

The First Fifty Years of the Connecticut Tumor Registry: Reminiscences and Prospects

WILLIAM HAENSZEL, Dr.P.H. AND
MARY G. McCREA CURNEN, M.D., Dr.P.H.

*University of Illinois at Chicago, School of Public Health, Chicago, Illinois,
and Departments of Epidemiology and Public Health and of Pediatrics,
Yale University School of Medicine, New Haven, Connecticut*

Received May 21, 1986

The first fifty years of the Connecticut Tumor Registry (1935-1985) have seen unprecedented progress in the collection of standardized data on cancer patients and in the processing of these data, from paper documents to punch cards and magnetic tapes. The need for collecting such information was first recognized, in the early 1930s, by a group of physicians, health professionals, and laymen in New Haven who observed alarming increases in cancer rates and poor survival of cancer patients in this city. This paper recalls the growth and development of the registry and the role played by the Connecticut legislature, the State Medical Society, the Connecticut Department of Health, and the National Cancer Institute in this process. For half a century, the registry has provided assistance to practitioners, hospitals, and research scientists, not only in Connecticut but across the country and around the world. By making available reliable data on incidence and survival, the registry has played a key role in patient management, clinical trials, and etiologic studies. It has also demonstrated the value and served as an exemplary model of a population-based registry. At this juncture in its history, prospects for the future of the Connecticut Tumor Registry appear bright. Its data base will be an essential resource for the recently established Cancer Control Research Unit (CCRU) in the state and for new intervention studies by investigators at Yale, the University of Connecticut, and the State Health Department.

In the early 1930s, a group of concerned physicians, health professionals, and laymen in New Haven found alarming cancer trends in this city. They reported an increase in cancer mortality from 66 to 180 per 100,000 population between 1900 and 1934, showing that New Haven had one of the highest cancer mortality rates in New England [1]. They also noted that, among patients hospitalized for cancer, fewer than 20 percent would survive longer than five years. This group, under the name of Cancer Committee of New Haven, initially chaired by Dr. Ira Hiscock, Professor of Public Health at Yale, assisted physicians and hospitals in New Haven with the collection of uniform data on the registration and follow-up of cancer patients.

The committee soon drew statewide recognition for its important work and, in May 1933, the State Medical Society appointed the first Tumor Study Committee, with Dr. Thomas H. Russell as chairman [2]. In 1935, this committee organized the Association of Tumor Clinics, which was chaired by Dr. Charles L. Larkin. With active support of hospitals and their staffs, the Tumor Study Committee was instrumental in passage by the Connecticut General Assembly of Senate Bill 101 in June 1935 [3]. This bill, which led toward the establishment of the Connecticut Tumor Registry (CTR), authorized

the State Board of Health "to make investigation concerning cancer, the prevention and treatment thereof and the mortality therefrom. . . ." The legislature also allocated \$10,000 in 1935 to enable the State Board of Health to carry out a cancer program in Connecticut, this money to be used from July 1, 1935, to June 30, 1937. In addition, the sum of \$6,683.00 was allotted in 1936 by the federal government under Title VI, Public Health Service Section of the Social Security Act, to be used in cancer activities [4].

With the new legislation, the Connecticut State Department of Health, in December 1935, moved to create the Division of Cancer Research as a new unit of the Preventable Disease Section. Dr. Matthew Griswold, Chief of the Division of Cancer and Other Chronic Diseases, was appointed to direct the educational and statistical research programs. Significantly, the former Executive Secretary of the New Haven Cancer Committee, Herbert F. Hirsche, was engaged as Research Statistician in the new cancer division. Both Dr. Griswold and Mr. Hirsche were graduates of the Department of Public Health at Yale University [5].

Although congressional attention to the issue of cancer control in the U.S.A. was reported as early as 1927, the National Cancer Institute Act (Public Law 244) was not signed until ten years later, in 1937, by President Franklin D. Roosevelt, to set in motion a federal commitment to cancer control [6].

