A human life is truly 'cost effective'

Part II in Dr. Wolfgang Lillge's series on the life-saving potential of high-quality, high-technology medical care.

The first article in this two-part series exposed the fallacies of "cost/benefit analysis," as applied to health care by such organizations as the congressional Office of Technology Assessment. We established that the OTA is using its "economic analysis" to justify its real aim, which is to suppress the applications of advanced technology to medical care, as a means, primarily, of controlling population growth. We began a discussion of the most promising medical technologies, which will save millions of dollars in the long-term—and lives immediately. In this article, that analysis is continued.

Vaccines

Preventive medicine is still one of the most effective—and "cost-effective"—ways to prevent disease. This is certainly the case with vaccination against a broad range of infectious agents. Normally, a single dose of vaccine, once introduced on a mass scale, will cost only a few cents, or at most a couple of dollars, and will save millions of dollars in treatment of diseases which once were the major killers of mankind. For several infectious diseases, especially viral diseases, vaccination is the only "treatment," because so far, hardly any drug has been found effective against them.

Recent breakthroughs in vaccine development include:

- Scientists at the New York State Health Department have developed a technique for genetically altering the Vaccinia virus, formerly used by William Jenner to inoculate against smallpox, to express up to eight different antigens, thus enabling vaccination against eight different diseases with a single injection.
- A vaccine against chickenpox, which infects 2-3 million children a year in the United States, and results in 60-100 deaths, has been developed.
- A vaccine against hemophilus influenza, the greatest cause of childhood infections, including pneumonia and meningitis, has been developed and proven effective in infants as young as 18 months. Inoculation of all eligible children could prevent 60% of these infections, which are potentially life threatening.
- An inexpensive vaccine against hepatitis B has been developed from a synthetic protein. This disease effects about 1 million people in the United States and 250-300 million people worldwide, primarily in the developing sector, where it is believed to be the cause of hundreds of thousands of cases of primary liver cancer.
- A new polio vaccine from killed viruses promises to eliminate the last traces of this disease from the United States in the next years. In addition, scientists are developing a polio vaccine that can be administered by inhalation and mass-produced for about 10¢ a dose.
- A breakthrough has occurred in the long effort to develop a vaccine against malaria. Scientists have succeeded in reproducing the genetic material that codes for a protein on the malaria parasite, thus stimulating the body to produce antibodies against the parasite. This genetic material can be inserted into bacteria, which will then produce the protein in large quantities.

One potentially serious problem in the United States is the growth of complacency, as many of the epidemic diseases of the past have now virtually disappeared. For example, many American children are no longer vaccinated against smallpox. But it is necessary to maintain a certain density of application, in order to prevent a single outbreak of the disease from spreading.

March of Dimes

The vaccination program against polio during the 1950s virtually wiped out that dreaded disease in the United States. Such preventive medicine is one of the most effective ways to prevent disease, and yet vaccination of children is now being curtailed.

Another case in point is measles. Licensing of a measles vaccine in 1964 led to a dramatic decline in cases, and sequelae, in the United States (**Figure 1**). Recent anti-vaccination propaganda has resulted in the development of a large non-immune population and major outbreaks of measles. The disease is spread by infected nose and throat secretions, and if introduced into susceptible populations under conditions of crowding and sanitary breakdown, it can result in devastating epidemics, with a high fatality rate.

The introduction of the polio vaccine in the mid-1950s not only ended one of the most cruel epidemics of this century, but could serve as a paradigm today of the way in which investments into basic biomedical research will save subsequent health dollars.

At the end of the 1970s, Dr. Hugh Fudenberg of the University of California Medical Center in San Francisco made a "cost/benefit" analysis of the research and development that led to the vaccine against polio. He found that the costs of basic research—and the infinitely greater costs of developing the vaccine and conducting field trials—came to little more than $41 million. But in the first seven years that polio vaccine was available, the economic benefits from savings in hospital costs, medical bills, and lost earnings due to disability totaled more than $6 billion!

