify genetic counseling as a primary preventive measure. Beyond this, early detection and treatment of the psychotic individual can reverse the disease and restore the individual to a productive life, although the relapse rate is high at 20 to 30 per cent in the first year, and 50 to 70 per cent in five years. Without early treatment the disease can become chronic and much more difficult to reverse.

The affective disorders of mania and depression constitute another major public health problem. In 1971, over 600,000 patients with these disorders were under care in facilities reporting to the National Institutes of Mental Health. For every one reported, there may be another not diagnosed or being cared for. There is growing evidence for genetic transmission in depressive psychoses that calls for greater efforts in making genetic-counseling services available as a form of primary prevention. Secondary prevention makes use of antidepressant drugs, which facilitate the successful treatment of 70 to 80 per cent of depressive episodes. The use of lithium and phenothiazines in the treatment of manic states has markedly altered the previously dismal prognosis for these diseases. Relapses and chronicity, suicide and injury can now be avoided with early secondary-prevention measures.

Finally, included within the problems of mental illness are the large number of people who are sufficiently troubled psychologically to handicap them seriously in

work, love, and play. Some surveys have shown that as many as 25 per cent of a community's population are in need of psychological testing and services. The roots of this malaise are multiple; they include the effects on the offspring of inadequate spacing of pregnancies, too early pregnancies among teenagers, inadequate maternal nutrition, inadequate infant nutrition, inadequate maternal and paternal caring, inadequate cognitive environment—in short, social impoverishment of the worst form. Leon Eisenberg has referred to this complex of maladjusted individuals as suffering from developmental attrition—"a sequential and cumulative failure to attain levels of cognitive and affective development sufficient for personal and social competence."⁷ The infant who represents the unwanted birth may be abused or neglected and cannot attain personal and social competence; poor nutrition in the last trimester of pregnancy and the first two years of life can stunt both intellectual and physical growth; inadequate affective and cognitive stimulation for the developing infant and child results in inadequate personality and intellectual development.

What form should preventive medicine take so that coming generations will not suffer from developmental attrition? Primary prevention must include family-planning services and therapeutic abortions, maternal- and child-health services with emphasis on good nutrition for everyone—and *food* for the poor, family counseling to help preserve its integrity, the full support of foster care and progressive adoption policies, the development of day-care centers for pre-school children of working mothers, and adult education emphasizing cognitive and affective development in infant and child care. Alleviation of poverty and a much higher national priority on the developmental needs of infants and children and their families are necessary, if this tremendous loss of human energy and potential is to be corrected.

Quite aside from the mental retardation due to developmental attrition or brain damage at birth, there are other diseases causing retardation which are inherited or are present from conception, namely Tay-Sachs disease, Down's syndrome, and phenylketonuria (PKU). In each of these, preventive measures can be utilized to avoid the abnormality, i.e., either through genetic counseling and avoidance of conception, in-utero diagnosis of the condition by amniocentesis and abortion, if desired, or screening at birth with dietary treatment to avoid retardation in the case of PKU.

Down's syndrome or mongolism occurs approximately once in every 600 births. The older the mother, the greater the risk. The average mother faces a 1-in-900 risk of producing a mongoloid infant, while the mother over 40 years of age faces a 1-in-50 risk. Amniocentesis (withdrawal of fluid from the fetal sac in the pregnant uterus and examination of the cells in the fluid) can detect from about the fifteenth week of pregnancy the chromosomal abnormality that signals the condition. Selective abortions can then be offered the prospective parents. Without the test of amniocentesis and selective abortion, roughly 57,000 to 83,000 mongoloid children (depending on birth rates) would be born in the United States between 1970 and 1980. The estimated cost today of caring for mongoloids is \$1.7 billion. The financial and emotional costs to parents and society-at-large are still more staggering. Prevention consists of primary efforts to counsel against childbearing in older women and secondary efforts of amniocentesis and selective abortion in those populations at high risk, e.g., pregnant women over forty years of age.

In summary, it is estimated that 30 per cent of severe forms of mental retardation could be avoided in the United States if all currently available scientific information were utilized, namely, identification of parents carrying recessive genes, birth

control, amniocentesis and induced abortion, screening and treatment at birth, and intensified efforts to enhance cognitive and affective development of infants and children.

