Special Perspective

Origins of Health Services Research

Thomas McCarthy and Kerr L. White

The idea that individual and population-based outcomes, benefits, hazards, and costs associated with medical interventions, practitioners, and institutions should be objects of research is not new. Sir William Petty and John Graunt in the seventeenth century; Thomas Short and Pierre-Simon Laplace (1749–1827) in the eighteenth century; Pierre-Charles-Alexandre Louis and Florence Nightingale in the nineteenth century; Ernest Codman and Paul Lembcke in the twentieth century; and many others over the years advanced what were widely regarded by the medical profession and hospital administrators as impertinent questions about the medical care enterprise (White 1991, 1993). What is relatively new, however, is the codification of these diverse concepts and methods under the rubric of health services research.

From the end of World War II and well into the next decade, numerous studies were conducted on disparate elements of medical, nursing, and dental services, and on the facilities, manpower, management, costs, utilization, and social and behavioral influences brought to bear on their use and effectiveness. Each of these pioneering studies was associated with one or more traditional disciplines. In contrast to the rapidly evolving field of biomedical research, however, no defined area of scientific investigation was labeled *health services research* (Flook and Sanazaro 1973).

As authors of this Special Perspective—this investigation into the origin of *health services research*—we (TM and KLW) had two meetings and numerous telephone conversations in an attempt to determine the time and place of the first use of the term that defines and describes our field. We consulted our own records and diaries, and we talked to Cecil Sheps, Murray Goldstein, and the late Glenn G. Lamson, Jr., former executive secretary of the Hospital Facilities Research and Health Services Research study sections (1955–1963).

Thomas McCarthy, Ph.D. was executive secretary of the Health Services Research Study Section, from 1962 through 1966. Kerr L. White, M.D. was a member of the Health Services Research Study Section from 1957 through 1966, and its chairman from 1962 through 1966. Address comments to Dr. McCarthy at 7925 Ivymount Terrace, Totomac MD 20854; and Dr. White at 500 Crestwood #1410, Charlottesville VA 22903-4858.

TM conducted a thorough search for pertinent documents in the holdings in the Division of Research Grants of the National Institutes of Health (NIH) and in the U.S. National Archives. What follows is our reconstruction of events (in third person, for the most part—i.e., TM, KLW—to avoid confusion), but we are prepared to learn from others if there are errors or omissions.

In September 1952, a landmark conference on research requirements for health and medical care was convened by the new School of Medicine of the University of North Carolina at Chapel Hill. It was the first conference of its kind to take place after World War II. Supported by a grant from the Rockefeller Foundation, the conference proceedings represented initial attempts to describe this new but still unnamed field of scientific inquiry (Sheps and Taylor 1954). The keynote speaker was J. (Jerry) N. Morris, director of the United Kingdom Medical Research Council's Social Medicine Research unit at the London Hospital, a pioneering organization in the application of epidemiological research concepts and methods to medical services and health matters. Morris's seminal volume, *Uses of Epidemiology* (1957), is a classic; it describes, for example, studies that identified small area differences in the rates for children's tonsillectomies in similar English provincial towns (the Glover Phenomenon) and other studies that quantified substantial variations that showed up in patient care outcomes for several medical and surgical conditions in teaching and non-teaching hospitals. Morris's address described the principles of randomization and of population-based studies. Above all, he made the point that three basic venues were appropriate for the conduct of medical and health-related investigations: the clinical encounter, the laboratory, and the population. He emphasized that one venue is not better or worse than the other two, or good or bad, right or wrong, soft or hard: that the choice among them depends on the question being asked or the problem being addressed. The field of study chronicled in these next pages—*health services research*—generally uses population-based approaches, in contrast to biomedical research.

Morris and the Chapel Hill conference introduced the American medical establishment to what were, for the most part, new epidemiological concepts and methods. Starting in the mid-1950s, undoubtedly influenced by this North Carolina gathering as well as by other forces, several small groups initiated studies that were referred to variously as *patient care research, medical care research,* and sometimes, *research in community health services.* Participants in these studies included, for example, George Reader and Doris Schwartz of Cornell's School of Medicine; Paul Densen, who was then with the New York City Health Department; Cecil Sheps, Sydney Lee, and Jerry Solon, all

three of whom were then at the Beth Israel Hospital in Boston; and Frank Williams, Bob Huntley, Bernie Greenberg, and KLW, who were then at the University of North Carolina in Chapel Hill. For several years, research results were presented and discussed at periodic gatherings, and annual sessions on patient care research took place at the major biomedical research meetings in Atlantic City during the late 1950s.