The new Division of Cancer Research in the Connecticut State Department of Health worked closely with the State Medical Society's Tumor Study Committee which, in 1949, adopted its current name, the Cancer Coordinating Committee. In the years between 1935 and 1941, it carried out analyses of mortality statistics, assisted in the establishment of tumor clinics, and facilitated legislative activities.

The 1935 legislation authorized the State Department of Health to investigate cancer and set aside money to pay hospitals for reporting. This had the effect of initiating a comprehensive statewide cancer reporting system. Money was deemed more important than a reporting requirement. The funds made available sufficed to support a registry staff in the Health Department and, equally important, to pay the salary of a tumor clinic secretary in each Connecticut hospital. The sponsors were primarily interested in patient survival data; incidence data were secondary. This is not surprising; cancer epidemiology was then in its infancy. There were no population-based cancer registries, and the first cancer morbidity survey undertaken by the National Cancer Institute (NCI) was just getting under way [7]. The first case-control studies on smoking and lung cancer would not be reported for another ten years [8,9]. The sponsors probably realized that direct support for secretaries to service the hospital clinics and tumor registry ensured that someone in each of the 28 to 30 hospitals then in existence in Connecticut would be on hand to take care of the records and do the necessary patient follow-up. The key reporting unit was the hospital, not the individual physician. So long as there were direct dealings between the hospitals and the cancer registry, concern about protecting the confidentiality of patients' records was not a major issue at that time.

In 1941, a team from the State Division of Cancer Research visited each participating hospital and made abstracts of the records of each cancer patient admitted to the hospital, beginning with January 1935. During these visits, the tumor clinics' secretaries were trained to carry out the case registration functions. The key element which made the tumor registry a going concern was the provision of financial support for each hospital's tumor clinic secretary. By December 1942, 22 hospitals, comprising over 90

percent of the hospital beds in Connecticut, were reporting. The remaining hospitals were contacted thereafter, and arrangements were made to incorporate them into the new registry system [10].

A reporting system that covered hospitalized patients only would have missed that fraction of patients not admitted to hospitals. This made it necessary to match all Connecticut death certificates which mentioned cancer against the case reports from hospitals in order to ascertain the fraction of deaths not previously reported as cases. From its inception, the registry routinely secured copies of death certificates from the Bureau of Vital Statistics. Over the years, the proportion of cancer deaths not previously reported as cases fell from a high 37 percent in the first six years of the registry to 1.3 percent in the late 1970s [11,12].

At the registry's inception, the plan was to report all cases of cancer first diagnosed on and after 1 January 1935. This ambitious goal was achieved despite complications encountered during World War II. The tumor registry's statistician, Mr. Hirsche, who held a commission in the army reserves, was called to active duty and never returned to the registry. He was replaced during the war years by Eleanor J. MacDonald, who was a research statistician in the Division of Cancer and Other Chronic Diseases. Recruitment of registry staff was difficult. Ms. MacDonald tackled all the problems with enthusiasm and was most effective in motivating tumor registry secretaries and hospital staffs to supply reports.

In April 1947, Dr. William Haenszel, from the Division of Vital Statistics, New York State Health Department, joined the staff of the Connecticut State Health Department as Director of the Bureau of Vital Statistics. The following notes record some of his personal recollections.

“By 1949, a substantial backlog of records awaited processing, and physicians were requesting assistance for ad hoc studies. This situation was further complicated by staff shortages. There was a need to move from the registry's development phase to the establishment of data processing routines on a current basis. Ms. MacDonald left the registry to accept an appointment as Professor of Epidemiology at M.D. Anderson Hospital in Texas. Prior to that time, I had no direct involvement in the management of the tumor registry, although I was aware of its activities and of the support it was getting from the State Medical Society. I remember that Dr. Griswold attended regularly the meetings of the State Medical Society's Tumor Study Committee, perhaps as often as once a month or every other month. I also recall the names of two physicians who were key participants in State Medical Society committees and keenly interested in working with the registry data—Drs. E.J. Ottenheimer and A.W. Oughterson. They were particularly interested in the survival of patients with cancer of the rectum [13]. This was a time when a more aggressive approach to rectal cancers, including dissection of the anus and rectum with colostomy, was being introduced. They were seeking evidence from registry data for improved survival of patients with rectal cancer.