But what is the responsibility of the individual in matters pertaining to health? The United States now spends more on health in absolute terms and as a percentage of the gross national product than any other nation in the world—from \$39 billion or 5.9 per cent of the GNP in 1965 to \$120 billion or 8.3 per cent of the GNP in 1975 (over \$550 per person per year). No one—but no one—can deny the fact that billions of dollars could be saved directly—and billions more indirectly (in terms of family suffering, time lost, and the erosion of human capital)—**if our present knowledge of health and disease could be utilized in programs of primary, secondary, and tertiary prevention.** The greatest portion of our national expenditure goes for the caring of the major causes of premature, and therefore preventable, death and/or disability in the United States, i.e., heart disease, cancer, strokes, accidents, bronchitis and emphysema, cirrhosis of the liver, mental illness and retardation, dental caries, suicide and homicide, venereal disease, and other infections. If no one smoked cigarettes or consumed alcohol and everyone exercised regularly, maintained optimal weight on a low fat, low refined-carbohydrate, high fiber-content diet, reduced stress by simplifying their lives, obtained adequate rest and recreation, understood the needs of infants and children for the proper nutrition and nurturing of their intellectual and affective development, had available to them, and would use, genetic counseling and selective abortion, drank fluoridated water, followed the doctor's orders for medications and self-care once disease was detected, used available health services at the appropriate time for screening examinations and health education-preventive medicine programs, the savings to the country would be mammoth in terms of billions of dollars, a vast reduction in human misery, and an attendant marked improvement in the quality of life. Our country would be strengthened immeasurably, and we could divert our energies—human and financial—to other pressing issues of national and international concern.

But so much conspires against this rational ideal: our historic emphasis on rugged individualism, social Darwinism, and unrestricted freedom together with our recent emphasis on individual rights as contrasted with responsibilities; a neo-liberal ideology which has stressed societal responsibility and the obligations of the beneficent state, resulting in an erosion of individual responsibility and initiative; a credit-minded culture which does it now and pays for it later, whether in drinking and eating or in buying cars and houses; an economy which depends on profligate production and consumption regardless of the results to individual health, or to the public health in terms of a wide variety of environmental pollutants; ignorance (and therefore a lack of conviction and commitment) on the part of both producers and consumers as to exact costs and benefits of many preventive and health-education measures, a reflection of the sparse national commitment to research in these areas; the failure, conceptually, to view health holistically, i.e., its interdependence with educational attainment, poverty, the availability of work, housing and the density of populations, degree of environmental pollution (air, water, noise, mass-media offerings), and levels of stress in work, play, and love; and finally, the values and habits of the health establishment itself. One cannot hope to develop a rational health system if the parts of the whole that bear on health are moving in irrational ways.

Within the health system, medical educators and the teaching hospitals display only acute curative, after-the-fact medicine. The rewards—intellectually, financially, and emotionally—for specialist care far outweigh those for the low-status generalist (primary-care physician) or public health worker. The specialty organizations (surgeons, internists, radiologists, for example), the American Medical Association, the Association of American Medical Colleges, the American Hospital Association, the “disease-insurance” companies, as well as governmental insurance programs (Medicare-Medicaid), pay lip service or no service to reordering priorities and sanctions to the needs of the people for prevention and health education. Present plans for national health insurance do not contend with the issues of preventive medicine and health education. Over 65 per cent of the 4.5 million workers in the health system are employed in hospitals, and their interests demand more expenditures and an even higher priority for acute, curative, after-the-fact medicine and the care of those with chronic disease. There is one health educator for every 17,000 people, while there is one physician for every 650 and one nurse for every 280 people.

Research priorities stress biological and not epidemiological, social, and environmental research. Even here, we should be willing to take decisive action when inferential evidence, e.g., the production of cancer in animals by drugs, is available, unacceptable as this may be to scientists. I cannot believe that man was meant to ingest drugs and artificial-food substances, breathe polluted air, or have his ears banged mercilessly by the uproar of industrial society. Those who do work in the field of prevention and health education have too often stressed social control (some have called them “health fascists”) rather than social change and have become curiously indifferent to the needs and aspirations of families, communities, and particularly minority groups. Those places where benefit-cost ratios are potentially most favorable for programs of health education and prevention—and where long-range research could be conducted—have been neglected: the schools and universities, places of work, hospitals and clinics, and, obviously, doctors’ offices. Very little is known about how television functions as a cognitive medium; little sophistication is shown by interested experts in developing sanctions, i.e., financial or other incentives, to modify bad habits of living. Those in the health professions play a minimal role in supporting the needs of minority groups for better housing and jobs, higher income, and improved transportation—not realizing that the fulfillment of these needs will reduce stress and anxiety and therefore improve health by reducing susceptibility to disease or to the disease-provoking habits of smoking and drinking.

