

# Health Systems Research to Deliver Comprehensive Services to Indians

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**A** CONCEPT of community medicine and an organization of health services and practices that does not separate prevention, cure, containment, and rehabilitation are envisaged by the staff of the Indian Health Service (IHS), Health Services and Mental Health Administration, Public Health Service.

Since 1955 the Indian Health Service has been responsible for administering a comprehensive program for individual and community health that benefits approximately 400,000 geographically and culturally isolated American Indians and Alaskan Natives (1). The prime mission of the service is to elevate the health status of these people to the highest possible level through optimum allocation of all available human and physical resources. The service's mission is carried out through health programs encompassing disease intelligence and control, screening, diagnosis, treatment, preventive services, sanitary facilities construction, home care, and education.

Today, the Indian Health Service operates 51 hospitals, 55 large health centers, and more than 300 health stations in 23 mainland States and Alaska. It also contracts with 300 community hospitals, 18 State and local health departments, and with more than 400 private

practitioners to provide a variety of health services where the service does not have facilities to deliver required special care.

The experience of the Indian Health Service has highlighted the fact that, as beneficiary demands and needs for health services continue to burgeon and the gap between them and available resources continues to widen, systematic management, training, and research are mandatory to assure the wise use of such resources. IHS's comprehensive health programs must compete successfully with other demands for the tax dollar.

## Health Program Systems Center

The service has recognized its unusual opportunities to study the total dynamics of a comprehensive health delivery system that is relatively closed; to evaluate community and program data required for meaningful health planning; to develop, test, and refine management-by-objectives concepts in an operating system; and to demonstrate the effective participation of the consumers of health services—the Indians themselves—in the direction and implementation of a health program which is, after all, their program.

Strengthened by the recommendations and encouragement of many IHS subcommittees of various medical academies and public health associations, the service in July 1967 established, with congressional recognition and approval, the Health Program Systems Center (HPSC)

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on the San Xavier Indian Reservation, Tucson, Ariz., to analyze, test, and evaluate alternate methods of allocating individual and community resources to maximize the health status of American Indians and Alaskan Natives. The systems center, known as Operation SAM (Systems Analysis Module) in its early developmental period, is an applied research activity of significance for the following reasons.

*Comprehensive health services.* The center's staff of researchers in many disciplines are part and parcel of a day-to-day health services operations team. The Sells Service Unit, one of IHS's 90 basic health units and under the administrative control of the center, currently provides comprehensive health services to a discrete community of approximately 8,000 Papago and other Indians residing on, and adjacent to the Papago Reservation—the second largest reservation in the country.

Diversified operations research and systems-analyses methods are being used to develop objective descriptions of health problems and priorities; responsive health information systems; health services models and simulations; allocation methods for maximizing available resources and for efficient use of professional and auxiliary manpower; and meaningful planning and evaluation methods. As the practicality and effectiveness of procedures and methodologies are demonstrated, those systems and subsystems that are successful will be recommended for use throughout the Indian Health Service.

*Research and training.* The Health Program Systems Center's research in applied health services is intertwined with the daily operations of the Sells Service Unit. The staff is also participating in the programs and activity of the IHS training center 25 miles northeast of the San Xavier Reservation.

As new operations, management, concepts, and methodologies are successfully demonstrated by the systems center, they must be translated into service-wide practice. The training center develops and presents topical training courses in systematic management principles, problem-solving techniques, resource-allocation schemes, and program planning methods to all levels of IHS and tribal managers of health services.

The personnel of the systems center are skilled in behavioral science, systems analysis, information sciences, and statistics, among other specialties. They routinely participate in orientation courses, seminars, and training programs mutually planned and conducted with the staff of the training center. Additionally, methodologies and models developed at the systems center are being incorporated in the curriculum of the training center.

*Technical and consultative assistance.* The systems center provides technical and consultative assistance in systems research to all operating levels of the Indian Health Service. The center, on request, gives onsite assistance to area offices and service units in resolving practical systems difficulties.

The center stimulates field suggestions for applied research activities and assists field office personnel in designing and implementing their study projects. It additionally coordinates and refines field-implemented systems moving from the demonstration phase to the application phase.

The interrelationship of the systems center and the training center provides strong bases for an Indian Health Service staff college. The staff and curriculum of this college would be committed to inservice education, research, and Indian community service. Such a college would undoubtedly strengthen the quality and continuity of IHS services and personnel and facilitate the training of Indian leaders in the ultimate management and direction of their own health programs.