“When Ms. MacDonald left the registry, the Commissioner of Health, Dr. Stanley Osborn, asked me to confer with Dr. Griswold and advise him on recruiting a replacement. Data management was the main concern. Dr. Griswold and I needed advice from someone experienced in large-scale processing of cancer patient data. The NCI's second national cancer morbidity survey of 1947–1948, headed by Harold Dorn, Ph.D., [14] was nearing completion, and we approached him for assistance. Dr. Dorn, Chief of the Biometric Section, NCI, sent Dr. Sidney J. Cutler, analytic statistician in

his section, to review the registry's operations. One should remember that the postwar years were those of transition in data management, ranging from hand files, keysort cards, punch cards, and the use of printing tabulators. Dr. Cutler provided sound advice and, in effect, ushered in the era of data management. Dr. Earl Pollack was recruited from the New York State Department of Health to replace Ms. MacDonald and, with the assistance of Charles S. Wilder, he implemented Dr. Cutler's recommendations and brought the data management and processing elements of the registry under good control.

"In 1952, Dr. Dorn recruited me as his replacement at the NCI Biometry Branch, so I became head of a consulting unit which I had earlier dealt with while acting in a different capacity. This sequence of events laid the foundation for the sustained collaboration between the Connecticut Tumor Registry and the NCI in later years.

"With the completion of the data management phase, it became time to focus attention on data analysis. Dr. Cutler, who continued to serve as a consultant to the registry, and I participated in the preparation of a monograph entitled *Cancer in Connecticut: 1935-1951*, which was published in 1955 [15]. This publication of registry data, based on a standardized format for tabulations, resulted from many discussions with and suggestions by Drs. Griswold and Pollack and Mr. Wilder. It would be hard to overestimate the significance of this report, which set the pattern for subsequent systematic publications of incidence and survival data by the Connecticut Tumor Registry. It established the registry's reputation as the prime American data source on cancer incidence and patient survival. This monograph reported data for three time periods: 1935-40 (early developmental years); 1941-46 (war years); 1947-51 (mature phase). It also reported patient survival data by hospital size. There was at the time great interest in comparing the experiences of small community hospitals with those of the large, tertiary care centers.

"After the Connecticut monograph was published, there was a changing of the guard in the tumor registry. Dr. Henry Eisenberg, who had been working on a federally supported Venereal Disease Program, replaced Dr. Griswold on his retirement as Director of the Division of Cancer and Chronic Diseases. Richard Greenberg, who was on the staff of the registry, became Chief Statistician, replacing Dr. Earl Pollack, who took a position at the National Institutes of Health.

"In 1956, I received a phone call from Dr. Colin White, Professor of Biostatistics at Yale University. He referred to a recent Yale medical school graduate, then completing an internship, who had written a senior thesis on methodological aspects of epidemiological studies. Could the NCI Biometry Branch find a spot for him? The branch did have an opening for a commissioned officer in the Public Health Service and John C. Bailar III, M.D., became linked to the history of the Connecticut Tumor Registry. Dr. Bailar was assigned to New Haven for about two years, where he worked with the registry materials in Hartford and in the New Haven hospitals. He collaborated with Dr. Ira Goldenberg, a New Haven surgeon and Yale professor, in a breast cancer study and contributed a note on the follow-up of lost cancer patients published in NCI Monograph 6 [16]. Dr. Bailar also participated in a comparative study of the survival of cervical cancer patients in Connecticut and the southwest region of England and Wales. This study was stimulated by the fact that much poorer survival experience from cancer was observed in New England when data from the two population-based registries were compared. This project involved visits by two pathologists to all hospitals in the two regions to review, according to protocol, the

pathologic characteristics of all cervical cancer cases diagnosed in a specific time period. This particular exercise demonstrated the unique capabilities of the Connecticut Tumor Registry for these special studies carried out by Dr. Bailar with staff support. The close liaison between the registry and hospitals, reinforced by the presence of tumor registry secretaries in each hospital, successfully met all the logistical demands of the traveling team of pathologists. The findings were published in NCI Monograph 19 [17].

