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Health Status and Health Care Access of Farm and Rural Populations

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Abstract

Rural residents have higher rates of age-adjusted mortality, disability, and chronic disease than their urban counterparts, though mortality and disability rates vary more by region than by metro status. Contributing negatively to the health status of rural residents are their lower socioeconomic status, higher incidence of both smoking and obesity, and lower levels of physical activity. Contributing negatively to the health status of farmers are the high risks from workplace hazards, which also affect other members of farm families who live on the premises and often share in the work; contributing positively are farmers' higher socioeconomic status, lower incidence of smoking, and more active lifestyle. Both farm and rural populations experience lower access to health care along the dimensions of affordability, proximity, and quality, compared with their nonfarm and urban counterparts.

Keywords: agriculture safety and health, electronic health records, farmer health, health, health care access, health care affordability, health care quality, health disparities, health IT, health status, mortality, rural health, telehealth, uninsured

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Summary

Health is a critical component of household well-being, and reforming the U.S. health care system is high on the national policy agenda. Health care access and health status are a particular concern in rural areas, where the population is older, has lower education and income levels, and is more likely to be living in medically underserved areas than is the case in urban areas.

What Is the Issue?

U.S. health policy debates have focused on expanding health insurance coverage, improving health care quality and value, and achieving greater efficiencies and sustainable financing. Information on current geographic and demographic disparities in both health outcomes and access to high-quality and cost-effective health care can aid in the design and implementation of effective policy solutions. This report focuses on the health status and health care access of members of the Nation's rural households and farm-operator households in comparison with those of urban and nonfarm households.

What Did the Study Find?

Health status. Rural (nonmetro) residents have higher rates of age-adjusted mortality, disability, and chronic disease than their urban (metro) counterparts, though mortality and disability rates vary more by region than by metro status. The recently identified gap between metro and nonmetro mortality rates opened in 1990 and has widened continually since then. Farming has one of the highest occupational fatality rates of all occupations, and farm children also have high fatal accident rates. In addition, farmers are at high risk for work-related lung diseases, noise-induced hearing loss, skin diseases, and certain cancers associated with chemical use and prolonged sun exposure.

Socioeconomic status and behavioral health risks. The nonmetro population is older, is less likely to be from a minority group, and has lower education and income levels than the metro population. (Higher socioeconomic status, including education, income, and nonminority status, tends to be positively associated with health status.) However, within nonmetro areas, farm operators are more likely to have college degrees and greater economic resources and are less likely to be from a minority group than their nonfarm counterparts. Farmers whose major occupation is farming are less likely to smoke than nonfarmers, whereas nonmetro adults overall are more likely to smoke, to be obese, and to be physically inactive than metro adults.

Health insurance coverage and health care expenditures. Among nonmetro and metro populations, about 15 percent of all individuals had no health insurance coverage during 2007—this includes about 17 percent of the nonelderly population and 2 percent of the elderly population. (The elderly share is low because Medicare coverage starts at age 65.) The rates of uninsurance are considerably higher in the South and West (21 percent and 19 percent, respectively) than in the Northeast and Midwest (both are 13 percent). The study found no statistically significant disparities in coverage or in level of health expenditures by metro status; however, because nonmetro incomes are lower than metro incomes, nonmetro

nonelderly populations pay a greater share of household income for health care than their metro counterparts.

Among all farm-operator households, 14 percent of all members did not have health insurance during 2007—this includes 15 percent of nonelderly and 7 percent of elderly household members. Lack of coverage is higher for members of households in which farming was the primary occupation of the operator (20 percent and 6 percent for nonelderly and elderly, respectively). The study did not find statistically significant disparities in coverage of nonelderly farm household members by metro status, and the regional variations are much smaller than those among the general population (lack of coverage is slightly elevated in the West relative to the South and the Midwest).

Nonmetro households are more likely than metro households to report that health care costs limit their medical care. In contrast, households of farmers who cite farming as a primary occupation are less likely to report that health care costs limit their medical care than households of nonfarmers.

Health care resources—quantity and quality. The accessibility of health care resources generally declines as population density declines and geographic isolation increases. In smaller and more remote counties where small patient volumes will not support full-service hospitals, the rural health care model focuses on providing primary care and emergency care locally, and referring patients to (often distant) regional health care centers for specialized care. As a result, rural residents in more remote areas incur higher financial and travel-time costs than urban residents for specialized treatment. As an alternative, they may substitute local generalists for specialists, or reduce their usage of health care.

Nonmetro hospitals, particularly the smaller, more remote Critical Access Hospitals, performed less well on average for process-of-care quality indicators for treatment of some conditions, though for other conditions their performance was comparable with metro hospital performance. Adoption rates for health information technology—widely touted to improve coordination of services and thereby improve quality and reduce costs—remain low at this point among all providers. Though high-speed connectivity to the Internet is becoming less of a stumbling block in nonmetro areas than it once was, nonmetro hospitals report lower adoption rates for electronic health record systems than their metro counterparts. Proposed national policy initiatives to improve health care quality and contain costs raise opportunities for rural health care. These initiatives, however, may also pose challenges for health care providers serving farmers and rural residents unless policies take into account distinctive features of the rural context. With smaller patient volumes, rural hospitals and other rural providers tend to provide a different portfolio of health care services and have a higher cost structure and lower levels of financial and human capital relative to urban providers.

How Was the Study Conducted?

This study used household-level data for various measures of health status, risk behavior, insurance coverage, and care expenditures, as well as for nonoccupational health risks and health care usage rates. (All health status and nonoccupational health risk variables are age adjusted.) For farm

households, USDA's Agricultural Resource Management Survey was the primary source of data on sociodemographic characteristics, insurance coverage, and health expenses. For all U.S. households, the U.S. Census Bureau's American Community Survey was the source for demographic information, and the Census Bureau's Current Population Survey was the source for economic and health insurance coverage information. The Medical Expenditure Panel Survey, developed by the U.S. Department of Health and Human Services (HHS), Agency for Healthcare Research and Quality, was the source for health expenditure data for all U.S. households. The National Health Interview Survey, developed by HHS's National Center for Health Statistics, was the source of measures of health status, behavior, and use of health care for nonmetro households and for farm households (identified by having a household member who indicates farming as an occupation, a subset of all farm households identified by USDA). Measures of health resources were drawn from the Area Resource File, a county-level file developed by HHS's Health Resources and Services Administration, which contains health-related data from a wide variety of sources.

Chapter 1

Introduction

Health is a critical component of well-being. Healthy individuals are able to enjoy leisure and gain satisfaction in life. They also have a greater ability to learn new skills, earn more income, and generate wealth to support current and future consumption.

Reforming the U.S. health care system is high on the national policy agenda. U.S. health policy debates have focused on expanding health insurance coverage, improving health care quality and value, and achieving greater efficiencies and sustainable financing. Because the three objectives are interconnected, addressing all three at the same time would be most efficient. Costs grow too rapidly because the system pays for volume, not quality. Quality indicators like lifespan and infant mortality remain lower than desired because too many individuals are left out of the health care system. Some families do not have health care coverage because health costs grow faster than labor productivity. And, health insurance costs increase partly due to providers shifting the cost of uncompensated care to their paying customers.

Information on current disparities in health outcomes and in access to high-quality and cost-effective health care can help in the design and implementation of effective policy solutions. The disparities in health status across rural-urban geography have been explored extensively (see Ricketts, 1999; Glasgow et al., 2004; Eberhardt et al., 2001; and Gamm et al., 2003). Yet, there is extensive variation in health status within metro and nonmetro areas and across regions. Moreover, the patterns, extent, and determinants of the geographical differentials observed are not well understood. Researchers are beginning to explore the factors associated with regional variations in health status, and how the role of metro status needs to be understood within the regional context (Ricketts, 2007).

This report focuses on the health care access and health outcomes of rural residents and farm operator households, in comparison with those of their urban and nonfarm counterparts. In this analysis, "farm population" refers to principal operators of family farms and their households. These households represent two-thirds of the farm workforce and account for half of all hours worked in farming. Hired farm workers, who account for the rest of the farm workforce, are not covered; they have a substantially different demographic and economic profile from operators (see Kandel, 2008; Variyam and Mishra, 2005).