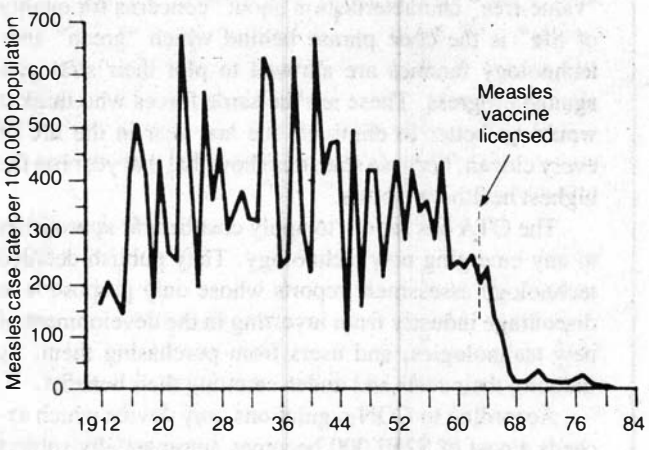
The greatest payoff was, of course, the number of lives saved. From the 1920s through 1950s, 1 person out of every 100,000 died of polio each year in the United States. Individual communities lost up to 1 person out of 20 in polio epidemics. In many epidemics, 10 times as many people were permanently crippled by the polio virus.

It is a commonplace in medicine to state that the best cure for a patient can be assured when the disease is discovered in an early stage. Doctors agree that early diagnosis has intangible gains. The patient saves innumerable costs, as well as time in and out of the hospital trying to get a diagnosis for his condition. The cure is less complicated, faster, and less expensive.

In many of the more common medical conditions, only early diagnosis can lead to a cure, whereas later diagnosis leaves the patient with an incurable medical handicap, and leaves the physician with the thankless task of managing a

FIGURE 1

Control of a communicable disease by immunization in the United States



Licensing of a measles vaccine in 1964 led to a dramatic decline in cases.

clinical condition that is irreversible. This is especially true for cancer, where in most cases total cure can only be achieved when the maligant process is eliminated right at its onset. The only society which would not find this advantageous, is the fascist state—the dying society in which life is expendible and no productive future exists for the population.

While vaccination is the most effective method of disease prevention, known as primary prevention, screening programs function as secondary methods of prevention. Effective screening has two principal preconditions: First, the disease itself must be detectable at an early stage; and second, technologies and techniques have
cheap and efficient, to detect this early stage of the disease. There are a number of such techniques available which have been established as highly effective—both in terms of their cost and their ability to detect disease.

It is clear that the ability to detect a disease in an early stage depends on our scientific knowledge about pathologic processes and on the development of diagnostic techniques. We will now look at some of these capabilities and analyse the question of why mass screening programs are not in as widespread use today as they should be. We begin with the cancer screening programs.

Cervical cancer: Screening for this type of cancer with the Pap test is perhaps the most powerful life-saver in the whole arsenal against cancer. An estimated 20-25 million American women take the Pap test each year, at an average cost of $5 per test. The Pap test detects cancerous or precancerous cells taken from the cervix, and allows a reliable staging of several cell forms which indicate a later tendency to develop into a cancer.

About 5-10 cases of different pre-stages of the disease

How the bureaucrats are sabotaging health care

The congressional Office of Technology Assessment (OTA), since its creation in 1972, has played a leading role in sabotaging the implementation of advanced medical technology, on grounds that it is not "cost-effective." One principal way in which such criteria are introduced is through the so-called Certificate-of-Need (CON) programs, operated by the different states through a jungle of anti-science bureaucracies.

The OTA's main function, according to its own description, is "to help legislative policymakers anticipate and plan for the consequences of technological changes and to examine the many ways, expected and unexpected, in which technology affects people's lives." This type of "value-free" characterization about "concerns for quality of life" is the code phrase behind which "green" anti-technology fanatics are allowed to plot their strategies against progress. These are the same forces who think it would be better to eliminate the last year in the life of every citizen, because statistics show that that year has the highest health-care costs.

The OTA has set out to apply cost/benefit approaches to any emerging new technology. They publish detailed technology assessment reports whose only purpose is to discourage industry from investing in the development of new technologies, and users from purchasing them, by inflating their costs and under-counting their benefits.

