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THE CHANGING NATURE OF RURAL HEALTH CARE

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■ **Abstract** The rural health care system has changed dramatically over the past decade because of a general transformation of health care financing, the introduction of new technologies, and the clustering of health services into systems and networks. Despite these changes, resources for rural health systems remain relatively insufficient. Many rural communities continue to experience shortages of physicians, and the proportion of rural hospitals under financial stress is much greater than that of urban hospitals. The health care conditions of selected rural areas compare unfavorably with the rest of the nation. The market and governmental policies have attempted to address some of these disparities by encouraging network development and telemedicine and by changing the rules for Medicare payments to providers. The public health infrastructure in rural America is not well understood but is potentially the most fragile aspect of the rural health care continuum.

INTRODUCTION

The character of rural health care delivery in the 1990s has undergone significant changes caused by the rapid transformation of the U.S. health care system. Rural providers had functioned, like their urban counterparts, in a system dominated by fee-for-service payment mechanisms in which there were recognizable differences in the philosophies of public and private interests. In the 1990s, both public and private systems began to use managed-care principles to control costs, and an emerging emphasis on corporate and business philosophies began to blur the distinction between public and private health care systems. Rural places felt these changes in ways other than through the dominance of markets by managed-care companies because there were fewer opportunities for cost savings or profit enhancement owing to the nature of rural markets (16). Rural health care changed more as a result of the increased integration and assimilation of professionals and institutions into systems and networks (58). The pressure of reform across the wider market resulted in important government policy changes for rural health

TABLE 1 Age-adjusted death rates per 100,000 resident population by race and urbanization in the United States, 1993–1995

Urbanization group	All races	White	Black
Large core metropolitan	538.2	491.9	810.5
Large fringe metropolitan	459.7	449.3	682.2
Medium small metropolitan	500.7	477.4	760.0
Urban, nonmetropolitan	519.1	499.4	761.9
Rural	526.4	503.9	737.1

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care delivery, including the establishment of alternative hospital forms under the Medicare program, adjustments to other Medicare payment systems that discriminated against rural providers, and implementation of rural-community-focused grant programs to encourage networks and system linkages. However, the persistence of recognized and long-standing problems of resource distribution was the salient characteristic of rural health care during the decade.

The distribution of physicians has remained skewed toward urban areas; rural America has 20% of the nation's population but less than 11% of its physicians; of 603,656 patient care physicians in the nation in 1997, 64,912 (10.8%) practiced in nonmetropolitan counties. This imbalance has worsened over time; in 1980 the proportion practicing in nonmetropolitan counties was 13.6% and in 1990, 12%. The total supply of patient care physicians grew by 24.3% between 1990 and 1997 but by only 11.1% in nonmetropolitan areas (66). Rural residents have roughly equivalent age-adjusted mortality rates (61), but certain rural regions have the highest levels of mortality and morbidity, often accompanied by the fewest health care resources (78, 79). The link between the distribution of these resources and health outcomes is not apparent; for example, Table 1 presents a somewhat mixed message for the relationship between a person's residence—urban, suburban, or rural—and mortality.

Rural residents are more often uninsured than urban residents [18.7% vs 16.3% (101)] and are more likely to report being in fair or poor health, having restricted activity, and having lower levels of access to a regular primary-care provider (90).

The important policy issues in rural health during the 1990s continued to focus on resource disparities, and perhaps the most important were payment policies for Medicare and the supply of health professionals. However, developments in technology and organization, including the expansion of the use of telemedicine and an increase in the numbers of rural hospitals and rural practitioners becoming parts of alliances and systems, captured the attention of rural health services researchers as well as policy makers. As quality of care became an important issue and a larger proportion of the nation's population was covered by managed-care plans (34), rural providers were not left out of the trend toward greater scrutiny over practice decisions, especially when costs could be reduced (57). More attention is being

paid to health care outcomes for rural and primary-care providers, as well as urban and specialist providers (96), and the reality of practice in rural America includes the pressures of managed care on both costs and quality of care (16). This article reviews these transformations, focusing on selected issues that are most important to rural health care delivery: the supply of professionals and hospitals, telemedicine, alliances and systems, policy issues, and rural public health and quality of care. However, there is a set of health care issues that are of special concern to rural populations, and they are considered first.

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SPECIAL PROBLEMS IN RURAL HEALTH

The rural environment, especially where agriculture, mining, forestry, and fishing are important or dominant parts of the economy, presents extraordinary threats to health (33, 105). Agriculture brings the use of pesticides and herbicides as well as heavy and potentially dangerous machinery. Mining is a consistently hazardous industry, and persons involved in fishing and forestry are at much higher risks of trauma. A review of the causes for visits to a single rural emergency department found that work-related injuries accounted for 12.5% of >12,000 injuries (105), although the national rate in 1997 was 4.2% of emergency department visits (62). Rural workers who were injured were more often older; the mean age of patients injured on the job was 33.8 years (range, 16–77 years), compared with a mean age of 27.7 years for all injury visits. The most common mechanisms of work-related injuries were overexertion (20%), cuts or pierces with sharp implements (16%), falls (16%), strikes by objects (13%), and transportation-related injuries (5%). Sprains and strains were the most common types of injuries sustained (27%), followed by wounds to upper limbs (18%), contusions (12%), and fractures (10%). Of the 1,539 patients coming to the emergency department with occupational injuries, 12% were transported via ambulance. Most (91%) were treated and released. The mechanisms of injury that most commonly resulted in hospitalization included strikes by objects (21%), transportation-related accidents (19%), falls (20%), and accidents involving crushing mechanisms (10%) and machinery (15%). Of workers requiring hospitalization, 97% were male, and the average length of stay was 4.4 days (105).

Children in rural areas have much higher rates of fatal injury; 1992 data show that rural children between the ages of 1 and 19 had a 44% higher death rate than their urban counterparts, and those between 1 and 14 had a 20% higher mortality risk (17). A single-state study in Colorado showed that rural children have significantly higher risk of death from motor vehicle crashes and unintentional firearm injuries (43).