### **Health Services Delivery Difficulties**

The systems center is currently studying difficulties in delivering services experienced by IHS and is attempting to find rational ways to make wise decisions in allocating limited resources of personnel, money, facilities, and equipment. Such difficulties include the following: (a) understanding the relationship between health program effort and individual and community health impacts (results); (b) meaningful methodologies for grassroots planning; (c) definitive assessments of individual and community health problems and priorities; (d) application of cost-finding and cost-effec-



**Figure 1. Main building, Health Program Systems Center, Indian Health Service, San Xavier Reservation, Tucson, Ariz.**

tiveness procedures; (*e*) acquisition, storage, transmission, and retrieval of useful operational, monitoring, and planning data; (*f*) efficient use of manpower resources; (*g*) understanding the society, culture, and attitudes of the population served; (*h*) effective coordination and integration of comprehensive health services; and (*i*) constructive participation of the tribal people in the planning and evaluation of their health problems.

#### **Staffing Pattern**

The systems approach and the tools of operations research associated with it are used in the

best interests of the entire organization to give decision makers a scientific basis for solving difficulties that arise during the interactions of components of the organization. The essential concern of systems analysis is to find the optimum decision, policy, or design. One way to reach optimum decisions is to use scientist teams whose members have been drawn from various scientific and engineering disciplines. A mathematician, physician, anthropologist, and economist, for example, may work together to devise an optimal transportation system for a health clinic.

The interdisciplinary team approach is essential. A major reason for systems analysis teams

is to bring the most advanced scientific procedures to bear on the problem at hand or to develop new and more fruitful procedures. No one mind can hold all the potentially useful scientific information, but a team mind may. Although most man-machine systems have physical, biological, psychological, sociological, economic, and engineering components, the total system studied can best be understood and analyzed by those trained in the appropriate fields. A mixed team increases the number of aspects of the operation which can be examined in detail, and the team can pool ideas of possible approaches to resolve given program difficulties.

Accordingly, the full-time research staff of the Health Program Systems Center currently includes, in addition to clerical and data management support personnel, the following persons:

- 3 operation research specialists
- 2 statisticians
- 1 mathematician
- 1 anthropologist
- 3 physicians
- 1 research nurse
- 1 research director
- 1 social science analyst
- 1 program analyst
- 2 information science specialists
- 1 management specialist
- 2 health service administrators
- 1 systems analyst

They work side-by-side with the traditional preventive health and medical care team of the Sells Service Unit. Direct health services are given to approximately 1,500 Indian families. This delivery system consists of a 50-bed hospital, three health centers, and one health station on the reservation. Auxiliary service resources are the IHS medical center in Phoenix and facilities and specialists in private practice in Tucson.

Expertise of staff of the Phoenix Indian Health Area Office, the Papago Tribal Council, the Bureau of Indian Affairs, the University of Arizona, the system center's inservice advisory board, and consultants provide additional support to the center.

During its initial operational experience, the systems center has completed these tasks: (a) the documentation of individual and community baseline information; (b) descriptions and

analyses of current health delivery subsystems, procedures, and interrelationships; and (c) the preliminary development of a responsive automated management information system (2, 3).

### Documentation of Baseline Data

In documenting the baseline data pertinent to the population under study, the center, in effect, was "calibrating the environment." Since the center will be systematically manipulating discipline mixes and program actions to measure precisely changes in health status, the need to measure the original base is evident. Examples of baseline studies undertaken by the systems center follow.

*Demographic census.* An enumeration has been completed of all Indians living on the Papago Reservation and in those urban communities contiguous to the reservation. Denominator parameters, previously unobtainable, will contribute to more precise measurements of health status. Enumeration and analyses of the data collected included age, sex, district of current residence, marital status, blood quantum, household size and composition, religion, education, occupation, employment, school enrollment, health facility utilization, and means of transportation.

*Premise and home environmental health survey.* The environmental sanitation status of each Indian home has been evaluated and documented. Indices of housing, outside environment, and sanitation facilities have been enumerated, including evaluations of food facilities, accident hazards, toilet facilities, bathing and washing facilities, water supply, waste facilities, vector infestation, housing construction, heating and ventilation, room sizes, occupancy, and lighting. Information accrued is providing a potential, previously unavailable, for studies that correlate disease with ecology, for precise identification of individual and community environmental sanitation deficiencies, and for meaningful planning and budgeting of programs.

*Transportation and communications study.* An assessment of the communication and transportation resources on the reservation has been completed. Road conditions, automobile ownership, driving time between villages and the



**Figure 2. Key punch operators, Management Information System, Health Program Systems Center.**

nearest health facilities, location of telephones, IHS bus routes, passenger loads, and transportation costs have all been documented. Analyses of such data, now underway, coupled with that of demographic data and other surveys will permit, through operations research techniques, the optimization of field health schedules, transportation services to health facilities, and facilities and services planning.

*Papago health concepts and attitudes.* Concepts of health and illness contained in Papago language and beliefs have been thoroughly analyzed. This study was designed to develop methodology for categorizing the attitudes of a discrete population group towards health and illness. Information from this study will provide helpful guidelines to medical and health care practitioners in their daily interactions with the people they serve, and provide a taxonomy of terms used by the consumers of health services in describing symptoms and conditions.

