
Rural Health and Telepharmacy: Public Health Challenges and Opportunities

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OBJECTIVES

1. Compare the three most common definitions of "rural" used by various government agencies.
2. Describe the typical demographics of residents living in rural areas within the United States.
3. Review the goals and priorities of Healthy People 2010 and Rural Healthy People 2010 (RHP2010).
4. Identify health care disparities that exist between urban and rural areas.
5. Define unhealthy behaviors and other factors common to rural residents that increase their risk of poor health and disease.
6. Describe health care challenges common in rural communities and specific features of rural pharmacy practice.
7. Identify alternative health care delivery approaches for serving medically underserved rural communities.
8. Explain the telepharmacy processes for delivering pharmacy services to remote rural communities in North Dakota and Alaska.
9. Discuss the importance of educating and training health professionals to address the health care needs of rural residents.
10. Identify RHP2010 community-based strategies and interventions being implemented to address rural health disparities and concerns.

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*Rural communities face unique [health care] challenges.
There is no one-size-fits-all approach.*

—U.S. DEPARTMENT OF HEALTH AND
HUMAN SERVICES SECRETARY
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More than 24 definitions are currently used by federal agencies to define a rural environment.¹ The many definitions have been developed by various agencies for different purposes; all have their value and limitations. Definitions of “rural” are used by the federal government in determining grant funding, by policy makers in implementing programs or laws, and by researchers and government agencies in conducting studies comparing population density, urbanization, employment, social and economic variables, age, ethnicity, and health care across various geographic regions of the United States.² Three federal agencies whose definitions are most often used are the U.S. Census Bureau, the Office of Management and Budget, and the U.S. Department of Agriculture (USDA) Economic Research Service (Sidebar 17-1).³⁻⁹ For purposes of this chapter, we will use the U.S. Census Bureau definition of rural: communities with fewer than 2500 people.

Other definitions frequently encountered in discussions of rural health include terms such as frontier, health professional shortage area, medically underserved area, central place, census area, census block, initial core, incorporated, and unincorporated.² A frontier is an isolated area that has a population of no more than six people per square mile.¹⁰ Counties are often classified using this terminology. A health professional shortage area is defined by the U.S. Department of Health and Human Services, on the basis of criteria established by the U.S. Public Health Service, as a geographic area that has shortages of health professionals, including primary medical care, dental, or mental health providers.¹¹ Medically underserved area and medically underserved population are defined by the federal government on the basis of four criteria: (1) ratio of primary care physicians per 1000 population, (2) infant mortality rate, (3) percentage of the population with incomes below the poverty level, and (4) percentage of the population 65 years of age or older.²

Demographics

According to the Census Bureau’s definition and 2000 census data, 59.1 million people (21% of the U.S. population) and 97% of the land area in the United States were considered rural.^{1,4,5} Of the rural population, slightly less than half (49%) lived in nonmetro counties (17% of the total U.S. population). More rural residents currently live in metro areas than in nonmetro areas (30 million versus 29 million).⁴ Populations in metropolitan and non-metropolitan areas increased by 14% and 10%, respectively, from 1990 to 2000.¹² Despite a trend over the years of population migration from rural to urban areas in the United States, the number of residents living in rural areas has continued to grow and is currently greater than it has ever been.^{13,14} From 1990 to 2000, 70% of U.S. rural counties increased in population.¹² The population density of the United States is 79.6 people per square mile, compared with 9.3 per square mile in North Dakota and 1.1 per square mile in Alaska. In North Dakota, 68% of the 53 counties are frontier (no more than 6 people per square mile), compared with 25.1% of U.S. counties.¹²

Sidebar 17-1 Definitions of Urban and Rural

The Census Bureau defines urban areas on the basis of population density. The definition of urban area includes a central city (central place) and the densely populated surrounding area (densely settled territory) and ignores county classifications or boundaries.³ One urban area, therefore, may contain several counties. An urban area must have a core population density of 1000 people per square mile and may contain adjacent areas with a minimum of 500 residents per square mile.⁴ Two types of urban areas are defined by the Census Bureau, *urbanized area* and *urban cluster*. An urbanized area is defined as an urban area with a population of 50,000 or more people. An urban cluster is an urban area with fewer than 50,000 but more than 2,500 people.^{1,4,5} The Census Bureau defines rural areas as all territories outside of urban areas or, by default, open country and settlements with fewer than 2,500 people;^{1,4} this is the official federal definition most often used for statistical purposes.

The Office of Management and Budget (OMB) defines areas in terms of their metropolitan status, or Metropolitan Statistical Area (MSA). Metropolitan (metro) or non-metropolitan (nonmetro) designation is determined by county.⁴ Economic researchers most often use areas designated as nonmetro in assessing rural population, employment, and income. A metro area is defined as one or more counties that have a core urban area of 50,000 or greater population, together with any adjoining counties that are strongly socially and economically integrated with the core urban counties, as measured by the number of people commuting to work.⁵ All counties outside metro areas are considered nonmetro counties. During the 2000 census, OMB replaced the MSA nomenclature with Core-Based Statistical Areas (CBSAs).^{6,7} In general, the terms "urban" and "rural" are frequently used synonymously with the terms "metropolitan" and "nonmetropolitan."

In 2003, the USDA Economic Research Service (USDA-ERS) established an alternative to OMB's definitions: Rural-Urban Commuting Area Codes (RUCAs) that use census tracts instead of counties.^{5,8} This classification scheme has 10 primary and 30 secondary codes. Code 10 is generally used for rural areas in this scheme based on commuting flow of the population.⁸ This code system allows for greater flexibility (from greater to lesser specificity, depending on preference) and a wide variety of definitions of urban versus rural depending on the code combinations used by researchers. Although fairly new, the RUCA codes have been widely adopted by researchers and policy makers alike, especially for rural health use. Urban Influence Codes (UICs) and Rural-Urban Continuum Codes (RUCCs) have also been developed and used by USDA-ERS in order to enhance characterization of rural areas.^{6,9}

The age of the population tends to increase as one moves from metro to nonmetro or urban to rural environments. An estimated 15–20% of individuals age 65 or older live in rural areas.^{15,16} U.S. population growth is expected to slow between now and 2050; however, the number of elderly is expected to continue to increase.¹⁷ With the large baby boom population aging, by 2030 individuals age 65–74 will increase as a percentage of the total population from 6% to 10%. Those 75 and older are expected to make up 9% of the total population by 2030 and 12% by 2050.¹⁷ The fastest-growing sector of the U.S. population is persons 85 and older.¹² Across the nation, the number of people 19 years of age and younger increased by 1.3% between 2000 and 2004, while the number age 85 years and older increased by

14.6%. In North Dakota during that same period, the number of people 85 and older increased by 11.5% and the number 19 and younger declined by 13%. Rural areas are seeing a trend of decline in younger residents and increase in elderly residents as a percentage of the total population.¹²

Increasingly, rural residents are migrating to urban areas. In North Dakota between 1950 and 2000, the percentage of the population living in rural areas decreased from 73% to 45%, while population in the urban sector increased from 26% to 54%. It is estimated that by 2020, North Dakota's population will be 59% urban and 41% rural.¹²

Common characteristics of rural populations include the following:^{15,16}

- The proportion of elderly residents is higher than in metro counties.
- A higher proportion of elderly residents in rural counties are women.
- Educational attainment is generally lower among rural residents (less post-high school education).
- A greater proportion of near-rural and rural residents are poor or near poor (i.e., income less than 125% of the poverty line).
- Residents in rural counties are more likely to have fair or poor health.
- Rural residents are more likely to have limitations of activity due to chronic health conditions.
- Near-rural counties have higher percentages of uninsured residents.
- Rural residents have fewer ambulatory care visits than residents of more urban places.
- The frequency of dental visits is lower for elderly rural residents.

The 2000 census showed that racial and ethnic minorities made up approximately 17% of the population in rural areas.¹⁴ The largest racial and ethnic groups in rural areas include non-white Hispanics, African Americans, and American Indian or Alaska Natives, with African Americans predominant in the South, Hispanics in the West, and American Indians in the West/Southwest.¹⁶ Because of the need for farm labor, the fastest-growing ethnic group in rural America is the Hispanic population; 25% of the growth in nonmetro areas has been attributed to Hispanic people. From 1990 to 2000, the Hispanic rural population increased by more than 70%, with all racial and ethnic groups increasing by 30%.¹⁴

Rural Health Problems and Priorities

Three-fourths (75%) of counties in the United States are designated as nonmetro, but they contain only about 20% of the U.S. population.¹⁴ Geographic, economic, environmental, and social factors as well as age, gender, and ethnicity can influence the overall health needs, access to health care, and quality of health care of rural residents. Rural dwellers are more likely to be older, female, less educated, poor, uninsured, sedentary, obese, and involved in alcohol and other substance abuse, and to smoke, lack a health care provider, lack easy access to health care, not pursue preventive care, have untreated and uncontrolled chronic health conditions, and have increased risk of dying from accidental injuries (Table 17-1).^{14,16,18-21}

Demographic, geographic, and cultural factors in rural areas often present barriers to residents seeking care as well as barriers to health providers delivering care, placing rural residents and rural communities at risk for poor health and limited sources of care. Rural health disparities in various regions of the United States are described in the Urban and Rural Health Chartbook (2001).¹⁶ Table 17-2 lists problems and priorities identified by national

TABLE 17-1 Health-Related Factors in Metro versus Nonmetro Areas

Factor	Percentage of Population	
	Metro ^a	Nonmetro ^b
Age > 65 yr	11.8	15.3
Poverty	9.1	16
Uninsured	12.2	21
Obesity	17.7	22.7
Smoking	21.6	28.5
Physical inactivity	30.9	46.3
Injury death rates	29.1	54.1

^aMetro = Metropolitan counties (large fringe).

^bNonmetro = Nonmetropolitan counties (without a city $\geq 10,000$ population).

Source: Reference 16.

TABLE 17-2 Rural Health Priorities Identified by National and State Health Experts

Priority Area ^a	% Respondents Identifying Priority Area (<i>n</i> = 44)
Access to health care (including one or more of the following)	73
Access to emergency medical services	32
Access to health workforce	29
Access to health services (general)	29
Access to health insurance	26
Access to primary care	24
Mental health	49
Oral health	41
Educational and community-based programs	29
Diabetes	26
Injury and violence prevention	26
Nutrition and overweight	21
Public health infrastructure	21
Tobacco	21
Maternal, infant, and child health	18
Occupational safety and health	18
Cancer	15
Environmental health	15
Heart disease and stroke	15

^aItem identified by at least 15% of respondents.