“The history of the Connecticut Tumor Registry was profoundly influenced by an event that took place at NCI. The research program in cancer treatment under the auspices of the Cancer Chemotherapy National Service Center (CCNSC) needed baseline data on patient survival to supplement data generated by clinical trials in evaluating the effects of new therapies. No systematic national data on site-specific cancer patient survival existed as of 1955. Dr. Michael Shimkin, Chief of Biometry Branch, NCI, proposed that a group of hospital-based registries and some population-based registries (including Connecticut) prepare a standard set of tabulations and report the findings at the 1956 National Cancer Conference in Detroit. The presentation of data was judged a success, leading to the proposal that the registries report their updated findings at the 1960 National Cancer Conference in Minneapolis. At a meeting of registry representatives, I proposed that the tabulations be replaced by a set of uniform punch cards. This led to the formation of the End Results Group (ERG), which not only reported their findings at Minneapolis but stayed together to publish their findings for many years thereafter. The Connecticut data played an important role in establishing the baseline experience of all cancer patients for comparison with the results from the specialized, tertiary care institutions. In these early years, the registry’s participation in the NCI-sponsored End Results Group was subsidized for out-of-pocket costs by the Connecticut Department of Health. The Connecticut data were also valuable for delineating trends in survival rates in Connecticut and California (NCI Monograph number 6) [18].

“Following the adoption of uniform punch cards for recording data, the staff in the Connecticut registry made important contributions to the ERG procedures manual by providing instructions for coding, editing, consistency checks, and other data management operations.

“In the late 1950s, Dr. Franklin Foote was Commissioner of Health. The staff of the registry then included Dr. Eisenberg, Director of the Division of Cancer and Chronic Diseases; R. Greenberg, Chief Statistician; Jack R. Keough, Registry Director; and Patricia Campbell, Tumor Registry Supervisor.

“The Connecticut registry indirectly influenced the interpretation of data from the clinical trials of leukemia chemotherapy. Dr. Cutler repeatedly brought to the attention of Dr. Zubrod, at the NCI, and other clinical investigators, that the results of clinical trials describing dramatic treatment effects were not being reflected in the experience of the general population as observed in the Connecticut registry. Continued reference to the Connecticut data tended to moderate the interpretation of the clinical trial findings.

“In addition to its participation in ERG, the Connecticut registry was a charter contributor to the first volume of *Cancer Incidence in Five Continents* [19] and has provided current data in all subsequent editions. Dr. Eisenberg was a member of the editorial committee that advised on the format for the initial publication.

“Standard actuarial procedures, described by Berkson and Gage [20], and Ederer,

Axtell, and Cutler [21], have been used for the analysis of patient survival data collected by the Connecticut registry. The long time span covered by the registry and the volume of available patient material encouraged liberal use of the interval survival ratio in data analysis. This concept involves comparison of the patient experience for specified intervals after diagnosis with the overall mortality experience for the general population of like age and sex composition.

“Papers reporting the long-term survival experience for breast, uterine, and ovarian cancers were published in 1959 and 1960 by Cutler, Ederer, Griswold, and Greenberg [22,23,24]. Papers utilizing the interval survival ratio documented that breast cancer patients never returned to the experience of the general population (ISR = 1.0) even 15 years or more after diagnosis. This pattern deviated markedly from the colon cancer experience, where patients surviving ten years returned to the general population experience [25]. The unfavorable experience for breast cancer patients was due primarily to continued high mortality from this cancer.

“In view of coverage of incidence data dating back to 1935, the Connecticut registry was in a very good position to report on trends in site-specific cancer incidence. The other U.S. sources of information were the two first cancer morbidity surveys in 1937–39 and 1947–48 [7,14], but these were certainly inferior to the Connecticut data. The Connecticut data clearly indicated the major changes in risk, the rise in male and female lung cancer, the decline in stomach cancer, etc. Given the predominantly white population of Connecticut, the registry did not supply useful data on blacks. In the early years of the registry, no examples can be cited of its ability to detect changes in risk for specific site-histology complexes. The latter had to await a more refined morphological classification of tumors contained in the Standardized Nomenclature of Pathology (SNOP) and adapted for tumor registries by an American Cancer Society committee [26]. However, according to Dr. John Berg, the Connecticut registry did signal the rise in mesotheliomas after World War II. This could have been detected sooner if someone had been looking for it.