Numerous definitions of rural exist.[1] Nonetheless, the key dimensions of rural—regardless of definition—are geographic dispersion of population and lesser access to markets for services and jobs. Both features have significant implications for the delivery of health care. This report primarily relies on the U.S. Office of Management and Budget's (OMB) county-based definitions of metropolitan, micropolitan, and noncore areas because data on attributes of the population and the economy are more available on a county basis than on noncounty-based measures of "rural."[2]

[1]ERS briefing room on Measuring Rurality: www.ers.usda.gov/briefing/rurality/

[2]Data on the characteristics of rural and urban residents based on the Census definition, for which the building block is Census tracts, are available only from the decennial censuses.

Limited information has been published examining the health status and health care access of farm households relative to their nonfarm counterparts in rural and urban areas. The comparison is informative because rural farm households share the health challenges of their nonfarm rural counterparts due to their geography but differ in other advantages and challenges as a result of their different social and economic status and occupational risks.

Chapter 2

Profiles of Farm and Rural Populations

Farming is a predominantly rural, or nonmetro, activity. However, as a result of a tremendous transformation in U.S. agriculture and rural life during the twentieth century, today most rural economies and populations are no longer tightly aligned with farming (see box, "Who Is a Farmer?"). The dramatic productivity increases in U.S. agriculture over the last century have freed a large share of the population to enter nonfarm occupations as well as to relocate to urban, or metro, areas. Today, agriculture employs less than 2 percent of the employed labor force. As the rural share of the U.S. population has declined, the share of the U.S. population living on farms has declined even more, so that the farm population now represents a small share of the rural population. While farming dependence once characterized most U.S. rural counties, by 2000, only 20 percent of rural counties were considered farming dependent. Geographically, these counties are mostly located down the middle of the country from North Dakota to northern Texas, with some dispersed in the South and the West [1] (Dimitri et al., 2005).

[1]To be defined as a farming-dependent county in 2000, a county had to meet one of two conditions: (a) 15 percent or more of average annual labor and proprietors' earnings was derived from farming during 1998-2000, ***or*** (b) 15 percent or more of employed residents worked in farm occupations in 2000. See www.ers.usda.gov/briefing/rurality/typology/

Today, nonmetro counties lag behind metro counties in nonfarming economic opportunities: a lower proportion of nonmetro jobs are in higher-paying professional and managerial positions. And the gap between nonmetro and metro earnings per job has expanded over the past three decades: by 2004, nonmetro earnings per job had dropped to 67 percent of metro earnings per job. Further, population growth has been lowest in the least densely populated counties: the population in noncore counties grew by 8 percent during the 1990s, compared with growth rates of 10 percent in micro areas and 14 percent in metro areas.

With urban sprawl, farming is increasingly occurring within metro counties (see box, "What Is Rural?"). Nonetheless, the geographical distribution of the households of farm principal operators is quite different from that of all U.S. households, which are predominantly located in metro counties (83 percent), with slightly more than half in large metro countries (populations of 1 million or more). Within nonmetro counties, the U.S. population is more concentrated in micro counties than in noncore counties (fig. 2.1). In contrast, farm operator households are predominantly located in rural areas, and among rural households, farm households are more likely to be in the lower density, more remote rural areas. Farm households located in metro areas are concentrated in smaller metro areas while nonfarm households are more likely to be in large metro areas.

Similarities and Differences Between Farm and Rural Households in Factors Affecting Health Outcomes

The literature identifies three critical factors contributing to health outcomes: access to health care resources (including proximity, affordability, and quality); the community and occupational environment; and personal behavior, such as smoking and diet (United Health Foundation, 2006). Further, the contributions of these three factors are mediated by age, geography, and socioeconomic status. Current research on health disparities associated with socioeconomic

Who Is a Farmer?

This analysis focuses on two farm household populations: households of all principal farm operators, and households of the subset of principal farm operators who identify farming as their principal occupations.

Households of all principal farm operators. To capture the population of principal operators of family farms, the analysis starts with the population of farms as defined by USDA ("any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the year"). Because the interest here is farm operator households, the analysis focuses on the approximately 2 million "family farms," defined as those in which the majority of ownership of the farm business is held by related individuals.[1] Nearly all U.S. farms (98 percent in 2007) are family farms.[2] The USDA data sets—the Census of Agriculture and the annual Agricultural Resource Management Survey—capture this population. (See appendix A for a description of data sources.)

Households of operators with farming as their principal occupation. In national surveys of the U.S. population, such as the National Health Interview Survey (NHIS) (which this analysis uses for data on health status, health risk behaviors, and health care usage by farm and metro status), a farmer is typically identified based on his or her self-identification of farming as a primary occupation. Many farmers hold off-farm jobs in addition to operating their farms. To identify a subgroup of farms from USDA data sets comparable to the farmer population available in NHIS data, this study reports USDA data for family farms that are headed by principal operators who identify farming as their principal occupation, which represented about 40 percent of all family farms in 2007.

Relative to all USDA farmers, "farm-occupation" farmers are more likely to be over age 65 and live in Midwest noncore counties. Economically, they are more reliant on farm income than other farm households, with lower median income but higher median wealth than all USDA farmers.[3]

[1]For more information, see the glossary in the ERS briefing room on Farm Household Economics and Well-Being: www.ers.usda.gov/briefing/wellbeing/glossary.htm

[2]About 40 percent of farms have more than one operator; however, for three-quarters of the farms with multiple operators, the farm is operated by a husband-and-wife team, so that both operators are part of the principal operator household on which we focus. About 10 percent of family farms have other operator households associated with the farm, which are not included in this analysis. For more information, see www.ers.usda.gov/briefing/wellbeing/.

[3]Over the last 10 years, U.S. farm households earned on average between 80 and 95 percent of their household income from nonfarm sources. The average share of household income from farming increases with the sales class of the farm. For more information, see www.ers.usda.gov/briefing/wellbeing/.

status (delineated by education, race/ethnicity, and financial resources) indicates that causal relationships vary, both across the dimensions and across the phases of the lifecycle. As summarized by Cutler et al. (2008), parental resources—education and income—as well as minority status appear to have powerful effects on the health of children. A surprising finding is that once childhood health is set, income and wealth no longer appear to have a large effect. In fact, the direction of causality tends to work in the opposite direction: poor health tends to limit the ability of individuals to work, resulting in lower

What Is Rural?

The two most commonly used definitions of rural are (1) the county-based definitions of metropolitan, micropolitan, and noncore areas of the U.S. Office of Management and Budget (OMB), and (2) the census-tract based definitions of rural and urban areas of the U.S. Census Bureau.

Metro and nonmetro areas. In 2003, OMB updated its definition of metro areas (based on 2000 census data) as (1) central counties with one or more urbanized areas, and (2) outlying counties that are economically tied to the core counties as measured by work commuting. Nonmetro counties are outside the boundaries of metro areas and are further subdivided into two types: *micropolitan*, or *micro*, *areas*, centered on urban clusters with at least 10,000 but no more than 50,000 persons, and all remaining *noncore* counties. In the 2003 update, nonmetro America covered 75 percent of the Nation's land but included only 17 percent (49 million) of the U.S. population.

Given that 83 percent of the U.S. population lives in metro counties, a number of systems exist to distinguish metro counties by size class. In this report, the National Health Interview Survey data split metro counties into large and small Metropolitan Statistical Areas (MSAs), where the dividing line is 1 million people; 54 percent of the U.S. population lives in large metro countries.

RUCA codes. The rural-urban commuting area (RUCA) codes are based on similar concepts and measures of population density, urbanization, and daily commuting as used by OMB to define county-level *metro* and *micro* areas. However, RUCA codes use census tracts as their building blocks and so allow a detailed and flexible scheme for delineating subcounty components of the U.S. settlement system. In a travel time study, Chan et al. (2006) aggregated the system of RUCA codes to create four categories: urban (a census-defined urbanized area of population 50,000 or greater); large rural city (in or associated with a large rural city of 10,000-49,999); small rural town (in or associated with a rural town of 2,500-9,999); and isolated rural town (in a town of less than 2,500 population and/or not associated significantly with a large town via work commuting flows). For a map illustrating the four-part RUCA coding of counties, see appendix B.