Exposure to cancer-causing agents is recognized as a hazard of rural life both for farmers and farm workers, but also for persons living near fields that are sprayed or living where runoff is likely from such operations. These factors result in higher than average rates among farm populations for brain, stomach, lymphatic

and hemopoietic, lip, prostate, and skin cancers (12). Rural children are at higher risk of exposure to pesticides and have higher rates of pesticide-related illnesses (27, 86). A number of programs have attempted to lower the risks of cancer and agricultural injury; these programs are sponsored by the National Institute of Occupational Safety and Health (20), the National Cancer Institute, and the U.S. Department of Agriculture, along with many state agricultural-extension services and foundations involved in prevention. The Appalachian Leadership Initiative in Cancer is an example of the combination of local public health agencies, clinicians, the agricultural extension service network of agents, and support units in land grant universities to address problems specific to rural populations (25).

Rural mental-health and behavioral-health care systems are fundamentally different from urban and suburban systems (38). This constellation of problems is seldom treated by specialists, and there are substantial difficulties in creating appropriate referral networks for mental health services when there are more intense issues related to anonymity and labeling in close-knit rural communities. The personalities and attitudes of rural residents, who tend to be more resistant to accepting diagnoses such as depression, also play an important role in the perceptions of mental illness and substance abuse and in shaping local policy to treat these conditions, as well as to fund programs and organizations that address the problems in the community (44).

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RURAL HEALTH PROFESSIONALS

In 1997, the American Medical Association counted 736,264 active physicians in the United States—more than double the number in 1970. The ratio of physicians to population grew from 130 patient care physicians/100,000 in 1970 to 276/100,000 in 1997 (66). This rapid growth has fueled a growing perception that the United States has a $\leq$20% oversupply of physicians. This point has been made by special commissions (52, 70) and a joint task force involving the American Medical Association, specialty societies, and the Association of Medical Colleges (AAMC) (69), and it has been affirmed by federal agencies that have used recent research to bolster their case (22, 24). This perception of an overall surplus flies in the face of continued evidence of shortages, especially in rural places. There remain many communities that do not now and have not in the past 25–30 years had the number of professionals that most experts consider "adequate" to provide reasonable access. As of September 30, 1998, there were 1,879 designated areas with shortages of primary-care health professionals in nonmetropolitan counties, and these areas required 2,370 full-time-equivalent primary-care practitioners to bring them above the minimum designation criterion and 5,355 to achieve a target ratio of 1 provider for every 2,000 persons (26).

The contrast of an overall national surplus with persisting shortages has created difficult policy options for graduate medical education (GME) policy (19), for changes in policy toward international medical graduates (23), and for the role

of the National Health Service Corps. Federal graduate medical education policy is seen by the Pew Health Professions Commission (70) as not making use of effective mechanisms for improving the geographic distribution of clinicians, such as training in nonhospital settings and support for nonphysician primary-care professionals. International medical graduates are an important source of physicians for rural, underserved areas, but their relative contribution to the supply in counties designated as underserved is seen in one study as only slightly greater than United States medical graduates (4). One analysis found that international medical graduates "worsen distributions" of physicians (71).

Recruitment and retention of providers remain issues for many rural places. The National Health Service Corps has been one of the most important programs to place and support physicians and other professionals in rural underserved areas, but its early performance did not meet expectations (67). Subsequent policy changes within the Corps improved its ability to place clinicians into long-term service in rural communities (83). In examining how to influence physicians to practice in rural places, researchers have traditionally focused on the rural practice environment and the personality and family characteristics of physicians. Recent work points to the positive influence of rural-focused training on the degree to which rural physicians interact with their practice communities (68, 97). The experience of the focused program at Jefferson Medical College provides an example of how such a program can influence the flow of physicians into rural places (74). However, it is not just physicians who are important primary-care providers in the rural environment; the new health professionals that emerged in the 1970s, nurse practitioners and physician assistants, have taken on broader and more effective roles in many rural places (5). For physician assistants, one of the original reasons for developing the profession was to relieve the burdens on house officers and residents in teaching hospitals. These professionals have found a place in hospitals that are less likely to be involved in teaching—rural hospitals (10)—but they are often paid less in rural than urban communities, though they may enjoy more autonomy (2). The issues that apply to rural primary-care clinicians also apply, although in a more local sense, to nurses. Recent studies find significant nonwage influences on the decision by nurses to enter or remain in a rural setting (64, 65).

The rural clinician is often described as "another breed" of health professional, willing to cope with relative professional isolation and ready to take on unfamiliar cases, but also often described with less flattering characterizations. Despite many firmly held perceptions of differences, little is systematically known about what the rural physician does that is different from what the urban physician does. A report from a team of researchers at the University of Washington painted a picture of what rural doctors do in comparison with their urban counterparts (6). The differences were less striking than the comparative generalizations would predict, showing substantial overlap between specialists and generalists, depending on location and specialty. Chiropractic medicine is often lumped under the term "alternative," but it is an important source of care for both urban and a growing number of rural

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people. Even less is known about the distribution of these caregivers and how they might modify their practice patterns based on the populations they serve. For example, a 1999 study of the use of chiropractors in the Midwest is one of the very few that focuses on a nonallopathic or mainline nursing or dentistry profession. It shows that chiropractics is an important health care option for rural people to access in a wide range of illnesses (41).

The ethics of rural and small-town health care practices have been discussed recently (80). There is evidence that perceptions of health and use of the health system are different for people in rural communities (31, 42, 53, 103), and this may influence the course of treatment and how issues of health and illness are viewed by rural clinicians and patients (72, 81, 99, 100). For example, rural people may more often tend to delay treatment. Perceiving that work is more important than health care, they tend to use health care more when there are lower demands on their time from seasonal work, and there is evidence that rural people suffer higher levels of stress.

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HOSPITALS

The role of the hospital in the American health care system is changing very rapidly. Indeed, there are some who see hospitals as disappearing from the scene, to be replaced by networks of professionals and institutions tied together through a variety of contractual arrangements to coordinate care and promote health—the so-called virtual hospital. For many rural communities, however, it is the hospital that has served as the focus of health care delivery in the community and that remains the most prominent and effective institution to organize the delivery of health care.

The leading proposals for national health care financing reform from the White House and Congress in 1993 and 1994 did not provide much comfort for rural hospitals. Rural areas were seen as areas in which managed competition and vertically integrated delivery systems would have trouble catching on (48), and few specific policy recommendations addressed this problem (84, 85). By 1997, market-driven changes were more dominant than policy-directed reform; integrated delivery systems were a growing phenomenon, and the cost-saving potential of managed care was being realized. Well before the time when national health reform was high on the political agenda, rural hospitals were faced with a prospective payment system under Medicare that paid them less than urban hospitals for the same services.

