Financing Cancer Research

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FAILURE OF THE NEELY-PEPPER BILL, calling for an appropriation of $100,000,000 for cancer research, to pass on July 27, 1946 was not the reflection in Congress of any unwillingness on the part of the public to foot the bill. On the contrary, the results of a Gallup Poll, reported on June 12, indicated that 87 per cent of voters were ready to support the Neely-Pepper program and that 72 per cent were even willing to pay extra taxes to provide the money. The bill failed because the experts could not pull together and advise our senators and representatives as to just what is needed. A similar confusion of tongues led to failure of legislation designed to foster scientific research by the establishment and maintenance of a National Science Foundation.

We must profit now by experience and frame a new cancer bill which will pass unanimously. First, it is essential to show, to the satisfaction of cancer experts, how $100,000,000 can be advantageously spent on cancer research with the single purpose of overcoming this disease as quickly as possible. Second, it is equally essential to show, to the satisfaction of Congress, how expenditure of this sum can be properly controlled.

Six objectives are worthy of consideration:

(1) *To expand cancer research facilities throughout the United States.*

At present most of the work is concentrated in the great cities along the Atlantic Seaboard. Except in the state of Missouri, there are no cancer hospitals west of the Mississippi which are recognized by the American College of Surgeons. In a general way the *age-adjusted* death rates from cancer per 100,000 population of the several states are indices of the alertness of the medical profession in the recognition of cancer, not of its actual frequency. According to data published in April 1946 by the National Cancer Institute, the two highest rates are those of New York and Rhode Island, with 144.61 and 138.43 per 100,000; the two lowest are those of Arkansas and New Mexico, with 62.25 and 71.13, respectively. Evidence such as this strongly suggests that citizens in the western and southern states have not an equal chance for cancer diagnosis with those in the eastern ones. California stands out in the Far West with the high rate of 118.43. In the testimony at hearings of the Neely-Pepper Bill the Midwest and Far West were inadequately represented; of a total of 24, only 3 persons from west of the Mississippi were heard, compared with 11 from New York City.

The outstanding cancer research centers of the world are the National Cancer Institute near Washington, D. C., operated by the Government (U. S. Public Health Service), and the Memorial Hospital in New York. They seem a long way off to westerners, some of whom are getting weary of voluntarily contributing fairly large sums, much of which is sent to New York and is expended mostly in the East. It is not surprising that they welcome a proposal that has been presented to the National Advisory Cancer Council of the U. S. Public Health Service, and by Dr. Sherwood Moore in testimony at a hearing of the Neely-Pepper Bill, in accordance with which pilot cancer centers, on a par with the National Cancer Institute and the Memorial Hospital, would be established and maintained in the Middle and Far West. The one for the Middle West should be an expansion of the Barnard Hospital in St. Louis, which for long years has been a pioneer comparable in a small way with Memorial Hospital in New York. St. Louis is a more strategic location than Chicago for this purpose, because the states immediately west and southwest of it are less adequately provided with cancer facilities than Iowa, Wisconsin, and Minnesota, west and northwest of Chicago. St. Louis stands on the border of a very large territory, commercially tributary to it, in which the influence of such a Midwest Center would lead to the development of cancer facilities still more conveniently located. San Francisco is probably better located than Los Angeles for the Far West, or Pacific Cancer Center.

Construction and equipment of each of these strategic centers would cost about $5,000,000. In addition, some expansion of cancer facilities in the East and throughout the United States is urgently needed. The total cost of necessary enlargement of such facilities can be conservatively estimated at about $20,000,000. Since there is urgency in this need for working space for both laboratory and clinical research, high priority should be given to construction of buildings and purchase of equipment.