Subsequent to its inception in 1946, the Hill-Burton Act had funded hospital construction across the country, especially in underserved, largely rural areas. In 1949, the 81st Congress recognized the significance of research activities directed at understanding and improving hospital facilities, but it took until 1955 before Congress provided additional funds for "research in hospital operation and administration." John Cronin, chief of the Division of Hospital and Medical Facilities, Department of Health, Education and Welfare—and later his successor, Jack Haldeman—were the officials responsible for these additions to the Hill-Burton program, together with Louis Block, chief of the Research Grants Branch under Cronin. From conversations that KLW had with Block, we believe that Block persuaded Cronin who, in turn, convinced Congressman John Fogarty in 1955 to add $1.2 million to that year's Hill-Burton appropriation. These were the first funds ever appropriated for what subsequently became the field of *health services research.* In later years the funds in the annual Hill-Burton appropriations that were designated specifically for this research rose to $5 million, and still later they were increased to $10 million. More importantly, Block seems to have construed the Hill-Burton Act's new mandate to include something called *medical care research.* In 1956, he and Cronin wrote:

> The widest latitude is allowed by the wording of the law to permit such research and demonstrations in the hospital *and related fields* [emphasis added]. There is almost universal agreement that needed information is lacking in many unexplored areas. At the same time, it is also recognized that there are few current methods that are not susceptible of improvement. (Cronin and Block 1956)

In 1955, the Division of Research Grants of the National Institutes of Health was assigned responsibility for reviewing research grant applications for these new funds. For this purpose NIH established the *Hospital Facilities Research study section.* Also in 1955 the NIH set aside funds for a nursing research program and the Division of Research Grants established the *Nursing Research study section.* The evolution of all study sections concerned with matters generally associated with *health services research,* and their status during the period 1946 to 1960, is summarized from various NIH documents in Figure 1.

Figure 1: Evolution of Study Sections

Study Section Title	*Year Created*	*Comments*
Public Health Methods	1946	"Methods" dropped from title
Sanitation	1946	Newly established Study Section
Environmental Health	1949	Resulted from renaming Sanitation Study Section
Public Health and Sanitation	1953	Resulted from merger of Public Health and Environmental Health Study Sections
Public Health and Nursing	1955	Resulted from division of Public Health and Sanitation Study Sections
Sanitary Engineering and Occupational Health	1955	Resulted from division of Public Health and Sanitation Study Sections
Hospital Facilities Research	1955	Newly established Study Section as a result of new research funds in Hill-Burton Act
Public Health Research	1957	Resulted from division of Public Health and Nursing Study Section
Nursing Research	1957	Resulted from division of Public Health and Nursing Study Section
Health Services Research	1960	Resulted from merger of Public Health Research and Hospital Facilities Research Study Sections
Human Ecology	1960	Resulted from merger of Public Health Research and Hospital Facilities Research Study Sections

It is significant that NIH officials, especially those in the Division of Research Grants, took the initiative in these changes and thereby played an important role in the metamorphosis of assorted public health entities into more realistic configurations. Representatives of the U.S. Public Health Service in what was then its Bureau of State Services (often referred to as the "downtown" part of the Department of Health, Education and Welfare) seem to have played no role in this. In 1955, Berwin Cole, chief of the Grants Review Branch, under Ernest Allen, the famed head of the NIH Division of Research Grants, recruited Murray Goldstein, a National Heart Institute staff member on leave at the University of California, Berkeley, to be one of his three assistant chiefs. Goldstein was assigned to oversee a group of ten study sections known as the *Health Services Group,* that dealt with public health research and behavioral sciences research. In addition to the study sections on Public Health Research, Hospital Facilities Research, Nursing Research, and Sanitary Engineering and Occupational Health, Goldstein was responsible

for the Toxicology, Mental Health, Behavioral Sciences, and Experimental Psychology study sections and for an Accident Prevention panel and a Special Studies section.

Initially, Edward Rogers, professor of ecology at the University of California, Berkeley, chaired both the Public Health Research study section and the Hospital Facilities Research study section. In 1957, Cecil Sheps, then at the University of North Carolina and later at the Beth Israel Hospital in Boston, succeeded Rogers as the first sole chair of the latter study section. Glenn G. Lamson, Jr. was its executive secretary from 1957 to 1962. KLW became a member of that study section in 1957.

