

# Appendix B.—Survey of Agency Use of CEA/CBA

## Introduction

This appendix reports on the results of an OTA survey of the use of cost-effectiveness and cost-benefit studies by the major Federal health agencies, State and local governments, and nongovernmental organizations. For the most part, OTA's survey showed that CEA/CBA analyses are not frequently conducted or applied to health care decisionmaking. Further, when such analyses are used, they tend to be cost-benefit rather than cost-effectiveness analyses.

## Office of Assistant Secretary for Planning and Evaluation, DHHS

In May 1966, John Gardner, Secretary of HEW (now DHHS), established five program analysis groups to conduct CBAS of several disease control programs. The objective of this effort was to provide a basis for comparing alternate programs and setting priorities for additional funding. Thus, an HEW official responsible for overseeing the analyses observed (266):

HEW supports, or could support a number of categorical disease control programs whose objectives are, or would be, to save lives or to prevent disability by controlling specific diseases. The studies were therefore an attempt to answer the question: If additional money were to be allocated to disease control programs, which programs would show the highest pay-off in terms of lives saved and disability prevented per dollar spent?

The effort was originally undertaken in response to a request by the Bureau of the Budget for thorough analysis of the costs, benefits, and objectives of existing and projected programs. That request reflected an interest in attempting to rationalize Government allocation decisions by building on the planning-programming-budgeting system adopted by the Defense Department under Secretary McNamara (637).

Ultimately, the five HEW program analysis groups produced several cost-benefit studies:

1. Disease Control Programs: Arthritis, 1966.
2. Disease Control Programs: Cancer, 1966.
3. *Disease Control Programs: Delivery of Health Services for the Poor*, 1967.
4. Disease Control Programs: Kidney Disease: Program Analysis, 1967.
5. Program Analysis: Maternal and Child Health Care programs, 1966.
6. Application of Benefit-Cost Analysis to Motor Vehicle Accidents, 1966.

## 7. Human Investment Programs: Vocational Rehabilitation, 1967.

In general, the impact of these studies appears to have been very limited by existing political and bureaucratic considerations, methodological shortcomings in the analyses, and unrealistic expectations of the impact such evaluation studies could have on decisionmaking (637).

One of the analyses, however, did have a major impact. The analysis of maternal and child health programs that examined the cost savings produced by federally sponsored periodic screening for low-income children played a major role in congressional passage of the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) Program (H. R. 57100, 1967) (637).<sup>2</sup> The Johnson administration's interest in enacting a child health program created a receptive audience for the ideas presented in the analysis. Difficulties in the implementation of EPSDT have arisen over the years. One of the major obstacles has proven to be the high costs that States incur when they participate in the program (213). This problem was not focused on in the original examination of societal costs and benefits.

## National Institutes of Health

NIH is the Government's principal biomedical research agency. Its 18 major organizational components support research on the causes, diagnoses, and treatment of diseases. Although a few institutes have engaged in economic analyses and cost-benefit studies, such efforts have been relatively atypical. The institutes have traditionally focused almost exclusively on gathering new knowledge as it relates to the disease process, having added an emphasis on assessing the safety and efficacy of new and existing technologies only recently. In addition, NIH has a very limited capacity to conduct economic analyses.

These factors, among others, have combined to discourage NIH from conducting CEA or CBA studies, as noted in an NIH staff memorandum (481):

<sup>1</sup>For a description of this effort, see R. N. Grosse and W. Smith, "Cost-Effectiveness and Cost-Benefit Analysis for Public Health Programs," *Public Health Reports*, 1968 (268).

<sup>2</sup>For description of this analysis and the role played in the passage of EPSDT, see J. Wholey and G. Silver, *Maternal and Child Health Care Program, 1966* (638); A. Levin, "Cost Effectiveness in Maternal and Child Health: Implications for Program Planning and Evaluation," *N. Eng. J. Med.*, 1968 (356); A. M. Foltz, "The Development of Ambiguous Federal Policy: Early and Periodic Screening, Diagnosis and Treatment (EPSDT)" (213), *Milbank Memorial Fund Quarterly*, 1975; and R. N. Grosse, "Cost Benefit Analysis of Health Services," 1972 (266).

The Institutes of the NIH lack the staff, funds, and in-depth expertise to undertake large-scale economic analyses. Furthermore, safety and efficacy are still the primary concerns in the areas of disease research in which NIH is involved, the state-of-the-art in many of these areas is not yet sufficiently advanced to make cost-benefit analyses feasible. However, the NIH shares with agencies responsible for health care delivery and regulation the mandate to evaluate new medical procedures and devices, and where appropriate the Institutes do conduct small-scale cost-benefit /cost-effectiveness analyses as components of more comprehensive technology assessment studies. Extensive efforts at cost-benefit analyses would be more appropriately undertaken by other federal agencies within DHEW . . . which relate more closely with the health care [delivery] sector.

Economic and cost-benefit studies that have been conducted by NIH have generally resulted from the interest of individual staff people (480). By far the most common types of economic analyses produced by NIH have been various cost-of-illness studies. These have been used in both planning and budget justifications. NIH cost-of-illness studies include:

1. National Institutes of Health, Office of the Director, "Trends of Economic Costs of Illness," 1979.
2. National Cancer Institute, "Measurement of the Cost of Cancer Care," 1978.
3. P. A. Hoffstein, K. K. Krueger, and R. J. Wine- man, "Dialysis Costs: Results of a Diverse Sample Study," *Kidney International*, 9:286, 1976. [This is a summary of a study conducted for the National Institute of Arthritis, Metabolism, and Digestive Diseases by the Nephrology Cost Group.]
4. National Institute of Arthritis, Metabolism, and Digestive Diseases, "The Cost and Prevalence of Complications of Dialysis in Five Dialysis Centers," 1978.
5. E. J. Sondik, "Heart Disease, Magnitude of the Problem," report prepared for the National Heart, Lung, and Blood Institute Task Force on Heart Disease in Childhood, July 3, 1979.
6. National Institute of Neurological and Communicative Disorders and Stroke, "Survey of the Incidence, Prevalence, and Cost of Intracranial Neoplasm," 1979.

The last study is part of a current effort by the National Institute of Neurological and Communicative Disorders and Stroke to link research priority setting more closely to identification of areas of greatest societal need and projects with the greatest potential for investment return. Thus, it is perceived as contributing to an effort to produce more "cost-effective" research (480). Similarly, the cost-of-dialysis studies of the National Institute of Arthritis, Metabo-

lism, and Digestive Diseases are perceived as having a cost-effectiveness element because they underline the different costs and complications of various modes of dialysis.