If the health establishment isn’t interested and the consumers don’t want or demand health education and preventive medicine, what is to be done? First of all we should look at a few concrete changes in behavior which, through a variety of mechanisms, have improved health:

- 1) When the Surgeon General issued his report on the hazards of smoking in 1964, 52 per cent of the male population smoked cigarettes. Through massive public educational programs and restrictions on advertising, the percentage was reduced over a 10-year period to roughly 42 per cent. (This desirable change has been accompanied, however, by an equally undesirable increase in teen-age smoking, particularly among females, and no change in the 41 per cent of 17-to-25-year-olds who smoke.)

- 2) During World War I, the United Kingdom increased taxes on alcohol, reduced

the amount of alcohol available for consumption, and restricted the hours of sale. Consumption of alcohol fell and, with it, deaths from cirrhosis of the liver—from 10.3 per 100,000 people in 1914 to 4.5 in 1920. Following the war, the regulations governing the amount of alcohol allowed for consumption and the hours of its sale were relaxed, but taxes on alcoholic beverages were continually increased. By 1936, the death rate due to cirrhosis was down to 3.1 per 100,000, and it has remained at this level in that country. In the United States, wartime prohibition also reduced the cirrhosis death rate, from 11.8 per 100,000 in 1916 to 7.1 per 100,000 in 1920; it was still 7.2 in 1932, the year before prohibition was ended. But following the repeal of prohibition, the death rate from cirrhosis climbed steadily to an all-time high of 16.0 deaths per 100,000 in 1973, five times the rate in Great Britain. These results suggest a national strategy for the United States of (a) steadily increasing taxes on alcoholic beverages, (b) a massive public education program on the hazards of alcohol plus restrictions on all advertising, (c) aid to farmers and companies to help them shift to other crops and products. Increased tax income should temporarily help to defray the costs of public health education. The same strategy should be applied to cigarettes.

3) The marked reduction in auto fatalities and injuries during the oil crisis suggests that a permanent reduction of speed limits combined with sanctions to limit the use of automobiles would more than justify the cost of enforcing such a program.

4) A program to improve the self-care of patients with diabetes (tertiary prevention) at the University of Southern California resulted in a 50 per cent reduction in emergency-ward visits, a decrease in the number of patients with diabetic coma from 300 to 100 over a two-year period, and the avoidance of 2,300 visits for medications. The theme was, "You must take responsibility for your own health." Savings were estimated at \$1.7 million. In other studies involving the care and education of diabetics, hemophiliacs, and others, hospital readmissions decreased by over 50 per cent. These efforts resulted in tremendous savings of time and money and reflected vastly improved self-care in cases of chronic disease.

5) A heart-disease-prevention program run by Stanford University similarly demonstrated that an intensive program of health education and preventive medicine—utilizing personal instructions, television spots, and printed material—resulted in a markedly higher level of information about the disease by the community and a marked improvement in dietary habits and in the reduction of smoking among those at high risk.

There are many other examples. Some encouragement can also be obtained from the results of occupational health programs, an occasional school health program, the efforts of the Kaiser Foundation Medical Program with its stress on prevention, the new attention being paid the subject in medical schools, largely through a renewed emphasis on the production of family or primary physicians, and the increasing numbers of legislative proposals which stress expansion of health education and preventive-medicine programs. A steadily growing number of newspapers and journals have health columns, and television and radio seem to be paying more attention to the subject. Industrial-medicine programs and socially responsible advertising and pamphleteering by insurance companies have done a great deal of good. The public's appetite for books on dieting and for Dr. Spock's *Infant and Child Care* speaks for a definite interest despite continuing bad habits.

