Experience of the Checkerboard Area Health System in Planning for Rural Health Care

RICHARD A. REID, PhD
HOWARD L. SMITH, PhD

MANY HEALTH PLANNING MODELS created since the inception of the Hill-Burton program, comprehensive health planning, and health systems agencies have been concentrated on systems germane to urban settings. The urban bias of planning models has been fostered by the recent expansion of the health planning discipline, the urban location of health care facilities around which many of the first health plans were centered, and the large populations of many U.S. metropolitan regions. As a result of these trends, the planning of rural health care services has often been patterned on urban-based models, and the implicit premises of these models usually have been retained. For example, large inpatient organizations typically have represented the central ingredient in health facility planning—the aggregation of personnel, beds, and equipment provides a critical mass necessary for initiating and implementing planning activities as well as permitting economies of scale critical to the maintenance of resulting physical plants. It is not unusual, therefore, to discover plans for rural health systems inappropriately based on decidedly urban themes.

A universally comprehensive model of health care suggested by Torrens (*1*) includes 10 components—preventive medicine-public health; emergency care; simple ambulatory care; complex ambulatory care; simple acute care; complex acute care; long-term care; mental health; transportation; and financial compensation. Although these functional components should be addressed during the planning of either an urban or a rural health care system, it must be recognized that a different set of assumptions may be linked with the rural plan. Each of the 10 components in the Torrens model may be distinctly different for a rural health system than for an urban health system. Moreover, each rural area or community has a unique ensemble of factors that must be incorporated into the plan for designing and operating a successful health system.

The formation of the Checkerboard Area Health System (CAHS) in northwest New Mexico was based on the 10 elements just mentioned. We describe the planning model used in this rural health setting and explain how it was implemented. The entire process of design and operation was undertaken for a remote geographic region having certain constraints that precluded adoption of traditional planning models for urban health care. This experience may be valuable to policymakers and planners confronted with health care environments that are not compatible with the characteristics of urban settings for which most planning principles have been developed.

Planning Constraints

The checkerboard area is a challenging environment for the establishment of a comprehensive health care system, as evidenced by its geography, population characteristics, economy, and existing health behavior.

Geography. The term "checkerboard" describes the pluralistic patterns of land ownership among Federal and State governments, the Navajo Tribe, the railroad company, and private individuals and organizations.

Dr. Reid and Dr. Smith are associate professors, Anderson Schools of Management, University of New Mexico, Albuquerque, N. Mex. 87131. *This study was supported in part by the Department of Family, Community, and Emergency Medicine, University of New Mexico, and pursuant to a consultant service agreement with the Presbyterian Medical Service under HURA research grant No. 99–P–90185/6. Dr. Richard Kozoll, director of the CAHS, and his staff participated in the collection of data for the study. Tearsheet requests to Dr. Smith.*

The climate, elevation, and vegetation vary widely within the region.

Since approximately 95 percent of all roads in the checkerboard area are unpaved, vehicular travel is inconvenient or difficult, sometimes unsafe. About 20 percent of all families have no access to a vehicle or live more than 1 mile from the nearest telephone. Thus, physical access to health care services is problematic. Moreover, if a health care provider is able to negotiate the roadways and determine the client's location, there is no guarantee that the patient will be there or that, if necessary, a timely return will be possible. Consequently, some health care personnel may be relatively nonproductive because of the significant amounts of time they must spend in traveling rather than delivering services.

Population characteristics. The population of the 4,000-square-mile checkerboard area is unique in several respects that may affect the health planning process. First, there are 14,000 American Indian (Navajo), Hispanic, and Anglo residents, and 5 of every 8 members of this population are Navajo. Further, 80 percent of the 14,000 are under age 45. These facts suggest that birth rates are high (young age of the population), infant mortality is high (minority-indigent characteristics of the population), demand by senior citizens is low (their low proportion and cultural variables associated with the ethnic groups), and environmentally generated disease (associated with primitive living conditions frequently found in this wilderness area) is high. Second, a number of epidemiologic constraints exist in this area. Health education is limited—the population generally has little conception of disease prevention. Further, alcoholism and infectious and parasitic diseases may be quite prevalent among this population.