According to CON regulations, any device which exceeds a cost of $250,000 becomes automatically subject to review. That means, if a hospital or private practice plans to purchase a Nuclear Magnetic Resonance (NMR) machine, for example, it has to make an application to the CON board and establish conclusive evidence of "need" for such an investment. The definition of "need" involves diverse criteria which are subject to arbitrary interpretation: consistency of the proposed project with state health plans, consistency of the project with the institutional applicant's long-range plan, systemwide effects, financial feasibility of the project, access to care, quality of care, availability of services and personnel, construction and architectural considerations, effects on competition, competence, and character of institutional management, and selection of the best alternative means of providing the proposed service.

The CON procedure comes on top of the intricate "premarket approval process" from the Food and Drug Administration, and this FDA procedure alone is well suited to derail or massively delay and raise the costs of even the safest and most efficient technological development.

If such a technology has managed to sneak through the FDA brushwood, its next hurdle is the CON approval process. And if it jumps over that, one can still not be sure that the various third party payers like Blue Cross/Blue Shield, HCFA, private insurers, etc., will include it in their reimbursement policy. A whole new set of review procedures is set into motion.

Here is the OTA's own favorable description of the certificate-of-need programs:

"A major public policy response to the perceived problem of technology-induced cost inflation has been to attempt restraint of technology diffusion to hospitals. The prime policy instruments have been State certificate-of-need programs. . . . *Although CON programs were not*

are discovered in every 1,000 women examined, and in certain high-risk population groups—such as women between the ages of 30 and 40—the rate may reach 20 cases per thousand.

When cervical cancer is discovered early, cure rates are higher than 90%, and the cost of early surgery varies from less than $600 to about $1,200. In later stages of the disease, ultimate costs may run as high as $50,000.

Dr. W. Ross, Jr. of the U.S. Public Health Service has offered a cost/benefit analysis of the Pap cancer test, which was presented at a conference of the American Cancer Society in 1979, which is still basically valid today. Over a five-year period, he estimated that it would cost $68 million to bring the Pap test to as many American women as possible through grants to hospitals, clinics, health agencies, and public education programs. At the same time, it would cost $50.6 million to treat all the newly discovered cases of cervical cancer, bringing total costs of screening and treating to $118.6 million.

But the benefits, according to Ross, would exceed the costs ninefold: $998 million saved over the five-year period in earnings by women whose early cure enabled them to return to work, plus $73 million in expensive treatment costs averted. Thus the total program's benefit would be nearly $1.1 billion!

As a matter of policy, the bureaucrats of the Office of Technology Assessment (OTA) come to quite a different conclusion. They stated, in a case study about the cost effectiveness of cervical cancer screening: "The results of the analysis show that the costs of screening for cervical cancer are always more than the financial savings of prevented future disease, indicating that private insurers have no direct financial incentive to screen." Obviously they are giving a cost/benefit analysis according to the criteria appropriate to the insurer rather than the patient, or society as a whole.

This is not a naive error. It reflects not only a difference in analytical method: The OTA is adhering to a worldview that axiomatically does not allow decent health care for everybody. In the fantasy-land of systems analysis, every dollar spent for health care is a lost dollar.

A different way of analysing the situation is presented by Dr. Bernhard L. Cohen, in an article in *Fusion* magazine (March-April 1985) adressing the need for spending money for disease prevention directly, rather than trying to figure out what could be saved. This emphasizes the need to develop technologies with increasing effectiveness, i.e., to cover the cost to save a human life. He comes to the conclusion that in the context of a comprehensive cervical cancer screening program, you have to spend $25,000 to save one life, which is relatively little compared to other screening programs available. Cohen writes that this is not "a study of the value of a human life, which is a moral, philosophical, ethical, and religious question. Rather, it is a matter of collecting observations and performing mathematical transformations on them, which is a straightforward application of scientific techniques."

Breast cancer: Treatment of breast cancer in recent years has developed to a point where this disease can be considered curable, when detected at an early stage. Approximately 85-90% of cases from this category have a survival rate higher than the five-year period which is usually considered equivalent to total remission for cancer. Screening programs include palpation of lumps by the physician and/or mammography with a high degree of sensitivity. According to Cohen, society has to spend $80,000 in screening costs for breast cancer to save one life.