Source: Reference 18.

and state rural health experts, including state rural health organizations, local rural public health agencies, rural health clinics and community health centers, and rural hospitals.¹⁸

The U.S. Department of Health and Human Services Department (HHS) Healthy People 2010 (HP2010) initiative identifies 467 objectives for improving the nation's overall health within 28 focus areas.²² The objectives are intended to set priorities and suggest actions by national, state, and local governments and by health care providers and community-based agencies nationwide. The overall goals of HP2010 are to increase the quality of life and life expectancy of Americans and to eliminate health disparities among different segments of the population.²² Healthy People 2020 (HP2020) is currently under development by HHS.²³ It will focus on major risks to health and wellness, changing public health priorities, and emerging issues pertinent to preparedness and prevention. The vision, mission, goals, and focus areas of HP2020 were to be released in 2009, and the HP2020 objectives will be released in 2010, along with guidelines for achieving the newly revised 10-year targets.²³

Lack of Coverage and Access

Access to quality care—including access to insurance, primary care, and emergency medical services—in rural areas is the top concern of rural health care experts.^{18,24–26}

Health Insurance

In 2007, there were 45.7 million Americans without health insurance.²⁷ Health insurance coverage is considered a leading indicator of access to care and a reliable predictor of overall health status.^{18,28} Health insurance coverage is an important determinant of health and disability status and of likely pursuit of physicians' care, preventive services, and overall health care.¹⁸ Residents in nonmetropolitan areas have a greater likelihood of being uninsured than residents living in metropolitan areas (20% versus 17%). Health insurance status affects rural residents' timely access to health care services, including emergency medical services. Uninsured rural residents are less likely to have a regular source of care, obtain preventive care services (e.g., cancer screening; dental, prenatal, and diabetes care), obtain necessary tests, and use prescription drugs.¹⁸ Because uninsured rural residents are likely to delay seeking care, their chronic health conditions tend to be more serious when they do seek care and the associated morbidity and mortality can be higher.^{18,29} With the higher rate of uninsured in rural counties than in urban counties, it is not surprising that more residents living in rural areas than urban areas report fair to poor health, no visit to a health professional in the past year, and less confidence in getting needed services.¹⁸

Hispanics (36%) and African Americans (21%) are more likely to be uninsured than whites (14%). Among the most likely to be uninsured are young adults age 19–24 years (32%) and those separated from their spouse (33%).¹⁸ Approximately 12% of all children in the United States (8.5 million) are uninsured.³⁰ Residents working in rural areas are less likely to have access to insurance because of their jobs (e.g., smaller businesses may not offer employer-sponsored insurance). Higher poverty rates and overall lower wages in rural areas contribute to the problem of lack of health insurance among rural residents.¹⁸

Primary Care

National and state rural health experts list access to the health care workforce, access to health services, and access to primary care as major concerns (Table 17-2).¹⁸ Timely access to primary care is a critical factor in avoiding preventable hospitalizations and effectively managing treatment of chronic health conditions. Recruitment and retention of primary care providers is a major focus of state rural health officers.¹⁸

TABLE 17-3 Number of Physicians per 100,000 People

Physician Specialty	Urban	Rural
General/family practice	28.1	26.1
Pediatricians	17.5	5.2
General internists	35.4	11.8
OB/GYN specialists	13.7	5.1
Other specialties	134.1	40.1

Source: Reference 25.

Even though 20–25% of the U.S. population (and 75% of U.S. counties) are in rural areas, only about 10% of practicing physicians provide services to rural/nonmetro areas.^{18,31,32} The imbalance of physicians between urban and rural areas is particularly evident with regard to medical specialists (Table 17-3).^{24,25} The federal government designates areas with a shortage of primary medical, dental, or mental health providers as health professional shortage areas.³³ The Health Resources and Services Administration (HRSA) uses a ratio of one primary care physician per 3500 population (3500:1) in defining a primary medical care shortage area.^{32–34} As of September 30, 2008, there were 6033 areas with shortages of primary care physicians, 4048 with dental care shortages, and 3059 with mental health care shortages.³³ There are 64 million people living in the primary care physician shortage areas; an additional 16,336 primary care physician practitioners would be needed to achieve HRSA's recommended primary care practitioner ratio of 2000:1.³³ Approximately 15% of the adult population in the U.S. has no designated or preferred doctor's office, clinic, or other location at which to routinely receive care.^{18,25}

Because of the lack of physicians in many rural locations, nonphysician primary care providers (NPPCPs) are relied upon for primary care services. Because NPPCPs can meet most primary care needs of most rural patients and do not demand the high salary of a physician, they are a reasonable and affordable solution for many rural communities. Slightly more NPPCPs practice in rural areas than in urban areas (Table 17-4).³⁵ Interest in urban practice is increasing, possibly because of more attractive jobs, higher salaries, and reduced work hours than in rural locations.³⁶ It remains to be determined whether NPPCPs will significantly improve access to primary medical care for underserved rural communities or if, like physicians, they will be lured to specialty practices in larger urban locations.

Nationwide shortages of other health professionals cause additional difficulty for rural areas that need to recruit and retain workers to deliver essential services. By 2014, 400,000 new nurses will need to be recruited in order to replace nurses currently in the workforce

TABLE 17-4 Number of Nonphysician Primary Care Providers per 100,000 People

Nonphysician Providers	Total Number	Urban	Rural
Nurse practitioners	55,730	20.08	24.72
Physician assistants	31,084	11.66	11.91
Certified nurse midwives	5,337	1.90	2.47

Source: Reference 36.

who are over age 55 and near retirement.³⁷ In addition, an increase of 1.2 million nurses will be needed to meet the nursing care needs of the nation.³⁷ The number of pharmacists in 2020 is estimated at 304,986, compared with 236,227 in 2007.³⁸ Given pharmacists' expanded roles beyond dispensing, 420,000 pharmacists may be needed by 2020.³⁹ A National Pharmacy Manpower Project report in 2002 predicted 157,000 additional pharmacist positions needing to be filled by 2020.⁴⁰

With the aging baby boom population demanding and consuming more health care services, and with projected shortages of health care professionals, access to primary care services in rural areas will likely continue to be a major challenge. Innovative solutions will be needed to adequately address the health care needs of rural America. The new models of health care delivery will need to be accessible and affordable while meeting quality standards. Models may need to be custom designed according to the geographic and demographic characteristics of the rural community (i.e., communities of 2500 people or fewer that are remotely isolated, have few resources, and contain minimal infrastructure will likely need a care delivery system that is structured differently than one for a larger nonmetro community or urban population).

Emergency Medical Services

Large disparities in access to emergency medical services (EMS) exist between rural and urban communities.^{25,41} Rural areas may be geographically isolated from these services, lack adequate health care facilities and highly skilled professionals (including first responders) to deliver emergency services, and lack the financial resources to develop and sustain such services. Many small communities in remote rural areas do not have a hospital.

Although accidents and injuries occur with similar frequency in rural and urban areas, injuries in rural areas are often more serious and life-threatening.^{16,25} Rural residents are at greater risk for serious injuries and death due to unintentional injuries.^{16,25}

A major reason for higher morbidity and mortality from unintentional injuries in rural areas is delay in discovery and response times.²⁵ Significant disparities exist between rural and urban areas in average response times to fatal car accidents; the times elapsed between the crash and notification of emergency personnel, between notification and arrival of emergency personnel, and between arrival at the accident scene and arrival at a hospital all are longer in rural areas (Table 17-5).²⁵ Average response times in the United States from the time of the car crash to emergency personnel arrival was 18 minutes for rural locations versus only 10 minutes for urban areas. In addition, death risks were found to be seven times higher for victims in rural areas if the emergency response time was longer than 30 minutes.²⁵ The elapsed time between the initial call and treatment of the patient in the hospital is often critical to the overall outcome and survival of the accident victim. Because of the great travel times and distances in rural areas, rural residents are at higher risk for death from unintentional injuries (Sidebar 17-2).⁴²⁻⁴⁵

TABLE 17-5 Ambulance Response Time in Urban versus Rural Areas

Response Time (Minutes)	Urban	Rural
Crash to notify	3.51	6.96
Notify to arrival	6.09	11.32
Arrival to hospital	26.21	35.96

Source: Reference 25.

Sidebar 17-2 Golden Hour and Platinum 10 Minutes

Rapid discovery, stabilization, and emergency treatment of trauma victims is crucial for lowering morbidity and mortality. Dr. R. Adams Cowley, a military surgeon, coined the term "golden hour" on the basis of World War I data demonstrating that if soldiers suffering from massive battle trauma received adequate shock treatment within 1 hour, their chances of survival were significantly higher (Table 17-6).⁴²⁻⁴⁴ The golden hour is a widely accepted concept in emergency medical services, emphasizing the importance of transporting a trauma victim to an established medical facility as quickly as possible. The hour following major traumatic injury is believed to often determine life or death of the trauma victim. The first 10 minutes of care by emergency medical technicians (EMTs) or paramedics at the trauma scene are also of critical importance for survival of the trauma victim. Without proper stabilization within that time, the patient's chances of survival are believed to be lower. This 10-minute time period, commonly referred to as the "platinum 10," is a major focus of EMT and paramedic training.⁴⁵

Health Behaviors and Risk Factors

Certain problems and conditions prevalent in rural populations are of particular concern to rural health experts¹⁸ and are briefly discussed in this section. Additional concerns exist regarding mental, oral, maternal, infant, and child health and other areas that are not addressed in this chapter.

Several factors increase rural residents' risk for poor health (Table 17-7).^{14,16,18,25} In general, rural residents are older, have less education, and are poorer. The population shift, particularly of young people, from rural to urban communities has left an isolated and increasingly elderly rural population.¹⁴ Communities have struggled to maintain their population base, especially younger working families (taxpaying citizens). Loss of people results in loss of revenue, which results in loss of community businesses (e.g., pharmacy, grocery store, hardware store), which results in loss of essential services needed to attract new families to the community. The loss of tax revenue produces a lack of available

TABLE 17-6 The Golden Hour Concept^{43,44}

Hours from Injury to Treatment	Mortality Rate (%)
1	10
2	11
3	12
4	33
5	36
6	41
8	75
10	75

Source: References 43 and 44.