Economy. Substantial evidence supports the observation that the checkerboard area is economically depressed. Five of every six residents are borderline or below the federally defined poverty level (*2*). Although the area does have natural resource extraction, small service businesses, trading posts, and government services, in some communities as many as 50 percent of the labor force may be unemployed. As a result, many residents depend on subsistence agriculture and stock-raising to supplement government financial assistance. This situation is further compounded by the unique cultural patterns, social mores, language barriers, and geographic isolation that affect employment potential. For example, the Hispanics and Anglos live in or near established communities, but the majority of the Navajos live in widely dispersed, isolated family camps and have limited access to traditional income sources in trade centers.

Existing health behavior. Although, at times, communication has been strained among the three ethnic groups with respect to certain community issues, they have collaborated to bring about water projects, sewer systems, school construction, and community recreation facilities that have upgraded sanitation and improved health status. However, the basic approach to contemporary health and medical care services is still rudimentary and for the most part episodic. Many of the people use folk healers such as herbalists, curanderos, or medicine men. Modern approaches to curative and preventive medicine are still viewed with suspicion, which would present a challenge to health educators if their services were to be made available. Modern sanitation is still an impending goal.

Obviously, the factors that are taken for granted in many urban-based health care plans—availability of health personnel, numerous health facilities, conven-

ient means of educating consumers and communicating with them, access to transportation, a relatively knowledgeable public, and high standards of sanitation—are nonexistent in the checkerboard area. Therefore the health system would need components that are not typical of planning models for a higher density population area. When the relevancy of the issues to the planning process was identified, these issues became important themes underlying the decisions on which the Checkerboard Area Health System was based.

Implementation of the CAHS

The formation of the CAHS resulted from the input of many individuals, groups, organizations, and agencies. However, the guiding force behind the planning process was the Presbyterian Medical Services (PMS) of Santa Fe, N. Mex. The informed and altruistic leadership of PMS supported and sustained the commitment to serve the health care needs of the rural southwest. PMS is an autonomous nonprofit organization that originated as a division of the Board of National Missions of the United Presbyterian Church. PMS is no longer under the control of its parent organization, but it continues to work closely with rural communities in establishing primary health care systems. Earlier efforts of PMS in sponsoring the delivery of rural health services have been documented (*3–5*).

The primary architect of the model, PMS continues to administer the CAHS. With the help of elected local, State, and national officials, tribal leaders, women's groups, medical providers, and other community leaders, PMS galvanized areawide concern into a feasible delivery system plan. Although not all of these groups agreed totally with the details of the resulting plan, substantial support for the basic concepts incorporated in the plan was provided readily by important opinion leaders. This outcome may have stemmed from the extensive local meetings concerning the CAHS design that helped to foster participation in the planning process. Of course, the PMS experience in grant writing and administration, as well as its earlier successes in establishing and operating rural primary health care facilities, extended credibility to the plan.