In the 1980s, as the number of rural hospitals closing their doors grew every year, there was a belief among expert observers of the health care sector that rural hospitals were perhaps an anachronism and that only those institutions that were very large and integrated with other parts of the health care system would survive (50, 60). At the start of the decade, there was strong concern over the viability of rural hospitals, and alarm was raised at the rate that rural hospitals were closing. Between 1980 and 1998, the total number of community general hospitals

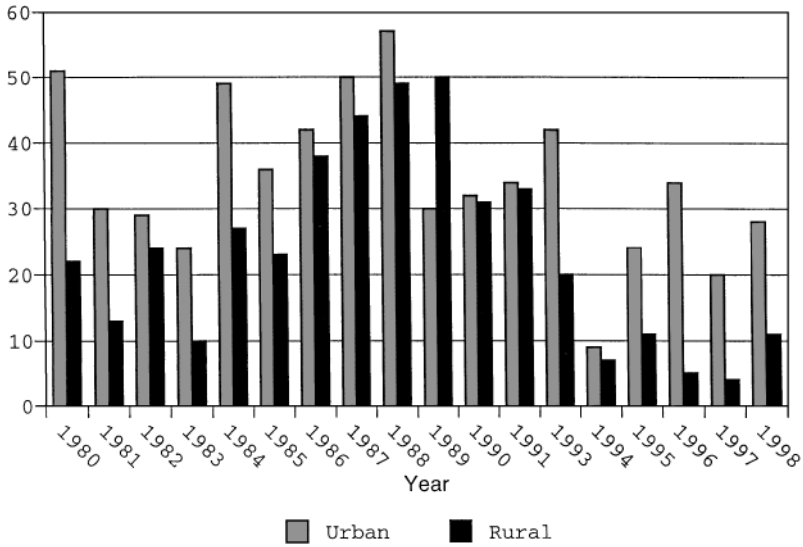

Figure 1 Hospital closings in rural and urban locations, 1980–1998.

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decreased from 5842 to 5153, an 11.8% decrease caused by closings, mergers, and conversions. During that period, there were ~1000 closings or conversions to some other form of health care delivery organization, >600 in metropolitan counties and 438 in nonmetropolitan. Although some hospitals were opening or relocating, a net reduction of 689 hospitals ensued. The pace of closings slowed after 1990; in 1998, 24 urban and 11 rural hospitals closed (Figure 1).

The hospitals that were most vulnerable to closing or conversions were those that had a smaller number of beds and lower occupancy rates, were managed as for-profit concerns, were not accredited by the Joint Commission on Accreditation of Health Care Organizations, and had high percentages of Medicaid inpatient days (32). Other vulnerable hospitals were those located >35 miles from their nearest hospital neighbor but also located in markets with higher population densities (98). Studies that examined the effects of closed hospitals on local communities found significant changes in the use of hospitals in general and, in one case, in the health status of residents (11, 37, 82). Others found that access was not significantly impaired by closings (14, 30, 55). Recent work indicates that the effects of rural hospital closings may be overstated in terms of absolute effects on use of services, but there are important access differences, a pervasive sense of loss, and a reduction in the social capital of the communities (76).

Rural hospitals have been able to survive, and some even thrive, because the Medicare payment policies that were discriminatory to rural hospitals have been blunted by Congress. More importantly, there has always been a justification for the location and mission of hospitals in rural places. Small rural hospitals have

been shown to contribute significantly to local economies (21), and they have been able to adapt by using payment options, including expanding outpatient care and use of the Rural Health Clinics program (47).

Since 1994, the dominant theme for rural hospitals has been adaptation and innovation to meet the challenges of a changing market, although survival is still an issue. The exit option for rural hospitals has not proven popular, although rural hospitals are at a disadvantage in many ways compared with urban hospitals, largely owing to differences in the resources available to them. For example, Medicare payments for rural hospitals have consistently been lower because of adjustments for lower wage levels in rural communities. Despite these difficulties, rural hospitals have been able to continue in their role as local and regional centers of health care activity because of the rapid diffusion of new management techniques, new systems of coordination and networking, new information technology and the adoption of new structures and approaches to health care delivery.

The limited-service-hospital model has been a policy option for over a decade, in the form of the Medical-Assistance Facility and the Rural Primary-Care Hospital (often called "peach"). These limited-service hospital models were introduced in 1987 in Montana as medical assistance facilities and in 1989 in a seven-state demonstration by the Health Care Finance Administration of the Essential Access Community Hospital-Rural Primary Care Hospital program (15). The medical-assistance facilities and rural primary-care hospitals were allowed to operate with restrictions on the number of their acute-care beds, up to six, and the length of stay for any Medicare patient—$\leq$72 hours. The hospital also had to have a network arrangement with a larger essential-access community hospital that would accept all transfers. The hospitals, in turn, received enhanced payments from the Health Care Finance Administration for Medicare patients and were allowed other relief from regulatory requirements.

Conversion to a limited-service model is restricted to those that qualify, but not all potential limited-service hospitals choose to make the conversion. It is more common for hospitals with more favorable performance measures to convert (1). These new organizational forms have been accepted in rural communities, but not without some misgivings by current or potential users (89).

Changes and conversions will become even more commonplace with the implementation of the Rural Hospital Flexibility Program passed by the Congress in 1997. The effects of the early implementation of that program have been described (77), and there is intense interest in how well this new model for rural hospitals copes with a health care environment whose dominant characteristic is change. The U.S. Office of Rural Health Policy has funded an evaluation of the Rural Hospital Flexibility Program. There are other alternatives being considered at the state level. For example, Avery assesses the feasibility of a freestanding emergency department that can substitute for currently operating, small rural hospitals as a part of an access network (3). This is an extreme option for restructuring the rural hospital but reflects the desire of regulators and planners to try to allow localities to retain the essential services that hospitals provide.