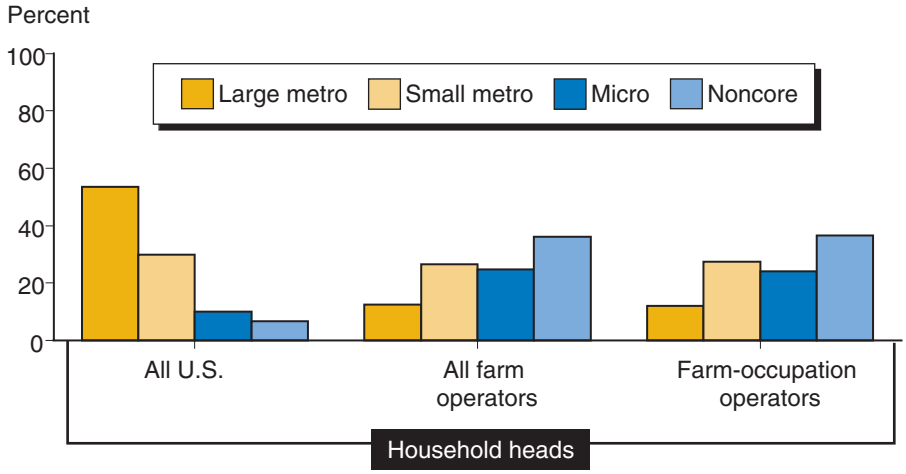
Source: Measuring Rurality briefing room on the ERS website: www.ers.usda.gov/briefing/rurality/.

income and wealth accumulation. In adulthood, education and membership in a minority group continue to be powerful determinants.

Nonmetro residents, particularly those living in more remote areas, face special health care challenges due to geography. Lower population densities mean that nonmetro residents must typically travel longer distances for health services, especially for specialty care. The nonmetro population also is older and has lower education and income levels than the metro population. (See appendix A for descriptive data on the farm and all U.S. populations by metro status.) On the other hand, nonmetro farm operator households are more likely to be of higher socioeconomic status than all nonmetro households: a larger share has household heads that graduated from college, a lower share has minority status, and median household income is higher.

Figure 2.1

Metro distribution of households for all farm operators, farm-occupation operators, and all U.S., 2007



Note: Nonmetro is subdivided into micro and noncore.

Sources: USDA, Economic Research Service using all versions of USDA's Agricultural Resource Management Survey 2007, (NASS and ERS), and the U.S. Census Bureau's 2007 American Community Survey.

In contrast, the relative socioeconomic status of metro farm operators is mixed, compared with that of metro nonfarmers. Metro farmers as a group are less likely to have college degrees, and metro farm-occupation farmers (though not all farmers) have slightly lower median household incomes than their all-U.S. counterparts. On the other hand, metro farmers are much less likely to be a member of a minority group. But on another critical measure of socioeconomic status—wealth—farm households (and, particularly, metro and farm-occupation farmers) dominate their nonfarm household counterparts. At the national level, median farm household wealth is five times that of all U.S. households (see appendix A). Farmers are self-employed entrepreneurs in a capital-intensive sector. Consequently, a large share of their net worth is in farm business wealth, including farmland.[2]

As relates to health status, other special challenges farmers confront include higher occupational risks of accidents and disease than their nonfarm metro and nonmetro counterparts.

[2]For more analysis on farm household economic well-being, see Jones et al. (2006) or Mishra et al. (2002).

Health Status and Health Risks

The principal indicators of health status summarized in this chapter are age-adjusted mortality rates, disability rates, farm accident fatality rates, and incidence of self-reported disease and self-assessed physical limitations. The analysis of disease incidence focuses on the leading causes of death in the United States. The analysis of health risk factors identifies self-assessed personal risk behaviors (and discusses their links to the leading causes of death) and risks of fatal injuries on the farm relative to other work environments. National data do not exist on mortality and disability by occupation, which would allow comparisons between farmers and other workers to complement comparisons between metro and nonmetro populations.

Mortality and Disability Rates, by Metro Status and Region

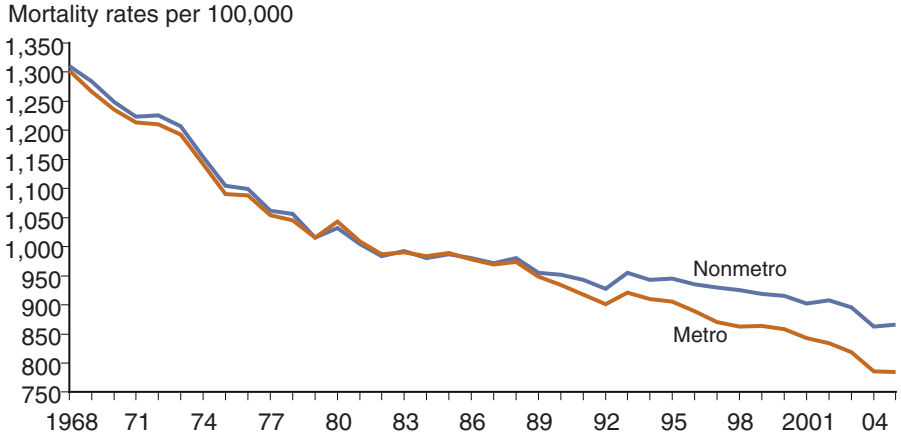
Mortality Trends by Metro Status, 1968-2005

The dominant trend in recent U.S. mortality has been one of decreasing death rates. During 1968-89, mortality rates for metro and nonmetro counties were similar and declined at about the same rates (fig. 3.1).

Data reveal that nonmetro mortality rates made a transition in 1990 (Cosby et al., 2008). Since then, metro rates have improved at twice the annual rate of nonmetro improvement. As a result, by 2001-05, the metro/nonmetro mortality disparity had steadily increased to around 70 deaths per 100,000. However, within the metro and nonmetro county groups, rates vary significantly across regions associated in part with differences in patterns of persistent poverty, race, and ethnicity of the populations (Cossman et al., 2003; Murray et al., 2006).

Figure 3.1

Annual metro and nonmetro age-adjusted mortality per 100,000 for the United States, 1968-2005



Note: 1974 nonmetro codes were used for 1968-75, 1983 nonmetro codes were used for 1976-85, 1993 nonmetro codes were used for 1986-95, and 2003 nonmetro codes were used for 1996-2005.

Sources: Cosby et al., 2008; USDA, Economic Research Service calculations for 2005 mortality estimates, using the Compressed Mortality File 1999-2005 from the Centers for Disease Control and Prevention, National Center for Health Statistics.

Mortality Rates: Regional Variations by Metro Status, 2005

The difference in 2005 age-adjusted mortality rates is substantially larger across regions than between metro and nonmetro counties (table 3.1). The difference from the lowest (West) to the highest (South) mortality-rate region is 108 per 100,000, though the difference doubles if the comparison is across region and metro status. The level of divergence between metro and nonmetro counties varies across regions, with the greatest metro-nonmetro gap occurring in the South, while in the Midwest, there was essentially no difference by metro status. For context, four of five U.S. farm households live in the South or the Midwest (compared with three of five for all U.S. households). Further, half of all farm households live in nonmetro counties in either the South or the Midwest, and 30 percent live in noncore counties in the two regions, compared with 13 and 6 percent, respectively, for all U.S. households. (See appendix A.)

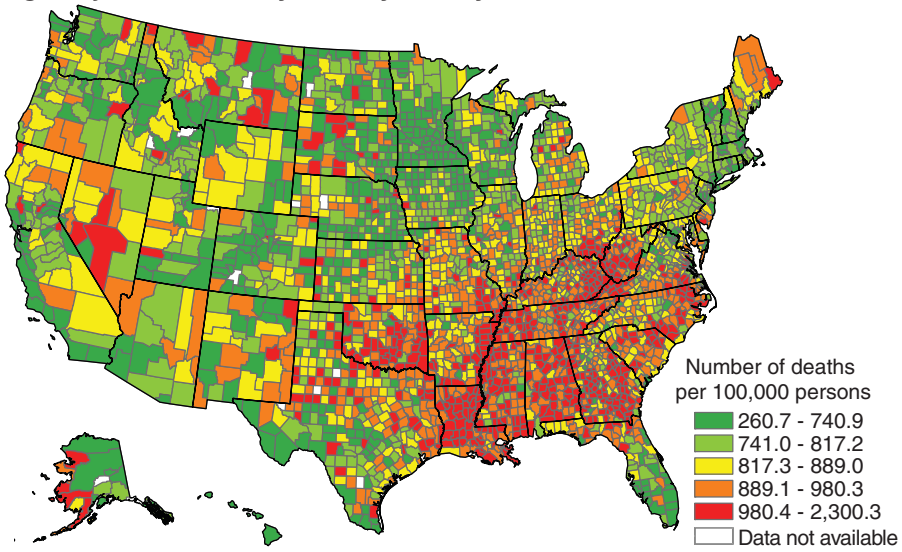
The regional nature of the mortality rates so apparent in figure 3.2 is corroborated by spatial statistical analysis of mortality clusters (Cossman et al., 2003). A low mortality-rate cluster is located in the Farm Belt portion of the

Table 3.1
Age-adjusted mortality rates, by region and metro status, 2005

			Nonmetro		
U.S. region	Total	Metro	Total	Micro	Noncore
		Number of deaths per 100,000			
Northeast	762.7	757.2	809.0	804.5	820.9
Midwest	813.0	813.5	814.1	816.4	812.9
South	845.6	818.7	938.8	922.5	960.6
West	737.4	730.0	796.7	799.5	792.3
Total	798.8	784.2	866.1	857.1	880.0

Source: USDA, Economic Research Service using data from the National Center for Health Statistics Compressed Mortality File, 2005.