(2) *To increase the effectiveness of cancer investigators without waiting to train them.*

These individuals are in three categories: (a) Expert clinicians, now busily engaged in treating cancer and patients suffering from other diseases, should be enabled to devote all their energy and skill to the cancer patients. If this could be arranged, it might further be feasible to encourage these clinicians constructively to attack aspects of the cancer problem that can be solved only in the clinic, even in some cases to take time off from practice for this purpose. They cheerfully rallied to the Nation's call in the war. Many of them will be no less ready to attack cancer in times of peace. (b) Persons now working only part time on cancer research should

be persuaded to devote full time to such research. I have in mind staff members of universities and medical schools who have proved themselves as productive cancer investigators in the time that they have been able to spare from their other duties. To get at the facts, a survey should be made of these individuals. This would probably show that a large amount of excellent work is at present being done by them, and that this could easily be doubled or trebled if they were to devote all their time and energy to the task. (c) Cancer is a problem peculiar in the fact that so many types of training can be utilized in its solution. Numerous physicists, biochemists, physiologists, pharmacologists, and others, by virtue of experience already mature, are well fitted without delay to play leading roles in this kind of research. Carefully selected individuals in this category might easily be induced to devote a year, or several years, to this inspiring task.

A new attitude toward these and other cancer investigators must prevail. They should not be expected to labor merely for the love of it at the smallest salary they will accept, but should be paid high salaries all along the line. We have witnessed key men in government, who worked for the country during the war at minute salaries, one after another seek employment now that the war emergency is over. Cancer is a very real threat to all of us, and the best brains of the Nation must be harnessed regardless of cost. To be content with second-raters would be to jeopardize the whole campaign against cancer. Yet this will be exactly the tendency of the more conservative of the cancer experts, who will say that so-and-so is best qualified but is beyond our reach.

(3) *To make sustaining grants for cancer research.*

Increases in facilities and personnel are not justified except for investigations that can be organized and sustained over a considerable period. Those of us in the field have often had to content ourselves with annual grants. A lot of good work has been financed in this way, and not infrequently the grants are repeated year after year. But, since there is usually no guarantee of continuing financial support, in all fairness one has to warn prospective members of his staff that they may soon have to seek other jobs. No one would blame a young man, beginning a career of promise, if he chose, instead, an appointment with more security. Older workers, who have proved themselves and have fairly secure positions, are naturally not attracted. In case a young man does gamble with his future and, by virtue of the success of his cancer research, is continued for 10 years or more by a succession of annual grants, he will then find himself with no accumulating annuity payments against eventual retirement, because this measure of protection is never provided in grants for cancer research. Being still young, he may say that he does not care, but we know that he will care later. A reasonable degree of economic security must be given cancer workers, not only in attractive continuing salaries, but also in some effective system of annuity—for instance, 10 per cent of salary paid into the annuity fund by the employer and 5 per cent by the employee.

Obviously, the largest item in the expenditure should be in the nature of sustaining grants for salaries, annuity payments, and operating expenses. These should be made to nonprofit institutions of recognized standing coincident with the above-outlined increases in plant and personnel. The said institutions should be required to invest these sustaining grants in Federal bonds. In size, the grants should be sufficient to carry the projects for 20 years, the recipient institutions expending interest and cashing bonds. This policy would amount to Federal endowment of cancer research. The amount of the expenditure should be about $60,000,000.

Precedent for Federal endowment of research in public institutions is found in the Purnell Act "to authorize the more complete endowment of Agricultural Experiment Stations" (see *Budget of the U. S.*, 1945, p. 230). Unless the policy can be adopted of aiding private institutions on a par with public ones, the idea of bringing all our institutional strength to bear on the cancer problem will be an idle dream. The Department of Agriculture is activated by a pressure group, the farmers of the Nation, and it has achieved wonders. The $60,000,000 to stabilize and maintain certain projects in cancer research on a sound basis for 20 years looks small in comparison with the Agricultural Research Administration general account of $40,313,650 in 1944 and $47,123,140 in 1945—not to mention additional millions for special investigations. We now have a group, known as the "Sponsors of Government Action Against Cancer," which is pressing for action and will not accept "no" for an answer. It is to be expected that within a few years other researches on cancer will similarly require stabilization and that this will be one of the accomplishments of the next $100,000,000 appropriation, with which we are not now concerned.