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TELEMEDICINE

Telemedicine has been described as the single most important way to equalize the differential in resource availability between rural and urban areas (73). Telemedicine is a general term for the use of telecommunications, including live interactive video and the transmission of images and data via the Internet or by telephone, or any combination of information transmission combined with the treatment of patients (7). Recently, satellite and fiber-optic cable systems have been developed to link health care providers in central teaching hospitals with distributed-delivery sites within specific states or across state and national borders (63). The federal government has stimulated the expansion of this technology with grant programs (75) and the establishment, in 1998, of a separate Office for the Advancement of Telehealth in the Health Resources and Services Administration. Most of these federally sponsored projects have been located or targeted to rural communities. Of 191 funded projects in 1994–1997, 118 were primarily to benefit rural communities, or they involved rural providers or patients. The research and evaluation literature on telemedicine and telehealth has featured descriptions of many projects and programs and has discussed in depth the policy issues that either facilitate or retard telehealth systems, but comparatively little structured evaluation and comparative quality assessment have been completed. The quality of individual telemedicine systems has been assessed in multiple studies; these studies most often focus on single therapeutic areas such as dermatology or radiology, in which the transmission of images and data over distances provides a clear benefit. However, the installation of complex video-based telemedicine systems has not always met with complete acceptance nor been deemed completely cost beneficial in all systems; one review of evaluation approaches calls telemedicine ". . . an expensive and, to date, poorly evaluated technology" (107).

Telehealth systems that are accepted in practice make use of appropriate, accessible, and stable technologies (91). The challenge of objectively evaluating telemedicine is not specifically one that requires consideration of rural conditions (35, 36). Telemedicine and telematics continue to grow in importance in rural health as patients and providers become more familiar with systems and technologies and grow more comfortable with the capabilities of telecommunications. The lingering issues of licensing and reimbursement are being addressed with an aim to clearing up problems of borders and bringing a reasonable stream of income to useful technologies (8).

NETWORKS AND SYSTEMS

Rural health professionals and institutions have chosen recently to join into systems and alliances to cope with the turbulent environment of health care policy and economics. These networks consist of multiple health care providers who share common characteristics of rural health care delivery: small population bases,

limited resources, and a need to exploit economies of scale. A rural health network may or may not have been developed as part of managed-care systems, but it is more likely to have been created to cope with general market conditions. By combining resources, rural providers expect to reduce their costs, manage their scarce resources, compete effectively, and increase their bargaining position with insurers and regulators (109). Managed care and market pressures have been cited as causes of this clustering, but an overall emphasis on efficiency and measurable quality has made it necessary for individual institutions to seek support and the efficiencies of scale that are available in these systems (92, 93). Defining a network is not straightforward in the rural context (104); Moscovice and colleagues have been explicit in their definition and have used it to create a characterization of network structures in and involving rural communities (59). Their study found that networks are widespread, 42% of rural hospitals are involved in some alliance or network, and more than half of the formal networks involve an urban institution (58). Hospitals joined these networks to gain financial advantages, to access resources, and to gain operational assistance from partners (104).

Hospital networks are not the only form of integrating structure appearing in rural communities; there are many cooperative and collaborative systems emerging as a result of policy initiatives and in response to incentives from foundations and payment systems. These include the New York State Rural Health Network Demonstration Program, initiated in 1986 to promote more effective health care delivery systems and to maintain essential community services. This program was later joined with the state's rate-setting mechanism in 1994, but that system was phased out in 1996. The 1996 Health Care Reform Act of the State of New York made available $7 million/year for network development between 1997 and 1999. A total of 34 awards, ranging from ∼$50,000 to $340,000, were made in 1997.

The Essential Access Community Hospital demonstrations required the formation of networks to support the rural primary-care hospitals, but the network activities were given less emphasis than the viability of the converted hospitals (106). Florida initiated a rural health network development program in 1993, certifying nine systems with various forms of organization. The networks included rural clinics, hospitals, and health departments in various combinations, and some were involved in the development of insurance or managed-care products. No formal evaluation of that program has been published. West Virginia created the Rural Health Networking Project in 1994, using funding from the Claude Worthington Benedum Foundation combined with federal and other foundation initiatives, including the Robert Wood Johnson Foundation's Southern Rural Access Program, which added support in 1998. The latter program supports rural network development in eight southern states but has only just begun its implementation phases, as of summer 1999.

The American Hospital Association, the Catholic Health Association of the United States, and Voluntary Hospitals of America, in cooperation with the W. K. Kellogg Foundation, the Duke Endowment, and the California Wellness Foundation, supported 25 community-care networks to develop systems that care for the

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uninsured and that improve health care coordination. The effects of this system building have not been published.

The Agency for Health Care Policy and Research created a series of Rural Managed Care Centers in 1994, linking rural communities with university health systems to determine whether this form of technical-assistance networking could help rural places better integrate with managed-care systems. The evaluation of that program has been qualitative and presents a picture of more potential than realized benefits (28, 39).

The Medicare Rural Hospital Flexibility Program was enacted as part of the Balanced Budget Act of 1997 (BBA) and is a nationwide program that creates a new category of rural hospitals called Critical Access Hospitals, as well as authorizing a program of grants to develop rural health care systems. Those grants, available to 48 qualifying states, can be used for network development, which is a required component of the flexibility program. In the initial year of the program, states had moved deliberately toward implementation of network-supporting systems, but networks were not the primary focus on the program; rather, more attention was being paid to the individual hospitals and their decisions to become critical-access hospitals (77).

Despite the secular trend toward greater involvement in networks and alliances, there remains little strong empirical evidence of the benefits of these networks and alliances for their members (104). There are open questions about the degree to which networks actually affect access to care and the eventual outcomes of care for rural populations.

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POLICY AND LEGISLATION

The most important change in rural health policy in recent years has come from those parts of the BBA that created special rural focused programs like the Rural Hospital Flexibility Program but also created major changes in how rural providers are paid. The BBA and its effects have drawn the attention of rural health advocates and policy analysts. The Rural Policy Research Institute, a consortium of academic centers that addresses a wide range of rural issues, has released four reports specifically addressing the legislation (18). The rural policy concerns described by the Rural Policy Research Institute panel focus on payment levels for rural hospitals, the phasing out of cost-based payments to federally qualified health centers (FQHCs), revised payments for home health care and long-term care facilities based on averages, the use of the hospital wage index for skilled nursing facility payments, reductions in home health payments, and the lack of sufficient market conditions to allow rural areas to benefit from Medicare + Choice and provider service organizations. Furthermore, the BBA replaced the adjusted average per-capita cost system with one in which county payment rates are set as the highest of (*a*) a local/national blended rate, (*b*) a national payment floor, or (*c*) a 2% minimum update from the previous year's rate. Simulations of payments anticipated under the BBA indicated that rural areas would suffer very large negative effects (88).

The response by rural advocates has been to revitalize their congressional presence and develop new leadership in the caucuses of the House and Senate. This has resulted in the development of both comprehensive and targeted bills to address problems in existing laws and regulations that negatively affect rural communities and providers, as well as to strengthen rural-directed programs.