Each institute of NIH seeks to reduce the morbidity and mortality associated with the disease under its mandate and considers research directions that are intended to reduce the human and economic toll of the diseases. Cost considerations have occasionally been considered in NIH consensus development conferences. Although their primary focus is on "clinically relevant research and the readiness of certain important findings to be put to use in health or regulation," these conferences may also consider social, ethical, legal, and cost implications. In general, however, they consider these implications only as necessary extensions of their scientific and technical evaluations of specific technologies. The principal responsibility for examining these "nontechnical" issues rests with the National Center for Health Care Technology (NCHCT), which is discussed in a separate section of this appendix. The consensus development conferences sponsored by NIH serve only as the forum for the issues' presentation. Consensus development conferences to date have addressed a wide range of subjects, including mammography, dental implants, and electronic fetal monitoring.

In addition, three NIH institutes have produced more explicit cost-benefit work. One, the National Heart, Lung, and Blood Institute (NHLBI) has conducted several cost-benefit studies. NHLBI's first experience with CBA was in a 1973 assessment of heart transplant surgery and artificial heart development and use. As part of its long-term program of examining mechanical circulatory technology, NHLBI issued a report on the medical, ethical, legal, financial, and social implications of artificial heart implantation (442). This assessment did not include a formal CBA, but did incorporate the concept by providing a detailed listing of the costs, as well as the medical and social benefits, of the artificial heart. The report's examination of the cost of the device probably proved less important than its discussion of the formidable engineering obstacles to development, however, since it was these obstacles that played a major role in discouraging greater investment of resources by the institute in the totally implantable artificial heart program (514).

In 1972, NHLBI's mandate was broadened to include prevention, education, and control responsibilities. Subsequently, the National High Blood Pressure Education Branch and the National High Blood Pressure Demonstration Program were created to work with Government and private agencies in an effort to increase an awareness of the dangers of hyper-

tension and to encourage the development of effective treatment. Both of these programs have utilized information produced by the cost-benefit studies to help convince State and local health agencies and private organizations of the value of instituting hypertension control programs (611,614).

In 1975, NHLBI's National High Blood Pressure Education Program conducted a CBA of a model hypertension control program in order to produce a model for analyzing the costs and benefits of a national hypertension treatment program. This study was recently updated (441) through the incorporation of new data and the development of a computer program which tests several of the major assumptions made in the 1975 report (577). NHLBI has used information from this and the earlier analysis to encourage effective treatment programs.

Further, the National Institute of Dental Research (NIDR) has produced two cost-benefit studies. NIDR's National Caries Program was established by Congress in 1971 to sponsor R&D activities directed toward ultimately reducing the incidence of dental disease in the American public. In carrying out this mission, program officials have used CBAS to assist them in their long-range planning of R&D investment decisions (83,522). In 1974, NIDR contracted for the development of a computer-based model for predicting the long-term "net social value" of the use of preventive procedures (462). The results of the study were expressed in terms of the dollar savings produced by dental care treatment on both a nationwide and regional basis. In 1978, an internal NIDR staff report assessed the costs and benefits of a specific caries prevention treatment, pit and fissure sealants (72).

Both of these NIDR cost-benefit studies contributed to a decision to halt investment in occlusal sealant clinical trials until a sealant and a system of delivery could be developed that would significantly reduce the clinical time required in sealant application (523). Examination of the "net social value" model also contributed to program decisions to increase funding of efforts aimed at reducing the high carcinogenicity of American diets and projects directed toward development of fluoride-based regimens for use in nonfluoride areas (523).

Another study employing the cost-benefit concept has been funded by the National Cancer Institute (NCI). NCI originally contracted with the Blue Cross/Blue Shield Associations to develop a model prepaid health service benefit package for a cancer-screening program (435,436). Although originally the contents of the benefit package were to be determined through the consensus of a panel of experts, the screening program that eventually was designed

was largely determined by the use of cost-effectiveness methods (168).

Cost-benefit considerations are often present in the various NIH institutes' clinical trial deliberations. Although the evaluation of benefits is largely qualitative, judgments about whether to undertake a clinical trial in order to test a given therapy often broadly consider costs and benefits. Perhaps the most systematic and formal example of this process is provided by NCI's method of selecting new drugs for clinical trials. Within NCI, a large staff committee called the "Decision Network Group" engages in a formal evaluation of costs and potential benefits. A staff member describing the process observed (542):

In making the selection of specific drugs to develop toward clinical trial, we consider the relative biological activity of the drug in comparison with the cost of development, including large-scale production. Thus, if the drug represents a new type of chemical class which is highly active and relatively inexpensive, we, of course, have no difficulty in reaching a decision. If, however, the new drug is of relatively marginal benefit in the experimental systems we utilize, and, in addition, it is estimated to cost a great deal of money to produce and develop, we very seriously consider the advisability of proceeding.

Another example of this type of cost consideration is a new drug related to one previously developed. If the original drug was very expensive and the new analog is considerably cheaper and of equivalent activity, we would very likely decide to switch to the new drug.

Cost has a major role in the development and design of the approaches we utilize for screening new potential antitumor drugs in experimental systems. Thus, in developing the panel of experimental systems currently utilized, we realized that it was impossible financially to carry out the testing in what might be considered the ideal scientific manner, namely, to test all materials in the complete battery of experimental systems. Since that approach was not financially feasible, we developed a pre-screening approach, so that the large number of compounds being tested would be evaluated in a relatively sensitive system first, and then further evaluated in the panel of experimental tumors based primarily on activity in that pre-screen.

Another example of cost analysis involves the large animal preclinical toxicology studies carried out on a drug being developed for clinical trial. Our standard protocol for studies requires about 9-10 months and costs on the order of \$120,000. We experimented with one very high priority drug to determine whether these experiments could be carried out in a shorter period of time. We found, indeed, that this could be done, but unfortunately, it required approximately twice as much money to carry out those experiments, since more tests had to be done simultaneously with some wasted effort in order to save time. Thus, it was decided that we would not routinely evaluate drugs in that manner since it was so expensive, but reserve

such alternate procedures for those very rare compounds that are considered of such high priority that they must be moved as rapidly as possible regardless of the cost . . .

In summary, although we cannot carry out what one might like to see as completely quantitative cost benefit analyses, cost considerations have always been and remain a vital part of our everyday life in making scientific decisions and in attempting to develop new and better modes of therapy in the shortest amount of time with the funds available to use.

Although other NIH institutes utilize a less formal selection process than NCI, cost-benefit considerations often enter into their decisions concerning the need for clinical trials. A staff member of NHLBI, for example, cited three instances in which cost considerations played a part in such decisions<sup>3</sup> (577).