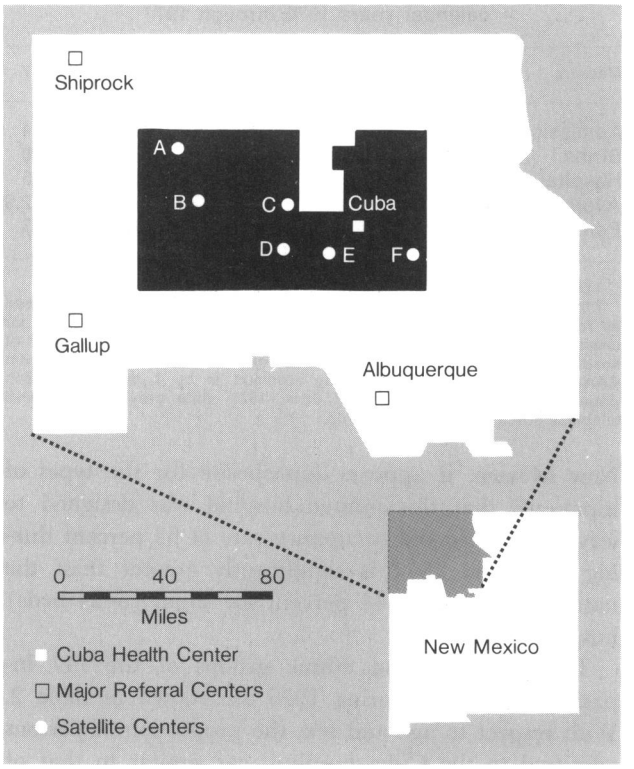
The resulting health care delivery plan was endorsed by the principal planning partners and supported financially by various Federal sources. After the plan was funded, a few impediments were encountered. Personnel problems surfaced almost immediately. In particular, a pool of trained support personnel did not exist in the area, and only a few highly trained experienced nurses and physicians could be attracted, on a long-term basis, to the area. Training programs were initiated locally to create a cadre of ancillary and clerical personnel. Fortunately, the ideal-seeking plan attracted a physician with strong leadership qualities who in turn was able to recruit missionary-oriented paramedical and nursing personnel. More recently, the National Health Service Corps directed professionals to the area. Beyond the personnel training and retention problems, the CAHS encountered commonly occurring inefficiencies that often accompany the initial implementation of a plan in a remote rural region. These problems, however, along with the usual problems of change, did not seriously jeopardize the system plan.

The Checkerboard Area Health System progressed through stages of planning, implementation, and stabilization. The initial period, 1971–74, was characterized by system conceptualization and the planning for facilities, recruitment, and training of provider and support personnel. Late in this period, the development and ensuing use of health care services occurred. Although the system suffered a temporary crisis during 1975 when Federal grant support expired and health services had to be curtailed to some patient groups, financial security and system stabilization resulted from the receipt of several relatively long-term government grant and contract awards. Comprehensive health care delivery has been supported through an initial Federal demonstration grant by the Social and Rehabilitation Services (SRS) and through subsequent U.S. Public Health Service (USPHS) grants under the Health for Underserved Rural Areas (HURA) program. The system currently receives support through a USPHS grant under the Primary Care Research and Demonstration Program, administered by the Bureau of Community Health Services.

From its beginning, the CAHS was created around an integrated planning model that sought to provide a full range of health prevention and primary medical care services. Outreach, transportation, health promotion and maintenance, selected outpatient diagnosis and treatment, and limited emergency and inpatient services were incorporated into the system. Public and school health services such as well-child clinics, disease screening, health education, family planning, communicable disease control, and immunization services became integral CAHS programs.

Organizationally, the administrative, medical, and ancillary units of the CAHS were not differentiated by hierarchical status. From a functional perspective, the structural associations and staffing assignments for the various health service programs were developed along mutually dependent associations. Although accountable for total system performance, boundary-spanning and

Region covered by the Checkerboard Area Health System



coordinating activities were the chief functions of the administrator. His office was primarily responsible for administering policy throughout the organization and devising or maintaining external relationships, particularly in the fiscal area. The medical director was responsible for the delivery of direct patient services, a role that requires competency in both administration and patient care.

To improve the geographic accessibility of health care services for the checkerboard residents, a network of six satellite clinics was established. Satellite support services and more sophisticated health care resources were available from a centrally located diagnostic and treatment facility in Cuba, N. Mex. The system of satellite clinics was designed to overcome barriers of distance and isolation by delivering primary care services from locations as close to the people as possible. The spatial relationships among the CAHS facilities and major referral centers are shown in the map. The roadway distance separating the satellite clinics from the Cuba Health Center ranges from 30 to 85 miles. Contractual obligations require that most referrals of Indian patients be made to Indian Health Service hospitals in either Shiprock or Gallup, resulting in a trip of at least 3 hours. Secondary and tertiary patient care services are available in Albuquerque.