TABLE 17-7 Factors Negatively Affecting Rural Residents' Health***Rural Residents Are More Likely to***

Lack consistent primary health care
 Have sedentary lifestyles and obesity
 Have poor dietary habits
 Have higher fat and calorie consumption
 Smoke tobacco and use smokeless tobacco
 Have higher alcohol use
 Suffer death from unintentional injuries
 Suffer death from motor vehicle injuries
 Commit suicide
 Suffer limitation in activity due to chronic health conditions

Rural Residents Are Less Likely to

Use seat belts
 Utilize health prevention screening services

Source: References 14, 16, and 18.

resources to support needed health care services (i.e., ambulance services, hospital, clinic, nursing home, pharmacy). The lack of access to health care facilities, professionals, and services may require rural residents (including elderly and seriously ill patients) to either go without care or travel great distances to receive care. Pharmacy and hospital closings, long travel distances for physician services, and a lack of choice of providers have been reported.⁴⁶ In addition, despite a large proportion of elderly residents in rural areas, Medicare spends less on rural elderly beneficiaries than on urban elderly residents.^{14,16} This disparity contributes to underfunding of rural hospitals, especially since rural hospitals are required to provide many of the same services as metro hospitals. Disparities also exist between rural and urban residents in regard to the percentage of Medicare patients who lack any prescription drug benefit (46% rural versus 31% urban).⁴⁷ All of these factors contribute to rural residents' increased risk for poor health.

Rural areas will continue to have more older people with more chronic health conditions, consuming more medications, requiring more monitoring, and needing more long-term care services such as nursing homes, assisted living, home health care, hospice, and home and community-based services.²⁶ The health care system will be challenged to find ways to deliver cost-effective services to residents in rural areas that often have declining populations, increasing isolation, and limited financial resources to support even basic health care services.

Cancer

Although cancer mortality rates are similar between rural and urban areas, rural residents are at greater risk of delayed diagnosis and more advanced cancer at initial diagnosis.^{25,48} Rural residents are likely to have less access to cancer diagnostic, screening, and prevention services. Late diagnosis often makes treatment less effective and results in poorer overall outcomes.⁴⁹

Diabetes

Diabetes mellitus is two to five times more prevalent in African Americans, Hispanics, American Indian or Alaska Natives, Pacific Islanders, and Asians than in other populations.^{25,50} The risk for type 2 diabetes progressively increases with age up to age 70 and is slightly greater in women than men.^{25,51} Up to 25–50% of elderly residents in higher-risk minority populations are likely to have diabetes.

Diabetes is closely associated with risk factors and unhealthy lifestyles prevalent in rural areas, including obesity, poor diet and nutrition (excessive fat and carbohydrate intake), physical inactivity (lack of exercise), and heavy alcohol use.²⁵ With rural populations becoming older and increasingly diverse (i.e., more minorities), diabetes (with its associated complications) is expected to continue to be a major health concern for rural residents. Diabetes screening and prevention programs are particularly important in rural communities with limited access to health care services.

Heart Disease and Stroke

Smoking, high fat diets, excessive alcohol use, and sedentary lifestyle put rural residents at considerable risk for heart disease and stroke.²⁵ Furthermore, attitudes, perceptions, and lack of education about their health and their risk of heart disease and stroke, as well as perceptions of health care providers, may prevent rural residents from seeking care. Elderly rural residents are less likely to pursue preventive screening programs because of a perceived lower risk of heart disease,²⁵ and screening programs may not even be available.²⁷ In addition, residents of rural communities do not have access to as many services for heart and stroke patients, such as rehabilitation services, dietitians, occupational and physical therapists, exercise specialists, and social workers, as are available in urban areas. Lack of motivation to seek and complete these services may also be a factor. In one study, only 28% of rural cardiac patients attended a formal cardiac rehabilitation program and only 17% of these participants actually finished the program.⁵³

Obesity

Because of unhealthy behaviors and lifestyles, obesity is more prevalent in rural areas than in urban locations.²⁵ Obesity or excessive weight is among the 10 leading health indicators (Table 17-8).²⁸ In obese persons, the risk of all-cause mortality is 1.5 times and the risk of mortality from coronary heart disease is two times as great as in non-obese persons.^{25,54} Obesity increases the risk of hypertension, stroke, heart disease, gallbladder disease, and a variety of cancers.⁵⁵ Excessive weight is also associated with psychological disturbances, incontinence, pregnancy difficulties, irregular menstruation, glucose intolerance, type 2 diabetes, and high cholesterol.^{25,55} The higher rates of chronic diseases in rural residents are likely associated with

TABLE 17-8 Healthy People 2010: Ten Leading Health Indicators

Physical activity	Mental health
Overweight and obesity	Injury and violence
Tobacco use	Environmental quality
Substance abuse	Immunization
Responsible sexual behavior	Access to health care

Source: Reference 28.

the greater prevalence of obesity in rural areas. Causes of obesity and excessive weight in rural residents include higher fat and calorie intake, lack of diet and nutrition education, limited access to dietitians and nutritionist specialists, lower frequency of exercise, and fewer physical education classes and exercise facilities.²⁵ In general, rural residents are older, have less education, and are poorer; individuals with these characteristics are also more likely to be obese.²⁵ Efforts to combat obesity should be aimed at individual behavior change, healthy dietary choices (lowering fat and calorie consumption), and regular physical activity.

Use of Alcohol, Tobacco, and Other Drugs

The use of alcohol, tobacco, and other drugs contributes significantly to morbidity and mortality in rural residents.^{25,28,56-59} Rural dwellers are at high risk for health problems and injuries linked to the abuse of alcohol and other drugs by virtue of their unhealthy lifestyles, heavy reliance on transportation and the need to travel great distances, dangerous rural roads, working in injury-prone jobs with heavy machinery, and limited access to education, counseling, and treatment facilities. "Non-metro" youth (age 12-17) have been shown to be more likely than metro youth to abuse alcohol or illicit drugs (9.6% versus 8.7%, respectively), to engage in binge drinking (12% versus 8.6%), to perceive the risk of alcohol use to be low (45.6% versus 36.9%), and to have used alcohol or an illicit substance in the past month (60.7% versus 52.6%).^{19,20}

Rural Pharmacy Practice

A retail pharmacy in a community of 2500 people or fewer is almost always a full-service pharmacy—one that provides prescription medications, health and beauty aids, and gifts, greeting cards, and other items needed by the rural community. The pharmacist typically serves as the consultant to the local nursing home. The community pharmacist also is usually the pharmacist in charge at the local hospital, under contract as a consultant. The rural community pharmacy may provide prescription medications directly to the hospital or swing-bed patients or may serve the hospital through its own on-site pharmacy. If there is a clinic in the local community separate from the hospital, the pharmacist will also serve as a drug information resource for nurse practitioners, physician assistants, or physicians who practice in that clinic and who may be rotating through the community from a larger medical center.

The hospital in a rural community of 2500 people or fewer is almost always a federally qualified critical-access hospital. This means that the hospital has no more than 25 beds, provides most of its coverage with midlevel practitioners, and typically has swing-bed patients who are on their way from acute care to a nursing home as soon as a bed is available there.⁶⁰ A critical-access hospital rarely has the resources to retain its own full-time hospital pharmacist. Therefore, the community pharmacist makes arrangements for or provides all of the pharmacy services needed by the hospital. Critical-access hospitals may be in communities with up to 15,000 people; even then, they will not have 24-hour, 7-day pharmacist coverage. A few hospitals in midsized communities may have one full-time pharmacist, but pharmacist staffing is usually limited to 5-day coverage, 8 hours per day.

Not all rural hospitals with fewer than 25 beds are critical-access hospitals. The Indian Health Service (IHS) provides opportunities for pharmacists to practice in a rural setting in a network of 48 hospitals, more than 230 clinics, and a system of tribal and urban programs.⁶¹ The Office of Rural Health Policy administers a Small Rural Hospital Improvement grant program for hospitals with 49 beds or fewer to help with costs related to implementing a prospective payment system, complying with Health Insurance Portability

and Accountability Act regulations, reducing medical errors, and support for quality improvement projects.⁶²

In a rural community, the pharmacist must not only have expertise in community pharmacy but must also be able to direct the operations of a small rural hospital pharmacy. Hospital responsibilities may include participating in the pharmacy and therapeutics committee, being available for consultation with nurses and other practitioners, and receiving faxed copies of hospital chart orders at the community pharmacy to review profiles and then provide medications. The consultant pharmacist may visit the hospital pharmacy on a daily basis to personally prepare patient-specific medications there or to check and approve medications previously prepared by a pharmacy technician before releasing them for administration to the patient. The use of telepharmacy technology helps pharmacists provide services to nursing homes and small rural hospitals. Consultant pharmacy services for a nursing home may be contracted with a traveling pharmacist consultant, but often they are provided by the community pharmacist from the local pharmacy.

The shortage of pharmacists and other health care professionals puts increased demands on practitioners in rural communities. Because of this shortage, the role of the pharmacy technician takes on increased importance. The pharmacist depends on the technician to prepare a prescription for dispensing so the pharmacist can devote more time to medication therapy management and patient counseling.

A rural pharmacy practice provides the opportunity for a close relationship with prescribing practitioners, patients, and community organizations. Rural pharmacists have the advantage of knowing most of the area physicians, midlevel practitioners, dentists, veterinarians, and patients personally and perhaps joining them in non-work-related activities. Involvement in community organizations will provide opportunities for speaking and other educational activities related to public health and wellness. Rural pharmacists can engage in public health activities with senior centers, local churches, service clubs, and other community groups. Schools in a small community may not be able to afford a school nurse; they may rely on the pharmacist as a consultant to educate staff on how to properly administer medications to students during the school day.

Medication therapy management and management of specific diseases provide additional opportunities for the rural pharmacist's involvement in public health. The Asheville Project, which began with pharmacist management of patients' diabetes, demonstrated the impact pharmacists can have on patients' health outcomes.⁶³ In July 2008, North Dakota began a statewide program to pay practicing pharmacists for providing disease management services to patients with diabetes in the state's public employees retirement system.⁶⁴ Statewide, 82 pharmacies are participating. This program allows eligible patients to sign up with a pharmacy of their choice and then visit that pharmacy on a regularly scheduled basis to review their medication therapy, establish specific goals for their diet and exercise, measure and monitor their A1c levels, and receive reinforcement from the pharmacist to continue their successful diabetes self-management. The North Dakota Pharmacists Association is assessing the program's impact on patient satisfaction, outcomes, and health care costs and will publish the results. This statewide network of trained pharmacists will soon implement programs for helping patients in rural communities to manage other diseases. The rural pharmacist can spend 20–30 minutes with a diabetes patient only if competent pharmacy technicians are available to prepare medications for the pharmacist to dispense to and discuss with the next patient when the diabetes patient's appointment has ended.