A number of the Institute's clinical trials were undertaken for reasons very much concerned with the potential benefits to be accrued from a careful testing of a given therapy or preventive regimen. In particular, the coronary artery surgery study (CASS) is to determine the efficacy of surgical vs. medical intervention for coronary artery disease . . . Coronary artery surgery (by-pass surgery) is an extremely expensive operation (between \$10,000 and \$20,000 per case) that may be able to be treated as efficaciously and at considerably less cost through non-surgical means. In arriving at the decision to undertake CASS, the Institute weighed the potential benefits of the information to be derived against the considerable cost of the study. In similar fashion, the Institute considered a trial related to mild hypertension treatment, but decided that the Institute's current portfolio of clinical trials related to hypertension would provide much the same information as a new trial. It was calculated that such a trial was not currently warranted. The Extracorporeal Membrane Oxygenator (ECMO) and Intermittent Positive Pressure Breathing (IPPB) trials are two additional NHLBI supported trials concerned with determining the effectiveness of costly, invalidated therapies.

## Food and Drug Administration

FDA is responsible for monitoring the safety of foods and cosmetics and evaluating the safety and efficacy of drugs and medical devices, food, feed, and color additives. With the exception of several studies performed by the Bureau of Radiological Health (BRH), FDA's experience with CEA is limited to eight analyses conducted in response to regulatory initiatives.<sup>4</sup>

<sup>3</sup>For a discussion of NHLBI clinical trial planning and decisionmaking, see R. I. Levy and E. J. Sondik, "Decision-Making in Planning Large-Scale Comparative Studies," and R. I. Levy and E. J. Sondik, "Initiating Large-Scale Clinical Trials," 1978.

<sup>4</sup>For other regulatory agencies' experience with these requirements, see T. B. Clark, "Its Still No Bureaucratic Revolution, But Regulatory Reform Has Foothold," *Natlona/ Journal*, Sept. 29, 1979 (97).

On March 23, 1978, Executive Order 12044 mandated that Government agencies examine the costs and benefits of major proposed regulations (i. e., regulations having an annual impact on the economy of "\$100 million or more or [causing] a major increase in costs or prices for individual industries, levels of government or geographic regions"). This mandate was built upon an earlier executive order issued by President Ford which required an "inflation impact" analysis of major proposed regulations in order to assure that the private sector not be burdened by unjustified costs.<sup>5</sup>

Under these mandates, FDA has conducted economic analyses of eight proposed initiatives (218):

1. Food and Drug Administration, Office of Planning and Evaluation, Office of the Commissioner, "Inflation Impact Statement of Proposed Rulemaking: Certain Fluorocarbons and Chlorofluorocarbons in Food, Food Additives, Drug, Animal Food, Animal Drug, Cosmetic and Medical Device Products as Propellants in Self-Pressurized Containers, Prohibition on Use," May 1977.
2. Food and Drug Administration, Office of Planning and Evaluation, Office of the Commissioner, "Inflation Impact Statement of Proposed Rulemaking: Nitrofurantoin (S-Nitro) Compounds," May 1976.
3. Food and Drug Administration, Office of Planning and Evaluation, Office of the Commissioner, "Inflation Impact Statement of Proposed Rulemaking: Diethylstilbestrol," January 1976.
4. F. H. Dworkin, Economics Staff, Office of Planning and Evaluation, Food and Drug Administration, "An Analysis of Economic Impact of the Drug Regulation Reform Act of 1978," November 1978.
5. F. H. Dworkin, Economics Staff, Office of Planning and Evaluation, Food and Drug Administration, "Chemical Compound in Food-Producing Animals: Criteria and Procedures for Evaluating Assays for Carcinogenic Residues," March 1979.
6. Food and Drug Administration, Office of Planning and Evaluation, Office of the Commissioner, "Inflation Impact Statement of Proposed Rulemaking: Saccharin and Its Salts in Foods, Drugs, Animal Feeds, Animal Drugs, Cosmetics, and as a Food Additive, Prohibition of Uses," April 1977.
7. P. F. Lewis, Environmental and Economic Impact Staff, Bureau of Foods, Food and Drug

<sup>5</sup>This earlier executive order was Executive Order 11821, superseded by Executive Order 11949, 1977.

Administration, "Regulatory Analysis for Final Regulation for Reduction of Temporary Tolerances for Polychlorinated Biphenyls in Food," June 27, 1977.

8. F. H. Dworkin, et al., Economics Staff, Office of Planning and Evaluation, Food and Drug Administration, "Draft Regulatory Analysis: Patient Labeling Requirements for Prescription Drug Products," June 1979.

In most of these economic analyses, however, FDA was only able to list benefits. In general, it was not able to quantify them owing to a lack of adequate data, methodological problems, and difficulty in projecting behavior precipitated by proposed manufacturing controls (43,646). Further, when an analysis involves a carcinogenic food additive, as it did in three instances,<sup>b</sup> FDA is legally forbidden to weigh costs and benefits in making a decision. According to the "Delaney clause" of the Food, Drug, and Cosmetic Act of 1938,<sup>7</sup> if a food additive is found to be carcinogenic, FDA must ban it.<sup>8</sup> Nevertheless, FDA seems to have found economic analyses generally useful, and the consideration of specific benefits probably has contributed to the modification of some provisions of several proposed regulations (43).<sup>9,10</sup>

One of FDA's component bureaus, BRH, has used economic analyses and CBAS more extensively than other component bureaus. BRH is responsible for protecting the public from unnecessary exposure to radiation and ensuring that radiation is used safely and efficaciously. In 1977, BRH conducted an "Economic Impact Assessment of the Proposed Performance Standard for Sunlamp Products," January 1977. Because of the limited projected impact of this regulation, BRH assessed only costs.

In April of 1977, however, BRH used the cost-benefit concept more specifically, to justify budget requests for expanding the Bureau's effort to reduce the unnecessary use of X-rays. Thus, the fiscal year 1979 Preliminary Budget Justification stated (217):

The proposed national X-ray system will cost an additional \$7.7 million contract dollars and 181 positions. This gives a benefit/cost ratio ranging from 32 to 1 to 70 to 1 for the 20-50 percent possible reductions in the genetically significant dose alone.

<sup>a</sup>The inflation impact statements for nitrofurantoin, diethylstilbestrol, and saccharin.

<sup>b</sup>See Office of Technology Assessment, U.S. Congress, *Cancer Testing Technology and Saccharin*, October 1977 (466).

<sup>c</sup>This legislation takes precedence over Executive Order 12044.

<sup>d</sup>The cost of releasing safety and efficacy data on new drugs, revealed by the analysis of the 1978 Drug Regulatory Reform Act, for example, contributed to the dropping of the draft requirement that such information be released.

<sup>e</sup>Another case in which economic analysis contributed to a modification of policy is FDA's action on antibiotics and feed: "Combined Economic Impact Assessment of Series of Proposals Regarding Penicillin/Tetracycline-Containing Premixes," undated.