“Other uses of the Connecticut data stimulated methodological developments. For example, Ederer, Myers, and Mantel examined the distribution of leukemia cases for 169 Connecticut towns over 15 years and proposed a test for the detection of space-time clusters of cases [27]. The test for clustering of leukemia cases was negative, but it is interesting to note that, when applied to known infectious diseases in Connecticut, such as poliomyelitis and hepatitis, the test was positive.

“In the 1960 decade, the data management activities of the Connecticut Registry were under good control. What was missing was the utilization of the registry for special studies. The rather inflexible Connecticut civil service personnel system made it difficult to write job classifications for research investigators, and the Health Department could not recruit such individuals. The problem was compounded by the departure of Dr. R. Greenberg, who had completed his work for a Ph.D. at Yale University. To fill the void created by his departure, the NCI assigned Roger Connelly, from its Biometry Branch, to the staff of the Connecticut Tumor Registry. He worked closely with Dr. Eisenberg and with him published a series of papers reporting the registry findings [10,28] until Dr. Eisenberg's death in 1968. At this time, Dr. Barbara Christine became chief of the Chronic Diseases Division and remained in office until she died of cancer in 1975. She published, in collaboration with her staff, a series of Connecticut Health Department monographs on cancer in Connecticut in the 1960s and reported on cancer incidence, mortality, and survival in Connecticut during this

period [29]. She was assisted by J.T. Flannery, who joined the registry in 1962 and became director in 1975. His management of the registry has remained, until this day, an example of efficiency and dedicated effort.

“In the late 1960s, a data management problem arose to complicate the effective participation of the Connecticut registry in the End Results Group. The state government committed itself to the establishment of a centralized computer center to service all departments of state government. Even though the NCI contract covered all data processing costs, the Connecticut registry was prevented from establishing its own computer unit. While the difficulties caused by this inflexible computer processing arrangement have improved over time, the Connecticut Tumor Registry does not, to date, have its own computer facilities.

“Early in the 1970s a budget crisis in the Connecticut state government intervened to threaten further supply of data to the End Results Group. To cope with this deficit, the governor proposed eliminating payments to the hospital tumor registry secretaries and making the reporting of cancer cases compulsory, thus shifting the costs to the individual hospitals. A statute was passed mandating that cancer become a reportable disease effective March 23, 1971 [30]. This turn of events posed a dilemma to the NCI. Connecticut’s participation in the End Results Group met important national goals. Experience elsewhere had shown that loss of funding for essential support services inevitably led to the demise of a cancer registry. The risk to the End Results Group program, through failure to support the hospital tumor registry activities in Connecticut, was unacceptable to the NCI, which had a substantial investment in the ERG. Therefore, the NCI increased its support to the Connecticut registry, which now had the legal right to require that cancer be reported to the State Health Department. It is worthwhile noting that at this time, on the national scene, the 92nd Congress of the U.S. passed a bill (H.R. 8343, H.R. 10681, S 1828) in 1971 to establish a National Cancer Authority in order to conquer cancer at the earliest possible date. This bill was entitled ‘The National Cancer Attack Act of 1971’ [31].

“Up to 1972, the relationship between the registry and NCI had been through participation in the End Results Group. Before that time, the NCI had two distinct programs for the collection of incidence and patient survival data. The End Results Group supplied the survival data, while the incidence data had been collected through cancer morbidity surveys. With the completion of the third national cancer morbidity survey covering the years 1969–71 [32], it was obvious that the cancer morbidity survey approach was inefficient and that it would be preferable to establish a network of population-based cancer registries. The Connecticut Tumor Registry became a participant in this network, which was established at the NCI in 1972 under the title ‘Surveillance, Epidemiology, and End Results (SEER) Program.’