Pharmacists in rural communities can also contribute to public health through involvement in immunizations. Public health nurses often rotate through rural communities and provide immunizations periodically. The rural pharmacist, being a permanent health care

provider in the community, can provide these immunizations when patients are picking up their prescriptions or other merchandise. Electronic capabilities for billing the patient's third-party insurance carrier or Medicaid or Medicare make this a cost-effective and efficient service. The rural pharmacist can have a significant impact on the community's overall health by increasing immunization rates.

Telehealth as an Alternative Approach to Health Care Delivery

Telehealth is the use of telecommunications and electronic information systems to deliver care to distant populations often living in medically underserved rural communities or those having problems accessing health care professionals and health care services.⁶⁵ The terms telehealth and telemedicine are often used interchangeably, but telemedicine more specifically describes the delivery of clinical services or clinical care to patients by a physician or other health care provider, whereas telehealth broadly describes all health-related use of technology including clinical care, health care education to professionals and patients, public health, research, and administration.⁶⁶ Areas in which telemedicine has been used include cardiology; dermatology; ear, nose, and throat; burns; speech therapy; plastic surgery; disease management; electronic medical records for rural health systems; HIV/AIDS; home care; mental health; pharmacy; rehabilitation; school-based services; and trauma and emergency care.⁶⁷ Telehealth services are being provided for all types of patients, including infant, elderly, uninsured, low income, minority, medically underserved, and high-risk patients and those who need the services of a medical specialist available only in urban areas. Telehealth services are used in a variety of settings including hospitals, medical clinics, nursing homes, pharmacies, assisted-living facilities, schools, prisons, health departments, and even patients' homes.⁶⁷ For example, a cardiology specialist may review a patient's electrocardiogram recorded at a remote rural facility. Through telemedicine, specialists' services can be made available to the local physician or midlevel practitioner in a rural area when the patient would otherwise have to travel a great distance for specialized services. Radiologists often provide services to rural communities by reading electronically transmitted x-rays or scans over long distances. Surgeries have been performed robotically by a specialist at a distant facility using telemedicine technology.

Telepharmacy

Telepharmacy is an effective way of providing services to remote medically underserved rural communities.⁶⁸⁻⁷⁰ It has been used to restore, retain, and establish pharmacy services in rural communities where access to pharmacists and pharmacy services is limited or non-existent. Through the use of telepharmacy videoconferencing technology and document imaging cameras, a licensed pharmacist can supervise a pharmacy technician processing prescriptions for patients at a remote rural location.⁶⁷ The pharmacist conducts a final check of the technician's work, including verifying the physician order, the prescription label (including patient instructions for use), the manufacturer's container, and the dosage form; performs a drug utilization review; and provides a professional consultation to the patient and, if needed, to the physician or nurse.^{67,68} Telepharmacy has been evaluated as a safe and cost-effective way of delivering pharmacy services to distant underserved rural communities. Medication error rates in telepharmacy have been found to be equal to or lower than in traditional pharmacy settings.⁷¹ Telepharmacy has also been shown to enhance revenue of rural pharmacies delivering these services.⁷²

North Dakota Telepharmacy Experience

In 2000, North Dakota became the first state to pass administrative rules allowing community pharmacies in certain remote rural areas to operate without requiring a pharmacist to be physically present at the site.⁷³ The first telepharmacy sites in the state were established in 2002 with the support of a grant from the federal Office for the Advancement of Telehealth within HRSA. As of September 2008, 72 telepharmacy sites had been established, including 24 central pharmacy sites and 48 remote rural telepharmacy sites; 51 of the sites are community pharmacies and 21 are hospital pharmacies. The project involves 62% of North Dakota counties and two counties in Minnesota. Approximately 40,000 rural citizens have had their pharmacy services restored, retained, or established through the project since its inception.^{68,71} In addition to restoring access to health care in remote, medically underserved areas, the project has resulted in approximately \$12.5 million in economic development for the rural communities, including the addition of 40 to 50 new jobs. Retail telepharmacy sites in North Dakota are full-service pharmacies that have complete drug inventories, including nonprescription and prescription drugs, health and beauty aids, and other general merchandise.^{68,71} Although not providing funds for the North Dakota telepharmacy project directly, the 2009 federal stimulus package (American Recovery and Reinvestment Act of 2009)⁷⁴ will give rural hospitals the opportunity to upgrade or obtain an electronic medical records system and thus will facilitate the provision of telepharmacy services, allowing the pharmacist to read or write in the patient's medical record over long distances.

The remote retail telepharmacy sites use the central processing unit at a main pharmacy. The remote site is staffed by a registered pharmacy technician with one or more years of experience. The rules allow the pharmacy technician in the telepharmacy setting to have a full prescription inventory at the remote site. The technician prepares the prescription while being supervised by the pharmacist over the audio and video link (Figure 17-1). A high-resolution document-imaging camera on the prescription counter allows the technician to show the pharmacist the original prescription, the completed label, the medication that has been placed in the prescription container, the original container, and any auxiliary labels to be attached (Figure 17-2). Once the pharmacist at the central site performs the final check and approves the prescription, the patient is invited into the counseling room and the pharmacist provides the mandatory medication counseling via the videoconferencing technology (using a television

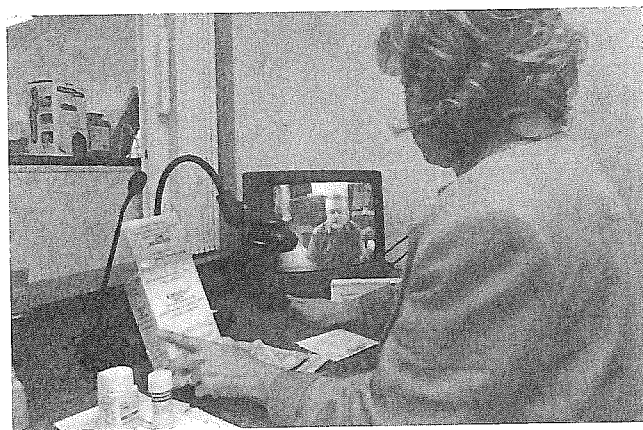


FIGURE 17-1 Technician at remote site interacts with pharmacist at distant location. Used with permission from reference 69.

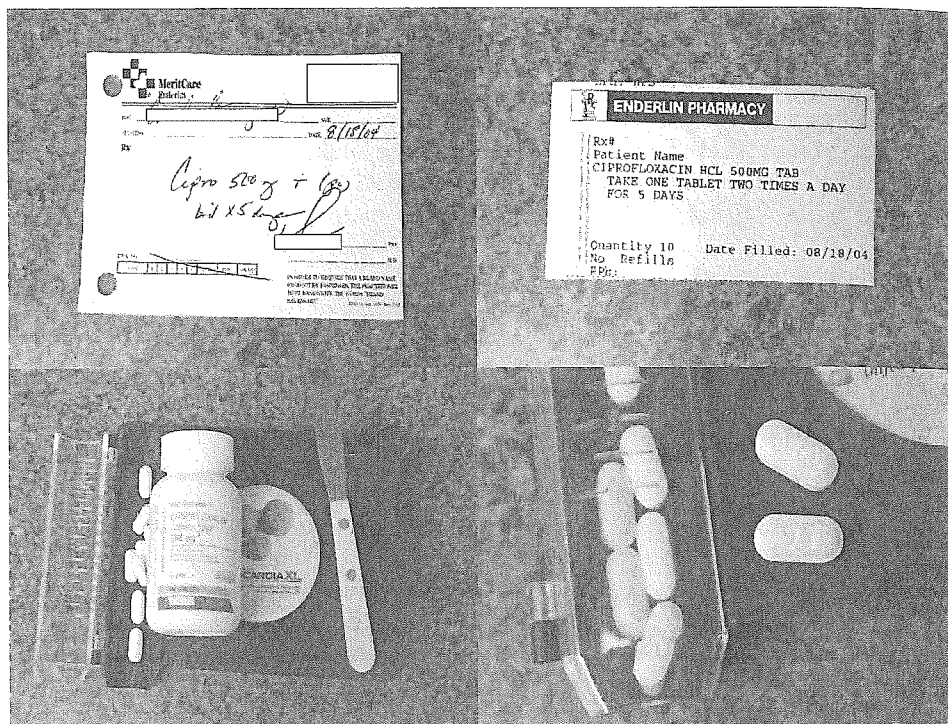


FIGURE 17-2 High-resolution document imaging camera pictures displayed by technician for final check by pharmacist. Used with permission from reference 69.

monitor and Polycom), after which the pharmacist is considered to have officially dispensed the prescription to the patient.

The goal of telepharmacy in North Dakota is to ensure that the pharmacist provides a professional consultation on the proper use of the medication for every patient over the audio and video link, so that no patient leaves without having his or her questions answered about the medication. Patients have been very receptive to the counseling.

Quality assurance requirements for telepharmacies in North Dakota are important for ensuring patient safety. To be eligible to work in a telepharmacy location, pharmacy technicians must complete a training program accredited by the American Society of Health-System Pharmacists and must have the equivalent of at least 1 year of work experience as a registered pharmacy technician. In addition, the pharmacist in charge must visit the remote telepharmacy site at least once a month to verify that all record-keeping and other telepharmacy requirements have been fulfilled. Some states that have developed telepharmacy rules more recently are requiring weekly visits by the pharmacist in charge. Typically in North Dakota, the pharmacist travels to the remote telepharmacy location periodically and the technician travels to the central pharmacy site to perform the telepharmacy function in reverse. The equipment works both ways, and the prescriptions can be prepared and the patients counseled from either end through the telepharmacy videoconferencing technology.