This cost-benefit argument was the "driving force" (341) behind the development of a cost containment plan: "A Proposed FDA Program To Reduce Unnecessary Patient Exposure From Diagnostic X-Rays: Cost Containment Considerations" August 1978. In this plan, CBA was used to demonstrate the cost savings produced by reducing unnecessary X-rays.

Another CBA performed by BRH was "The Diagnostic X-Ray Equipment Performance Standard and the Policy on Assembly and Reassembly," November 1978. This study represented a refinement and elaboration of an earlier attempt (216) to examine the costs and benefits of the X-ray equipment standard in an environmental assessment report in 1974. The results of this updated study contributed to FDA's decision to amend its policy on the assembly and reassembly of diagnostic X-ray equipment and revoke two regulatory provisions which were shown not to be cost beneficial (215,340).

## Center for Disease Control

CDC is responsible for monitoring, controlling, and reducing the incidence of preventable diseases and conditions. Over the years, CDC has conducted a number of assessments of the costs of illnesses and treatment methods, as well as cost-benefit studies. In 1966, CDC involvement in the HEW program analyses of the costs and benefits of tuberculosis and syphilis control promoted staff interest in examining the economic impact of disease.<sup>11</sup> Since then, CDC has often used economic analysis to supplement the Center's traditional public health perspective by allowing the costs of a disease to be considered along with morbidity and mortality statistics. Since much of CDC's work involves providing information to State and local public health officials who must be concerned with budgets, economic analysis has proved particularly helpful in supporting the value of suggested disease prevention control programs (32, 601). A CDC official noted:

[These analyses] enable the cost of disease control efforts and investigations to be placed in perspective. For vector-borne diseases (dengue, equine encephalitis), such analyses make it easier to justify costly spraying and clean-up efforts.

The economic impact studies conducted by CDC staff include:

1. D. J. Sencer and N. W. Axnick, "Utilization of Cost Benefit Analysis in Planning Prevention Programs," *Acta Medica Scandinavica*, Supplement 576, 1975. [This study reports on the

<sup>11</sup>See the section in this appendix on the Office of the Assistant Secretary for Planning and Evaluation, DHHS. Also, for a discussion of CDC's analyses of syphilis and tuberculosis control, see R. N. Grosse, "Cost-Benefit Analysis of Health Services," *Ann. Am. Ac.*, 1972 (266).

- costs of hepatitis, hospital infections, and the 1964-65 rubella epidemic. ]
2. D. D. Tolsma and J. A. Bryan, "The Economic Impact of Viral Hepatitis in the United States," *Public Health Reports* 91:349, 1979.
  3. S. D. Von Allmen, R. H. Lopez-Correa, J. P. Woodall, D. M. Morens, J. Chiniboga, and A. Casta-Valez, "Epidemic Dengue Fever in Puerto Rico, 1977: A Cost Analysis," *American Journal of Tropical Medicine*, November 1979.
  4. E. L. Baker, Jr., W. Peterson, S. D. Von Allmen, and J. Fleming, "Economic Impact of a Community-Wide Waterborne Outbreak of Gastrointestinal Illness."
  5. M. L. Cohen, R. E. Fontaine, R. A. Hollard, S. D. Von Allmen, T. M. Vernon, and E. J. Gargarosa, "An Assessment of Patient-Related Costs in an Outbreak of Salmonellosis."
  6. D. D. Tolsma and J. D. Millar, "Costs and Accomplishments of the United States National Influenza Immunization Program, 1976," Eighth International Scientific Meeting of the International Epidemiologic Association Symposium on Epidemiologic Aspects of Cost-Effectiveness Studies, San Juan, Puerto Rico, Sept. 19, 1977.
  7. R. C. Rendtorff, J. C. Curran, R. W. Chandler, W. L. Wisner, and H. Robinson, "Economic Consequences of Gonorrhea in Women: Experiences From an Urban Hospital," *Journal of the American Venereal Disease Association*, 1(1), September 1974.
  8. S. D. Von Allmen, W. Cates, Jr., K. F. Schulz, D. A. Grimes, and C. W. Tyler, Jr., "Cost of Treating Abortion-Related Complications," *Family Planning Perspectives*, 9(6), November/December 1977.
  9. J. L. Bradley, "The Cost of Diphtheria Epidemic in San Antonio, Texas, 1970-71," paper presented at the American Public Health Association Meeting, San Francisco, Nov. 7, 1973.
  10. P. M. Schwab, "Economic Cost of St. Louis Encephalitis Epidemic in Dallas, Texas, 1966," *Public Health Reports*, 83(10):860, October 1968.
  11. B. S. Levy, "The Economic Impact of a Food-Borne Salmonellosis Study," *Journal of American Medical Association*, 230:1281, Dec. 2, 1974.
  12. N. W. Axnick, "Cost of 1968-69 Influenza Epidemic," paper presented to the Surgeon General's Advisory Committee on Immunization Practice, April 1970.
  13. S. D. Von Allmen, R. H. Lopez-Correa, J. P. Woodall, D. M. Morens, J. Chiniboga, and A. Casta-Valez, "Epidemic Dengue Fever in Puerto Rico, 1977: A Cost Analysis," *American Journal of Tropical Medicine*, November 1979.
  14. E. L. Baker, Jr., W. Peterson, S. D. Von Allmen, and J. Fleming, "Economic Impact of a Community-Wide Waterborne Outbreak of Gastrointestinal Illness."
  15. M. L. Cohen, R. E. Fontaine, R. A. Pullard, S. D. Von Allmen, T. M. Vernon, and E. J. Gargarosa, "An Assessment of Patient-Related Costs in an Outbreak of Salmonellosis."
  16. N. W. Axnick and J. M. Lane, "Costs Associated With the Protection of the United States Against Smallpox," *World Health Organization Report*, March 1973.
  17. P. M. Layde, S. D. Von Allmen, and G. P. Oakley, "Antenatal Screening for Downs Syndrome: An Economic Viewpoint," September 1979.
  18. J. J. Witte and N. W. Axnick, "The Benefits From 10 Years of Measles Immunization in the United States," *Public Health Reports*, 90:3, May-June 1975.
- In recent years, CDC also has conducted a number of cost-benefit studies. Several CDC officials noted that CBA contributes an additional dimension to more traditional evaluations of morbidity and mortality, and where adequate data exist, it has become logical to consider this information an evaluation. In some cases, CBA seems to provide a particularly meaningful perspective, because humanitarian concerns can be weighed against dollar costs and the value of prevention can be made more tangible by describing benefits in terms of averted costs. As a consequence, CBA has been used by CDC staff to plan and evaluate prevention and control programs and justify investment in such efforts (32,325).
- Cost-benefit assessments conducted for the CDC staff include:
1. P. M. Layde, S. D. Von Allmen, and G. P. Oakley, "Maternal Serum Alpha-Fetoprotein Screening: A Cost Benefit Analysis," *American Journal of Public Health*, 69(6):566, June 1979.
  2. P. M. Layde, S. D. Von Allmen, and G. P. Oakley, "Congenital Hypothyroidism Control Programs: A Cost-Benefit Analysis," *Journal of the American Medical Association*, 24(21): 2290, May 1979.
  3. P. V. Strange and A. T. Sumner, "Predicting Treatment Costs and Life Expectancy for End-Stage Renal Disease," *N. Eng. J. Med.*, 298: 372, Feb. 16, 1978.
  4. D. J. Sencer and N. W. Axnick, "Cost Benefit Analyses," *Proceedings of the 145th Synrpo-*

sium on Vaccination Against Communicable Diseases, Monaco, March 1973.