Between 1957 and 1959, members of the Hospital Facilities and Nursing Research study sections began playing a role in the gradual creation of the emerging field of *health services research.* The former study section appointed an ad hoc committee on program planning with Nicholas Demerath, professor of sociology at Washington University, as its chair. In response to a solicitation for suggestions from study section members, KLW wrote, in a March 11, 1959 letter to Demerath (addressed through Glenn Lamson, Jr., the study section's executive secretary and mailed to Lamson's address at NIH, Bethesda, Maryland):

> Should we not encourage the redefinition of "hospitals" and possibly of the Study Section's functions? . . . The concept of the "hospital" is in some ways outmoded and I think . . . we should spell out what is either stated or implied in the Hill-Burton Act that we are concerned with all facilities, including private physicians' offices, health centers, clinics, diagnostic facilities, industrial health offices, rehabilitation centers, health departments, outpatient departments and in-patient services, both general and specialized, to the extent that they contribute to the medical care needs of society. We have certainly reviewed and sponsored grants in many of these areas.
>
> Should we not encourage studies and approaches which have as their base the health problems of the populations concerned rather than the institutions currently serving these needs? What are the medical care needs of various groups? Who are the patients? Which populations need care—preventive, diagnostic, therapeutic and rehabilitative? What economic, social, psychological, cultural, and informational factors inhibit and facilitate access to the best medical care at the earliest phases of disease? Who is to render this care? What health personnel must be educated or trained? How can these professional workers best be organized? What physical facilities are needed for them?
>
> Perhaps the Study section should have its name changed to the Health Facilities Research Study Section or the Medical Care Research Study Section. (White 1959)

The minutes of two meetings of the Ad Hoc Committee on Program Planning—on February 28, 1959 in St. Louis and on March 12, 1959 in Washington D.C.—contain no mention of a possible name change for the Hospital Facilities Research study section. At the June 29–30, 1959 meeting of the full study section at the Woodner Hotel in Washington, D.C., however, the last item on its agenda, dated June 18, 1959, is "9. Name of Study Section," and penciled in beside it is "Carried over to September 1959 meeting." (KLW, who attended the former meeting, was in Europe when the latter convened.) The agenda for the June meeting must have been prepared by Glenn Lamson, Jr. with the concurrence of Cecil Sheps. Lamson undoubtedly had read KLW's letter of March 11, 1959, since it was addressed to Demerath "in care of" Lamson at NIH.

By 1959, members of both the Hospital Facilities Research and the Nursing Research study sections had become sufficiently concerned to do something about the mounting confusion over their two missions and the gaps in research needs that neither was addressing. Accordingly, in the spring of 1959, a joint meeting of members of the two study sections was held in the Westwood Building in Bethesda, an off-campus venue used by NIH. (This meeting took place some time after the March 12 meeting of the Ad Hoc Committee on Program Planning and before the June 29–30, 1959 meeting of the full Hospital Facilities Research study section).

The only persons still living who participated in the Westwood meeting appear to be Cecil Sheps and KLW. The two recently reviewed their recollections by telephone, and both of them believe that the term *health services research* was coined at that meeting: neither of them had encountered it previously. Sheps does not remember introducing the term but says that he strongly supported it. KLW does not recall introducing it either, but he recalls that he definitely did not like the label "Health Resources Research study section," which had been proposed informally by someone, possibly Murray Goldstein. In KLW's view, much more than "resources" required investigation, as indicated by the excerpt from his letter to Demerath quoted earlier. The nurses who were present contributed substantially to defining the field of *health services research* and supported the name change. The important point is that the new term arose at that joint meeting; both Cecil Sheps and KLW are certain of that. The meeting unanimously recommended that the name *Hospital Facilities Research study section* be changed to the *Health Services Research study section* and that the Nursing Research study section retain its title and focus more specifically on patient care research. In the fall of 1960, members of the two committees met again

and issued an extensive statement about patient care research (Freeman et al. 1963).