Most of the state telepharmacy sites in hospitals⁷⁰ use a remote order-entry and verification system. The order is transmitted to the pharmacy at a distant location, usually by a nurse, after transcribing or after originally being written by the physician. The pharmacist reviews the patient's medication profile, conducts a drug utilization review, checks for drug inter-

actions, appropriate dosage, drug therapy treatment guidelines, and necessary laboratory tests and then electronically approves the order and releases the medication to the nurses' station for administration to the patient. Usually, the nurse retrieves the medication from an automated dispensing device at the hospital. However, since automated dispensing devices are not always affordable for small rural critical-access hospitals, North Dakota has developed an alternative. A technician at the remote hospital prepares the medication for dispensing, relabeling or repackaging the medication under the supervision and approval of a pharmacist at a distant location using telepharmacy videoconferencing technology.^{70,71} The medication can then be delivered to the nurse by the pharmacy technician, either directly or through an automated dispensing device. A wireless mobile telepharmacy cart (Figure 17-3) is used in the remote hospital to allow nurses and physicians in the patient care area to have 24-hour access to a pharmacist for face-to-face consultation to answer any drug therapy or medication questions (Figure 17-4). North Dakota is working to establish telepharmacy services to

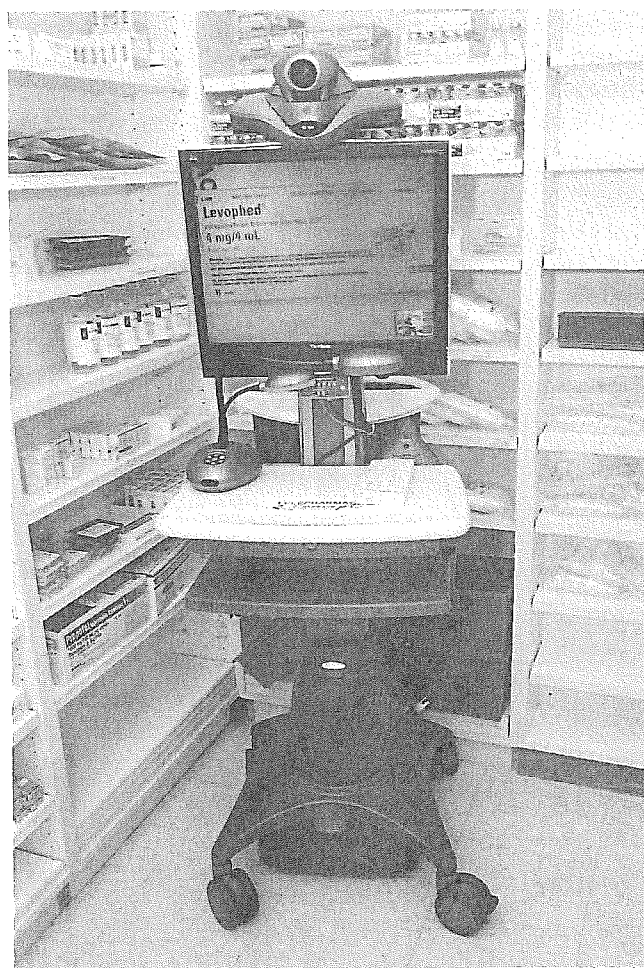


FIGURE 17-3 Wireless mobile telepharmacy cart used by remote rural hospitals. Used with permission from reference 71.

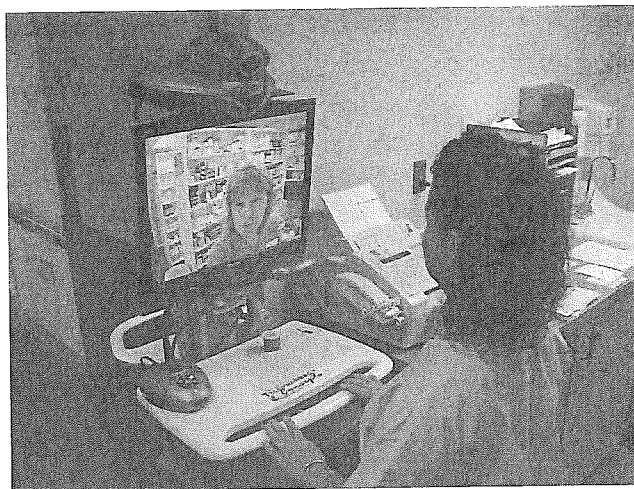


FIGURE 17-4 Nurse receives pharmacist consultation in patient care area via wireless mobile telepharmacy cart. Used with permission from reference 71.

all critical-access hospitals within the state and any rural hospitals from other states that need such services.

North Dakota telepharmacy started out serving a community on one of the American Indian reservations in Rolette, North Dakota, and quickly expanded to serve many communities across North Dakota and rural Minnesota. In 2008, it was decided that the North Dakota telepharmacy model would be excellent for serving the remote communities on the Three Affiliated Tribes reservation. These communities, separated by Lake Sakakawea, are a half day's trip from the tribe's central pharmacy in New Town. With the help of the local pharmacist, who had experience with other North Dakota telepharmacies, a network of four remote sites and one central site was developed. The central site, from which the pharmacist provides oversight and patient counseling, is located in a community with a population of only 380 people.

Future applications of telepharmacy include the extension of pharmacy services to public health units that have a medical director who visits occasionally but typically are staffed by nurses, with no full-time pharmacists. Telepharmacy would allow a nurse who is cross-trained as a telepharmacy technician to prepare medications for dispensing to the patient, who could be counseled remotely by the pharmacist over the audio and video computer links. Similarly, in large cities, where hospitals and clinics typically have locations scattered around the community, a pharmacist in the central pharmacy could counsel patients at all the locations.

Medication therapy management services can be provided via telepharmacy, and eventually patients will be able to access information through their own television sets and speak with the pharmacist or other health care provider either from their own homes or from community sites established for this purpose. Once electronic health records become readily available, a specialist will be able to review the patient's information over great distances and communicate directly with the patient using videoconferencing technology.

An important opportunity for providing affordable medications to rural communities is available through the federal 340B drug program, which can be extended through telepharmacy to contract pharmacies in underserved areas. Rural contract pharmacies in underserved areas are typically eligible as prescription providers for federally qualified look-alike

health centers. These clinics in small rural areas very seldom have the resources to provide their own pharmacist and pharmacy services. However, a contracted community telepharmacy site can have access to this federal program to obtain the 340B discounted drugs and make these services available to rural patients who could not otherwise afford their medications.⁷¹

The ability to extend the reach of a pharmacist for a face-to-face encounter with a patient at a long distance offers almost unlimited opportunities to provide patient care. We must be open to adopting these technologies, using well-trained support personnel such as pharmacy technicians, to reach out to underserved patients, allowing those patients to stay in their homes, in their communities, and avoid the expense and risk of travel.

Alaska Telepharmacy Experience

Perhaps more than any other rural location in the United States, Alaskan villages exemplify the difficulty of providing health care services for rural populations. The Alaska Native Medical Center (ANMC), located in Anchorage, provides health care to IHS beneficiaries who are Alaska Natives and American Indians. The service area exceeds 170,000 square miles of south central Alaska, including more than 50 villages.⁷⁵ The populations of these villages range from 50 to 900.⁷⁶ Many of the villages have significant transient population growth due to commercial fishing seasons. Most of the villages are accessible only by boat or small aircraft. The communities' access to care is further restricted by austere living conditions and extreme weather patterns.

Because of the small population, low workload volume, and limited financial resources, health care positions for the isolated villages are not easily justified. For sites that do have health care providers, recruitment and retention are difficult. Most clinics do not have physicians, nurse practitioners, physician assistants, pharmacists, or pharmacy technicians. In response to the lack of available health care providers, the Alaska Community Health Aide Program was established to train local people as medical providers.⁷⁷ Each remote community is assigned a family medicine physician from the ANMC who travels to the village at least annually to provide patient care and assess the skills of the community health aide. Some 550 health aides are practicing in 170 villages. In addition to basic and emergency medical care, they provide elder care, behavioral health services, and dental care. The aide uses the program manual when delivering care and prescribes and issues medications in accordance with the manual.⁷⁸ The aides are also responsible for medication security, accountability, inventory, and storage. Monthly inspections, including the identification and removal of outdated medications, are required.

Alaska Native Medical Center's Telepharmacy Program

The ANMC telepharmacy program began in 2002 as a pilot program to assess the feasibility of using available technology in Alaska's difficult environment to improve pharmaceutical care to remote sites. The telepharmacy equipment includes automated dispensing devices, videoconferencing equipment, bar code scanners, and related peripherals such as printers, fax machines, and telephones.

A community health aide operates an automated dispensing device at the remote site and hands the medication to the patient. In contrast, the North Dakota telepharmacy model has a registered pharmacy technician at the remote site who prepares the prescription for dispensing from a full drug inventory at a licensed pharmacy. In both models, however, the order and the completed prescription are verified by the pharmacist, and the patient is counseled through use of video conferencing technology. In the Alaskan model the prescriber (physician, physician assistant, or nurse practitioner) sends the prescription via the electronic prescribing system to the pharmacist at the central pharmacy site. The pharmacist

reviews the medication order and the patient medication profile, and then checks for adverse drug reactions, drug-disease problems, and allergies. Once the medication is reviewed and approved by the pharmacist, the pharmacist electronically releases the medication to the aide at the remote site and prints the label. The aide then helps the patient access the counseling session with the pharmacist, who provides instructions on proper use of the medication and answers questions. If problems arise, the patient must call or return to the provider site for follow-up.

The automated dispensing devices are made of heavy gauge steel with a bullet-resistant glass front. A triple lock mechanism allows controlled substances to be stored inside, exceeding regulatory storage requirements. The automated dispensing devices can hold up to 120 different prepackaged medications. Medications are packaged for a typical course of therapy, or a 30-day supply for chronic medications. The formulary is fairly standardized across all 21 locations. Quantities on hand are adjusted to reflect local needs and prescribing habits. Medication containers are prepared at the ANMC pharmacy in Anchorage. Two-dimensional bar codes on the medication containers enable national drug codes, package sizes, lot numbers, and expiration dates to be uploaded to the telepharmacy application.

Each medication is assigned a high and a low quantity level. When the low quantity level is reached, the medication displays on the replenishment report that is run daily by a pharmacy technician at the ANMC pharmacy. The pharmacy technician then prepares the medications for replenishing the automated dispensing device and ships the medications to the remote clinic via the U.S. Postal Service. Clinics usually receive their medications within 2 or 3 days; however, delays in excess of 3 weeks have occurred because of inclement weather or inoperable equipment at the airport. When the medications are received at the clinic, staff with user privileges load each container into the automated dispensing device, using bar code scanning to prevent loading errors. The activities are logged into the telepharmacy application in real time. The pharmacy technician monitors loading activity to ensure that it is done quickly and accurately. Any discrepancy in loading quantities is readily identified and investigated.