Figure 3.2
Age-adjusted mortality rate, by county, 2005



Source: USDA, Economic Research Service using data from the National Center for Health Statistics, Compressed Mortality File, 1999-2005.

Midwest, from Wisconsin and Iowa west to the Dakotas, and south through Nebraska and Kansas to northeastern Colorado. (The area includes many of the farming-dependent counties identified by ERS.) The high mortality-rate clusters are in the South, including the Mississippi River Delta, the Black Belt of the southern coastal plane from Virginia through Alabama, and Appalachia. Factors associated with higher mortality across the clusters include high persistent-poverty rates, high shares of Black or Appalachian population, and low rates of high school graduation (Cossman et al., 2003).

Disability Rates: Regional Variations by Metro Status, 2000

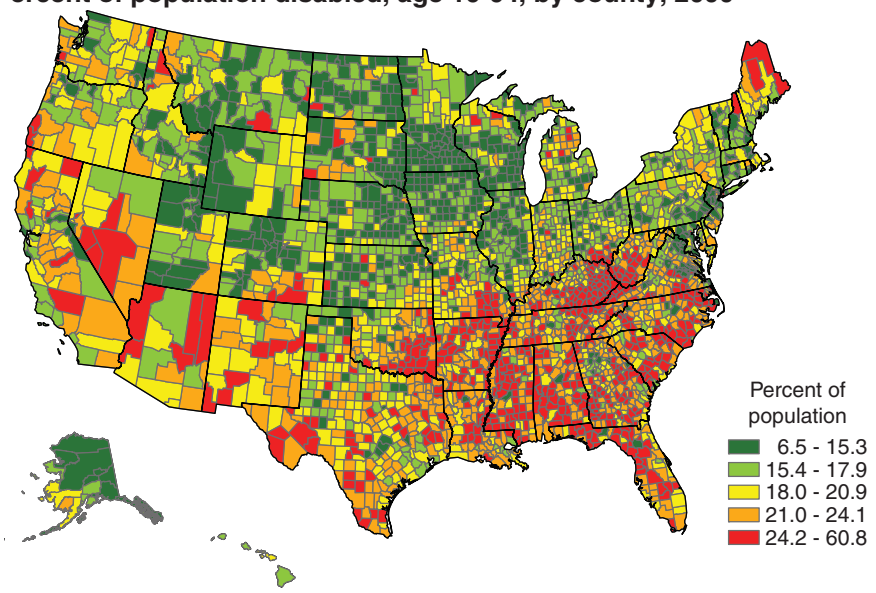
In 2000, 18.6 percent of the U.S. population age 16-64 reported having at least one of six possible disabilities (table 3.2).[1] The distribution of disability by region and metro status is similar to that of mortality. The nonmetro rate of disability was somewhat higher than the metro rate. Nonmetro areas with a low incidence of disability were concentrated in the Midwestern Farm Belt (fig. 3.3). Areas with high nonmetro disability include the areas of high mortality in the South: Appalachia, the Delta, and the Black Belt.

Table 3.2
Disability rates for population age 16-64, by region and metro status, 2000

			Nonmetro		
U.S. region	Total	Metro	Total	Micro	Noncore
	Percent of population reporting disability				
Northeast	18.2	18.2	18.1	17.6	19.5
Midwest	16.4	16.2	17.0	16.5	17.8
South	20.2	19.2	23.9	23.0	25.1
West	18.4	18.4	19.1	19.2	19.1
Total	18.6	18.2	20.5	19.7	21.6

Source: USDA, Economic Research Service using data from the U.S. Census Bureau, Census of Population, Summary File 3, 2000.

Figure 3.3
Percent of population disabled, age 16-64, by county, 2000



Source: USDA, Economic Research Service using data from the U.S. Census Bureau, Census of Population, Summary File 3, 2000.

[1]The U.S. Census asked questions about six different impairments and the limitations they imposed of respondents: 1) Does this person have any of the following long-lasting conditions: a) blindness, deafness, or a severe vision or hearing impairment; b) a condition that substantially limits one or more basic physical activities such as walking, climbing stairs, reaching, lifting or carrying? and 2) Because of a physical, mental or emotional condition lasting 6 months or more, does this person have any difficulty in doing any of the following activities: a) learning, remembering, or concentrating? b) dressing, bathing, or getting around inside the house? c) going outside the home alone to shop or visit a doctor's office? or d) working at a job or business? If an affirmative answer was given to any of the six questions, respondents were classified as having a disability.

Farm and Farm Family Health Risks From the Work Environment

Agriculture ranks among the most hazardous industries, according to the National Institute of Occupational Safety and Health (NIOSH), charged by Congress in 1990 with developing an agricultural safety and health program to address the high risks of injuries and illnesses experienced by workers and families in agriculture. Farmers face risks from working with machinery and animals as well as from potential exposures to high concentrations of hazardous substances associated with agricultural chemicals, including pesticides, herbicides, and fertilizers. As a result, farmers are at high risk for fatal and nonfatal injuries, work-related respiratory diseases, noise-induced hearing loss, skin diseases, and certain cancers associated with chemical use and prolonged sun exposure (NIOSH, 2009). Different types of farms have different patterns of exposures and accident risks, resulting in different patterns of elevated diseases and accident types (see the meta analyses of studies conducted by Blair et al., 1992; and Acquavella and Olsen, 1998). Farming is also one of the few industries in which the families (who often share the work and live on the premises) are also at risk for injuries, illness, and death.

National data are reported annually on fatal (and nonfatal) accidents, by occupation. However, a national system for calculating rates of total mortality, disability rates, and chronic disease by occupational history—necessary to compare farmers with other workers—does not exist. Alternatively, the occupational incidence of total mortality and mortality by chronic disease is studied by conducting epidemiological studies, which may be based on data collected for administrative purposes, including death certificates, census registers, and tumor registries, or by enrolling selected populations in a longitudinal survey. Calculating total mortality rates for an occupation and for all other workers for comparison is challenging due to difficulties in identifying the total population of workers who have worked in that occupation.[2]

Consequently most studies focus on the relative incidence of diseases across worker groups, or relative to the general population. Starting with a DHEW Vital Statistics Report in 1963 (see Guralnick, 1963), various epidemiological studies of farmers in the United States and in other countries have suggested that, whereas White male farmers have higher incidences of fatal accidents and of certain diseases associated with agricultural exposures, they have had a lower incidence of diseases associated with smoking and obesity (including heart disease and lung cancer) (Blair et al., 1992; Acquavella and Olsen, 1998, Blair et al., 2005). In recent years, however, some studies have raised questions as to whether the incidence of heart disease among White male farmers remains lower (Fleming et al., 2003; Brackbill et al., 1994; Lee et al.,2002).[3]

Incidence of Fatal Farm Accidents, 1992-2007

Farming has one of the highest fatality rates of all occupations, according to the U.S. Department of Labor. While the overall fatality rate in the United States in 2007 was 3.7 per 100,000 workers, the rate for those with farming or ranching as a major occupation was more than nine times higher—38.4 per 100,000 (fig. 3.4). Furthermore, whereas fatal injuries per 100,000 workers generally

[2]One challenge with death certificate data, for example, from the National Occupational Mortality Surveillance Data (NOMS), is identifying the total population of a particular occupation for which NOMS is reporting death rates. Lacking population data, age-adjusted mortality rates for specific diseases can be compared across different occupations represented, but total mortality rates for a particular occupation cannot be calculated. Fleming et al. (2003) employed an alternate methodology that matched records from a sample of respondents in the National Health Interview Survey for 1986–94 with records from the National Death Index to estimate mortality rates for pesticide-exposed workers and for all other workers. However 30 percent of their sample was farm workers, rather than farm operators.