Each satellite facility provides similar services. All of the clinics have radio-equipped vehicles for transporting patients to facilities and staff to patients' homes. Total staff for the 6 clinics consists of 5 nurse practitioners and physician assistants, 1 licensed practical nurse, 1 emergency medicine technician, 11 comprehensive care assistants, and 5 clerks. Physician assistants or nurse practitioners supervise clinic activities and manage independently about 90 percent of all patient encounters. Immediate physician support is available by telephone or radio from the Cuba Health Center, which has 3 staff physicians, 4 registered nurses, 1 nurse practitioner and 1 physician assistant, 5 licensed practical nurses, 10 aides, 1 emergency medical service technician, 2 emergency medical technicians, 2 public health nurses, 1 outreach worker, 1 clerk, 1 nutritionist, and 1 school nurse. Each week, a staff physician visits each satellite to review charts, examine referral patients, and conduct staff training while monitoring the quality of care delivered.

The referral center for the satellite clinics is the Cuba hospital—a limited-services hospital that maintains 10 beds, 3 for obstetrics, 3 for pediatrics, and 4 for general medical purposes. Childbirth is a relatively frequent reason for hospital admission. Other conditions commonly treated in the inpatient unit include shigella, pneumonia, gastroenteritis, malnutrition, trauma, and acute intoxication. Some patients are admitted to insure that they are correctly prepared for complicated diagnostic procedures or to prepare them for transfer to other facilities for sophisticated medical procedures.

Besides providing inpatient medical services, the three CAHS physicians assist in the management of complex outpatient clinical or emergency room problems, supervise both locally and remotely based nurse practitioners and physician assistants, control the quality of services provided, and conduct inservice training and staff development workshops. Although the physicians are responsible for the delivery of all patient care, it is noteworthy that the extensive delegation of authority to nonphysician providers is an efficient and effective aspect of the CAHS model.

Health care services in the checkerboard area were eventually stabilized by systematic planning where constraints were identified, solutions proposed, alternatives selected and implemented, and results monitored and compared with expectations. When changes were necessary, they were made. Unlike previous health systems models based on urban-oriented constraints, the CAHS vigorously promoted new ways to provide health care services, which included the following:

• extensive use of paraprofessionals to provide primary care,
• a system of primary care services that promoted disease prevention whenever possible,
• a reliance on referral to alternative institutions from primary to tertiary care, thereby minimizing the tendency to construct a system around a large health care facility,
• the equalization of authority and roles as a result of extreme interdependencies among paraprofessional and professional staff members,
• the incorporation of community residents as ancillary and paraprofessional workers, and
• the provision of services over a very extensive geographic area where transportation is a hardship.

Results from the CAHS System

The CAHS medical services are diverse, yet they can be evaluated by analysis of inpatient, outpatient, and emergency room visits. The integration of the satellite clinics with inpatient and referral sources is largely represented by the use of the Cuba Health Center.

Inpatient performance measures. The CAHS opened its Cuba Health Center in September 1973. The center was designed originally to provide obstetrical care and short-term holding and observation services. Inpatients have been admitted continuously since its opening, except in March 1975 when insufficient funds for the reimbursement of inpatient services forced closing the hospital temporarily. Some selected measures of inpatient use of the facility are presented for calendar years 1975 through 1977 in table 1. Between 1975 and 1976, the number of hospital days increased by 93 percent but the number of admissions increased by only 29 percent, resulting in concomitant increases in average length of stay (to 3.1 days) and occupancy rates (to 63 percent). Although the 3-day average length of stay observed during 1976–77 is about one-half the average for acute-care general hospitals in New Mexico, it appears appropriate for the types of inpatients that this limited hospital was designed to serve. The observed occupancy rate of 63 percent during 1976 and 1977 is significantly greater than the national average of 44 percent for small (6–24 beds) hospitals (*6*).