RURAL PUBLIC HEALTH

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The rural public health infrastructure has not been given much recent attention in rural health policy or rural health research. There are published reports of the changes required by individual public health departments or state health departments, but an overall analysis of rural issues in public health has appeared only in the form of a report from the University of Minnesota Rural Health Research Center (56). Public health departments in cities have been affected by the expansion of managed care as health plans have taken on the treatment of populations once considered solely the responsibility of health departments (29, 51). There are limited examples of managed-care effects on rural public health departments, although health departments in general are scaling back direct patient services (94). There is evidence that, in states with Medicaid managed-care programs, public health departments more often have dropped well-child services. The move to managed care in the Medicaid system poses a particular risk to public health departments because these departments have historically focused the provision of clinical services on Medicaid-eligible or other low-income populations. As of May 1997, 57% of rural counties participated in Medicaid managed-care programs in some form, including case management (95). In a study that examined the impact of Medicaid managed care in rural communities in 10 states, local health departments in almost all of the states reported a sharp decrease in the provision of well-child services (29). In 3 of the states, respondents noted that the local health departments had already stopped or were planning to stop providing any clinical services. The changes seen in these rural areas parallel changes in other communities across the country (102). The impact of these changes in any particular community will depend on whether there are other private providers willing to assume care for the patients who historically received care from the health department. Lipson noted that 10% of local health departments, especially those in rural areas, reported that they were sole providers of care to the medically indigent (51); thus, rural communities may be more adversely affected if rural public health departments cease providing clinical services owing to the influences of statewide Medicaid managed-care programs or policies that call for health departments to deemphasize direct patient care. Health departments have also reportedly used Medicaid revenues to partially cross-subsidize population-oriented services; thus, a concern has been raised that the loss of Medicaid revenues may also affect the ability of local health departments to meet their core public health responsibilities (102).

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QUALITY OF CARE IN RURAL PLACES

Whether the quality of care provided in rural areas is different from that in urban places remains an issue. Keeler and colleagues (46) drew strong responses from other researchers and rural health advocates when they found that rural and non-teaching hospitals have lower levels of quality (9). The rural research center at the University of Minnesota completed an overview of issues related to quality of care in rural versus other places in the United States (57). This review points to the few studies of quality that consider rural conditions and the realities of the workforce and practice conditions in rural communities. Much of the fundamental information necessary to assess quality in the rural environment has not been collected. For example, only recently has the content of rural versus urban practice been described; rural medical care typically does not include the full range of therapies, with orthopedics and pediatric care less often included in the rural generalists scope of services (6). To promote overall quality in medical care, many have suggested expanding the use of practice guidelines. However, a study by Yawn and colleagues (108) indicated that adherence to published guidelines for diabetes would require 1%–3% more total primary-care physicians in the United States; there are ~216,000 patient primary-care physicians in the United States, and a 1% increment in demand would require more physicians than the number that would eliminate shortage designations of health professional shortage areas across nonmetropolitan counties of the United States.

Volume remains an important factor in determining the appropriate mix of services to provide in rural areas, where volumes are necessarily low (40, 45, 54). However, the only review of volume-outcome relationships that specifically considered the types of procedures normally done in rural and smaller hospitals found that outcomes of those procedures done in rural hospitals had little variation associated with volume (87).

The quality of care provided by rural physicians is often described in case study descriptions that focus on a single rural practice. For example, one study of the process and costs of care for Medicaid children found that rural providers had lower costs, but their content of care was, in the words of the researchers studying rural Medicaid care delivery, "potentially unfavorable" (13).

CONCLUSIONS

Rural health policy and rural health services research have matured into a recognizable segment of the overall health policy domain (49). This is evidenced by the volume and variety of material targeting rural health issues that has appeared in the peer-reviewed clinical and health services research literature. During the 3-year period 1996–1998, the HealthStar system of the National Library of Medicine yielded 1188 citations relevant to the United States under the expanded categories of rural hospitals, rural health or health services, and rural populations. The articles

appear in journals representing the breadth of the field of health services research, from the *New England Journal of Medicine* to state medical journals to discipline-specific clinical journals.

The issues that are important to rural providers, professionals, and institutions working under stress with uncertain futures and reduced streams of income are the same issues that are being faced by the broader health system. The analysis of rural provider behavior is important for its implications for rural health policy, but there are other reasons to pay attention to the rural experience. Rural health care contexts can be seen as harbingers of the more general national health care system, in which pressures for efficiency and cost control may create systems that are expected to function with far fewer resources, and of heavy dependence on communications and telemetry, in which a heightened concern for outcomes places the systems in a unique ethical bind.

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LITERATURE CITED

1. Alexander JA, D'Aunno TA, Succi MJ. 1996. Determinants of rural hospital conversion. *Med. Care* 34:29–43
2. Anderson DM, Hampton MB. 1999. Physician assistants and nurse practitioners: rural-urban settings and reimbursement for services. *J. Rural Health* 15:257–67
3. Avery S. 1999. A limited service rural hospital model: the freestanding emergency department. *J. Rural Health* 15:173–81
4. Baer LD, Ricketts TC, Konrad TR, Mick SS. 1998. Do international medical graduates reduce rural physician shortages? *Med. Care* 36:1534–44
5. Baldwin KA, Sisk RJ, Watts P, McCubbin J, Brockschmidt B, et al. 1998. Acceptance of nurse practitioners and physician assistants in meeting the perceived needs of rural communities. *Public Health Nurs.* 15:389–97
6. Baldwin L-M, Rosenblatt RA, Schneeweiss R, Lishner D, Hart LG. 1999. Rural and urban physicians: does the content of their Medicare practice differ? *J. Rural Health* 15:240–52
7. Bashshur RL. 1995. On the definition and evaluation of telemedicine. *Telemed. J.* 1: 19–30
8. Bashshur RL. 1997. Critical issues in telemedicine. *Telemed. J.* 3:113–26
9. Behringer B, Rosenblatt RA, Hart LG, Buck R, Keeler EB, et al. 1993. Quality of care in rural hospitals. *JAMA* 269:865–67
10. Bergereon J, Neuman K, Kinsey J. 1999. Do advanced practice nurses and physician assistants benefit small rural hospitals? *J. Rural Health* 15:223–36
11. Bindman AB, Keane D, Lurie N. 1990. A public hospital closes: impact on patients' access to care and health status. *JAMA* 264:2899–904
12. Blair A, Malker H, Cantor CP, Burmeister L, Wiklund K. 1985. Cancer among farmers: a review. *Scaned. J. Work Environ. Health* 11:397–407
13. Bronstein JM, Johnson VA, Fargason CA Jr. 1997. How rural physicians compare on cost and quality measures for Medicaid ambulatory care episodes. *J. Rural Health* 13:126–35
14. Bronstein JM, Morrisey MA. 1990. Determinants of rural travel distance for obstetrics care. *Med. Care* 28:853–65
15. Campion DM, Dickey DF. 1995. Lessons from the essential access community hospital program for rural health network