### **Systems Analyses**

The center is documenting and analyzing the activities, staffing patterns, costs, impacts, and interrelationships of various components of the total health delivery system to identify fruitful areas for testing alternate actions to effect health status improvements. Following are descriptions of several such studies.

*Public health nursing activities.* An analysis of the activities, accountability, and interaction patterns of public health nursing on the Papago Reservation has been completed. Scope and location of services provided, origin of service activities, and the communication and interaction patterns within the total health care system were studied. Studies to identify meaningful statistical information necessary to plan and evaluate public health nursing services effectively and to develop practical field procedures that will facilitate collection of this information are currently underway.

*School health services.* The center is studying the various approaches to providing school health services for Indian children now used by the IHS. These approaches are services provided exclusively by IHS personnel, services provided solely by contract with outside resources, and services provided by a combination of IHS and contract personnel.

The services—health screening, treatment or referral, followup, health education, and environmental control—are being evaluated in relationship to inputs (professional and non-professional efforts), outputs (health impacts), and costs. Preliminary simulation models of these alternative approaches have been devised to facilitate evaluation efforts.

*Sanitary facilities construction.* The relative impact of the IHS water supply and waste facility construction program (P.L. 86-121) on the health status of the population served has been studied. Selected morbidity experiences of 647 persons residing in communities served by water supplies and waste disposal facilities constructed under the program, and those of 688 persons in similar communities not so served were studied retrospectively for 2 years before and 2 years after the introduction of the facilities. Variables were carefully controlled.

Results of the study indicated significant improvement in the health status of families having these sanitary facilities. The study also highlighted the need for more intensive instruction in operating and maintaining the facilities and the need for a balanced environmental sanitation program.

*Resources allocation.* The development of a model to assist in the optimal allocation of both operational and planning resources is underway. Coded MASROP (Master Allocation System for Research and Operations Planning), the objective of this project is to develop a general mathematical model to assist in planning the resource requirements for health services and in selecting the best areas for research. The model will additionally assist in budget preparations and justification.

The methodology includes the enumeration of a standard list of patient needs by diagnoses, determining resource requirements by diagnoses, establishing minimum treatment levels, developing a measure of the increase in health

status experienced, developing computer programs to process the data, testing models on the data for the Papago Reservation, and evaluating and refining the model until specific guidelines for resource allocation can be recommended.

### **Management Information System**

To support medical and management functions of a comprehensive health program, the Management Information System (MIS) is being developed as a tool for use by physicians and field health personnel in the delivery of health services and by health planners and managers in relation to program management, planning, and budgeting requirements. The ability to identify health problems is incorporated in the system to provide support for allocation decision making. The improvement of direct health care will result from MIS providing medical and paramedical personnel with pertinent medical, social, and environmental data. The system will also provide a mechanism for quality control of medical care.

Data required to implement the prototype MIS for the Sells Service Unit are presently being consolidated for entry into a central computer storage bank. Social and demographic data and environmental data are being correlated with each person's medical record number(s). Medical data will be mechanically updated after the patient visits IHS facilities or encounters various personnel in the field. The preliminary system is scheduled to be operational on an experimental basis in the fall of 1969.

The data will be stored and can be accessible in two basic modes, online and offline, and will fulfill the two primary objectives of the system—health services support and management support. Information stored in the online mode will be on a diskfile and is accessible through remote teletype terminals at each of the medical facilities in the service unit. This system will give the physician, at the time of a patient's visit, two types of information: (a) in emergency cases, "Medalert" will deliver data in a matter of seconds on vital information such as the patient's blood type, previous critical illnesses, medication, and drug allergies and (b) before each outpatient examination a



"patient profile" will be generated; it will accompany the patient into the examining room. This profile will include summary-type data such as previous visits by date, type, and place; premise and environmental record; immunization summary by type, date, and results; and, if appropriate, a prenatal summary.

Data stored offline will be on tape files and will support both medical and management functions. It will generate statistical reports to meet area office and headquarters requirements, provide data for epidemiologic surveys, cost-benefit analysis, studies for resource allocation, and, in contrast to summary records that are standard for all visits, provide detailed patient records for physicians upon demand.

Other projects in applied health services research have been initiated by the center. Socio-cultural information concerning the consumers of health services has been studied to identify those behavioral factors which enhance or preclude full use of services. A systems design for IHS service-wide collection, analysis, and reporting of Indian vital statistics has been developed. Evaluation of the tribal community health representative program continues. Demand generators for inpatient and outpatient facilities are being studied in order to develop a model that can be used to regulate demand for services and to provide more effective and efficient services.