In this telepharmacy model, prescriptions and visit forms are faxed to a pharmacist at the ANMC. The pharmacist conducts a prospective clinical review of the prescriptions, ensures adherence to the community health aide's scope of practice, identifies and resolves medication problems or concerns, enters the prescription into the electronic medical record, and prints the bar coded prescription label to the remote clinic. The provider at the clinic scans the bar code on the prescription label using the telepharmacy application, and the medication is released from the automated dispensing device. As a final verification, the bar code on the released medication container is scanned. Next, the provider affixes the pharmacist-generated prescription label to the medication container. The patient is offered the opportunity for consultation with the pharmacist using videoconferencing equipment or the telephone.

Documentation of the pharmacist's interventions shows that the pharmacist's clinical expertise is frequently sought by remote health care providers. The pharmacists efficiently identify and resolve problems such as dosing errors and prescribed medications to which the patient is allergic or those that could be harmful during pregnancy, and they ensure that prescriptions are complete and meet regulatory requirements. Additional benefits of the telepharmacy program include improved medication inventory, decreased costs due to wastage, improved medication-use safety, and better utilization of the health care provider to provide direct patient care. Obstacles encountered include the delivery of the large equipment, location of the automated dispensing device within the clinic space, provider resistance to incorporating a pharmacist into the health care team, privacy concerns, and the cost of equipment and service.

The telepharmacy software enables a variety of reports to be generated and reviewed by the ANMC pharmacy. Medication recalls and outdates can be responded to more efficiently through the telepharmacy application. Monthly reports are run to identify medications soon to expire, and those items are replaced in advance. Usage reports ensure that inventory levels are appropriate. Other reports allow quality improvement opportunities to be identified. One example was a comparison of controlled substance usage between similar clinics; outliers were readily identified, and plans were deployed to reduce the quantity of controlled substances dispensed where appropriate.

The ANMC telepharmacy network was to be expanded to cover 30 remote village locations by the end of 2009. The farthest clinic is more than 1200 miles from the central pharmacy in Anchorage, and the closest is 45 miles away.

Telepharmacy models can successfully extend pharmacy services to distant populations. Access to quality pharmaceutical care is improved, patient care is elevated, and resources are utilized more efficiently.

Health Education and Training: Addressing Rural Health Needs

Current accreditation standards for pharmacy schools expect schools to increase their emphasis on public health education and training, including the provision of population-based care and effective health-promotion and disease-prevention services.⁷⁹ Programs are needed to support didactic and experiential training in public health for both students and practicing pharmacists. Several pharmacy schools are offering dual Doctor of Pharmacy and Master of Public Health (PharmD/MPH) degrees.⁸⁰ Many other disciplines are also offering combined degrees (MD/MPH, MSN/MPH, PA/MPH, DVM/MPH, DO/MPH). The MPH degree requires 42 credit hours with both core and elective course requirements covering biostatistics, environmental health sciences, epidemiology, health policy and management, and social and behavioral sciences.⁸¹ Discipline-specific MPH programs are being developed that allow pharmacy, nursing, medicine, and other disciplines to create their own specific curricula (tracks) to equip health care professionals with the skills to effectively deliver meaningful public health programs and services (i.e., health promotion, disease prevention, intervention, and education) to their patients and community at the point of care. These "applied" MPH programs contain seven interdisciplinary competencies in the following areas: leadership, diversity and culture, communication and informatics, professionalism, public health biology, program planning, and systems thinking (see Figure 21-2).⁸² This public health approach creates a new model for the training of teams of interdisciplinary health professionals with the needed knowledge, skills, attitudes, and behaviors to effectively work with rural communities to improve the health of citizens.⁸³ Schools will need to develop clinical training sites and experiences in public health for pharmacy students, with qualified faculty for student experiential rotations and residencies.⁸⁰ Rural communities will be ideal locations for pharmacy students and practitioners to apply their training and develop health promotion and disease prevention (including targeted intervention) programs. Pharmacists trained in public health can work with state epidemiologists and state health officers, using population data to define areas of need (public health concerns) within the state and to target preventive screening, education, and interventions to meet the specific needs of rural communities.⁸⁴⁻⁸⁶ Research can subsequently be conducted on the impact of the pharmacist and pharmacy services in improving public health in targeted populations. Pharmacy schools could also offer continuing-education and certificate programs for pharmacists focused on public health, which could be structured to eventually lead to an MPH degree if desired.

The new accreditation standards have placed pressure on schools to find a sufficient number of sites and preceptors for experiential training, for both advanced pharmacy practice experiences and introductory pharmacy practice experiences.⁷⁹ This presents an opportunity for pharmacy schools to develop partnerships with rural communities to provide greatly needed health care programs, services, education, and health professionals in exchange for clinical training experiences for students. At North Dakota State University (NDSU), all pharmacy students must complete a rotation in a community with a population of no more than 5000 people. More than 40 sites and preceptors in various locations throughout North Dakota and Minnesota offer rural rotations for NDSU pharmacy students,⁸⁷ exposing students to rural practices and lifestyles that they would otherwise not experience and potentially enhancing their desire to practice in a rural community.

Several challenges and barriers must be overcome in developing clinical training experiences for students in rural areas. One is getting students interested in leaving an urban area to live and train in a small rural setting. The isolation and lack of urban amenities (including entertainment) is not attractive to many students. For this reason, schools in rural states such as North Dakota have made rural rotations a requirement for all students. Without this requirement, many students would not likely choose this option on their own. Extra transportation and housing expenses can place an additional financial burden on the student. Stipends can be provided to help entice students to pursue rural rotations and help defray the additional costs the students incur. Rural locations may have limited housing for students. Schools considering rural rotations should determine the availability of housing in the community to support students' ongoing experiential training. Partnerships with local health facilities can often help with student housing arrangements.

The volume, variety, complexity, and acuity level of patient care experiences can be limited in rural areas. Critically ill patients are usually transferred to urban tertiary-care facilities. Lack of access to other health professionals can also be problematic. For these reasons, it is important for pharmacy schools to select rural communities that can provide the breadth and depth of patient, health condition, and interprofessional exposure needed to meet accreditation standards and provide a comprehensive clinical experience for students. Some states are developing regional teaching hubs in selected rural communities to provide the infrastructure for student training experiences, including access to health facilities (i.e., hospital, medical clinic, nursing home, community pharmacy), an interdisciplinary team of health professionals, and sufficient quantity and complexity of patients.^{88,89} Faculty can be hired and placed at these sustainable rural training sites to establish active clinical practices, provide valuable health care education and services to the community (and surrounding rural communities), and assist in supervision of students. These hubs can provide faculty-supervised advanced practice experiences for students; smaller communities with less teaching infrastructure can be used for introductory pharmacy practice experiences. Video conferencing technology can be used to connect rural faculty, students, and facilities, reducing their isolation and enhancing interactions to enrich the educational experience.

Pharmacy schools should consider rural needs in their admissions decisions, student clinical training experiences, faculty placements, outreach programs, and services to health facilities, the public, and the profession. Health professionals who were born and raised in rural communities are more likely to practice in a small town environment, and underrepresented, disadvantaged, and minority groups are more likely to serve underrepresented, disadvantaged and minority populations.¹⁸ If states need pharmacists to serve in rural areas or to serve minority populations, pharmacy schools should consider actively recruiting students from small rural communities and from underrepresented and minority populations. Loan forgiveness programs, scholarships, and other community incentives can be made

available to entice future pharmacists to practice in rural areas. Programs to assist graduates with pharmacy ownership can also be of benefit to rural areas where pharmacy store owners want to retire and sell their stores.

Actions for Change Today

Many rural areas have a severe lack of access to community-based programs focused on health promotion, disease prevention, and intervention.²⁶ Often the pharmacist is the most accessible source of health information and education. Pharmacists have a great opportunity to become involved in meaningful community-based public health education in rural areas.

- Seek out rural community gathering places (schools, employers, hospitals, assisted-living facilities, churches, scout meetings, community centers, agricultural extension services) to provide health promotion and disease prevention education programs.²⁶
- Provide health screening programs (e.g., for blood pressure, cholesterol, glucose, cancer) and influenza vaccinations and other immunizations in community locations and at local events.
- Become an emergency medical technician (EMT) serving a rural population, and assist in training others.
- Provide education on topics not easily accessed in rural communities: health insurance, nutrition and diet, physical fitness and exercise, healthy lifestyles, health risk factors, seat belt use, alcohol and substance abuse, smoking cessation, oral health, mental health, and infant and child health.^{18,22,24-26}
- Assist rural communities in obtaining grant funds from private foundations and state and federal sources to support health education efforts.
- Utilize novel technology, such as telehealth videoconferencing, to deliver community-based public health education programs to remote rural communities in your state, region, or nation.⁹⁰⁻⁹²
- Provide disease management and drug therapy monitoring programs to patients and their physicians to address chronic diseases, stroke, obesity, smoking, and alcohol and other drugs of abuse.^{62,93-95}
- Promote the use of pharmacists and pharmacies as alternatives to traditional primary care sites for persons with limited access to physicians or medical centers.⁹⁶
- Review Rural Healthy People 2010 (RHP2010) volumes 1 through 3 in order to better understand rural health priorities and problems in the United States.²⁴
- Identify, from RHP2010, community-based strategies and interventions currently being implemented to address rural health disparities and concerns.²⁴

Conclusion

Demographic, geographic, and cultural factors in rural areas often present barriers to residents seeking care as well as barriers to health providers delivering care, placing rural residents and rural communities at risk for poor health and limited sources of care. Pharmacists practicing in rural communities can contribute to public health by providing access to services and offering health education and medication management. Telepharmacy technology can be used to provide pharmacists' services to remote areas. With projected shortages of health care professionals, access to primary care services in rural areas will likely continue to be a major challenge. Pharmacy schools should work to provide student pharmacists with experience in rural areas.