5. J. P. Koplan, S. Schoenbaum, M. Weinstein, and D. Fraser, "Pertussis Vaccine: An Analysis of Benefits, Risks, and Costs," *N. Eng. J. Med.*, Oct. 25, 1979.
6. J. K. Paperfuss and B. C. Ejeldsled, "Cost-Benefit Study of Selected Interventions in Control and Prevention of Tuberculosis in the State of Michigan," study prepared by the Michigan Division of Health for CDC, December 1969.

## Alcohol, Drug Abuse, and Mental Health Administration

ADAMHA has major responsibility for the prevention and treatment of mental illness, alcohol abuse, and drug abuse. One of ADAMHA's three component bureaus, the National Institute on Drug Abuse (NIDA), has produced several cost-of-illness and cost-benefit studies. They include:

1. Arthur D. Little, "Social Cost of Drug Abuse," 1976.
2. Macro Systems, Inc., "Unit and Episodic Costs of Drug Abuse Treatment: A Feasibility Study," May 1978.
3. Center for Social Research on Drug Abuse, "The Assessment of Social Cost Savings," March 1978.
4. Research Triangle Institute, "Management Effectiveness Measures for NIDA Drug Abuse Treatment Programs: Costs to Society," vol. 11, 1977.

These studies have been used in both planning and budget justification. The cost information yielded by the analyses has provided basic data for CEA/CBA of drug abuse treatment.

In 1972, the U.S. Bureau of Narcotics and Dangerous Drugs conducted a study of the costs and benefits of alternative approaches to addiction control (386). A study funded by NIDA in 1975 extended this idea by developing four primary measures of the effectiveness of drug treatment and comparing the cost-effectiveness of five treatment modalities: methadone maintenance, therapeutic community, inpatient detoxification, outpatient detoxification, and drug-free treatment (535a).

More recent studies have focused on the development of a more sophisticated cost-effectiveness and cost-benefit ratios for drug abuse treatment programs (504) and examination of the applicability of CEA to primary drug abuse prevention programs (298,505). These recent NIDA analyses are acknowledged to have serious methodological limitations because of inadequate data about such factors as the total num-

ber of drug abusers, the relapse rate of treated abusers, the relationship between drug abuse and unemployment and crime, and the relationship between patient outcome and treatment modality (535).

Nevertheless, the cost-benefit /cost-effectiveness studies are credited with providing valuable information for program evaluation and management and NIDA budget justification (360,520,534,535a). The studies have also confirmed the worth of allocating more funds to the less traditional and expensive treatment approaches (i. e., of a funding formula which favors outpatient methadone maintenance, outpatient drug detoxification, and outpatient drug-free programs rather than inpatient detoxification and residential community approaches). In addition, they have been useful in confirming the benefits produced by the Federal investment in drug abuse treatment. As an official of NIDA observed (535a):

... Based on an empirical analysis of data, we have established average gains per patients year on performance criteria and can translate these gains into cost savings benefits to society. In turn, we can compare them to what society has invested in treatment. The conclusion is that it pays to invest in treatment.

Unfortunately, such analyses are still severely limited by their inability to specify which treatment modality tends to work best for a given type of client. In order to better address this question, NIDA is currently attempting to collect more accurate data on drug abuse and rehabilitation patterns through the Drug Abuse Reporting Program (DARP) and the Treatment Outcome Prospective Study (TOPS).

At the National Institute of Mental Health (NIMH), there are two potential applications of CEA/CBA studies: 1) in measurement of service program outcomes, such as the community mental health centers (CMHCS) that receive Federal sponsorship, and 2) the measurement or evaluation of psychosocial interventions. It is important to keep these two quite different research levels separated. Depending on the research focus—program outcomes or psychosocial treatment outcomes—there will be differences in what is measured, the means of measurement, the purpose of measurement, the uses of the information, and the types of people involved in the research.

The Psychotherapy and Behavioral Intervention Section of NIMH's Division of Extramural Research Programs is responsible for funding research on the effectiveness, efficacy, safety, etc., of psychosocial treatment mechanisms for specific mental disorders. Although one or two of the NIMH-sponsored psychotherapy outcome studies have examined variables related to cost benefit or cost effectiveness (e. g., duration of treatment required), most such studies are not intended or designed to address cost variables.

Traditionally, psychotherapy research seeks only to elucidate the mechanisms of action and the efficacy of specific treatments for specific diagnostic categories of mental disorders. The Psychotherapy and Behavioral Intervention Section is currently attempting to encourage the use of a range of standard procedures for the measurement of change in psychotherapy in the hope of achieving greater comparability in the assessment of outcomes across various studies. Cost-effectiveness variables, though, are even more difficult to apprehend and often are not useful at this level of research.

The Division of Biometry and Epidemiology at NIMH has conducted several studies of the services programs and episodes-of-illness costs of patients treated in federally sponsored CMHCS. Costs and cost-effectiveness criteria appear to be potentially relevant for use in evaluating program costs and examining the outcomes of delivering mental health services at the community level. NIMH has funded studies under contract which seek to advance the methodological framework of CBAS as applied to CMHCS' programs (443). NIMH (or the Division) does not conduct such studies itself because of the limited development of the methods, differences in CMHCS' clientele, and the tendency for such assessments to be subject to misrepresentation and to be used to criticize the management of individual CMHCS.<sup>12</sup>

NIMH has supported training courses in CBA through its staff ..college, and through the contract mechanism, is supporting several State governments in the development of management systems that will provide unit cost data for mental health service systems. A few States (Colorado, Oregon, 13 and Washington) have officials who are working with NIMH to develop a more sophisticated methodology for examining CMHC program costs and outcomes.

## National Center for Health Care Technology

(See ch. 9 for a discussion of NCHCT.)