Lung cancer: This is the cancer with the highest incidence rate, which has become the most frequent cancer in men and, at current growth rates, will soon be the most frequent in women. Screening programs so far have relied

originally intended to constrain the diffusion of medical technology, they have been used for that purpose. To the extent that individual devices had price tags exceeding the established dollar threshold for CON review, new medical technologies became subject to CON regulations. . . . CON agencies frequently play pivotal roles in determining which institutions may acquire new technologies [Health Technology Case Study 27 on NMR imaging technology, September 1984; emphasis added]."

This language barely conceals the liberal, environmentalist wrath against that technological progress which alone can lead the way out of economic stagnation. The incompetence of OTA's and CON's approach to the problem is so undeniable that the same OTA study had to admit:

"The inability of the [CON] planners to evaluate the technology [x-ray CT scanner] constrained its diffusion into medical practice more severely than may have been wise. The lack of available evaluative mechanisms and criteria for review made it difficult for planners to dispel the uncertainty surrounding x-ray CT scanning, thereby *leading to many controversial and, at times, seemingly arbitrary decisions on individual CON applications. The net effect was a loss of credibility by the planners, as evidence of the truly revolutionary nature of x-ray CT scanning accumulated over time* [emphasis added]."

Why, one has to ask, do we afford the luxury to maintain agencies which are not only useless, but also dangerous, as they admit themselves to be? Decisions on such vital questions as the competent use of high technology in health care must be trusted to people who want to preserve life, unlike our liberal pro-euthanasia congressmen who would even have outlawed the introduction of disinfectants, in order to protect the "civil rights" of bacteria and viruses.

mostly on chest x-ray controls, but when a lung tumor has reached the stage where it becomes visible on the x-ray image, it is in most cases already inoperable or has metastazised into other parts of the body.

As discussed in Part I of this series, a new method of screening for malignant cells in the sputum, as a marker for the existence of a lung tumor in an early stage, has been developed, which promises to be as efficient as the Pap test is for cervical cancer screening.

When, in addition, the above-mentioned "photodynamic treatment" for early-stage lung cancer is established as general procedure, cost for surgery (opening the chest and excising a whole lobe), with all its risks, could be reduced drastically. The cost per life saved of $70,000, which Cohen calculates for lung cancer screening, may be reduced to $25,000 or less.

Colo-rectal cancer: While colon cancer is not the most frequent human cancer, it is the most common of the "lethal" cancers. About half a million persons currently alive carry the diagnosis of colon cancer, and every year approximately 115,000 people are discovered to have the disease, over half of whom will eventually die of it.

There are three main screening procedures to detect a malignant lesion in the colon, before a patient will visit the doctor for diagnosis of symptoms: With digital rectal examination, about one-sixth of all colon cancers are within reach of the exploring finger; with sigmoidoscopy, the entire terminal 25 cm of the colon, where about one-half to two-thirds of all cancers are located, can be inspected directly and biopsy material can be taken; with a cheap test, the stool can be tested for occult blood which may have originated from an early colon cancer.

According to Dr. Cohen, the fecal blood test is one of the cheapest screening methods available in order to save lives. Cohen writes, "If males over age 55 were given fecal blood tests to detect cancer of the colon and rectum, the fraction in whom tumors would be found is estimated to be 3 per thousand, and an estimated 20 percent of these would be saved by the early detection. Thus a program of testing 10 million men in this age range should include 3,000 victims, of whom 600 would be saved. A fecal blood test costs $3, and it is estimated that collecting and delivering a fecal sample in-

NSIPS/Jerry Belsky

FIGURE 2

How water treatment reduced typhoid deaths

	Typhoid death rate per 100,000 population	
	1906	1914
11 cities		
No treatment in 1906 or in 1914	76.8	74.5
16 cities		
No treatment in 1906; treatment in 1914	90.5	15.3

Note: Source of water supply for each of the 27 cities was unchanged between 1906 and 1914.

The most effective of all preventive medicine is to guarantee a safe and pure water supply. The United States today, of course, unlike most of the developing sector, has adequate sanitation and high-quality water available. However, that water system is deteriorating in municipalities throughout the country, as the example of McKeesport, Pennsylvania (pictured here) indicates. The McKeesport water filtration system has deteriorated to the point where there have been three epidemics of Giardiasis since 1984. This intestinal disease is not life-threatening, but such a breach of water safety is a warning that more dangerous epidemics could occur. Control of swamp water and insect-borne disease are also essential aspects of public health.

volves about $3 worth of inconvenience, making the total cost $6 per test, or $6 million for the program. Hence an expenditure of $6 million for the program would save 600 lives, at an average cost of $10,000 per life saved."