Table 1. Selected measures of inpatient use of Checkerboard Area Health System (CAHS) hospital at Cuba, N. Mex., calendar years 1975 through 1977

Measure	*1975*	*1976*	*1977*
Admissions [1]	579	747	804
Births [1]	100	107	118
Hospital days [2]	1,197	2,309	2,305
Average length of stay	2.1	3.1	2.9
Percent occupancy rate	33	63	63

[1] Data obtained from CAHS inpatient log.
[2] Newborn hospital days are excluded. Hospital day data were obtained as follows: 1975—estimated by subtracting the mean length of stay for newborns in 1976–77 for each 1975 newborn from the total number of hospital days, data from CAHS business office; 1976—direct count from CAHS inpatient log, minimum stay assumed to be 1 day, 1 pediatric patient was hospitalized for 162 days; 1977—data provided by CAHS business office from billing records.

The age, sex, and ethnic groups of the 747 inpatients admitted during 1976 are shown in table 2. With respect to age and sex, the proportion of persons admitted to the Cuba hospital was similar to that of hospitals in most parts of the nation. Disproportionally less use by young persons, relatively higher rates for females in the childbearing age group (15–44) and lower rates for males in the 15–44 age group, proportional use relative to population estimates for both sexes in the 45–64 age group, and significantly higher use by all senior citizens are the expected trends observed. Furthermore, five of every eight persons in the catchment population were American Indian. Among the American Indians, young males had almost twice the admission rate of young females, and females aged 15–44 had more than twice the hospitalization rate of males in the same age group.

The association between inpatient use of the hos-

Table 2. Age, sex, and ethnic groups of CAHS inpatients admitted to the Cuba hospital during calendar year 1976

Age group (years) [1]	*American Indian*		*Hispanic*		*Anglo*		*Total number*		*Total percent*		*Total by age*	
	Male	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*	*Male*	*Female*	*Number*	*Percent*
Under 15	127	78	3	4	3	1	133	83	17.8	11.1	216	28.9
15–44	89	220	9	23	1	21	99	264	13.3	35.3	363	48.6
45–64	43	47	8	4	6	2	57	53	7.6	7.1	110	14.7
Over 64	24	24	4	3	2	1	30	28	4.0	3.8	58	7.8
Total	283	369	24	34	12	25	319	428	42.7	57.3	747	100.0

[1] Age at last birthday.

Table 3. Frequency distribution of distance between residence and the CAHS hospital for all inpatients during 1979

Ethnic group	Estimated distance (in miles)					
	Less than 25	25–49	50–74	More than 74	Total	Percent of total
American Indian	10	474	139	29	652	87.3
Non-American Indian	66	8	0	21	95	12.7
Total	76	482	139	50	747	100.0
Percent of total	10.2	64.5	18.6	6.7	100.0	

pital and distance to patients' residences was a major consideration in the health plan regarding location of facilities. As shown in table 3, 474 (72.7 percent) of the Indian inpatients comprised the largest patient group that lived between 25 to 49 miles from the CAHS hospital. In contrast, most non-Indian subgroups lived less than 25 miles from the hospital. Also, 139 (21.3 percent) Indian inpatients lived between 50 to 74 miles from the hospital.

Finally, a cross-tabulation of admitting diagnoses and patient disposition is presented in table 4. More than 75 percent of all patients were discharged home, and another 20 percent were referred to other hospitals that have more sophisticated diagnostic or treatment capabilities. Planned referral for boarders accounted for almost one-half of all inpatients referred to other hospitals. With the exception of neoplasms and digestive system diseases, less than 30 percent of the inpatients in all admission categories were referred to other hospitals. Only four inpatients died during 1976; one of these was a stillborn infant.

In sum, the inpatient performance of the CAHS indicates that good performance levels are attained when the measures—such as hospital days, admissions, and occupancy—generally used in assessing inpatient services are applied. The age and sex characteristics as well as the use experiences of inpatients are not highly different from those observed in other hospitals across the country. However, use by Indians was proportionally higher than that of the other ethnic groups in the catchment area. Moreover, the long distances that patients had to travel for care indicated a need for improved accessibility to medical services. Finally, only 20 percent of all the patients were referred to secondary and tertiary sources of care after they were admitted to the Cuba hospital.