Annu. Rev. Public Health 2000.21:639-657. Downloaded from www.annualreviews.org
Access provided by 207.241.229.48 on 03/29/21. For personal use only.

development. *J. Rural Health* 11:32–39
16. Christianson J. 1998. The growing presence of managed care in rural areas. *J. Rural Health* 14:166–68
17. Clark SJ, Savitz LA, Randolph RK. 1999. Rural children's health. In *Rural Health in the United States*, ed. TC Ricketts, pp. 150–58. New York: Oxford Univ. Press
18. Coburn A, Fluharty CW, Hart JP, MacKinney AC, McBride T, et al. 1999. *Implementation of the Provisions of the Balanced Budget Act of 1997: Critical Issues for Rural Health Care Delivery.* Rural Health Panel, Rural Policy Res. Inst., Columbia, MO
19. Coffman J, Mertz E, Commission PHP. 1998. *Beyond the Balanced Budget Act of 1997: Strengthening Federal GME Policy. Rep. Pew Comm. Fed. Policy Taskforce.* Cent. Health Prof., San Francisco
20. Connally LB, Schulte PA, Alderfer RJ, Goldenhar LM, Calvert GM, et al. 1996. Developing the National Institute for Occupational Safety and Health's cancer control demonstration projects for farm populations. *J. Rural Health* 12:258–64
21. Cordes S, Sluis Evd, Lamphear C, Hoffman J. 1999. Rural hospitals and the local economy: a needed extension and refinement of existing empirical research. *J. Rural Health* 15:191–204
22. Council on Graduate Medical Education. 1996. *Patient Care Physician Supply and Requirements: Testing COGME Recommendations, Counc. Grad. Med. Educ. Rep. 8, Bur. Health Prof., Health Resour. Serv. Admin.*, Washington, DC
23. Council on Graduate Medical Education. 1998. *International Medical Graduates, the Physician Workforce and GME Payment Reform, Counc. Grad. Med. Educ. Rep. 11, US Dep. Health Hum. Serv.*, Rockville, MD
24. Council on Graduate Medical Education. 1999. *COGME Physician Workforce Policies: Recent Developments and Remaining Challenges in Meeting National Goals, Counc. Grad. Med. Educ. Rep. 14, Bur. Health Prof., Health Resour. Serv. Admin.*, Washington, DC
25. Couto RA, Simpson NK, Harris G, eds. 1994. *Sowing Seeds in the Mountains: Community-Based Coalitions for Cancer Prevention and Control.* Natl. Cancer Inst., Bethesda, MD
26. Division of Shortage Designation. 1998. *Selected Statistics on Health Professional Shortage Areas as of September 30, 1998.* Bur. Prim. Health Care, Health Resour. Serv. Admin., Bethesda, MD. 10 pp.
27. Eskenazi B, Bradman A, Castorina R. 1999. Exposures of children to organophosphate pesticides and their potential adverse health effects. *Environ. Health Perspect.* 107(Suppl. 3):409–19
28. Fasciano NJ, Felt-Lisk S, Ricketts TC, Popkin B. 1999. Preparing rural communities for managed care: lessons learned. *J. Rural Health* 15:78–86
29. Felt-Lisk S, Silberman P, Hoag S, Slifkin R. 1999. Medicaid managed care in rural areas: a ten-state follow-up study. *Health Aff.* 18:238–45
30. Fleming ST, Williamson HA, Hicks LL. 1995. Rural hospital closures and access to services. *Hosp. Health Serv. Admin.* 40:247–62
31. Garrison MEB. 1998. Determinants of the quality of life of rural families. *J. Rural Health* 14:146–54
32. General Accounting Office. 1991. *Rural Hospitals: Federal Efforts Should Target Areas Where Closures Would Threaten Access to Care*, Washington, DC: US Gen. Acc. Off.
33. Gerberich SG, Robertson LS, Gibson RW, Renier C. 1996. An epidemiological study of roadway fatalities related to farm vehicles: United States, 1988 to 1993. *J. Occup. Environ. Med.* 38:1135–40
34. Gosfield AG. 1997. Who is holding whom accountable for quality? *Health Aff.* 16:26–40
35. Grigsby J, Kaehny M, Sandberg E,

Annu. Rev. Public Health 2000.21:639-657. Downloaded from www.annualreviews.org
Access provided by 207.241.229.48 on 03/29/21. For personal use only.

Schlenker R, Shaughnessy P. 1995. Effects and effectiveness of telemedicine. *Health Care Financ. Rev.* 17:115–31