A simple digital examination would be even cheaper, and a proctoscopic examination would cost $30,000 per life saved. The only way to increase the rate of early detection of cancers, is to massively increase the number of people being examined.

Screening for non-cancer diseases

Probably the easiest and cheapest screening test is for hypertension, a test which can be carried out by paramedics (and now there are even automated procedures available). Outside of cancer itself, hypertension is one of those insidious diseases which is very widespread and for a long time will not show any symptoms that would cause the patient to see a doctor. When symptoms have developed, they are often so grave (cardio-vascular complications, kidney failure, etc.) that medical intervention may not be very effective any more. On the basis of a mass screening program which involves regular hypertension controls, millions of people with high blood pressure could be detected and given adequate medication.

Cohen estimates that the cost per life saved with a hypertension control program is $75,000. This is, compared to other similar kinds of inexpensive tests, a lot of money, i.e., there are other costs to be considered, apart from screening, which arise in the successful treatment of the disease. One of the main reasons for this is that the established treatment with anti-hypertensive drugs is based on insufficient knowledge of the etiology of the disease, reflected in the fact that the cause of 99% of all cases of hypertension is unknown. Thus, hypertension is a prime example of the necessity for further basic biomedical research, which ultimately will lead to a massive reduction of the costs per life saved, based on screening for hypertension control.

Rescue helicopters

The development of trauma centers with a parallel operation of rescue helicopters has made it possible in highly populated areas to reduce the number of deaths from traffic accidents and other disasters significantly. The success of this is based primarily on the speed of transport from the site of the accident to the trauma clinic, which is optimally equipped to save the victims. Dr. Cohen estimates the cost per life saved for using rescue helicopters to be $65,000—less than must be spent in order so save a life in the hypertension control program.

Screening for eye defects

In the last couple of years, Marshall Space Flight Center in Alabama has developed a photographic test which can detect ocular abnormalities in many cases. The test, called "generated retinal reflex image system," is intended primarily for the screening of elementary-school children. It exploits the "red-eye effect" that is caused by the reflection of light from the retina and is usually a nuisance in color portrait photography.

A color photograph of the eyes of the subject, taken with a normal 35-mm slide film, is examined for defects of the lens, cornea, anterior chamber, or retina. Given the simplicity of the equipment and the low price for each test (less than 30¢ per person), the procedure could prove very efficient to detect children with eye diseases and provide them with the necessary treatment.

Genetic testing

Regular tests on newborn infants to spot genetically caused diseases—the most frequent of which are those involving lack of an enzyme required in the metabolism of amino acids—can prevent the development of severe symptoms when a special diet is provided for the child.

Together with the rapid development of genetic engineering (especially the technique of growing monoclonal antibodies), such tests will provide the possibility of definite treatment of such genetic defects, but also the development of whole batteries of tests for diseases which are associated with genetic markers. The latest test that emerged out of this kind of research is one that could be used to determine whether someone is prone to heart attacks. The blood tests spots an abnormality in the genes frequently found among those suffering from coronary artery disease, which afflicts about 30% of the population, causing some 500,000 deaths annually.

Why screening is cost effective

Even by current methods for estimating medical costs, screening compares favorably to the costs of educating a skilled worker, a corporate executive, a scientist, etc., and with the productive output (based on GNP) per year per individual in the United States. We can calculate, based on 1983-85 figures from the U.S. Department of Education, that it costs $39,000 to educate a skilled blue-collar worker; $63,000 to produce an operative with three years of vocational training and a high school diploma; $79,000 for a bachelor's degree; $89,000 for a master's degree, and $129,000 for a Ph.D. If these sums are spent to educate a person, isn't it "worth" spending an equivalent amount of money to keep that person alive?

With a systematic program in which all citizens are screened simultaneously for all potential illnesses, which a new technology like Nuclear Magnetic Resonance particularly lends itself to, screening program costs would drop significantly. Also, with the increased use of technologies like NMR, the price of such technology would drop considerably, further cheaping the fixed capital costs, while the efficient use of such a machine for mass screening would bring down operating costs.