TM recalls tales of the 1959 joint meeting that circulated after he became executive secretary of the *Health Services Research study section* in 1962. Unfortunately, the search of documents pertaining to NIH study sections in the NIH Division of Research Grants and in the U.S. National Archives failed to produce any minutes of that historic Westwood meeting. The name change recommended at that meeting presumably was negotiated by Glenn Lamson, Jr. and Berwin Cole, chief of the Grants Review Branch, NIH. From numerous discussions that TM had with Cole and others in the 1960s, it appears that Cole played an essential role in bringing about the name change. He is reputed to have said that in his view public health research was "all screwed up," and others in the Division of Research Grants allegedly shared this view. More specifically, the NIH leaders were of the opinion that, if it was to thrive, *health services research* had to become more than an offshoot of the biomedical enterprise: it needed to emerge as a distinct field of scientific inquiry (Flook 1971). Given this internal support for change and the recommendation for the name change by the joint meeting of the Hospital Facilities Research and Nursing Research study sections, it should have surfaced promptly.

In a memorandum to Ernest Allen and Berwin Cole, dated October 26, 1959, Goldstein recommended several name changes for study sections: Hospital Facilities Research was to become Health Resources Research, and Public Health Research was to become Human Ecology. Sanitary Engineering and Occupational Health was to become Environmental Engineering Research (Goldstein 1959). Of special significance is the fact that, after the title "Health Resources study section," Goldstein added "[Health Services Research?]," the term in brackets with a question mark after it. Clearly, the latter term was being considered by the responsible authorities in NIH during 1959. There were now four potential labels for this new area of research: *medical care research, health facilities research, health resources research,* and *health services research.*

An official document authorizing the selected change finally emerged on March 9, 1960 (Allen 1960). It was signed by Ernest M. Allen, chief, Division of Research Grants, NIH, and stated:

> Effective September 1, 1960, James Shannon, Director, NIH, has approved the reorganization of the Public Health Study Sections in the Health Services Research Group, Research Grants Review Branch. This reorganization will involve the renaming and/or reorientation of four of the five study sections. The new names will be:

PRESENT	*NEW*
Public Health Research	Human Ecology
Hospital *Facilities* Research	Health *Services* Research
Nursing Research	Nursing Research
Toxicology	Toxicology
Sanitary Engineering and Occupational Health	Environmental Engineering

This document went on to describe the missions of each. Cole seems to have been less effective in defining the *Health Services Research study section*'s mission. The mission "statement" for the *study section* reads:

> This study section would be concerned primarily with operational research in a community setting, such as a health department; it would have responsibility for the review of research grant applications in the areas of:
>
> 1. Community health:
>
> a. Needs (professional, organizational, institutional, including hospitals, etc.)
>
> b. Resources (professional, organizational, institutional, etc.)
>
> c. Planning (professional, organizational, institutional, etc.)
>
> d. Practices (professional, organizational, institutional, etc.)
>
> 2. Public Welfare programs in relation to community health.

There was yet another short document, dated May 12, 1960, from Ernest Allen to the Director of NIH, that stated:

> Upon request of staff and *study section* members [emphasis added], I should like to make the following changes in the names of Study Sections:
>
PRESENT	*NEW*
Health *Resources* Research	Health *Services* Research
Environmental Engineering	Environmental Sciences and Engineering
>
> Approval is requested. (Allen 1960)

The request was approved on May 13, 1960 by Kenneth M. Endicott, who at that time, was briefly the acting director of NIH.

Why the name change took a year to wend its way through the NIH administration and required two official edicts remains a mystery. Neither TM nor KLW remembers anything called the Health Services Research Group or any such entity as the Health Resources Research study section. Nor are any such entries in the list of study sections recorded in the official history of the NIH Division of Research Grants (Mandel 1996).

In 1962, TM became executive secretary of the *Health Services Research study section*. He had recently completed a Grants' Associates Training Program at NIH, where much emphasis had been placed on the responsibility of all study sections not only for reviewing grant applications but also for defining and developing their respective field, stimulating needed research, and improving the field's quality and credibility. The task of program development was to assume importance equal to that of the scientific merit review of research grant applications. In particular, TM had been impressed with the work of the Biophysics and Biophysical Chemistry study section in developing what was then a comparatively new, even unknown, field in many respects. When KLW assumed the chairmanship of the *Health Services Research study section* in 1962, he enthusiastically welcomed the additional opportunity to expand the emerging field of *health services research*. TM and KLW agreed that it would take more than a name change to establish a new field. It had to be described and legitimized, but above all it had to attract first-rate investigators and produce meaningful research results.