(4) *To produce special supplies and equipment.*

It frequently happens that cancer research is held up for want of certain chemicals that are hard to obtain. Some of them have to be made for the purpose. Physical apparatus is often required which is not on the market and which manufacturers will not take the trouble to design and produce, because it would not be high priced and would never be wanted in quantity. The best way to remove these obstacles that cause most annoying delay and inhibit research would be to establish and maintain a Central Physiochemical Institute for supplies. Such an organization would help not only by giving advice as to feasibility of implementing the ideas of cancer workers, but also by manufacture and, perhaps, by loaning costly apparatus which is available and the need for which might be only temporary. Moreover, reliance on service

by the Institute would be economical, for it would relieve research organizations of the necessity of having their own usually poorly equipped mechanical shops and synthetic chemical laboratories. The Institute might well act as a clearinghouse for distribution of isotopes which are now of such importance. Cost to build and equip the Institute might be in the neighborhood of $2,000,000 plus operating expenses of, say, $500,000 a year for 20 years, making a total of $12,000,000.

(5) *To focus cancer research on the human problem.*

The Committee on Growth of the National Research Council, financed by the American Cancer Society, is wisely approaching the cancer problem on a very broad basis. Anything having to do with growth, even remotely, is included as cancer research because of the bearing it may have on malignant growth. All kinds of living things from plants to man are included, because observations on all forms of life may well afford clues to conditions in man. Very few of the 95 grants made by the Committee through June 15, 1946 and amounting to a total of $623,057 related to cancer of definite types in specified organs or tissues. Several concerned breast cancer in mice; two, leukemia; one, melanoma; one, cancer of the thyroid; two, the Brown-Pearce tumor of rabbits; one, normal and malignant fibroblasts; one, the rabbit papilloma virus; and one, leukemia, Hodgkin's disease, etc. Research specified as dealing with cancer of the uterus, stomach, lungs, and other organs of the body was not included. Yet the basic investigations promoted by the Committee on Growth are all to the good. They should be supported from the proposed $100,000,000 appropriation if the funds collected by the American Cancer Society prove insufficient, and other equally fundamental researches should be initiated.

To supplement this fine general and fundamental program of the Committee by developing a different line of attack, it is proposed, with part of the Federal appropriation, to focus research on specific cancers in man. The physician has to diagnose and treat cancer of the stomach, uterus, skin, brain, lungs, and so on through all parts of the body. Cancer in all locations has some features in common, on which light may be expected from the basic researches referred to; but cancer in each of them must be considered individually because of individual differences in the operation of certain important factors. Thus, exposure to external influences like sunlight, which, in excess, is known to cause cancer, is greatest for the skin and negligible for the brain. Mechanical injury is of consequence in cancer of the breast, testicles, bone, and skin and insignificant with respect to the appearance of cancer of the pancreas and lungs. Conditions of cell life in the several parts of the body are of acknowledged importance in regard to the malignant transformation. Since these conditions are far from uniform, they cannot be ignored but must be purposefully taken into consideration. Some tissues have an abundant blood supply, while others are avascular; some are more under the grip of internal secretions than are others, and the functions performed by each are related to needs for supply and removal of waste. Another consequence of the different functional roles is that the symptoms of early cancer will, to some extent, be dependent on the particular function disturbed by the cancer. Therefore, we have to attack cancer wherever we find it, marshaling all available knowledge of specific conditions in every part.

The system of panels advocated would be specifically for uterine, skin, gastric, and lung cancer, and so on down the list of some 20 or more. Each would have a chairman and a vice-chairman, both usually clinicians and, when feasible, of rather different views and training. For instance, the hematologists heading the panel on leukemia (blood cancer) could well represent quite divergent schools of thought. Also, it would not be difficult to find two leading gynecologists for the panel on uterine cancer who would bring different and supplementary experience to bear on the problem. Two leading dermatologists for the panel on skin cancer would supply more effective coverage than one. The other members of each panel should include a physiologist, a biochemist, a pharmacologist, a radiologist, a cytopathologist, an endocrinologist, a nutritionist, a geneticist, and possibly others, each one particularly qualified by experience to deal with problems of the panel. It would be essential for a considerable number of these other members to be engaged in the experimental study of cancer in the organ represented by the panel. The membership of panels should gradually change to bring in the best talent from the whole Nation.