36. Grigsby J, Schlenker R, Kaehny M, Shaughnessy P, Sandberg E. 1995. Analytic framework for evaluation of telemedicine. *Telemed. J.* 1:31–39
37. Hadley J, Nair K. 1991. *The Impact of Rural Hospital Closure on Medicare Beneficiaries' Access to Hospital Care.* Georgetown Univ. Cent. Health Policy Stud., Washington, DC
38. Hartley D, Bird DC, Dempsey P. 1999. Rural mental health and substance abuse. See Ref. 17, pp. 159–78
39. Hartley D, Jackson J, Mueller KJ, Nichols A, Williams V. 1999. AHCPR-funded rural managed care centers: report from the field. *J. Rural Health* 15:87–93
40. Hartz AJ, Kuhn EM, Krakauer H. 1997. The relationship of the value of outcome comparisons to the number of patients per provider. *Int. J. Qual. Health Care* 9:247–54
41. Hawk C, Long C. 1999. Factors affecting use of chiropractic services in seven midwestern states of the United States. *J. Rural Health* 15:237–44
42. Heckman TG, Somlai AM, Kalichman SC, Franzoi SL, Kelly JA. 1998. Psychosocial differences between urban and rural people living with HIV/AIDS. *J. Rural Health* 14:138–45
43. Hwang HC, Stallones L, Keefe TJ. 1997. Childhood injury deaths: rural and urban differences, Colorado 1980–8. *Inj. Prev.* 3:35–37
44. Johnsen MC, Morrissey JP, Calloway MO, Fried BJ, Bank M, et al. 1997. Rural mental health leader's perceptions of stigma and community issues. *J. Rural Health* 13:59–70
45. Jollis JG, Peterson ED, Nelson CL, Stafford JA, DeLong ER, et al. 1997. Relationship between physician and hospital coronary angioplasty volume and outcome in elderly patients. *Circulation* 95:2485–91
46. Keeler EB, Rubenstein LV, Kahn KL, Draper D, Harrison ER, et al. 1992. Hospital characteristics and quality of care. *JAMA* 268:1709–14
47. Krein SL. 1999. The adoption of provider-based rural health clinics by rural hospitals: a study of market and institutional forces. *Health Serv. Res.* 34:33–60
48. Kronick R, Goodman DC, Wennberg J, Wagner E. 1993. The marketplace for health reform: the demographic limitations of managed competition. *N. Engl. J. Med.* 328:148–52
49. Laumann EO, Knoke D. 1987. *The Organizational State: Social Choice in National Policy Domains*, pp. 9–10. Madison: Univ. Wisc. Press
50. Lillie-Blanton MS, Felt S, Redmon P, Renn S, Machlin S, et al. 1992. Rural and urban hospital closures, 1985–1988: operating and environmental characteristics that affect risk. *Inquiry* 29:89–102
51. Lipson DJ, Naierman N. 1996. Effects of health system changes on safety net providers. *Health Aff.* 15:33–48
52. Lohr KN, Vanselow NA, Detmer DE. 1996. *The Nation's Physician Workforce: Options for Balancing Supply and Requirements* pp. 3–5. Washington, DC: Natl. Acad. Press Inst. Med.
53. Matthews HF, Lannin DR, Mitchell JP. 1997. Coming to terms with advanced breast cancer: black women's narratives from eastern North Carolina. In *The Social Medicine Reader*, ed. GE Henderson, NMP King, RP Strauss, pp. 43–61. Durham, NC: Duke Univ. Press
54. McGrath PD, Wennberg DE, Malenka DJ, Kellett MA Jr, Ryan TJ Jr, et al. 1998. Operator volume and outcomes in 12,998 percutaneous coronary interventions. Northern New England Cardiovascular Disease Study Group. *J. Am. Coll. Cardiol.* 31:570–76
55. McKay NL, Dorner FH. 1996. The effect of rural hospital closures on the financial performances of neighboring rural

Annu. Rev. Public Health 2000.21:639-657. Downloaded from www.annualreviews.org
Access provided by 207.241.229.48 on 03/29/21. For personal use only.

hospitals. *Inquiry* 33:271–82
56. Moscovice I, Casey M, Wellever A, Yawn B. 1998. *Local Public Health Agencies and Managed Care Organizations in Rural Areas: Opportunities and Changes*, Rural Health Res. Cent. Div. Health Serv. Res. Policy, Univ. Minn., Minneapolis
57. Moscovice I, Rosenblatt R. 1999. *Quality of Care Challenges for Rural Health*, Rural Health Res. Cent., Univ. Minn., Minneapolis. 16 pp.
58. Moscovice I, Wellever A, Christianson J, Casey M, Yawn B, et al. 1997. Understanding integrated rural health networks. *Milbank Mem. Fund Q.* 75:563–88
59. Moscovice I, Wellever A, Christianson J, Kralewski J, Manning W. 1995. *Building Rural Hospital Networks*, p. 3. Ann Arbor, MI: Health Admin. Press
60. Mullner RM, Rydman RJ, Whiteis D. 1990. Rural hospital survival: an analysis of facilities and services correlated with risk of closure. *Hosp. Health Serv. Admin.* 35:121–37
61. National Center for Health Statistics. 1998. *Health, United States 1998*, pp. 218–19. Hyattsville, MD: Natl. Cent. Health Stat., US Cent. Dis. Control Prevent.
62. Nourjah P. 1999. *National Ambulatory Medical Care Survey: 1997 Emergency Department Summary*, p. 15. Hyattsville, MD: Natl. Cent. Health Stat., Cent. Dis. Control Prevent.
63. Office for the Advancement of Telehealth. 1998. *Federal Telemedicine Directory.* Washington, DC: Health Resour. Serv. Admin., Dep. Health Hum. Serv.
64. Pan S, Dunkin J, Muus K, Harris T, Geller J. 1995. A LOGIT analysis of the likelihood of leaving rural settings for registered nurses. *J. Rural Health* 11:106–13
65. Pan S, Straub L, Szigeti E. 1998. Factors influencing nurses to practice in rural areas. *Tex. J. Rural Health* 16:5–14
66. Pasko T, Seidman B. 1999. *Physician Characteristics and Distribution in the US, 1999*, p. 14. Chicago: Am. Med. Assoc.
67. Pathman DE, Konrad TR, Ricketts TC. 1992. The comparative retention of National Health Service Corps and other rural physicians. Results of a 9-year follow-up study. *JAMA* 268:1552–58
68. Pathman DE, Steiner BD, Jones BD, Konrad TR. 1999. Preparing and retaining rural physicians through medical education. *Acad. Med.* 74:810–20
69. Pear R. 1997. Doctors assert there are too many of them. *N. Y. Times:* March 1:9
70. Pew Health Professions Commission. 1995. *Critical Challenges: Revitalizing the Health Professions for the Twenty-first Century.* Univ. Calif., San Francisco Cent. Health Prof., San Francisco
71. Politzer RM, Cultice JM, Meltzer AJ. 1998. The geographic distribution of physicians in the United States and the contributions on international medical graduates. *Med. Care Res. Rev.* 55:116–30
72. Purtilo R, Sorrell J. 1986. The ethical dilemmas of a rural physician. *Hastings Cent. Rep.* 16:24–28
73. Puskin DS. 1992. Telecommunications in rural America: opportunities and challenges for the health care system. *Ann. NY Acad. Sci.* 670:67–75
74. Rabinowitz HK, Diamond JJ, Markham FW, Hazelwood CE. 1999. A program to increase the number of family physicians in rural and underserved areas: impact after 22 years. *JAMA* 281:255–60
75. Randall T. 1994. *Reaching Rural Telemedicine: Is It Part of the Cure? Can It Bridge the Distance Barrier?* Off. Rural Health Policy, Health Resour. Serv. Admin., US Dep. Health Hum. Serv., Rockville, MD
76. Reif S, DesHarnais S, Bernard S. 1999. Community perceptions of the effects of rural hospital closure on access to care. *J. Rural Health* 15:205–12
77. Reif S, Ricketts TC. 1999. The Medicare Critical Access Hospital Program: the first year. *J. Rural Health* 15:61–66
78. Ricketts TC. 1998. *Mapping Rural Health*,