With unanimous endorsement of the *Health Services Research study section* and the superb support of two consummate public servants, Gilbert Barnhart and Evelyn Flook, the study section embarked on drawing up a series of initiatives not unlike those pioneered by the Biophysics and Biophysical Chemistry study section. Under the chairmanship of Philip Bonnet, at that time president of the American Hospital Association and administrator of the Massachusetts Memorial Hospital, a subcommittee of the *Health Services Research study section* developed guidelines for four types of research grants: exploratory research grants, research project grants, pilot research program grants, and research program grants. Later another subcommittee, chaired by Robert Haggerty, then professor of pediatrics at the University of Rochester, developed guidelines for *Health Services Research Center* grants. Under the leadership of Donald Mainland, professor of medical statistics at New York University, a series of 14 papers by eminent scholars was commissioned. This series described the many facets of *health services research* that seemed amenable to scientific and scholarly inquiry. A report on health services research in Scandinavia was also included. The papers were discussed at two conferences and published in the *Milbank Memorial Fund Quarterly* and subsequently as an independent volume (Mainland 1966). Later, a further report on health services research in Great Britain was published (Bierman, Connors, Flook, et al. 1968). These papers essentially staked out the field of *health services research* at that time.

Finally, to acquaint the members of the *Health Services Research study section* with examples of sites for future research, visits were made to major medical and health organizations and institutions, including the American Hospital Association, the American Medical Association, the California Health Department, the University of Puerto Rico and the Puerto Rico Health Department, and what was then the Center for Communicable Diseases. During these visits study group members were also able to familiarize their leaders with the opportunities and potential benefits of this new field of research.

The *Health Services Research study section* adopted a policy of making site visits to many initial grant applicants to spread the gospel. Someone observed that the poor quality of the early grant applications was characterized by unduly sophisticated methods to investigate trivial problems and by trivial methodological approaches to global problems. These "evangelical" site visits, as they came to be called, were designed to help young investigators (and some not so young) to get started in this new field of *health services research.*

Health services research also needed a journal of its own. In 1965, when the Hospital Research and Educational Trust, an affiliate of the American Hospital Association, applied for a grant to start a new journal to be called *Hospital Research,* the *Health Services Research study section* dispatched a site visit team to Chicago to assess the situation. A few minutes into the discussion it was explained that the emerging needs for research funded under the aegis of this particular study section covered a range much broader than hospitals. If the Hospital Research and Educational Trust wanted to start a new journal, it should be called *Health Services Research.* The applicants regrouped and, after a brief discussion, agreed to the name for the new journal. The grant was approved and *Health Services Research* began its successful, probably essential, contribution to developing the field.

A new field also needs a "club" or in scholarly parlance an Association or Society. In his June 10, 1984 address at the first meeting of the *Association for Health Services Research,* Bob Blendon stated, possibly in jest, that in 1964 Cecil Sheps and KLW at the University of North Carolina "envisioned the need to organize an association of health care researchers. . . . The organization's stationery was ordered, the meeting invitations were printed, but unfortunately they were never mailed" (Blendon 1984). Sheps and KLW have no recollection or knowledge of any such exercise. Neither was at Chapel Hill at the time; Sheps was at the University of Pittsburgh and KLW was at the University of Vermont! Cliff Gaus and the late Alice Hersh deserve all of the credit for conceiving and establishing the Association plan.

Looking to the Future in the Health Services Research Field

As with many scientific endeavors, *health services research* undoubtedly could have evolved in some other manner. These are our recollections of its genesis. But what of its future? A label, a journal, and an association may be necessary conditions for the establishment of a scientific enterprise, but they are far from sufficient. The essential ingredient is a vision of the field's potential: in our view, a vision for improving the health of individuals and populations. At least five opportunities are worth considering:

- Conduct a major national political and educational campaign to substantially increase the budget of the *Agency for Healthcare Research and Quality.* In addition to federal funds it is reasonable to tax all health insurance carriers and HMOs one percent of revenues to fund this essential agency. The country's politicians and the public need to understand that efficacious, effective, efficient, and equitable health care depends as much or more on *health services research* as on biomedical research.
- Conduct a campaign for the *Joint Commission on Accreditation of Healthcare Organizations* to require that all hospitals, HMOs, and related facilities have at least one full-time person responsible for developing credible quantitative data about that institution's quality of care. This and comparable information from similar organizations at regional, state, and federal levels should be disseminated to all health care personnel and the public. The evolution of systems and standards for these entities should be developed by universities with skills in such areas.
- Conduct a campaign urging the *Association of American Medical Colleges* and the *Association of Schools of Public Health* to require that all of their member institutions have a department, center, or institute devoted to *health services research.*
- Emulate airline practices and standards. Airlines provide services that offer close analogies to organizations that provide health services. They have developed and continue to develop sophisticated systems dedicated to improving safety, reliability, redundancy, retraining and recertification, efficiency, professional and public accountability, and customer convenience, courtesy, satisfaction, and comfort (to varying degrees). Above all, the airlines place a top priority on learning from their errors, near-errors, and critical incidents; the health care enterprise needs to adopt similar policies and practices. *Health services research* could help to transfer important concepts and systems from airlines to health care institutions and professionals. General Electric