The defeatist will question the usefulness of such panels, saying that there is no assurance that progress will result from these direct attacks and even implying that, in his judgment, the only worth-while strategy is to concentrate on fundamentals—a nice comforting term—and for the time being to ignore special cases. We agree, as already stated, that work on fundamentals must be not only continued but extended with the aid of the $100,000,000 appropriation. In addition, however, we plead for consideration of the cancers in the very regions of the body where they are death dealing. There is reason to hope for significant advances by some of these panels. Reports to the Nation of no progress with respect to types of cancer from which citizens are dying by the thousands would increase determination to make progress. It is not beyond the bounds of possibility that means may be discovered satisfactorily to treat cancer before we learn all the secrets of its nature. In fact, a specific treatment for the greatest human killer in view of number of deaths—malaria—was discovered before the cause was determined. Means of prevention of scurvy was discovered long before its nature was revealed. Several similar examples can be cited. In

my opinion, these regional cancer panels are justified as one major part of the grand strategy of the campaign.

The panels should meet regularly four times a year, twice in the East, once in the Middle West, and once in the Pacific states, a limited number of nonmembers in each region being invited to attend and present their work. This, like the strategic pilot centers, would tend to draw all parts of the country into the effort. At one meeting each year leading cancer investigators from abroad should cooperate. Yearly digests of world literature on cancer in the domain of each panel, together with the most up-to-date possible accounts of prevention, diagnosis, and treatment and a summary of research in progress, should be published and widely circulated.

The cost of this regional panel system is difficult to estimate, but the item for travel would be substantial. It is further proposed to make each participant a per-diem payment, as with medical consultants to the Veterans Administration, and, naturally, to cover cost of a full-time secretary for the chairman of each panel, printing, postage, etc. It might amount to $200,000 a year, or, for 20 years, $4,000,000.

(6) *To promote international cooperation in the war against cancer.*

Clearly, cancer is a world problem, and we, ourselves, can have no monopoly of wisdom. It would be highly desirable to arrange for distinguished foreign cancer specialists to come and work in our laboratories for a year or more. Particular types of cancer research in this country will be benefited, and their own experiments at home will also be advanced thereby. Also, carefully selected American cancer investigators should work in foreign countries under the same proviso of mutual advantage. They should be given not merely travel expenses but an allowance for scientific expenses of their work abroad so that they would not constitute a financial burden on the host institutions. A special American committee, working through the newly formed World Health Organization (*Science*, September 27), should be charged with promotion of this international cooperation, with ability to draw on an appropriation for this purpose of $3,000,000.

Control of Expenditure

It is a waste of time to suggest any plan for delegating administrative control to any private agency, since Congress will insist on Federal control of Federal expenditures. Within the Federal Government it is obvious that the U. S. Public Health Service is best fitted to act in this capacity. A division of the Service, the National Cancer Institute, with its advisory body of the Nation's outstanding cancer experts, the National Advisory Cancer Council, has been recommending grants for cancer research to both public and private institutions for nearly 10 years under authority of the National Cancer Institute Act. All that is necessary is to strengthen this Council so that it will be able to discharge the greatly increased duties contemplated in the proposed new cancer bill. This can probably be accomplished without any change in organization or operation which would be considered controversial.

The officers of the Council should continue to serve in their present capacities: the Surgeon General of the U. S. Public Health Service as *chairman*, ex officio; the chief of the National Cancer Institute of the U. S. Public Health Service as *secretary*, ex officio; and the *executive director* as an appointed official.

The other members of the Council should be increased in number to nine, and the policy should be adopted of making them still more representative of the whole Nation. This could be accomplished in several ways. Rotation of membership has proved satisfactory. With the increase in number, and with period of service three years, three members should be replaced annually by new appointees recommended by the Council. In order regularly to draw "new blood" into the Council, retiring members should not enjoy the privilege of subsequent reappointment, but the active interest and advice of these retiring members should be retained by appointing them members emeriti of the National Advisory Cancer Council. It is proposed that they should meet regularly once a year in the National Cancer Institute and that matters of consequence should be submitted to them for advice on this occasion and also informally at other times.