## National Center for Health Services Research

NCHSR funds a number of CEA and CBA studies as part of its services research function (439). It is currently the major supporter of CEAS and CBAS in the Federal health care research system. Two of NCHSR'S research priority areas—health care costs and cost containment, and planning and regulation—specifically call for research using CEA studies to examine the issues in these priority areas (438).

The types of economic analyses NCHSR supports range from what could be considered traditional CEAS or CBAS to analyses that focus on either costs or outcomes of a given technology or program. It is difficult to characterize the range of economic studies NCHSR supports. The studies range from rigorous examinations of specific health care topics to broader studies of more complex health care issues. CEA or CBA may be the focus of a grant or may be incorporated into larger, more global assessments. Nevertheless, NCHSR is a significant source of support for these types of techniques. Some of the more recent CEA and CBAS that have received support from NCHSR are listed below (439):

1. "Impact of Ophthalmic Technicians on Outpatient Care," HS 03647.
2. "Improving Clinical Decision Making in Arthritis," HS 03115.
3. "Prediction of Cost Effective Stroke Rehabilitation," HS 03693.
4. "Controlled Trial of a Quality Assurance Mechanism," HS 02485.
5. "Evaluation of Breast Cancer Detection Strategies," HS 03256.
6. "Cost Effective Strategies in Ambulatory Care," HS 02063.
7. "A Guide to Investment Criteria for Critical Care Units," HS 03569.

## National Center for Health Statistics

NCHS is an agency within the Office of the Assistant Secretary for Health of DHHS. It is one of the principal health services research agencies of the Federal Government. Health statistics activities, which eventually were formalized and combined by the creation of NCHS, were authorized by Congress in 1946 (vital statistics) and in 1956 (National Health Survey). NCHS was formed in 1960 and has played a major role in the development of national health statistics policy and programs. Under its current mandate—the Health Services Research, Health Statistics, and Medical Libraries Act of 1974 (Public Law 93-353)—NCHS is responsible for collecting and dis-



seminating health data including information on the costs of illness, health care, and health financing.

The importance of data collected by NCHS cannot be overemphasized. Information such as that concerning the incidence and prevalence rates of diseases, natural history of disease, medical care utilization, workloss, surgical rates, and premature mortality is crucial to CEA/CBA. Although NCHS does not conduct full cost-effectiveness studies, it has conducted cost-of-illness studies, and these have been used in other agencies' CEA/CBAs. Currently, NCHS staff are coordinating an interagency Public Health Service (PHS) Cost of Illness Committee which is examining the state-of-the-art of estimating costs of illness and disability. As noted by an NCHS official, it has often proved impossible to compare the results of cost-of-illness studies conducted by NCHS and other DHHS agencies (297):

Frequently . . . the assumptions, methods and data employed vary to such an extent that estimates from two different studies differ markedly, and the costs of several illnesses cannot be compared.

In an attempt to address this problem, the PHS Cost of Illness Committee will recommend a set of guidelines for future PHS studies.

### Health Resources Administration

HRA is responsible for improving the national capacity to develop and effectively use health resources. Its Office of Program Planning and Evaluation has sponsored conferences which produced two studies focusing on cost-effectiveness methodology:

1. S. O. Schweitzer, "The Economics of the Early Diagnosis of Disease." [This article presents a methodological framework for the evaluation of the cost-effectiveness of early diagnostic tests.]
2. H. A. Foley, D. B. Fisherman, and F. Kalibat, "The Cost-Effectiveness of a Mental Health Center: An Experiment," in *Evaluation in Health Services Delivery*, edited by R. Yaffe and D. Zalkind, proceedings of an Engineering Foundation Conference, South Berwick, Maine, Aug. 19-24, 1973.

The Bureau of Health Manpower (BHM), one of HRA's component agencies, has also produced one cost-effectiveness study:

1. N. Doherty, "Study to Determine the Cost and Effectiveness of Different Practice Modes of Dental Care for Children," February 1977.

Another HRA agency, the Bureau of Health Planning (BHP), has sponsored two cost-benefit studies:

1. Arthur D. Little, "Introduction to Cost-Benefit Analysis Applied to New Health Technologies," December 1977.

2. Stanford Research Institute, "Decision Making Methodology for Health Care Services," study prepared for the Region IX (San Francisco) Office of DHEW, December 1979.

Title V of the National Health Planning and Resources Development Act of 1974 (Public Law 93-641) suggests that local health planning agencies (health systems agencies (HSAS)) should consider the costs and benefits of projects (sec. 1514(3)):

In establishing the Annual Implementation Plan, the agency shall give priority to those objectives which will maximally improve the health of the residents of the area, as determined on the basis of the relation of the cost of attaining such objectives to their benefits, and which are fitted to the special needs of the area.

But most HSAS do not appear to use CBA. <sup>4</sup> The two guidebooks to cost-benefit methodology which BHP has funded constitute only a small segment of the technical assistance literature which is being distributed to HSAS.

### Health Services Administration

The Health Services Administration is responsible for Federal programs that provide health care services to specific populations. It has sponsored a number of studies that deal with cost-benefit considerations:

1. Abt Associates, Inc., "Analysis of Benefits and Costs of Ambulatory Care Services Offered by the Bureau of Community Health Services," March 1975.
2. Geomet, Inc., "Comparison of Cost-Per-Day in PHS Hospitals: An Approach to Service and Cost Comparisons," September 1975.
3. Health Services Administration/OPEL and Geomet, Inc. (A. Dobson and H. L. Heaton), "An Economic Analysis of HSA Program Potential, 1976-1981," report No. OPEL 75-4, May 1975.
4. Health Services Administration/OPEL and Geomet, Inc. (I. Enger and N. Pindus), "Cost and Utilization Evaluation Migrant Hospital Program," report No. OPEL 77-I, January 1977.
5. Health Services Administration/OPEL and Geomet, Inc., "Improved Pregnancy Outcome Program Evaluation Manual," report No. OPEL 77-2, March 1977.
6. Health Services Administration/OPEL, "PSRO: An Evaluation of the Professional Standards Review Organization Program," vol. 1-11, report No. OPEL 77-12, October 1977.

<sup>4</sup>For further discussion of this subject, see ch. 6 of this report

7. Transaction Systems, Inc., "Credentialing of Health Care Professionals: Its Costs and Some Alternatives for the Health Services Administration," March 1975.
8. General Research Corporation, "PSRO Program Cost Study," April 1974.
9. Geomet, Inc., "Cost and Utilization Evaluation of Migrant Ambulatory Care Entitlement Programs," March 1979.
10. Geomet, Inc., "Comparative Cost and Financial Analysis of Ambulatory Care Providers," June 1976.
11. Health Services Administration, "Migrant Ambulatory Care Entitlement Programs ~ Cost and Utilization Evaluation of Rural Health Initiative," October 1978.