Table 4. Number of inpatients per admitting diagnosis category by disposition for the CAHS in 1976

Admitting diagnosis category	Discharged home	Hospital referral	Nursing home or alcohol treatment facility	Died	Total
Infective and parasitic diseases	41	6	...	...	47
Neoplasms	3	4	...	1	8
Endocrine, nutritional, metabolic diseases	11	...	...	...	11
Blood and blood-forming organ diseases	1	...	...	...	1
Mental, psychoneurotic diseases	33	6	2	...	41
Nervous system, sense organ diseases	9	1	1	...	11
Circulatory system diseases	13	5	1	1	20
Respiratory system diseases	73	6	...	1	80
Digestive system diseases	4	4	...	...	8
Genitourinary system diseases	8	2	...	...	10
Maternity	138	14	...	...	152
Skin and cellular tissue diseases	6	...	...	...	6
Musculoskeletal system diseases	5	...	...	...	5
Symptoms and ill-defined conditions	56	20	...	...	76
Injuries and accidents	67	11	...	...	78
Newborn and stillborn	100	6	...	1	107
Boarders awaiting referral	55	86	...	...	141
Diagnostic tests	27	...	...	...	27
Holding for observation	20	5	...	...	25
Total	670	176	4	4	854
Percent of total	78.5	20.5	0.5	0.5	100.0

Outpatient clinic performance measures. The CAHS has maintained its commitment to the delivery of comprehensive ambulatory health services, and the wide range of health care resources presents a balanced offering of both preventive and curative outpatient services. Table 5 indicates that outpatient use increased at a rate of 15 percent a year. The largest gains in use occurred in preventive services; visits for both family planning and the Women, Infant and Child Nutrition Supplementation Program (WIC) nutritional services more than doubled between 1976 and 1977. Increases in screening and public health activities were more modest; 1977 visits were approximately 1⅓ the number of the 1976 encounters. In sum, outpatient encounters for curative services increased about 11 percent between 1976 and 1977. Visits to the satellite and specialty clinics increased by about 20 percent each while some decrease was observed in both primary care visits at the Cuba Health Center and dental visits. Staff turnover problems may account for the reduction in visits for dental care. A comprehensive perspective of outpatient clinic performance indicates progressive improvement in use, especially for preventive services.

Table 5. CAHS outpatient visits for calendar years 1976 and 1977

Outpatient encounters [1]	*1976*	*1977*	*Percent change from 1976 to 1977*
Curative services:			
Satellite clinics [2]	22,205	26,778	+21
Cuba Health Center	10,111	9,852	− 3
Dental care	3,739	3,257	−13
Emergency room	2,821	3,198	+13
Specialty clinics	1,684	2,025	+20
Subtotal	40,560	45,110	+11
Preventive services:			
Screening [3]	2,296	3,027	+32
Public health [4]	2,178	2,073	+36
WIC nutritional [5]	1,258	2,711	+115
Family planning	277	649	+134
Subtotal	6,009	8,460	+41
Total	46,569	53,570	+15

[1] Data obtained from monthly summaries of statistics tabulated by CAHS business office.
[2] Includes visits for well-child examinations and home visits from Cuba Health Center.
[3] Includes school health examinations, group services, EPSDT visits, and adult medical screening activities.
[4] About one-fourth of all encounters at satellite clinics are home visits which, according to the CAHS medical director, usually include some public health activities.
[5] Women, Infant and Child Nutrition Supplementation Program.