with its Six-Sigma Quality Program also has much to teach us (Buck 1996).

- Devote much greater attention to the powerful potential of the ubiquitous therapeutic impact on patients and personnel of the Placebo and Hawthorne Effects. Together they account, on average, for as much as half of the overall benefits of health care interventions and services. To substitute inappropriate, unnecessary, or useless pills, potions, and procedures for listening, counseling, and caring is a recipe for escalating health care costs and risking potential harm to patients (White 1991; Revans 1996).

Health services research will continue to evolve as a thriving enterprise that in the eyes of policymakers and leaders of health care organizations eventually should be accepted as a field of importance equal to that of biomedical research in improving the health and well-being of individuals and populations.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the assistance of Doctor Murray Goldstein and Doctor Cecil Sheps.

REFERENCES

Allen, E. M. (Chief, Division of Research Grants, National Institutes of Health). 1960. Memorandum to Director, National Institutes of Health, 12 May.

———. 1960. Memorandum to Grants Branch Chiefs, National Institutes of Health, 9 March.

Bierman, P., E. J. Connors, E. Flook, R. R. Huntley, T. McCarthy, and P. J. Sanazaro. 1968. "Health Services Research in Great Britain." *Milbank Memorial Fund Quarterly* XLVI (1): 9–102.

Blendon, R. J. 1984. "Health Services Research: Future Trends and New Directions." Excerpts from the Opening Address at the first national meeting of the Association for Health Services Research and the Foundation for Health Services Research, 10–12 June. Printed offset, no other dates or identification.

Buck, C. R. 1996. "Quality Measurement: A Purchaser's Point of View." *America's Health in Transition* (Institute of Medicine, Washington, DC) 1: 4–8.

Cronin, J. W., and L. Block. 1956. "U.S. Grants Stimulate Hospital Research." *The Modern Hospital* (January).

Flook, E. 1971. "Commentary on the 1967 Study of Health Services Research in Great Britain." Paper Presented at an Anglo-American Seminar, Oxford, England, 20–23 September. Mimeograph.

Flook, E., and P. J. Sanazaro. 1973. *Health Services R&D in Perspective.* Chicago: Health Administration Press.

Freeman, R., C. G. Sheps, H. G. Tibbits, and G. G. Lamson, Jr. 1963. "Patient Care Research: Report of a Symposium." *American Journal of Public Health* 33 (6): 965–69.

Goldstein, M. (Assistant Chief, Research Grants Review Branch, National Institutes of Health). 1959. Memorandum to E. M. Allen, Chief, Division of Research Grants, NIH; and B. A. Cole, Chief, Research Grants Review Branch, NIH, 24 October.

Mandel, R. 1996. *A Half Century of Peer Review.* Bethesda, MD: National Institutes of Health, Division of Research Grants.

Mainland, D. 1966. *Health Services Research I & II.* New York: Milbank Memorial Fund.

Morris, J. N. 1957. *Uses of Epidemiology.* Edinburgh, London, and New York: Churchill Livingstone.

Revans, R. W. 1996. "The Hospital as a Human System." Reprinted from *Physics in Medicine and Biology* 7 (1962): 147–55, in *Bulletin of the New York Academy of Medicine* 73: 418–32.

Sheps, C., and E. E. Taylor. 1954. *Needed Research in Health and Medical Care.* Chapel Hill, NC: University of North Carolina Press.

White, K. L. 1993. "Health Care Research: Old Wine in New Bottles." *Pharos* 56 (3): 12–16.

———. 1991. *Healing the Schism: Epidemiology, Medicine, and the Public's Health.* New York and Berlin: Springer-Verlag.

———. 1959. Letter to Professor Nicholas Demerath, Washington University, through Glenn G. Lamson, Jr., National Institutes of Health, 11 March.