### Health Care Financing Administration

HCFA is responsible for administering the medicare, medicaid, Professional Standards Review Organization (PSRO), and End-Stage Renal Disease Programs. It has conducted several studies of the economic toll of illness and the cost of health care financing. These include:

1. B. S. Cooper and D. P. Rice, "The Economic Costs of Illness Revisited," *Social Security Bulletin*, 39(2), February 1976.
2. D. P. Rice, "Estimating the Cost of Illness," *Health Economics Series No. 6*, Public Health Service, 1966.
3. R. M. Gibson and C. R. Fisher, "National Health Expenditures, Fiscal Year 1977," *Social Security Bulletin*, 41(7):3, 1978.

In addition, HCFA is currently sponsoring an effort aimed at encouraging the integration of cost containment information into medical school curricula:

1. American Association of Medical Schools, "A Primer on Quality Assurance and Cost Containment for Faculty and Students."

Also, HCFA has sponsored a study which indirectly employed the cost-effectiveness concept:

1. Massachusetts Department of Public Welfare, "Cost Effectiveness Under Medicaid," 1978.

This study was designed to investigate whether medical criteria could be utilized within a medicaid program to reduce inappropriate and ineffective medical care. Problems in implementation, however, led to HCFA'S termination of funding for the study.

In addition, HCFA has conducted an assessment of the costs and the benefits of PSROS. Under Title XI of the Social Security Act, PSROS are responsible for reviewing the medical necessity, quality, and appropriateness of federally financed health programs. In order to perform this function, PSROS must develop

norms, criteria, and standards for the appropriate utilization and acceptable quality of health care services. A 1979 report by HCFA, elaborating on a previous evaluation (288), concluded that the savings produced by PSROS through reduced use of hospital services by medicare patients exceed the cost of PSRO review (285). Subsequently, this finding was used in PSRO program justification before Congress.

Two other Government evaluations of PSROS, however, have challenged HCFA'S findings. One, a study by the Congressional Budget Office found that PSROS only slightly reduce medicare patients' use of hospital services and concluded that the "PSRO program probably yields a net loss" (121). Similarly, a 1979 General Accounting Office study stated that the data HEW reviewed in its 1977 and 1978 evaluations "are not based on appropriate hospital statistics" and that several estimates of cost savings attributable to PSROS were overstated (245).

### Office of Human Development Services

OHDS of DHHS administers a wide range of programs which are designed to aid children, youth, families, the aged, the handicapped, and native Americans. Over the last few years, since the first application of cost-benefit framework to vocational rehabilitation by Ronald Conley in 1965 (124), OHDS has conducted a number of CBAS of rehabilitation services. OHDS, as well as many State vocational rehabilitation agencies, has used this type of analysis to justify increased Government spending on training programs for the disabled.

The application of CBA to vocational training appears to have been facilitated by the existence of both a traditional set of program goals (e. g., gainful employment of the disabled) and a long-term information system about such factors as increased earnings and reduced costs of special medical or custodial care (479). Among the many federally and State-sponsored studies of this type are the following:

#### Federally Sponsored Studies

1. Rehab Group, Inc., "Feasibility Study for the Evaluation of Methodologies for Cost Benefit Analysis of Restoration Services in Rehabilitation," prepared for OHDS, October 1978.
2. R. O. Washington, D. Y. Rowland, C. Hairston, "Quantification of Human Services Outcomes: A Manual for Applying Program Budgeting, Systems Analysis and Cost-Benefit Analyses to Human Service Programs," prepared for Social and Rehabilitation Services, August 1974.

3. L. Mars, "An Exploratory Cost-Benefit Analysis of Vocational Rehabilitation," prepared for the Vocational Rehabilitation Administration, 1967.
4. D. E. Carter and T. J. George, "A Manual for Reporting and Analyzing the Costs and Benefits of Social Services," prepared for Social and Rehabilitation Services, November 1973.
5. H. Emler, et al., "Estimated Health Benefits and Cost of Post-Onset Care for Stroke," prepared by Analytic Services, Inc., in cooperation with Johns Hopkins University, for Social and Rehabilitation Services, September 1973. [This is an assessment of the cost and benefits of poststroke care in the population of three States.]
6. D. R. Matlack, "Cost Effectiveness of Spinal Cord Injury Center Treatment," prepared by the National Paraplegia Foundation for OHDS, 1974. (This report provides a CEA of two alternatives spinal cord injury treatment methods.)
7. Stanford Research Institute, "Feasibility and Cost Effectiveness of Alternate Long-Term Care Settings," prepared for Social and Rehabilitation Services, May 1978. [This is a pilot study which is designed to identify methods that could be used to determine the relative cost-effectiveness of various alternate types of long-term care settings.]
8. C. Cole and R. Dodson, "An Introduction to Cost Benefit Analysis of the Vocational Rehabilitation Program: A Model for Use by State Agencies," prepared for the Institute of Urban and Regional Development, University of California, Berkeley, Calif., October 1972.
9. F. C. Collignon, "A Working Outline for Cost-Benefit Analyses of Vocational Rehabilitation Programs," prepared for the Institute of Urban and Regional Development, University of California, Berkeley, Calif., November 1971.
10. D. W. Dunlop, "Benefit/Cost Analysis: An Analytical Framework for Vocational Rehabilitation," prepared for the Michigan Vocational Rehabilitation Service, Lansing, Mich., 1969.

It is generally conceded that these studies possess a number of serious limitations. Several of the analyses, particularly those conducted by State vocational rehabilitation agencies, suffer from poor methodological design and inadequate data (52). In addition, cost estimates are often imprecise because of the difficulty of measuring rehabilitation costs, and benefit assessments tend to represent general estimates because a number of benefits are psychic or intangible and do not lend themselves to quantification (123).

The 1973 amendments (Public Law 93-112) to the 1965 vocational rehabilitation legislation (Public Law 89-333) mandated that Federal officials broaden their efforts and work towards achieving the goal of independent living for the severely disabled. Measurement of the costs and benefits of services to the severely handicapped is very difficult, though, because of the problem of expressing in economic terms the worth of independent living. Further, many policymakers emphasize the importance of considering together with the costs of rehabilitation programs their humanitarian goals, and they argue that a traditional cost-benefit framework is inappropriate for this purpose (123,460,599).