The center is developing tools for measuring and evaluating the impact of family planning programs on population distribution, IHS facility use, and infant and maternal morbidity and mortality. A practical index of health program priorities, developed by the Indian Health Service, continues to be refined. The maternal-infant continuum was studied to identify high-risk mothers and children more readily and to improve obstetric and pediatric practices.

### Comments

Although considerable progress has been made by the Indian Health Service in improving the health of the American Indians and Alaskan Natives in a relatively short time (4), the health status of these descendants of our first Americans lags significantly behind other population groups in the United States. Tradition, emotion, bias, hunches, public health prac-

tice not based on theory or principle, and subjective justification for fiscal and program support can no longer substitute for quantified descriptions of specific difficulties and priorities, for analyses of alternate courses of action, and for measures of accomplishment which highlight positive impacts on health status.

We have come to a time when effective management of health services can be achieved only through decision making and allocation of resources based upon valid and meaningful information. The Indian Health Service is confident that the following improvements can be made:

- The planning and providing of preventive, restorative, and rehabilitative health services can be systematized.

- Many factors and facets can be identified and measured which contribute to the total yield of such health services.

- There are, and can be developed, accurate and practical methods and procedures for diagnosing a community's health status.

- Evaluation systems can be devised which truly reflect the results of any specific program, combination of programs, or discipline *et cetera*.

- Simulation models of health delivery systems and subsystems can be developed and used to predict changes which may occur in the health status of a discrete population when a specified package is systematically administered or altered, or both.

The Health Program Systems Center represents the service's active commitment to developing, testing, and demonstrating the efficacy and efficiency of such concepts. If its efforts in applied research can be translated into effective medical and public health practice throughout the nation's communities, the service's work will have added meaning.

### Summary

Since 1955 the Indian Health Service has been responsible for the management of a comprehensive program for individual and community health to elevate the health status of 400,000 geographically and culturally isolated American Indians and Alaskan Natives to the highest possible level.

The service is committed to carrying out its responsibilities through judicious allocation of scarce human and physical resources, in con-

cert with the wishes and requirements of the Indian people themselves. The service has established the Health Program Systems Center at Tucson, Ariz., to develop, test, refine, and demonstrate optimal and alternative ways of planning, implementing, and monitoring comprehensive health services for a discrete population group—namely 8,000 Papago and other Indians residing on, and adjacent to the Papago Reservation.

A multidisciplinary staff is using diversified methods in operations research and systems analysis to develop objective descriptions of health services delivery problems and priorities, to design concepts of alternative improvements, to test and refine such improvements, and to demonstrate their efficacy and service-wide feasibility.

After documenting demographic, environmental, and sociocultural baseline data concerning the sample population, the center is developing and analyzing quantitative models of selected components of the delivery system to predict changes in the community's health

status when a specified program is systematically administered or altered. In addition, the center is designing a computerized management information system to serve the operational and research needs of the comprehensive health delivery system under study. This system, in prototype form, is scheduled to be in use by the fall of 1969.

#### REFERENCES

- (1) U.S. Public Health Service: The Indian health program of the U.S. Public Health Service. PHS Publication No. 1026. U.S. Government Printing Office, Washington, D.C., 1966.
- (2) Operation SAM—applied research in health services management. Health Program Systems Center Monograph, Tucson, Ariz., June 1967. Mimeographed.
- (3) HPSC current project summaries and published monograph abstracts. Health Program Systems Center Monograph. U.S. Government Printing Office, Washington, D.C., September 1968.
- (4) U.S. Public Health Service: To the first Americans—a report on the Indian health program of the U.S. Public Health Service. PHS Publication No. 1580. U.S. Government Printing Office, Washington, D.C., 1968.

## Community Health Aspects of Physical Therapy Education

A report, "Community Health Aspects of Physical Therapy Education," has been published by the University of North Carolina School of Public Health, as a result of a 5-day institute conducted in Durham, N.C., in October 1968 with 52 participants.

The institute was the climax of a 2-year project designed to strengthen the preparation of physical therapists for expanded participation in community health. The project was supported by contract No. PH 110-72 with the Public Health Service and co-sponsored by the Council of Physical Therapy School Directors and the University of North Carolina.

Discussions were led by nationally recognized community health leaders, with group problem-solving sessions assisted by physical therapists experienced in community health practice. In addition to the edited proceedings of the institute, the report includes a statement

of the potential role and function of physical therapists in community health.

A rationale for change in physical therapy curriculums is outlined in a working statement prepared by the staff and task force which planned the institute. Summary findings of 46 schools of physical therapy (83 percent responding) give an indication of the current status of community health aspects in physical therapy curriculums.

The report, with emphasis on the need for change and alternate methods for curriculum development, should be useful to other health disciplines seeking to enlarge their scope of practice and education.

Requests for a copy of the report should be addressed to Miss Lydia Holley, associate professor, School of Public Health, University of North Carolina, Chapel Hill, N.C. 27514.