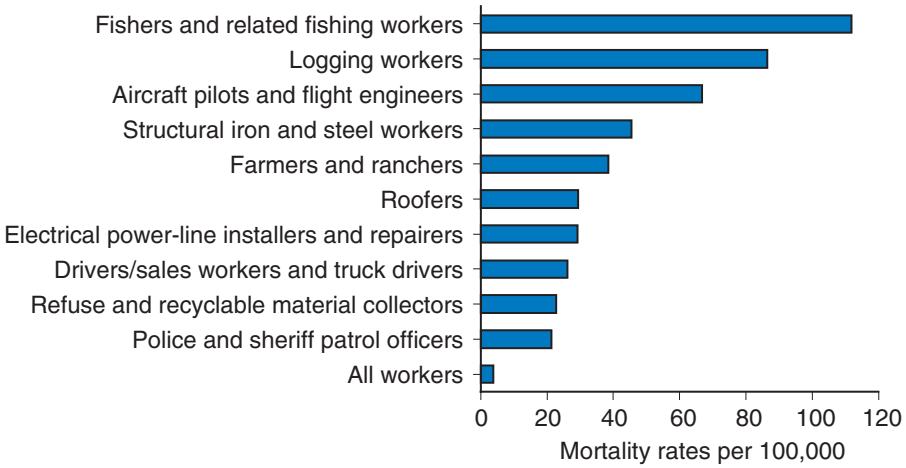
[3]To study the relationship between exposures and disease incidence in pesticide-exposed farmers and farm spouses, the National Cancer Institute, the National Institute for Environmental Health Sciences, and the National Institute for Occupational Safety and Health are sponsoring a long-term study of a panel of registered pesticide applicators (5 percent of whom are commercial applicators, the rest are almost entirely farmers) and their spouses in North Carolina and Iowa. The study enrolled participants during 1994-97 and plans to follow the population for 20 years. Interim findings (Blair et al., 2005) comparing the mortality rates of the pesticide-exposed population with that of the general population in the two States indicate the pesticide applicator cohort experienced a low mortality rate through 2000. The authors suggested that a more healthful lifestyle may contribute to the lower deficit but also cautioned that part of the mortality deficit may be the result of comparing the pesticide-exposed population with the general population over a short time period (3-7 years), since individuals who are currently working typically are more healthy than the general population. This "healthy worker" effect, typically estimated to be on the order of 15-20 percent in surveys of workers observed at one point in time, may decline in future years of followup.

declined for all U.S. workers from 1992 to 2006, the fatality rate for farmers and ranchers almost doubled during this same period (fig. 3.5).

Leading causes of farm fatalities from workplace injuries and accidents are transportation incidents (including tractor rollovers), contact with objects or equipment, and assaults (including animal attacks). Contributing to the risks are the long hours worked during planting and harvesting periods by farmers, their family members, and hired workers. The fatal injury rate for those in crop production has averaged more than twice that for those in animal production. Among agricultural workers, the fatal injury rate for those age 55 and older in 1995-2002 was 47.9 per 100,000, almost twice the rate for younger agricultural workers (Meyer, 2005). Around 60 percent of all farm operators and 70 percent of farm-occupation principal operators are age 55 or older.

Figure 3.4

Farming and other selected occupations with high fatality rates, 2007



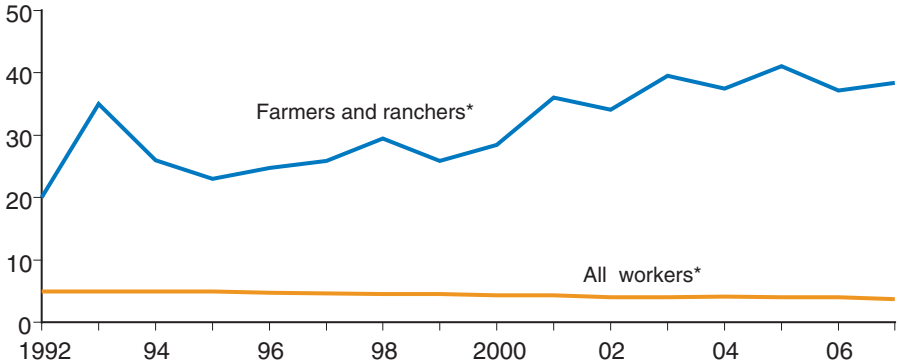
Rate = Fatal work injuries/employment x 100,000.

Source: USDA, Economic Research Service using U.S. Department of Labor, Bureau of Labor Statistics, National Census of Fatal Occupational Injuries, All Worker Profile, 1992-2007.

Figure 3.5

Occupational injuries, farmers and ranchers and all workers, 1992-2007

Injuries per 100,000 workers



*Hired managers are excluded for 1998-2007, horticultural managers are excluded for 1998-2002, and farm workers are included for 1992, 1996, and 1997.

Source: USDA, Economic Research Service using U.S. Department of Labor, Bureau of Labor Statistics, National Census of Fatal Occupational Injuries, All Worker Profile, 1992-2007.

Further, farm families who live on the premises and often share the work are also at risk. According to NIOSH, an estimated 1.12 million youth under age 20 resided on farms in 2006, with about 590,000 of these youth performing work on the farms. On average, 8 per 100,000 youth died annually from farm-related injuries between 1995 and 2002.[4] The leading sources of fatal injuries to youth on U.S. farms are machinery, motor vehicles, and drowning (NIOSH, 2009a).

[4]This fatality rate includes the 1.12 million children and adolescents living on the farm, as well as an additional 307,000 who were hired to work on U.S. farms in 2006.

Incidence of Health Risk Behaviors, Chronic Disease, and Physical Limitations, by Farmer and Metro Status

The leading causes of death in the United States in 2005 were heart disease, cancer, stroke, chronic respiratory diseases, accidents, and diabetes. The two top causes of death, heart disease and cancer, account for roughly half of all U.S. deaths.

Behavioral decisions by individuals are critical determinants of the burden of disease. The risk factors associated with the greatest total disease burden in North America are smoking, alcohol use, and overweight and obesity (Murray et al., 2006). Cigarette smoking contributes to numerous chronic illnesses, including several types of cancers, chronic obstructive pulmonary disease, cardiovascular disease (heart disease and stroke), as well as to reduced bone density, reduced fertility, and premature death (USDHHS, 2004). Although there is some debate over the health benefits of small amounts of regular alcohol consumption, the negative short- and long-term health effects of excessive alcohol use are well established. Short-term effects include motor vehicle injuries, falls, domestic violence, and child abuse. Long-term effects can include liver cirrhosis, pancreatitis, various cancers, high blood pressure, and psychological disorders, including dependence. Being overweight or obese also increases the risk for numerous ailments, including high blood pressure, diabetes, heart disease, stroke, arthritis, cancer, and poor reproductive health.[5]

[5]The Centers for Disease Control and Prevention defines overweight as having a body mass index between 25 and 30, and obese as having a body mass index over 30. Body mass index is a measure that adjusts body weight for height (USDHHS, CDC, 2004).

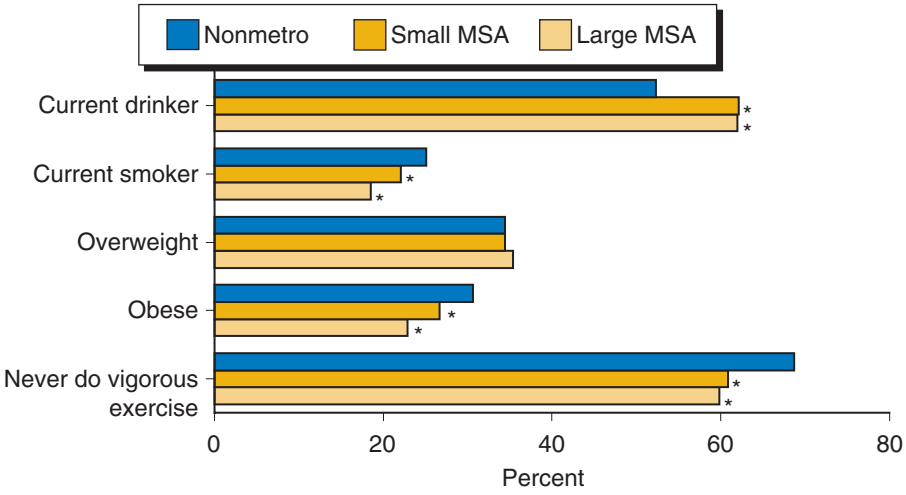
NHIS asked adults in a nationally representative sample of households about the incidence of various health risk factors, self-reported chronic disease, and self-assessed physical limitations. The metro/nonmetro comparison is based on a sample of all adults, whereas the farmer/other worker comparison is based on a sample of working adults categorized by their major occupation at the time of the survey, which excludes people who are sick or have a disability and are unable to work (and therefore will be a pool of healthier individuals than the total population).