Following extensive hearings before the Senate Subcommittee on Health of the Committee on Labor and Public Welfare during 1975,⁸ a new National Health

Information and Health Promotion Act (Public Law 94-317) was signed into law in 1976. It is designed to encourage healthier living habits and to enhance the federal role in disease prevention and control. It signals a new public interest and, depending on the level of implementation of its consumer health education and information programs to be run from an office within HEW, it could represent a shift in the direction of the nation's health effort.

The individual must realize that a perpetuation of the present system of high cost, after-the-fact medicine will only result in higher costs and greater frustration. The next major advances in the health of the American people will be determined by what the individual is willing to do for himself and for society-at-large. If he is willing to follow Breslow's seven rules for healthy living, he can extend his life and enhance his own and the nation's productivity. If he is willing to reassert his authority with his children, he can provide for their optimal mental and physical development. If he participates fully in private and public efforts to reduce the hazards of the environment, he can reduce the causes of premature death and disability. If he is unwilling to do these things, he should stop complaining about the steadily rising costs of medical care and the disproportionate share of the GNP that is consumed by health care. This is his primary critical choice: to change his personal bad habits or stop complaining. He can either remain the problem or become the solution to it; Beneficent Government cannot—indeed, should not—do it for him or to him.

In terms of public policy and the social responsibility of the individual, I believe he should consider the following:

- 1) Support vastly increased funding to develop the best possible integration of health education into the school system, stressing measures that the individual can take to preserve his own health and knowledge about environmental hazards. There are over 45 million children enrolled in grades kindergarten through 12 in nearly 17,000 school districts comprising 115,000 schools and 2.1 million teachers. These children are at the most impressionable stage of development, and, for the long range, this population—its attitudes, knowledge, and habits—will determine the health of the nation. In the majority of schools, health education is assigned low or no priority. Curricular material needs to be developed, school health educators recruited and trained, and courses on health education given the same central importance (with examinations) as reading, writing, arithmetic, and athletics!

- 2) Support a far greater national commitment for research in health education and preventive medicine with emphasis on epidemiologic studies, benefit-cost analysis, and the most effective and least offensive ways of changing human behavior. Arbitrarily, the less than 0.5 per cent for health education and 2.5 per cent for preventive medicine (services and research) of the total national health expenditure now spent should be increased to at least 5 and preferably 10 per cent of that total. Ten billion dollars could be saved and made available for such programs, if by some miracle all unnecessary surgery were abolished, or all cigarette smoking stopped, or all alcohol consumption ceased in the United States. More realistically, a 20 per cent increase in taxes on the \$30 billion annual expenditure on cigarettes and whisky would produce the \$6 billion needed annually for this program. Beyond this, there remains the need for increased support for fundamental biological research on the mechanism of disease-producing environmental contaminants.

- 3) With respect to cigarettes and whisky, the individual should support greatly

increased taxes on the consumption of both, massive public education programs on the hazards of their use, and severe restrictions on advertising. New tax money generated could be used to defray the costs of public education. Consumption should fall and health improve with the above measures. A more extreme additional measure would be to limit amounts available for consumption and to provide subsidies to help producers change to other products.

4) Support the development of genetic-counseling services, family-planning services, and selective abortion.

5) Support the development of age-specific preventive measures, which would include selective screening and counseling services. Preventive services must be tied into a comprehensive system of personal-health services to provide for continuous follow-up. Programs to expand the numbers of qualified individuals in the disciplines of health education and preventive-medicine services and research must be supported.

6) "Disease insurance" should be converted to health insurance. Coverage for preventive medicine and health education would change the behavior of both consumers and producers by introducing economic sanctions. We have barely scratched the surface in our search for those that would be most effective.

7) More attention should be devoted to the family as the basic social unit of the nation. The responsibilities of parents—for using genetic counseling and family planning, for pursuing the proper intellectual, affective, and physical development of their children both at home and in school, and for setting the example of individual responsibility and prudence in their own life styles—are paramount. A nation is only as strong as its children and as good as its parents.

8) The shadows of disease and unhealthy habits follow poverty and ignorance. The greatest costs are incurred, but the greatest benefits can be obtained, through preventive medicine and health-education measures aimed specifically at impoverished minority groups in inner-city as well as rural areas. Quite beyond these direct measures, one must understand that total health depends on the eradication of poverty and ignorance, the availability of jobs, adequate transportation, recreation and housing, the level of public safety, and an aesthetically pleasing and physically benevolent environment. Improve health—improve those elements equally which are central to the quality of life.