Another means of making those engaged in cancer research throughout the land feel that the Council is theirs hinges on both membership and meetings. At present, cancer research is mainly centered in the eastern states. Since it is clearly desirable to encourage people in other parts of the country, also possessed of great resources, to engage in the war on cancer with all their might, it would be a wise policy to begin by recruiting members of the Council from west of the Mississippi in the ratio of one to every three from east of the Mississippi. This would amount to a substantial increase in western representation. By the same token, regular meetings of the Council every two months should be held west of the Mississippi in the same ratio of one to every three east of the Mississippi.

The members of the Council not only should be increased in number but also should be enabled to devote more of their time and energy to this service which can mean so much to the people of the United States and of all lands. Though willing and eager to serve without recompense, each of the 12 members of the Council should receive a yearly salary of $5,000 in addition to travel expenses. Moreover, failure from whatever cause to attend two consecutive regular meetings of the Council should be construed as resignation from membership. To operate effectively the Council would require adequate full-time assistance of experts, but the

total administrative cost should not exceed 1 per cent of the whole appropriation, namely, $1,000,000.

It is essential that the Council have power to recommend grants for construction of cancer facilities and for expenses of research over periods not to exceed 20 years. Expenditure of all grants by recipient institutions should be audited in accordance with the usual procedure of the U. S. Public Health Service. In selecting projects to be aided, the Council should have complete discretion. The expenditures outlined earlier are, of course, merely suggestions to indicate that $100,000,000 is needed for disbursement in the first 5 years. More will probably be required, and the administrative machinery outlined is intended to carry on for 20 years with the aid of subsequent appropriations establishing other lines of cancer research on an equally firm financial basis.

It would save time and avoid confusion and embarrassment if the Council were to take the initiative—that is, not merely to wait for the shower of high-pressure applications certain to be received if such a cancer bill is passed by Congress but, instead, actively to investigate needs and to invite and assist cancer research institutions considered worthy to formulate projects. No applications for financial aid not originally solicited by the Council should be accepted.

There is a chance that a bill along these lines would go down in history as marking a new era in human welfare in which all-out financial support is provided by government, not for war or for any commercial advantage, but to solve a definite problem in medicine. It is fitting that cancer should be the first disease so attacked. The public is of one mind in this matter. If the experts raise their sights and organize research with skill and wisdom on a large scale, and the policy is adopted of subsidy of long-term projects wherever it is most advantageous throughout the United States, the results will justify many times this expenditure, and the precedent will have been set for a similar approach to other devastating human diseases. Indeed, such a bill would signalize a new kind of emancipation—one of freeing the people from what is believed to be needless suffering and from untimely death.

Scientific Development of the Use of Human Resources:

Progress in the Army Air Forces

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THERE ARE FEW WHO WOULD QUESTION the fact that by far the most important of the resources available to us are human talents. It is also true that there are few areas in which so little progress has been made in the observation and classification of facts and the establishment of verifiable general laws as in the study of human resources and their utilization. This paper will attempt to show that a science can be developed regarding the use of human resources. Some of the recent findings resulting from the increased activity during the war years will be presented primarily to illustrate the types of research and experimentation which can be expected to be productive of results of practical significance.

The general field in which further research and experimentation is proposed includes the more accurate description of the individual in terms of his aptitudes, basic interests, temperament, and potentialities; the training and education of this individual with such methods and materials as to enable him to make maximum use of his personal endowment; his guidance into the types of vocational and avocational activities which will be of greatest assistance to him in his further development; and evaluation of his success in the activities in which he participates.

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In this field certain laws and principles were established by psychologists a number of years back. These relate especially to such matters as learning, forgetting, perception, and motivation. More recently, individual differences and trait differences and their implications for participation in various types of activities have been the subjects of extensive investigation. Scientific research on these matters requires very large groups of individuals, and some of the problems also necessitate waiting several years before final evaluation can be made. In most situations the extent of control of the individuals taking part in an experiment is also quite limited.

In many respects the military situation during wartime is ideal for this type of research. Large numbers are readily available. The life cycle from the time of individual analysis and classification, through training, and on to performing the job for which the individual was selected and trained is compressed into a period of only two or three years. Furthermore, the necessities of war give military authorities a much greater degree of control of the individual with public approval than would ordinarily be possible.

Having the resources of this large laboratory to work with, including the availability, for the staff, of a large