Nonmetro adults were more likely than their counterparts from large-metro and small-metro areas to report engaging in most of the risky health behaviors: higher shares of adults in nonmetro households were current smokers, were obese, or were inactive (fig. 3.6). In contrast, a lower share of nonmetro adults was current drinkers. For those whose major occupation was farming, the pattern was mixed (fig. 3.7). The incidence of farmer smoking was less than that of other workers. The presumption is that farmers are more active on the job. Farmers, however, were more likely than other workers to be overweight but less likely to be obese. Lower farmer rates of obesity and of current drinking were statistically significant at the 10-percent level.

Relative to adults in metro households, adults in nonmetro households reported higher incidence rates of hypertension, heart disease, cancer, and stroke. The small difference in rates of respiratory disease was not statistically significant

Figure 3.6

Incidence of behavioral health risk factors by metro status, 2006 (age standardized)

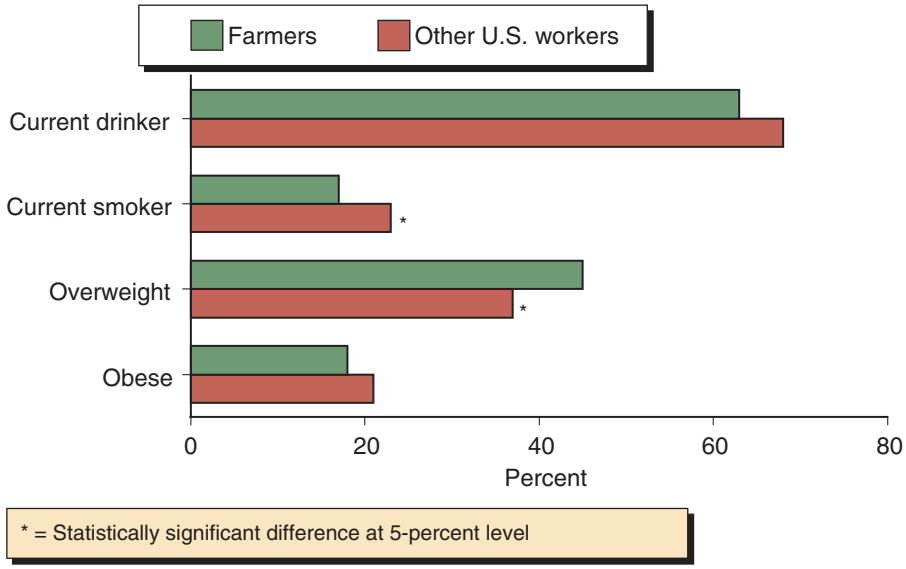


MSA = Metropolitan Statistical Area.

Source: USDA, Economic Research Service using U.S. DHHS, 2008, *Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2006*. Vital and Health Statistics, Series 10, Number 235.

Figure 3.7

Incidence of behavioral health risk factors by farmer status, 1997-2003 (age standardized)

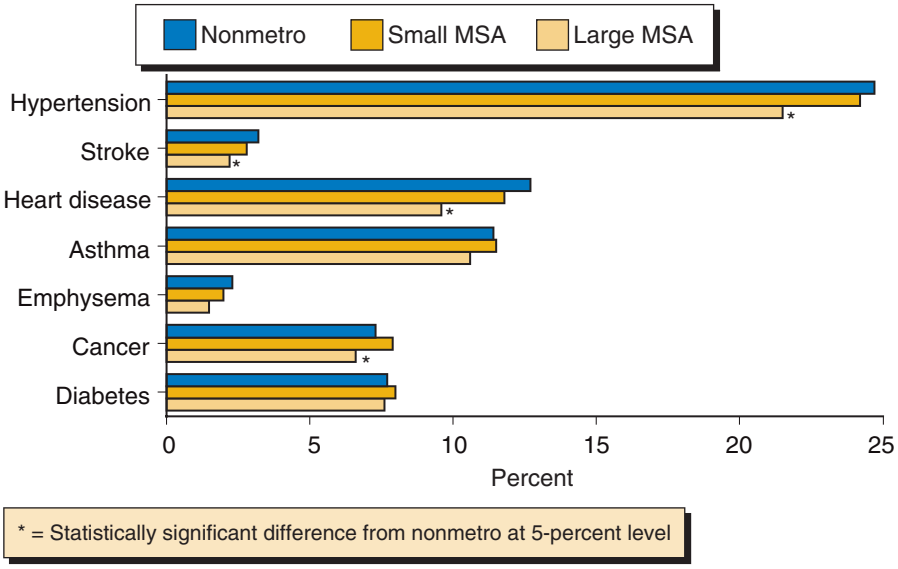


Source: USDA, Economic Research Service using U.S. DHHS, National Center for Health Statistics, National Health Interview Survey, 1997-2003.

(fig. 3.8). Relative to nonfarm workers, farmers reported lower incidence rates of cardiovascular disease and asthma and emphysema (fig. 3.9). The differences in rates for the other diseases were not statistically significant. In contrast, Brackbill et al., (1994) found a statistically significant excess incidence of cardiovascular conditions, but not for respiratory disease, when comparing a national sample of

Figure 3.8

Incidence of chronic disease conditions by metro status, 2006 (age standardized)

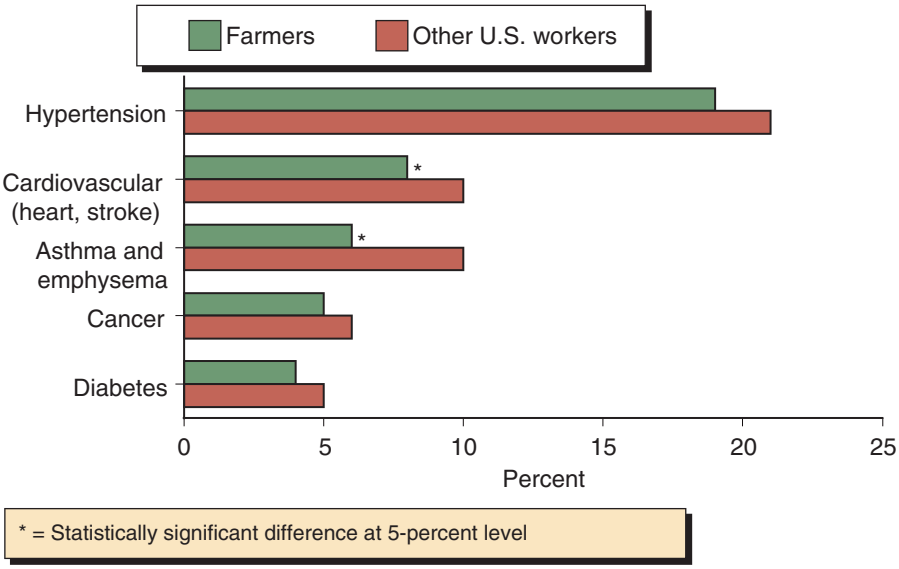


MSA = Metropolitan Statistical Area.

Source: USDA, Economic Research Service using U.S. DHHS, 2008, *Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2006*. Vital and Health Statistics, Series 10, Number 235.

Figure 3.9

Incidence of chronic disease conditions by farmer status, 1997-2003 (age standardized)



Source: USDA, Economic Research Service using U.S. DHHS, National Center for Health Statistics, National Health Interview Survey, 1997-2003.