pp. 14–18, 27–40. Chapel Hill, NC: Rural Health Res. Program, Cecil G. Sheps Cent. Health Serv. Res., Univ. NC, Chapel Hill
79. Ricketts TC, Johnson-Webb KD, Randolph R. 1999. Populations and places in rural America. See Ref. 17, pp. 1–19
80. Roberts LW, Battaglia J, Smithpeter M, Epstein RS. 1999. An office on Main Street: health care dilemmas in small communities. *Hastings Cent. Rep.* 29:28–37
81. Robillard HM, High DM, Sebastian JG, Pisaneschi JI, Perritt LJ, et al. 1989. Ethical issues in primary health care: a survey of practitioners' perceptions. *J. Community Health* 14:9–17
82. Rosenbach ML, Dayhoff DA. 1995. Access to care in rural America: impact of hospital closures. *Health Care Financ. Rev.* 17:15–37
83. Rosenblatt RA, Saunders G, Shreffler J, Pirani MJ, Larson EH, et al. 1996. Beyond retention: National Health Service Corps participation and subsequent practice locations of a cohort of rural family physicians. *J. Am. Board Fam. Pract.* 9:23–30
84. Rural Policy Research Institute. 1994. *Anticipated Impacts of the Health Security Act (HR 3600) on the Rural Health Delivery System*, pp. 2–6. Univ. Mo.: Columbia, MO
85. Rural Policy Research Institute. 1994. *The Rural Perspective on National Health Reform Legislation. Addressing the Critical Rural Issues*, pp. 12–15. Univ. Mo.: Columbia, MO
86. Sanborn MD, Scott EA. 1998. Environmental health concerns in urban and rural family practice [see comments]. *Can. Fam. Physician* 44:1466–72
87. Schlenker RE, Hittle DF, Hrincevish CA, Kachny MM. 1996. Volume/outcome relationships in small rural hospitals. *J. Rural Health* 12:395–409
88. Schoenman JA. 1999. Impact of the BBA on Medicare HMO payments for rural areas. *Health Aff.* 18:244–54
89. Schreffler MJ, Capalbo SM, Flaherty RJ, Heggem C. 1999. Community decision-making about critical access hospitals: lessons learned from Montana's medical assistance facility program. *J. Rural Health* 15:182–90
90. Schur CL, Franco SJ. 1999. Access to Health Care. See Ref. 17, pp. 25–37
91. Scott L. 1994. Will healthcare accept the 'virtual' doctor? Maybe, but telemedicine's cost-effectiveness remains in question. *Mod. Healthc.* 48:34–41
92. Shortell S, Gillies R, Devers K. 1995. Reinventing the American hospital. *Milbank Mem. Fund Q.* 73:131–59
93. Shortell SM, Gillies RR, Anderson DA, Mitchell JB, Morgan KL. 1993. Creating organized delivery systems: the barriers and facilitators. *Hosp. Health Serv. Admin.* 38:447–66
94. Slifkin R, Silberman P, Reif S. 1999. *The Effect of Market Reforms on Rural Public Health Departments.* Chapel Hill, NC: NC Rural Health Res. Policy Anal. Program, Cecil G. Sheps Cent. Health Serv. Res., Univ. NC, Chapel Hill
95. Slifkin RT, Hoag SD, Silberman P, Felt-Lisk S, Popkin B. 1998. Medicaid managed care programs in rural areas: a fifty-state overview. *Health Aff.* 17:217– 27
96. Starfield B. 1997. The future of primary care in a managed care era. *Int. J. Health Serv.* 27:687–96
97. Steiner BD, Pathman DE, Jones B, Williams ES, Riggins T. 1999. Primary care physicians' training and their community involvement. *Fam. Med.* 31:257–62
98. Succi MJ, Lee S-YD, Alexander JA. 1997. Effects of market position and competition on rural hospital closures. *Health Serv. Res.* 31:679–99
99. Turner LN, Marquis K, Burman ME. 1996. Rural nurse practitioners: perceptions of ethical dilemmas. *J. Acad. Nurse Pract.* 8:269–74
100. Ullom-Minnich PD, Kallail KJ. 1993.

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Physicians' strategies for safeguarding confidentiality: the influence of community and practice characteristics. *J. Fam. Pract.* 37:445–48

101. Vistnes JP, Zuvekas SH. 1999. *Health Insurance States of the Civilian Noninstitutionalized Population: 1997.* Agency Health Care Policy Res., Rockville, MD
102. Wall S. 1998. Transformations in public health systems. *Health Aff.* 17:64–80
103. Weinert C, Long LA. 1987. Understanding the health care needs of rural families. *Fam. Relat.* 36:450–55
104. Wellever A. 1999. Rural Health Care Networks. See Ref. 17, pp. 119–33
105. Williams J, Higgins D, Furbee P, Prescott J. 1997. Work-related injuries in a rural emergency department population. *Acad. Emerg. Med.* 4:277–81
106. Wright G, Felt S, Wellever A, Lake T, Sweetland S. 1995. *Limited Service Hospital Pioneers: Challenges and Successes of the Essential Access Community Hospital/Rural Primary Care Hospital (EACH-RPCH) Program and Medical Assistance Facility (MAF) Demonstration.* Math. Policy Res., Washington, DC
107. Yawn BP. 1999. *Telemedicine: A New Framework for Quality Assessment.* Rural Health Res. Cent., Univ. Minn., Minneapolis
108. Yawn BP, Casey M, Hebert P. 1999. The rural health care workforce implications of practice guideline implementation. *Med. Care* 37:259–69
109. Zuckerman H, Kaluzny A, Ricketts TC. 1995. Strategic alliances: A worldwide phenomenon comes to health care. In *Partners for the Dance: Forming Strategic Alliances in Health Care*, ed. A Kaluzny, H Zuckerman, TC Ricketts, pp. 1–18. Ann Arbor, MI: Health Admin. Press

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