Currently, OHDS is trying to deal with some of these problems and make CBAS more useful for its decisionmaking by sponsoring the development of a more sophisticated cost-benefit model. At the same time, however, several officials emphasized the danger of using CBA without understanding its limitations (479). Many seem to agree with John Noble's

#### State-Sponsored Studies

1. Michigan Department of Education, Division of Vocational Rehabilitation, "A Benefit-Cost Analysis of Vocational Rehabilitation Programs in the State of Michigan," 1970.
2. R. D. Struthers, "A Benefit/Cost Model Developed in a State Vocational Rehabilitation Agency: Michigan Vocational Rehabilitation," *Journal of Rehabilitation Administration*, July 1977.
3. E. Wright, "A Benefit-Cost Analysis of Vocational Rehabilitation Programs in the State of Michigan," prepared for the Michigan Rehabilitation Service, Lansing, Mich., 1970.
4. C. M. Grigg, A. G. Holtman, and P. F. Martin, "Vocational Rehabilitation for Disabled Public Assistance Clients: An Evaluation of Fourteen Research and Demonstration Projects," prepared for the Institute for Social Research, Florida State University, Tallahassee, Fla., 1969.
5. J. E. Muthard, et al., "The Vocational Rehabilitation of Public Assistance Recipients: A National Survey," prepared for the Rehabilitation Research Institute, University of Florida, Gainesville, Fla., 1976.
6. K. W. Reagles and G. N. Wright, "A Benefit-Cost Analysis of the Wood County Project: An

observation made in 1977 that "the state-of-the-art needs substantial upgrading before CBAS can be taken seriously as a guide to priority-setting in the field of rehabilitation" (461).

## Veterans Administration

VA operates the largest centrally directed hospital and clinic system in the United States. VA also is extensively involved in medical and health services research. Apart from one current study of the cost-effectiveness of hospice care, however, VA has not been involved in conducting cost-effectiveness or cost-benefit studies. Health systems research officials intend to study the results of the hospice study, "An Evaluation of the Wadsworth Palliation Treatment Programs," which is to be completed in 1983, in order to assess the feasibility of using CEA (184).

Officials within VA are considering intensifying VA's efforts in the evaluation of health care technology and are therefore interested in exploring the cost-benefit methodology. VA's new health services R&D director, Dr. Richard J. Green, has expressed a special interest in the use of evaluation techniques such as CEA in the examination of health care issues. A few of the areas in which VA hopes to employ CEA techniques in the future are rehabilitation medicine, alternative models of care, extended care programs, and contracted services. An area that VA hopes to focus more attention on in the future is preventive care and preventive care packages for veterans. It is uncertain at this point whether CEA will play a role in the evaluation and planning in this area, but it seems clear that there is great interest in its use.

## State and Local Governments and Nongovernmental Organizations

Although a few State and local governments and nongovernmental organizations have had experience with cost-effectiveness and cost-benefit studies, they appear to use such analyses only rarely. This is not surprising for at least two reasons. First, these groups traditionally devote far less funds and staff to evaluation than the Federal Government does. And second, State, local, or regional CEA/CBAs tend to be expensive because the necessary data are generally difficult to obtain. Where State and local CEA/CBAs have been conducted, their performance has usually reflected individual staff interest in CEA/CBA techniques. Perhaps, the one major exception to this generalization lies in the area of rehabilitation, where many State and local governments have followed the

Federal Government's lead in using cost-benefit studies to justify investment in vocational training. I

As the following lists of State and local studies show, apart from vocational rehabilitation studies, most State and local CBAS have been conducted in Massachusetts and New York (19).

### State Government Studies

1. Massachusetts Department of Public Health, "Cost-Benefit Analysis of New Born Screening for Metabolic Disorders, N. Eng. J. Med., 291:1414, 1974.
2. Massachusetts Department of Public Health (M. E. Farber and S. N. Finkelstein), "A Cost Benefit Analysis of A Mandatory Premarital Rubella-Antibody Screening Program," N. Eng. J. Med., Apr. 12, 1979.
3. D. S. Shepard, and M. Thompson, "The Economics of Prevention: The Method of Cost-Effectiveness Analysis," prepared for the Office of State Health Planning, Boston, Mass., July 1977, revised and published as "First Principles of Cost-Effectiveness Analysis in Health," Public Health Reports, November/December 1979.
4. A. Rogers and P. M. Bloomburgh, "Cost-Effectiveness Under Medicaid," Dec. 31, 1979, prepared by staff of the Massachusetts Department of Public Welfare for the Health Care Financing Administration. [HCFA terminated this project before its scheduled completion.]
5. E. L. Hannany and J. K. Graham, "A Cost-Benefit Study of a Hypertension and Screening and Treatment Program at the Work Setting," Zinquiry, 4(4):345, December 1978, prepared for the New York State Department of Health, Bureau of Disease Control.
6. J. K. PaPerfuss and B. C. Ejeldshed, "Cost-Benefit Study if Selected Interventions in Control and Prevention of Tuberculosis in the State of Michigan," prepared by the Michigan Division of Health for the Center for Disease Control, December 1969.

### Local Government Studies

1. A. Leslie, "A Benefit/Cost Analysis of New York City Heroin Addiction Problems and Programs, 1971," in *Analysis of Urban Health Problems*, edited by I. Levinson and J. Weiss, New York: Spectrum Publications, Inc., 1976.
2. M. L. Ingbar, "Data System To Evaluate Cost-Effectiveness of Ambulatory Health Services to the

<sup>1</sup>See the section of this appendix on the Office of Human Development Services (p. 154) for a discussion of these State and local studies.

Poor in Cambridge, Massachusetts ” 1971, prepared by staff of the Department of Health, Hospitals, and Welfare, Cambridge, Mass.

### **Nongovernmental Studies**

Among nongovernmental agencies, cost-effectiveness and cost-benefit studies also have been infrequent. Further, as the following list shows, those studies that have been conducted have often been funded by the Federal Government.

1. D. R. Matlack, “Cost-Effectiveness of Spinal Cord Injury Center Treatment,” prepared by the National Paraplegia Foundation for the Office of Human Development Services, HEW, 1974.
2. A. Zuvekas, “Cost-Effectiveness of Community Health Centers,” prepared by the National Association of Community Health Centers for the National Center for Health Services Research, 1979. [This study provides a cost-effectiveness methodology for evaluation of CHCS. ]
3. M. M. Kristein and S. Jonas, “A Cost-Effectiveness Manual for HSA Planning. Prepared by the American Health Foundation for the National Center for Health Services Research, 1980. [This study will provide an HSA cost-effectiveness manual with particular emphasis on health promotion areas. ]
4. M. M. Kristein and C.B. Arnold, “Mammographic Screening for Breast Cancer: The Economic Analysis,” paper presented at the American Public Health Association, Oct. 17, 1978.
5. M. M. Kristein, “Cost-Effectiveness of Various Smoking Cessation Methods,” prepared by the American Health Foundation, 1978.
6. M. M. Kristein, “The Economics of Secondary Prevention: Screening for Disease: An Example From Colo-Rectal Cancer,” prepared by the American Health Foundation for the National Cancer Institute, 1978.