“A problem which reoccurred during this period was the inability of the Connecticut Tumor Registry to recruit research staff. This situation called for other arrangements. There was a need to combine the strong Connecticut registry capabilities in data management with those of an institution with a good research base. In Connecticut, the two obvious candidates were the University of Connecticut School of Medicine and Yale University. Yale was judged superior because of its ability to identify people who could conduct epidemiologic research and who were in contact with physicians in the state. There ensued exploratory negotiations concerning the feasibility of establishing a Connecticut Cancer Epidemiology Unit (CCEU) at the Yale University Department of Epidemiology and Public Health. The outcome was that the work of the Connecticut

registry and its research arm, the CCEU, was supported by two NCI contracts, one with the State Department of Health and the other with Yale University. Dr. J. Wister Meigs was appointed the first director of CCEU in 1974 [33]. In a recent paper, he described the role of the Connecticut Tumor Registry during its fifty years of service in assisting a large number of cancer epidemiologists, both at home and abroad [34].”

The contracts and administrative relationships which existed between the NCI, the Connecticut Tumor Registry, and the Connecticut Cancer Epidemiology Unit at Yale were in force when Dr. W. Haenszel retired from the National Cancer Institute in 1976. In reminiscing, he states:

“My successor responsible for overall direction of the NCI’s Surveillance, Epidemiology, and End Results (SEER) Program and the Connecticut participation in this program was none other than Dr. Earl Pollack, who was research statistician with the Connecticut Registry in the 1950 decade. Thus, serendipity played a large role in the development of the Connecticut Tumor Registry. It did not develop according to a predesigned plan, but the people involved were able to take advantage of opportunities as they presented themselves. It can certainly be defended as a good example of close cooperation between units in the state and federal governments that were able to pool their resources and efforts to pursue a common goal.”

In 1982, Dr. Meigs was succeeded by M.G. McCrea Curnen, M.D., Dr. P.H., who became director of the CCEU and medical director of the Connecticut Tumor Registry. She reported on the assistance which the Connecticut Tumor Registry offers toward the development of cancer prevention programs [35]. Following a survey of 1,572 records from the Connecticut Tumor Registry, she also evaluated the usefulness of epidemiologic data currently being collected on patients’ occupation/industry, smoking habits, and family history of cancer. Criteria for usefulness of these data were based on their potential for standardization and statistical analysis [36]. In this study, the rapidity with which hospitals report cancer cases to the Connecticut registry was also investigated. The study found that 47.5 percent of cases had been reported to the Connecticut Tumor Registry within three months of diagnosis, 77.5 percent within six months, and 97.5 percent within one year. There was no evidence that hospital size played a major role in the rapidity of reporting, although small hospitals had a greater number of cases reported within three and six months than larger hospitals.

While the Connecticut Tumor Registry was dependent for data on the hospital tumor clinic secretaries in the early years of its development, it now depends on the hospital tumor registrars to provide rapidly an increased amount of data to the registry. Registrars, who are presently certified by the National Tumor Registrars Association, are well trained and capable of performing a wide variety of cancer data management skills [37]. They play an important role in maintaining the quality and completeness of data in the Connecticut Tumor Registry.

Dr. D. Janerich became director of the CCEU and Medical Director of the Connecticut Tumor Registry in 1985. He established, in the Department of Epidemiology and Public Health at Yale, the first Cancer Control Research Unit (CCRU) for Connecticut, supported by the NCI, and the CCEU research arm of the tumor registry was moved from New Haven to Hartford.

This new CCRU endeavor is developed around the Connecticut Tumor Registry, which will require uninterrupted financial support. It will bring together investigators from Yale University, the University of Connecticut, and the Connecticut State Department of Health Services in an effort to devise and apply methods of prevention

for various types of cancer. Among a number of epidemiologic, clinical, and laboratory projects, a statewide study will be undertaken during the 1986–1991 period aimed at eradicating invasive cervical cancer, a disease which should be preventable at this time [38].