References

1. Cromartie J, Bucholtz S. Defining the "rural" in rural America. U.S. Department of Agriculture. Amber Waves, June 2008. www.ers.usda.gov/AmberWaves/June08/Features/RuralAmerica.htm. Accessed October 16, 2008.
2. Rural Assistance Center. What is Rural? www.raconline.org/info_guides/ruraldef/. Accessed November 2008.
3. United States Department of Agriculture. National Agriculture Library. Rural Information Center. What is Rural? www.nal.usda.gov/ric/ricpubs/what_is_rural.shtml. Accessed October 15, 2008.
4. United States Department of Agriculture. Economic Research Service. Briefing Rooms. Measuring Rurality: What is Rural? www.ers.usda.gov/Briefing/Rurality/WhatIsRural/. Accessed October 28, 2008.
5. United States Department of Agriculture. Economic Research Service. Data Sets. Rural Definitions: Data Documentation and Methods. Identifying Nine Rural Definitions. www.ers.usda.gov/Data/Ruraldefinitions/Documentation.htm. Accessed October 17, 2008.
6. Hall SA, Kaufman JS, Ricketts TC. Defining urban and rural areas in U.S. epidemiologic studies. *J Urban Health*. 2006;83(2):162-75.
7. United States Department of Agriculture. Economic Research Service. Briefing Rooms. Measuring Rurality: New Definitions in 2003. www.ers.usda.gov/briefing/rurality/NewDefinitions/. Accessed October 16, 2008.
8. United States Department of Agriculture. Economic Research Service. Briefing Rooms. Measuring Rurality: Rural-Urban Commuting Area Codes. www.ers.usda.gov/briefing/rurality/ruralurbancommutingareas/. Accessed November 3, 2008.
9. United States Department of Agriculture. Economic Research Service. Briefing Rooms. Measuring Rurality: Rural-Urban Continuum Codes. www.ers.usda.gov/briefing/rurality/ruralurbcon/. Accessed October 28, 2008.
10. National Center for Frontier Communities. www.frontierus.org/. Accessed October 17, 2008.
11. Center for Rural Health. University of North Dakota. School of Medicine and Health Sciences. Health Professional Shortage Areas (HPSAs) and Medically Underserved Areas (MUAs). <http://ruralhealth.und.edu/projects/pco/pdf/hpsa.pdf>. Accessed December 16, 2008.
12. Center for Rural Health. University of North Dakota. School of Medicine and Health Sciences. Rural Health Facts Sheets. Demographics. Spring 2006. http://ruralhealth.und.edu/pdf/fs_demographics.pdf. Accessed October 24, 2008.
13. Ricketts TC, ed. *Rural Health in the United States*. New York: Oxford University Press; 1999.
14. Chafey K, Hill WG, Burg GR. Rural and migrant health. In: Nies MA, McEwen M, eds. *Community/Public Health Nursing*. 4th ed. St. Louis: Saunders/Elsevier; 2001:437-67.
15. Agency for Healthcare Research and Quality. Medical Expenditure Panel Survey. Chartbook #13: Health Care in Urban and Rural Areas, Combined Years 1998-2000. www.meps.ahrq.gov/mepsweb/data_files/publications/cb13/cb13.shtml. Accessed October 24, 2008.
16. National Center for Health Statistics. Health, United States, 2001 with Urban and Rural Health Chartbook. 2001. www.cdc.gov/nchs/data/hus/01.pdf. Accessed December 10, 2008.
17. National Center for Health Statistics. Health, United States, 2007, with Chartbook on Trends in the Health of Americans. 2007. www.cdc.gov/nchs/data/07.pdf. Accessed December 10, 2008.
18. Gamm LD, Hutchinson LL, Dabney BJ, et al., eds. *Rural Healthy People 2010: A Companion Document to Healthy People 2010. Volume 1: Introduction, Overviews, and Models for Practice*. College Station, Tex: Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center; 2003.
19. Substance abuse or dependence in metropolitan and non-metropolitan areas. The National Household Survey on Drug Abuse (NHSDA) Report. January 3, 2003. www.oas.samhsa.gov/2k3/Urban/Urban.pdf. Accessed July 28, 2009.
20. Underage drinking in rural areas. The National Household Survey on Drug Abuse (NHSDA) Report. August 27, 2004. www.oas.samhsa.gov/2k4/ruralYouthAlc/ruralYouthAlc.pdf. Accessed July 28, 2009.

21. Drug and Alcohol Services Information Services. Treatment admissions in urban and rural areas involving abuse of narcotic painkillers: 2002 update. DASIS Report. August 6, 2004. www.oas.samhsa.gov/2k4/ruralPainTX/ruralPainTX.pdf. Accessed July 28, 2009.
22. Office of Disease Prevention and Health Promotion. Healthy People 2010. www.healthypeople.gov/. Accessed October 24, 2008.
23. Office of Disease Prevention and Health Promotion. Healthy People 2020: The Road Ahead. www.healthypeople.gov/HP2020/. Accessed May 26, 2009.
24. Rural Healthy People Project. Southwest Rural Health Research Center. Texas A&M University System Health Science Center. Rural Healthy People 2010—Publications. www.srph.tamhsc.edu/centers/rhp2010/publications.htm. Accessed October 24, 2008.
25. Gamm LD, Hutchinson LL, Dabney BJ, et al., eds. Rural Healthy People 2010: A Companion Document to Healthy People 2010. Volume 2. College Station, Tex: Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center; 2003.
26. Gamm LD, Hutchinson LL, Dabney BJ, et al., eds. Rural Healthy People 2010: A Companion Document to Healthy People 2010. Volume 3. College Station, Tex: Texas A&M University System Health Science Center, School of Rural Public Health, Southwest Rural Health Research Center; 2003.
27. Reinberg S. Number of uninsured Americans drops. *U.S. News and World Report*. August 26, 2008. <http://health.usnews.com/articles/health/healthday/2008/08/26/number-of-uninsured-americans-drops.html>. Accessed October 24, 2008.
28. U.S. Department of Health and Human Services. Healthy People 2010. What are the leading health indicators? www.healthypeople.gov/LHI/lhiwhat.htm. Accessed December 7, 2009.
29. Kaiser Commission on Medicaid and the Uninsured. The uninsured: a primer. Key facts about Americans without health insurance. October 2007. www.kff.org/uninsured/upload/7451-03.pdf. Accessed December 14, 2009.
30. Mills RJ. Health insurance coverage: 2001. Current Population Reports. Washington DC: U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau; September 2002.
31. Pasko T, Seidman B, Birkhead S. *Physician Characteristics and Distribution in the U.S. 2000–2001* ed. Chicago: American Medical Association; 2000.
32. U.S. Department of Health and Human Services. Health Resources and Services Administration. Federal Office of Rural Health Policy. Facts about . . . Rural Physicians. www.shepscenter.unc.edu/rural/pubs/finding_brief/phy.html. Accessed December 14, 2009.
33. Health Resources and Services Administration. Shortage Designation: HPSAs, MUAs & MUPs. <http://bhpr.hrsa.gov/shortage/>. Accessed October 24, 2008.
34. University of Missouri. Center for Applied Research and Environmental Systems (CARES). Map Room. Map created of Health Professional Shortage Areas—Primary Care. October 2008. <http://www.cares.missouri.edu/>. Accessed December 4, 2008.
35. Baer LD, Smith LM. Non-physician professionals and rural America. In: Ricketts TC, ed. *Rural Health in the United States*. New York: Oxford University Press; 1999.
36. Martin KE. A rural-urban comparison of patterns of physician assistant practice. *J Am Acad Physician Assist*. 2000;13:49–50,56,59.
37. Health Resources and Services Administration. Toward a Method for Identifying Facilities and Communities with Shortages of Nurses, Summary Report. <http://bhpr.hrsa.gov/healthworkforce/nursingshortage/default.htm>. Accessed November 4, 2008.
38. Knapp KK, Caltice JM. New pharmacist supply projections: lower separation rates and increased graduates boost supply estimates. *J Am Pharm Assoc*. 2007;47(4):463–70.
39. Pal S. Pharmacist shortage to worsen in 2020. *U.S. Pharmacist*. 2002;27(12).
40. National Center for Policy Analysis. Daily Policy Digest. Health Issues. Pharmacist Shortage Worsens Nationwide. November 9, 2005. www.ncpa.org/sub/dpd/index.php?Article_ID=2505. Accessed November 4, 2008.
41. Williams JM, Ehrlich PF, Prescott JE. Emergency medical care in rural America. *Ann Emerg Med*. 2001;38(3):323–7.

42. University of Maryland Medical Center. R Adams Cowley Shock Trauma Center. www.umm.edu/shocktrauma/history.htm. Accessed May 26, 2009.
43. Trauma.org. History of Trauma. Trauma Resuscitation. www.trauma.org/archive/history/resuscitation.html. Accessed May 26, 2009.
44. MedTEAM.wordpress.com. The Golden Hour in Transit? <http://medteam.wordpress.com/2008/01/07/the-golden-hour-in-transit-%E2%80%93-proposed-nhs-%E2%80%93-restructuring%E2%80%93targets-ae-and-maternity-care-with-dangerous-cuts-that-will-cost-lives/>. Accessed May 26, 2009.
45. Bulkowski CW. The Platinum 10: 2nd BCT, 101st Airborne improves medical training to help save lives. *Infantry Magazine*. July–August 2006. http://findarticles.com/p/articles/mi_m0IAV/is_4_95/ai_n17154164/. Accessed May 26, 2009.
46. Committee on the Future of Rural Health Care. *Quality through Collaboration: The Future of Rural Health*. Washington, DC: National Academies Press; 2005. www.nap.edu/openbook.php?record_id=11140&page=R1. Accessed November 4, 2008.
47. Mueller C, Schur C. Insurance coverage of prescription drugs and the rural elderly. *J Rural Health*. 2004;20(1):17–25.
48. Monroe AC, Ricketts TC, Savitz LA. Cancer in rural versus urban populations: A review. *J Rural Health*. 1992;8(3):212–220.
49. Amey CH, Miller MK, Albrecht SL. The role of race and residence in determining stage at diagnosis of breast cancer. *J Rural Health*. 1997;13(2):99–108.
50. Carter JS, Pugh JA, Monterrosa A. Non-insulin-dependent diabetes mellitus in minorities in the United States. *Ann Intern Med*. 1996;125:221–32.
51. Boyle JP, Honeycutt AA, Narayan KM, et al. Projection of diabetes burden through 2050. Impact of changing demography and disease prevalence in the U.S. *Diabetes Care*. 2001;24(11):1936–40.
52. Fiandt K, Pullen CH, Walker SN. Actual and perceived risk for chronic illness in rural older women. *Clin Excell Nurse Pract*. 1999;3(2):105–15.
53. Johnson J, Weinart C, Richardson J. Rural residents' use of cardiac rehabilitation programs. *Public Health Nurs*. 1998;15(4):288–96.
54. Sjostrom L. Impact of body weight, body composition, and adipose tissue distribution on morbidity and mortality. In: Stunkard AJ, Wadden TA, eds. *Obesity: Theory and Therapy*. 2nd ed. New York: Raven Press; 1993,13–41.
55. National Heart, Lung, and Blood Institute. North American Association for the Study of Obesity. The practical guide—identification, evaluation, and treatment of overweight and obesity in adults. www.nhlbi.nih.gov/guidelines/obesity/prctgd_c.pdf. Accessed December 8, 2008.
56. Centers for Disease Control and Prevention. Motor Vehicle Safety. Fact Sheet: Impaired Driving. www.cdc.gov/ncipc/factsheets/drving.htm. Accessed December 3, 2009.
57. Alcohol Alert. 2006 Drunk Driving Statistics. www.alcoholalert.com/drunken-driving-statistics.html. Accessed November 19, 2008.
58. American Cancer Society. Prevention & Early Detection. Cigarette Smoking. www.cancer.org/docroot/PED/content/PED_10_2X_Cigarette_Smoking.asp. Accessed November 19, 2008.
59. Burge SK, Schneider FD. Alcohol-related problems: recognition and intervention. *Am Fam Physician*. January 15, 1999. www.aafp.org/afp/990115ap/361.html. Accessed November 19, 2008.
60. Centers for Medicare and Medicaid Services. Fact Sheet: Critical Access Hospital. www.cms.hhs.gov/MLNProducts/downloads/CritAccessHospfactsht.pdf. Accessed December 18, 2008.
61. Indian Health Service. IHS Public Health Professions. Jobs and Scholarships. www.ihs.gov/JobCareerDevelop/careers/. Accessed June 15, 2009.
62. Health Resources and Services Administration. Rural Health Policy. Small Rural Hospital Improvement Grant Program (CFDA 93.301). <http://ruralhealth.hrsa.gov/ship.htm>. Accessed June 11, 2009.
63. Cranor CW, Bunting BA, Christensen DB. The Asheville Project: long-term clinical and economic outcomes of a community pharmacy diabetes care program. *J Am Pharm Assoc*. 2003;43:173–84.