Emergency room performance measures. Emergency medical care is available 24 hours a day, 7 days a week from the emergency room, and 2 fully equipped ambulances with radio communication units are available to respond to medical emergencies in the catchment area and to transport patients needing sophisticated treatment to referral institutions. For a 1-year period starting in September 1976, a total of 3,098 visits were recorded for the CAHS inpatient facility emergency room; the average daily visit rate was 8.5 patients. Although no seasonal effect was expected or could be identified, trend analysis showed an increase of 38 patient visits per month in average utilization.

The average daily visit rate ranged from a low of 5.7 patients on Tuesdays to a high of 14.2 on Saturdays. Higher emergency room visit rates were noted on weekends and holidays when the outpatient clinic was closed and on Wednesdays when the clinic was on an abbreviated schedule. Relative to service area population proportions, a study of a 20 percent sample of emergency room visits, stratified by day of week, showed that use rates were lower for young females and all persons age 45 or older and higher for all persons between the ages of 15 and 44 years. The continued monitoring of these use patterns proved useful in revising planned resource allocations. In conjunction with these patterns, it became necessary to evaluate travel distances from a patient's residence to the CAHS emergency room. As for inpatient admissions, emergency visits are most often made by patients whose residences are 25 miles or more from the hospital. However, a higher percentage (27 percent) of the emergency room visits were by patients who lived less than 25 miles from the CAHS facility compared to the lower percentage (10 percent) of inpatients from this same mileage category (table 6); thus, certain communities within the catchment area may have used the system services selectively.

A cross-tabulation of the type of presenting problem

Table 6. Frequency distribution of distance between the CAHS emergency room and the patients' residences for a stratified sample of visits

	Emergency room visits	
Estimated distance (miles)	*Number*	*Percent*
In-State visits:		
Less than 25	178	27
25–49	281	44
50–74	81	13
More than 75	88	14
Out-of-State visits	13	2
Total	641	100

by patient disposition for the sample of emergency room visits is shown in table 7. For almost 80 percent of all visits the patient was discharged home. Of the 13 percent admitted to the CAHS hospital, slightly less than one-half went into the maternity wing. Trauma accounted for the majority of patients who were referred to other hospitals for diagnostic or treatment procedures, or both. Six persons (1 percent of the sample) died; however, four of these patients were dead on arrival.

A summary of emergency room performance in the CAHS indicates fairly heavy use, as expected for a rural health facility. Progressive gains were made in many dimensions of emergency services, most notably in the average number of visits per month. The uniqueness of providing care in the checkerboard area is evident from the distances traveled by most patients (25 miles or more) and the large number of maternity patients seen first in the emergency room and then admitted to the hospital.

A Comprehensive View of the CAHS

The planning for an integrated rural health care system in the checkerboard area resulted in greatly improved measures of performance in inpatient, outpatient, and emergency room services. However, more extensive planning was not the only stimulus behind improved system efficiency. Three corollary factors are considered to be primarily responsible for the increased use by inpatients. First, there has been a growing awareness and acceptance of the inpatient services by the target population. Second, increasing the productivity of CAHS providers and extending their associated medical expertise through ancillary personnel has permitted reasonable on-call coverage schedules and the treatment of more complicated conditions. Third, medical or administrative changes in admission and discharge policies reflect the availability of new Federal sources of funding support. It is highly probable that these additional events would not have occurred in the inpatient area if a solid planning basis had not been established.

The outpatient program of the CAHS indicates that traditional ambulatory care can be integrated successfully with other health services more oriented toward health maintenance. Use of outpatient services increased at an annual rate of 17 percent, reflecting increased efficiency of the limited health care resources that are available. Although curative services were the major component of the total outpatient program, health promotion and disease prevention activities such as family planning and nutritional services were the strongest areas of growth. These gains are attributable to a comprehensive set of available services, competent and concerned clinical staff personnel, well-established internal referral procedures, and active consumer health education programs. These measures of performance reflect a background of planning by system providers and administrators, consumer representatives, and government officials.