This multidisciplinary effort to prevent cancer will require the collaboration of many investigators whose various skills will increase our understanding of the biology and control of this disease.

A renewed emphasis on cancer control, both at home and abroad, will be featured in the years ahead. These preventive programs will continue to utilize the resources of the Connecticut Tumor Registry and add another chapter to its first fifty years of valuable service.

ACKNOWLEDGEMENT

We thank Ms. Ann Marie Tears for her invaluable assistance in preparing this manuscript.

REFERENCES

1. The cancer problem in New Haven: Report of the Cancer Committee Program, April 1930–December 1935, with a statistical analysis of cancer morbidity and mortality 1920–1934. Orange, CT, The Wilson H Lee Co, 1935
2. Connecticut State Medical Society, Proceedings. New Haven, CT, Connecticut State Medical Society, 1933
3. State of Connecticut, Senate, Substitute for Senate Bill No. 101. 1935
4. McLellan PM: Association of Tumor Clinics. *Conn State Med J* 1 (2):100–113, 1936
5. Gershman ST, Flannery JT, Barrett H, Nadel RK, Meigs JW: Development of the Connecticut Tumor Registry. *Conn Med* 40 (10):697–701, 1976
6. Breslow L: A history of Cancer Control in the United States 1946–1971. Book Two: A history of programmatic developments in cancer control, DHEW Publication No (NIH) 79-1518. Washington, DC, U.S. Government Printing Office, 1979, pp 511–513
7. Dorn HF: Illness from cancer in the United States. *Publ Health Rep* 59:33–48, 65–77, 97–115, 1944
8. Wynder EL, Graham EA: Tobacco smoking as a possible etiologic factor in bronchiogenic carcinoma: A study of six hundred eighty-four proved cases. *JAMA* 143:329–336, 1950
9. Doll R, Hill AB: Smoking and carcinoma of the lung: Preliminary report. *Brit Med J* 2:739–748, 1950
10. Connelly RR, Campbell PC, Eisenberg H: Central Registry of cancer cases in Connecticut. *Publ Health Rep* 83 (5):386–390, 1968
11. Eisenberg H, Campbell PC, Flannery JT: Cancer in Connecticut: Incidence characteristics 1935–62. Hartford, CT, Conn State Dept Health, 1967
12. Heston JF, Kelly JB, Meigs JW, Flannery JT: Forty-five years of cancer incidence in Connecticut, 1935–1979. *Natl Cancer Inst Monogr* No. 70. Washington, DC, U.S. Government Printing Office, 1986
13. Ottenheimer EJ, Oughterson AW: Observations on cancer of the colon and rectum in Connecticut. An analysis based on 5572 proved cases. *New Eng J Med* 252:561–567, 1955
14. Dorn HF, Cutler SJ: Morbidity from cancer in the United States. *Publ Health Monogr* No. 56. *Publ Health Serv Publ* 590. Washington, DC, U.S. Government Printing Office, 1959
15. Griswold MH, Wilder CS, Cutler SJ, Pollack ES: Cancer in Connecticut, 1935–1951. Hartford, CT, Conn State Dept Health, 1955
16. Bailar JC III, Loury R, Goldberg IS: A note on follow-ups of lost patients. In *End Results and Mortality Trends in Cancer*. U.S. Dept of Health, Education, and Welfare. *Natl Cancer Inst Monogr* No. 6. Washington, DC, U.S. Government Printing Office, 1961, pp 123–127
17. Bailar JC III, Thomas LB, Thomson AD, Eisenberg H, Vick RM: Morphology and survival rates of cervical cancer in Connecticut and Southwest England. U.S. Dept of Health, Education, and Welfare. *Natl Cancer Inst Monogr* No. 19. Washington, DC, U.S. Government Printing Office, 1965, pp 385–403
18. Axtell LM, Breslow L, Eisenberg H: Trends in survival rates of cancer patients: Connecticut and California. In *End Results and Mortality Trends in Cancer*. U.S. Dept of Health, Education, and