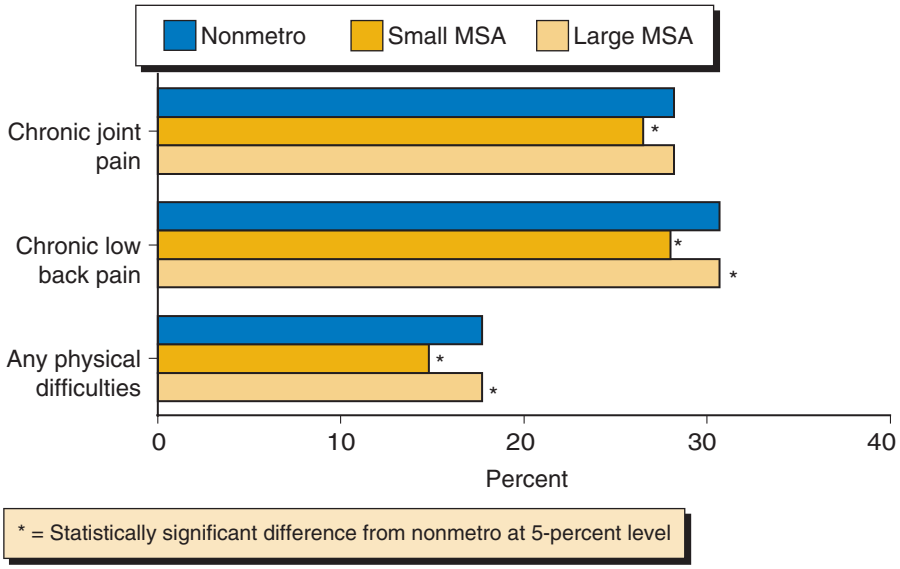
farmers with other White male workers for the period 1986-90, using a comparable methodology with pooled NHIS data.

Nonmetro adults reported higher incidence rates of chronic joint pain, chronic low back pain, and physical limitations, such as difficulty walking a quarter of

a mile, climbing 10 steps without stopping, or standing or sitting for 2 hours, than their metro counterparts. These results are consistent with the findings reported earlier from census data. In contrast, farmers reported a higher incidence of chronic joint pain but are otherwise comparable with other workers in terms of chronic injuries and physical limitations (figs. 3.10 and 3.11).

Figure 3.10

Incidence of chronic pain and physical difficulties by metro status, 2006 (age standardized)

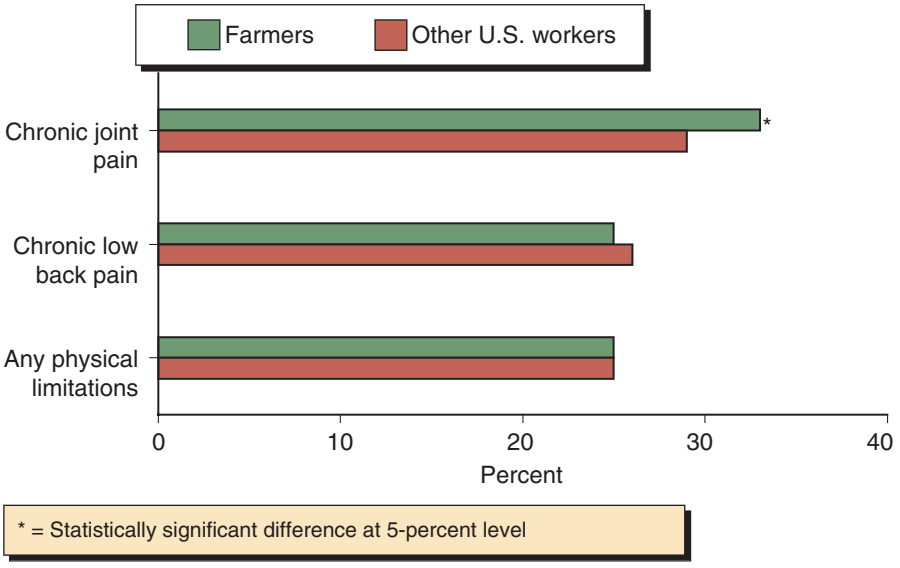


MSA = Metropolitan Statistical Area.

Source: USDA, Economic Research Service using U.S. DHHS, 2008, *Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2006*. Vital and Health Statistics, Series 10, Number 235.

Figure 3.11

Incidence of chronic pain and physical difficulties, by farmer status, 1997-2003 (age standardized)



Source: USDA, Economic Research Service using U.S. DHHS, National Center for Health Statistics, National Health Interview Survey, 1997-2003.

Chapter 4

Health Care Access

"Access to health care" is the number one rural health priority identified by *Rural Healthy People 2010* (Gamm et al., 2003). Specifically identified as priorities were access to health insurance and access to primary, dental, and mental health care, as well as emergency services. Rural households confront special challenges to achieving healthy outcomes due to socioeconomic status and age factors, and due to less healthy behaviors.

Affordability

Health Insurance Coverage

Lack of health insurance creates a range of consequences, including increased incidence of illness, lower quality of life, and lower life expectancy, in tandem with higher financial burdens. In addition to protecting households against the financial risks imposed by expensive and unanticipated medical events, health insurance coverage tends to increase the likelihood of timely access to health care, including preventive care, diagnostic tests, and prescriptions, which can help prevent escalation of health problems. Coverage may also increase survival rates from life-threatening disease and reduce costs, for example, by preventing avoidable hospitalizations for chronic conditions, such as congestive heart failure or uncontrolled diabetes (Gamm et al., 2003; IOM, 2000; Dorn, 2008).

Senior status is a critical determinant of coverage because Medicare coverage is available to U.S. citizens age 65 and older. Because the farmer and nonmetro populations have a larger share of elderly than their respective counterpart populations, it is important to control for age when comparing covered populations.

For nonelderly individuals, the backbone of the U.S. health insurance system is employment-based coverage. Nationally, about three-quarters of workers are offered employment-based insurance (CBO, 2009). One reason such plans are popular is that they are subsidized by the tax code: neither employer nor employee payments are subject to income or payroll taxes. Larger employers are more likely than small employers to offer insurance to their workers because of the economies of scale in administrative costs and in risk pooling. Alternatively, individuals may purchase private insurance directly but will not generally have access to the group-rate insurance policies that offer lower costs due to risk pooling. In most States, premiums for direct purchase policies may vary with age or health status, and applicants with particularly high expected costs are generally denied coverage. Also, direct purchase insurance generally does not receive favorable tax treatment. The exception is for households of the self-employed who can deduct the premiums for self-purchased health insurance, yielding a reduction in after-tax health insurance cost equal to their marginal tax rate.[1]

Major public sources of insurance for nonelderly individuals include the Federal/State Medicaid program and the related, but smaller, Children's

[1]The tax benefits for direct-purchase insurance among the self-employed are lower relative to those of employer-sponsored insurance (ESI) because the self-employed tax deduction only reduces income taxes while the ESI tax exclusion reduces both income and payroll taxes.

Health Insurance Program (CHIP). Both programs provide free or low-priced coverage for children in low-income families and, to a more limited degree, their parents. Medicaid also covers poor individuals who are blind or have other disabilities. Other public sources include Federal health programs for military personnel or veterans, and Medicare for nonelderly individuals who are disabled or have severe kidney disease.

It is important to note that comparisons of household out-of-pocket expenditures on premiums across types of insurance can be misleading as an indicator of effective costs to the household, as well as of actuarial value of the policy.[2] A useful summary statistic for comparing plans with different designs is their actuarial value, which essentially measures the share of health care spending for a given population that each plan would cover. Actuarial values for employment-based plans typically range between 65 and 95 percent, with an average of 80-85 percent; in contrast, for direct purchase plans, they generally range from 40-80 percent, with an average of 55-60 percent. Public programs vary in the extent of coverage they provide (CBO, 2009).

Prior literature indicates that insurance coverage is lower in nonmetro areas, in large part because working adults living in rural areas are less likely to be offered health insurance through their jobs. Employment-based insurance is less likely to be offered for low-skilled service jobs and by small employers—both of which are more prevalent in rural areas. Farmers might be expected to have lower coverage because they are self-employed; on the other hand, a majority of farm households have someone who works off the farm. Further, farm households tend to be in a better financial position than the nonfarm population, and consequently are better able to afford the cost of private health insurance. ERS research has shown that, in 2006, farm-operator household members nationwide were slightly more likely to have insurance coverage than the general U.S. population (Ahearn, 2008). Consistent with these national results, a recent survey of farmers in seven Great Plains States also found higher than average coverage rates for farm households: over 90 percent of farm households headed by a nonelderly person in those States indicated that all members of their households had been continuously insured during 2006.[3]

Coverage—nationally and by region and metro status. According to the U.S. Census Bureau's Current Population Survey (CPS), 45.7 million people in the United States did not have health care coverage at any time during 2007.[4] About 17 percent of all nonelderly individuals were estimated to be without health insurance coverage during the same period. Due to coverage by Medicare, the share of elderly individuals without insurance was significantly less, at 2 percent. About 15 percent of nonelderly farm household members lack coverage—slightly lower than that of the general U.S. population. However, among households of primary-occupation farmers (40 percent of all farmers), 20 percent of nonelderly members lack insurance coverage (table 4.1).