64. North Dakota Public Employees Retirement System. NDPERS Diabetes Wellness Program. About the Patient. www.aboutthepatient.net/index_files/ndpers.htm. Accessed December 18, 2008.
65. Health Resources and Services Administration. Telehealth. What is Telehealth. www.hrsa.gov/telehealth/. Accessed December 18, 2008.
66. Puskin DS, Mintzer CL, Wasem C. Part 4: Rural health care: pitfalls and promises of telemedicine. *J Am Chiropractic Association*. November 1998. http://findarticles.com/p/articles/mi_qa3841/is_/ai_n8819755. Accessed December 14, 2009.
67. Health Resources and Services Administration. Office for the Advancement of Telehealth. Tracy J, ed. Telemedicine technical assistance documents: a guide to getting started in telemedicine. 2004. <http://telehealth.muhealth.org/general%20information/getting.started.telemedicine.pdf>. Accessed December 18, 2008.
68. North Dakota State University. What is telepharmacy? <http://telepharmacy.ndsu.nodak.edu/>. Accessed December 18, 2008.
69. Peterson CD, Anderson HC. The North Dakota telepharmacy project: restoring and retaining pharmacy services in rural communities. *J Pharm Technol*. 2004;20:28–39.
70. Peterson CD, Rathke A, Skwiera J. Hospital telepharmacy network: delivering pharmacy services to rural hospitals. *J Pharm Technol*. 2007;23:158–65.
71. McCarthy D, Nuzum R, Mika S, et al. The North Dakota Experience: Achieving High-Performance Health Care through Rural Innovation and Cooperation. The Commonwealth Fund. May 2008. www.commonwealthfund.org/usr_doc/1130_McCarthy_North_Dakota_experience.pdf?section=4039. Accessed December 18, 2008.
72. Khan S, Snyder HW, Rathke A, et al. Is there a successful business case for telepharmacy? *Telemed J E Health*. 2008;14(3):235–44.
73. North Dakota Telepharmacy Project. North Dakota State University. Telepharmacy Rules. www.ndsu.edu/telepharmacy/telepharmacy_rules/. Accessed December 14, 2009.
74. National Institutes of Health. Grant Funding Opportunities. Recovery Act Grant Information. <http://grants.nih.gov/recovery/>. Accessed June 11, 2009.
75. Alaska Native Medical Center. Highest quality health services. www.anmc.org/. Accessed December 13, 2008.
76. Alaska State Demographer. Department of Labor and Workforce Development; 2002.
77. Alaska Community Health Aide Program. CHAP Home Page. www.akchap.org/. Accessed December 13, 2008.
78. Alaska Community Health Aide Program. Alaska Community Health Aide/Practitioner Manual (CHAM). 2006. www.akchap.org/CommunityHealthAideManual.cfm. Accessed December 13, 2008.
79. Accreditation standards and guidelines for the professional program in pharmacy leading to the Doctor of Pharmacy degree. Chicago: Accreditation Council for Pharmacy Education. July 1, 2007. www.acpe-accredit.org/standards/default.asp.
80. William RV, Smith KM, Steinke D. Opportunities for pharmacists in public health. *Am J Health Syst Pharm*. 2007;64(19):2002–7.
81. Council on Education for Public Health. Accreditation criteria—Public Health Programs. Amended June 2005. www.ceph.org/files/public/PHP-Criteria-2005.SO5.pdf. Accessed November 19, 2008.
82. Association of Schools of Public Health. Master's degree in public health core competency. Development Project, version 2.3, October 2004–August 2006. www.asph.org/userfiles/version2.3.pdf. Accessed November 19, 2008.
83. Peterson DJ, Hovinga ME, Pass MA, et al. Assuring public health professionals are prepared for the future: the UAB public health integrated core curriculum. *Public Health Rep*. 2005; 120(Sept/Oct):496–503.
84. Alciati MH, Glanz K. Using data to plan public health programs: experience from state cancer prevention and control programs. *Public Health Rep*. 1996;111(Mar/Apr):165–72.
85. North Dakota Department of Health. Division of Health Promotion. North Dakota Healthy People 2000 Summary. October 2002. www.ndhealth.gov/HealthyPeople2010/Healthy%20North%20Dakota%20Update.pdf. Accessed December 15, 2008.

86. North Dakota Department of Health. Division of Health Promotion. Healthy People 2010 North Dakota Progress Report 2005. www.ndhealth.gov/HealthyPeople2010/HP2010_2005.pdf. Accessed December 15, 2008.
87. College of Pharmacy. Alumni News. North Dakota State University. Rural rotations help address N.D. pharmacist shortage. Winter 2006. www.ndsu.edu/fileadmin/pharmacy/PharmacyWinter06.pdf. Accessed December 14, 2009.
88. University of Minnesota College of Pharmacy. Pharm.D. Professional Program. APPE Program. www.pharmacy.umn.edu/pharmd/eep/appe/home.html. Accessed December 15, 2008.
89. Borrego ME, Rhyne R, Hansbarger LC, et al. Pharmacy student participation in rural interdisciplinary education using problem based learning (PBL) case tutorials. *Am J Pharm Educ.* 2000; 64:355–63.
90. Bynum AB, Cranford CO, Irwin CA, et al. Participant satisfaction with a school telehealth education program using interactive compressed video delivery methods in rural Arkansas. *J Sch Health.* 2002;72(6):235–42.
91. Faulkner KM, McClelland L. Women's Health Queensland Wide Inc., Brisbane, Queensland, Australia. Engaging rural communities using a videoconference health education program: lessons learned and the way forward. www.engagingcommunities2005.org/abstracts/Faulkner-Kathryn-final.pdf. Accessed November 19, 2008.
92. Riverside County Foundation on Aging. Roundtable. October 2006. Using telehealth and other connective technologies to reach and serve older adults and adults with disabilities. www.rcaging.org/opencms/system/galleries/download/ooaging/telehealth_report_oct06.pdf. Accessed November 19, 2008.
93. Swain JH, Macklin R. Individualized diabetes care in a rural community pharmacy. *J Am Pharm Assoc.* 2001;41:458–61.
94. American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in substance abuse prevention, education, and assistance. *Am J Health Syst Pharm.* 2003;60:1995–8.
95. Kennedy DT, Giles JT, Chang ZG, et al. Results of a smoking cessation clinic in community pharmacy practice. *J Am Pharm Assoc.* 2002;42(1):51–6.
96. Knapp KK, Paavola FG, Maine LL, et al. Availability of primary care providers and pharmacists in the United States. *J Am Pharm Assoc.* 1999;39(2):127–35.

Additional Sources of Information on Rural Health

- Healthy People 2010—www.healthypeople.gov/
Rural Healthy People 2010. A Companion Document to Health People 2010 (Volume 1, Volume 2, and Volume 3)—www.srph.tamhsc.edu/centers/rhp2010/publications.htm
Health, United States, 2007 with Chartbook on Trends in the Health of Americans. HHS, CDC, and National Center for Statistics—www.cdc.gov/nchs/data/hs/hs07.pdf
Health, United States, 2001. Urban and Rural Health Chart. HHS, CDC, and National Center for Statistics—www.cdc.gov/nchs/data/hs/hs01cht.pdf
Journal of Rural Health (2002)—A supplemental issue on rural health research by S. Loue and B. E. Quill
CDC Wonder website—<http://wonder.cdc.gov/>
Rural Populations and Health Care Providers: A Map Book—www.shepscenter.unc.edu/rural/mapbook2003/mapbookintro.pdf
National Center for Health Statistics—www.cdc.gov/nchs
U.S. Census Bureau State and County Quick Facts—<http://quickfacts.census.gov/qfd/states/48000.html>
North Dakota Center for Rural Health—<http://ruralhealth.und.edu/>
National Center for Frontier Communities—www.frontierus.org/
North Dakota State Data Center—www.ndsu.nodak.edu/sdc/
HHS Rural Assistance Center—www.raonline.org/about/
USDA Economic Research Service—www.ers.usda.gov/
USDA Rural and Community Development (State Rural Development Offices)—www.rurdev.usda.gov/recd_map.html

- USDA Cooperative Extension System Offices—www.csrees.usda.gov/Extension/
- National Rural Health Association—www.ruralhealthweb.org/
- National Rural Recruitment and Retention Network—www.3rnet.org/
- National Association for Rural Mental Health—www.narmh.org/
- The Kaiser Commission. Health Insurance Coverage in Rural America—www.kff.org/uninsured/upload/Health-Insurance-Coverage-in-Rural-America-PDF.pdf
- The Kaiser Commission. The Uninsured in Rural America—www.kff.org/uninsured/upload/The-Uninsured-in-Rural-America-Update-PDF.pdf
- The Kaiser Family Foundation website—www.statehealthfacts.kff.org
- The Area Resource File (ARF)—www.arfsys.com/