Ironically, we can be grateful for some of our failures in health education, for at least, as Guy Steuart has said, "we have been spared the realization of the dreadful specter of an Orwellian society in which our daily behavior would be motivated primarily by health considerations, in which hangovers would yield to hang-ups, Shakespeare to plays about unsaturated fats, and Beethoven to the ecstatic crunch of raw broccoli."⁹ I agree, but Madison Avenue and television almost have us there now by an alternative route. Instead of fats and broccoli, we have cigarettes and belly-wash, and an abysmally low level of national support for the arts and humanities—those areas of human endeavor which give joy to life, enhance human understanding, and glorify the human condition.

I began by saying that the health of human beings is determined by their behavior, their food, and the nature of their environment. Over 99 per cent of us are born healthy and suffer premature death and disability only as a result of personal misbehavior and environmental conditions. The sociocultural effects of urban industrial life are profound in terms of stress, an unnatural sedentary existence, bad habits,

and unhealthy environmental influences.¹⁰ The individual has the power—indeed, the moral responsibility—to maintain his own health by the observance of simple, prudent rules of behavior relating to sleep, exercise, diet and weight, alcohol, and smoking. In addition, he should avoid where possible the long-term use of drugs. He should be aware of the dangers of stress and the need for precautionary measures during periods of sudden change, such as bereavement, divorce, or new employment. He should submit to selective medical examination and screening procedures.

These simple rules can be understood and observed by the majority of Americans, namely the white, well-educated, and affluent middle class. But how do individuals in minority groups follow these rules, when their members include disproportionately large numbers of the impoverished and the illiterate, among whom fear, ignorance, desperation, and superstition conspire against even the desire to remain healthy? Here we must rely on social policies *first*, in order to improve education, employment, civil rights, and economic levels, along with efforts to develop accessible health services.

Beyond these measures, the individual is powerless to control disease-provoking environmental contaminants, be they drugs, air and water pollutants, or food additives, except as he becomes knowledgeable enough to participate in public debate and in support of governmental controls. Here, we must depend on the wisdom of experts, the results of research, and the national will to legislate controls for our protection, as damaging as they may be, in the short run, to our national economy.

When all is said and done, let us not forget that he who hates sin, hates humanity. Life is meant to be enjoyed, and each one of us in the end is still able in our own country to steer his vessel to his own port of desire. But the costs of individual irresponsibility in health have now become prohibitive. The choice is individual responsibility or social failure. Responsibility and duty must gain some degree of parity with right and freedom.

REFERENCES

- ¹T. McKeown, *The Modern Rise of Population* (London, 1976), pp. 152-63.
- ²M. Susser, ed., *Prevention and Health Maintenance Revisited* (*Bulletin of the New York Academy of Medicine*, 51 [January, 1975], pp. 5-243), p. 96.
- ³N. B. Belloc and L. Breslow, "The Relation of Physical Health Status and Health Practices," *Preventive Medicine*, 1 (August, 1972), pp. 409-21; see also "Relationship of Health Practices and Mortality," *Preventive Medicine*, 2 (1973), pp. 67-81.
- ⁴F. W. Ashley, Jr., and W. B. Kannel, "Relation of Weight Change to Changes in Atherogenic Traits: The Framingham Study," *Journal of Chronic Diseases*, 27 (March, 1974), pp. 103-14.
- ⁵J. F. Fraumeni, ed., *Persons at High Risk of Cancer: An Approach to Cancer Etiology and Control* (New York, 1975), p. 526.
- ⁶L. Breslow, "Research in a Strategy for Health Improvement," *International Journal of Health Services*, 3 (1973), pp. 7-16.
- ⁷Susser (cited above, note 3), p. 124.
- ⁸*Disease Control and Health Education and Promotion, 1975. Hearings before the Subcommittee on Health of the Committee on Labor and Public Welfare, U.S. Senate, 94th Congress* (U.S. Government Printing Office, 1975), p. 1306.
- ⁹Susser (cited above, note 3), p. 179.
- ¹⁰J. H. Knowles, *Health in America. Health Service Prospects: An International Survey* (London, 1973), pp. 307-34.