Like the inpatient and outpatient areas, the emergency room at the Cuba Health Center achieved a relatively impressive service record, apparently as a result of a well-planned and implemented system. Given the constraints associated with planning an integrated health care system within this rural context, it is obvious that emergency services presented a stimulating challenge to the CAHS planners. Nonetheless, through early conceptualization and careful integration of all components of heath care delivery, the performance of the emergency care subsystem of CAHS is exemplary. Although many patients must travel considerable distances to reach the emergency room, efficient and effective service is delivered promptly.

Finally, it is possible to assess the extent to which the CAHS has achieved a truly comprehensive system of health care relative to the elements previously iden-

Table 7. Cross-tabulation of presenting problem types by resultant patient disposition for a stratified sample of CAHS emergency room visits

Presenting condition	*Home*	*Admission to Cuba hospital*	*Referral to other hospital*	*Death*	*Total*
Trauma	158	14	25	2	199
Acute illness	275	20	10	...	305
Chronic illness	35	13	10	...	58
Followup service	27	1	1	...	29
Maternity	5	40	1	...	46
Dead on arrival	...	...	...	4	4
Total	500	88	47	6	641
Percent of total	78.0	13.7	7.3	1.0	100.0

tified by Torrens (*1*). As the preceding discussion indicates, public health services, emergency care, simple ambulatory care, simple acute care, and patient transportation—major components in Torrens' model—are key functional components of the Checkerboard Area Health System. Services required to provide both complex ambulatory and acute care are available through speciality clinics held periodically at the Cuba facility as well as through a referral network of secondary and tertiary physician and institution providers. Long-term rehabilitative care occurs, in part, through an outreach program whereby patient services are provided by home health workers. Current plans call for building a 25-bed skilled nursing or intermediate care facility in Cuba that will be integrated into the existing CAHS system.

Mental health services represent an important element of the Torrens' comprehensive health care system. Some patient counseling is provided by regular CAHS providers as well as a social worker. An isolation room at the inpatient facility has been used for emergency mental health care. In view of alcoholism problems in the target population, new plans calling for an additional commitment of health resources is necessary to obtain comprehensiveness. The final element in the Torrens' model, financial compensation, is also a key element related to the long-run goal of survival of the system. The CAHS has been designed, developed, and implemented with large, relatively long-term Federal program grants. Although significant administrative effort has been devoted to achieving fiscal self-sufficiency, areawide poverty constrains the reality of financial viability on a fee-for-service basis. Hence, some form of direct or indirect government subsidy will probably be necessary to insure CAHS survival.

Although the CAHS planning for an integrated health care system has been successful in inpatient, outpatient, and emergency room care, many other aspects of improved health care are not easily measurable. The constraints of the rural setting are mainly responsible for the difficulties in providing rural health care. Nonetheless, the indications of better health care in the checkerboard area offer strong support for health policymakers and planners striving toward improved systems of health care. All persons involved in the planning must be keenly aware of the constraints present in rural areas before they progress toward putting a system into operation.

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SYNOPSIS

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The design of rural health care delivery systems often is based on concepts obtained from urban models. The implicit planning premises of successful urban models, however, may be inappropriate for many rural systems. An alternative model planned and implemented in the checkerboard region of rural northwest New Mexico has proved to be successful. This experience may be helpful to health care policymakers and planners confronted with environments that are not congruent with typical urban settings.

The checkerboard region presented a challenging health planning environment characterized by formidable geographic, population, economic, and health behavior constraints. The Checkerboard Area Health System (CAHS), designed to provide comprehensive services in an area dominated by these constraints, was formed around a central diagnostic and treatment facility with six satellite clinics. The CAHS used an innovative administrative structure, extended the productivity of traditional providers by extensive use of mid-level and ancillary personnel, and created an effective referral network. These features are distinctly different from those of urban health care models.

Overall, the CAHS attained a high rate of inpatient use. Additionally, the performance of the outpatient program indicates that traditional ambulatory care can be integrated with other health services that are more oriented toward health promotion and disease prevention. Finally, the emergency room at the central facility has attained an impressive record that, like the inpatient and outpatient areas, is responsive to the needs of the target population.