- Welfare. Natl Cancer Inst Monogr No. 6. Washington, DC, U.S. Government Printing Office, 1961, pp 49-67
19. Doll R, Payne P, Waterhouse J. (ed): Cancer Incidence in Five Continents. A Technical Report. International Union Against Cancer. New York, Springer-Verlag Publishers, 1966
 20. Berkson J, Gage RP: Calculation of survival rates for cancer. *Proc Staff Meet Mayo Clinic* 25:270-286, 1950
 21. Ederer F, Axtell LM, Cutler SJ: The relative survival rate: A statistical methodology. In *End Results and Mortality Trends in Cancer*. U.S. Dept. of Health, Education, and Welfare, Natl Cancer Inst Monogr No. 6. Washington DC, U.S. Government Printing Office, 1961, pp 101-121
 22. Cutler SJ, Ederer F, Griswold MH, Greenberg RA: Survival of breast cancer patients in Connecticut, 1935-1954. *J Natl Cancer Inst* 23:1137-1156, 1959
 23. Cutler SJ, Ederer F, Griswold MH, Greenberg RA: Survival of patients with uterine cancer, 1935-1954. *J Natl Cancer Inst* 24:519-539, 1960
 24. Cutler SJ, Ederer F, Griswold MH, Greenberg RA: Survival of patients with ovarian cancer, 1935-1954. *J Natl Cancer Inst* 24:541-549, 1960
 25. Eisenberg H, Cutler SJ, Axtell L: Differential survival of cancer for selected sites. *Achter Internationaler Kongress Fur Lebensversicherungsmedizin (Proc 8th International Congress of Life Assurance Med)* Luzern, Switzerland, 15-19 June 1964. Basel, Schwabe & Co Verlag, 1964, pp 121-134
 26. Percy C, Berg LW, Thomas LB (ed): *Manual of Tumor Nomenclature and Coding*. American Cancer Society, Inc, LB Thomas Publisher, 1968
 27. Ederer F, Myers MH, Mantel N: A statistical problem in space and time: Do leukemia cases come in clusters? *Biometrics* 20:626-638, 1964
 28. Eisenberg H, Sullivan P, Connelly RR: *Cancer in Connecticut. Survival Experience, 1935-1962*. Hartford, CT, Conn State Dept of Health, 1969
 29. Christine BW, Sullivan PD, Connelly RR, Foote F: Cancer incidence, mortality and survival in Connecticut during the 1960s. *Conn Med* 34 (8):564-569, 1970
 30. State of Connecticut, Administrative Regulations. Department of Health, 1971
 31. National Cancer Attack Act of 1971. Part 1. Hearings before the subcommittee on public health and environment of the Committee on interstate and foreign commerce, House of Representatives, 92nd Congress. 1st Session on H.R. 8343, H.R. 10681, S. 1828 (and all other bills and resolutions). Serial No 92-40. Washington, DC, U.S. Government Printing Office, 1971, p 5
 32. Cutler SJ, Young JL Jr: Third National Cancer Survey; Incidence data. U.S. Dept of Health, Education, and Welfare. Natl Cancer Inst Monogr No. 41. Washington, DC, U.S. Government Printing Office, 1975, pp 1-454
 33. Meigs JW: The Connecticut Cancer Epidemiology Unit. *Conn Med* 39 (10):637-640, 1975
 34. Meigs JW: The impact of the Connecticut Tumor Registry on cancer epidemiology. *Conn Med* 49 (11):742-746, 1985
 35. Curnen MG McCrea, Thompson WD, Heston JF, Flannery JT: Cancer prevention: The Tumor Registry connection. *Cancer Detect Prev* 7:191-199, 1984
 36. Curnen MG McCrea, Thompson WD, Flannery JT: The Connecticut Tumor Registry: Potential for increasing its usefulness in etiologic research. *Conn Med* 49 (11):753-759, 1985
 37. Hurst MC: The Tumor Registrar: Past, present, future. *Conn Med* 49 (11):737-740, 1985
 38. Janerich DT, Hadjimichael O, Flannery JT: Strategy for elimination of invasive cervical cancer in Connecticut. *Conn Med* 49 (11):746-753, 1985