The analysis did not find statistically different disparities in coverage by nonmetro status for either the whole U.S. population or the farm-operator household population (fig. 4.1). For nonmetro households, it is noteworthy that the size (and statistical significance) of the previously observed metro/nonmetro differences in coverage appear to have dissipated over the last 10 years since the introduction of CHIP (see box, "Changing Metro/Nonmetro Patterns of Insurance Coverage, 1997-2005"), though individuals in the more

[2]It is well understood that the employee out-of-pocket share of employment-based policies understates total premium costs. Further, research indicates that costs of employers' payments are passed on to employees as a group, mainly in the form of lower wages—so employee out-of-pocket costs also tend to understate the effective costs of the insurance policy to the employee (CBO, 2009).

[3]The seven States were Montana, North Dakota, South Dakota, Minnesota, Nebraska, Iowa, and Missouri, all of which (except Montana) were above the U.S. average in the share of covered individuals (Access Project, 2007).

[4]For our reporting, we rely on USDA's Agricultural Resource Management Survey (ARMS) for farm households and the U.S. Census Bureau's Current Population Survey (CPS) for all U.S. households. The Census Bureau cites evidence to support the possibility that the supplement to the CPS, which collects health insurance data for the U.S. population (i.e., the Annual Social and Economic supplement (ASEC)), uses a data collection approach that leads to underreporting the share of households that had health insurance coverage at any point during the year. In particular, survey research suggests that respondents are likely to be reporting their insurance coverage at the point of time of the data reporting rather than for the entire previous year, as is explicit in the wording of the survey question. The CPS ACES survey question on health insurance is similar to the ARMS survey question. Hence, the implication of this finding relating to respondents' interpretation of the survey question likely is similar for both the ARMS and the CPS ACES. For more information, see appendix C of DeNavas-Walt et al., U.S. Census Bureau, P60-235, August 2008.

Table 4.1

Health insurance coverage of persons in all U.S. and farm households, by metro status and by source of coverage, 2007

	Individuals under age 65 (total)			Individuals 65 and older			Individuals of all ages		
	Total	Metro	Nonmetro	Total	Metro	Nonmetro	Total	Metro	Nonmetro
					Percent				
All U.S. persons									
Uninsured *	17.1	17.1	17.4	1.9	2.0	1.4	15.3	15.3	15.0
Any insurance coverage **									
Employer	62.9	63.5	59.4	34.1	35.2	29.8	59.3	60.2	54.9
Private direct purchase	6.5	6.5	6.7	25.9	24.5	31.8	8.9	8.6	10.5
Public (Medicare, Medicaid, other)	18.5	17.8	22.4	93.7	93.1	96.2	27.8	26.6	33.5
Persons in all households of principal farm operators									
Uninsured	15.3	15.0	15.5	7.4	8.4	6.7	13.8	13.7	13.9
Any insurance coverage	84.7	85.0	84.5	92.6	91.6	93.3	86.2	86.3	86.1
Employment-based	60.7	60.0	61.1	12.9	12.0	13.5	52.6	51.8	53.0
Private direct purchase	17.9	17.7	18.1	29.5	29.3	29.6	20.1	20	20.2
Public	6.3	6.7	6.1	79.4	78.8	79.8	19.9	20.7	19.4
Persons in households of farming-occupation operators									
Uninsured	19.9	23.9	17.6	11.1	na	na	16.5	19.6	14.7
Any insurance coverage	80.1	76.1	82.4	93.7	93.3	94.0	83.5	80.4	85.3
Employment-based	47.9	44.1	50.1	11.6	10.5	12.3	40.5	38.2	41.7
Private direct purchase	24.9	23.3	25.4	30.7	30.5	30.9	26.3	25.1	27.1
Public	7.2	6.5	na	82.9	84.1	82.2	26.2	26.0	26.4

na = Insufficient sample.

*"Uninsured" refers to no insurance coverage during the last 12 months.

**Sources of coverage add up to more than the total due to multiple sources of insurance.

Source: USDA, Economic Research Service calculations, using data from 2008 March Current Population Survey (ASEC) for all 50 States, and USDA's 2007 Agricultural Resource Management Survey, Version 1.

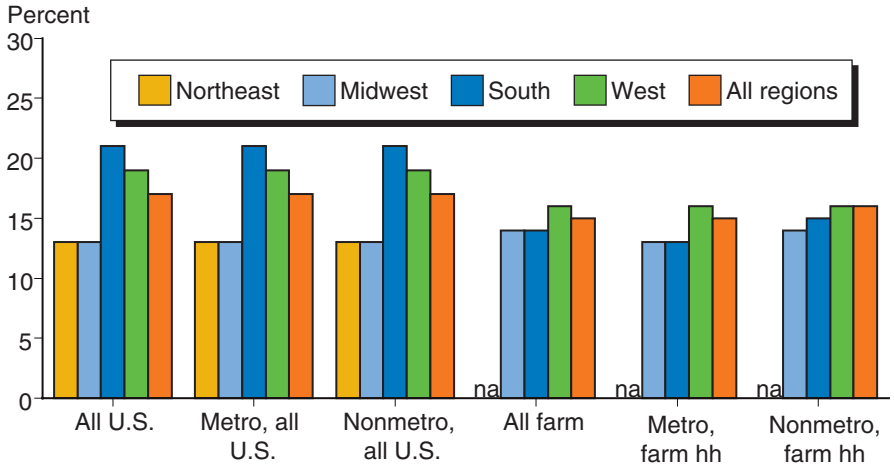
remote (noncore) counties still have lower coverage than urban residents.[5] However, regional location appears to have more impact than rurality, with the Northeast and Midwest having consistently higher rates of health insurance coverage than the South and the West.

Coverage by source of insurance. Among the nonelderly, employment-based insurance is the most common type for both farm and nonfarm individuals, providing coverage for more than 60 percent of both populations. Among nonelderly persons in primary-occupation farming households, close to half are covered by employment-based insurance. Although farm operators are self-employed on their farm, either the operator or the spouse, or both, of two-thirds of farm operator households worked off the farm in 2007. Even in cases where the operator cites farming as his or her major occupation, nearly 20 percent of operators work off the farm.

[5]Lenardson et al. (2009). This result is based on analysis of pooled December 2004 and December 2005 Medical Expenditure Panel Survey (MEPS) data.

Figure 4.1

Percent of uninsured nonelderly persons, by region and metro status, all U.S. and all farm households, 2007



na = insufficient numbers to report for Northeast. hh = household head.

Source: USDA, Economic Research Service using U.S. Department of Commerce, Census Bureau, Current Population Survey and USDA's Agricultural Resource Management Survey 2007, Version 1 only.

For all U.S. nonelderly households, the second most common type of coverage is public insurance. The nonmetro share from public sources is 4 percent higher than the metro share, compensating for the difference in employment-related shares. In contrast, for nonelderly farm households, the second most common source is private direct-purchase of insurance. With higher incomes relative to their nonfarm counterparts, farm households are more likely to have the financial resources for self-purchase and will typically not qualify for Medicaid or CHIP. Even those with low income, perhaps due to a bad year in the farm economy, are more likely to have assets that would disqualify them in their low-income years.

Among the elderly populations, participation in government insurance programs is very high, as expected. Many elderly persons also supplement their Medicare coverage. For farm households and for all nonmetro households, direct purchase is more common than employment-based sources—the reverse of the pattern for metro households.

Health Expenditures

Health care expenditures are separated into two components: household expenditures on insurance premiums and out-of-pocket costs for care (not covered by insurance). Higher health care expenditures do not necessarily imply a higher level of medical services—it could reflect a lower level of insurance coverage, for example, direct purchase policies typically have lower coverage relative to employment-based plans. Also, for the self-employed (farm and nonfarm), the after-tax effective cost of a given level of out-of-pocket household expenditures on insurance premiums will be lower for direct-purchase relative to employment-based coverage due to the differential tax treatment.[6]

Expenditures by farm and metro status. As with insurance coverage, the analysis did not find statistically significant disparities in the level of health expenditures by nonmetro status—both groups annually spend, on average, about $3,300 (table 4.2). However, because the average income of nonmetro

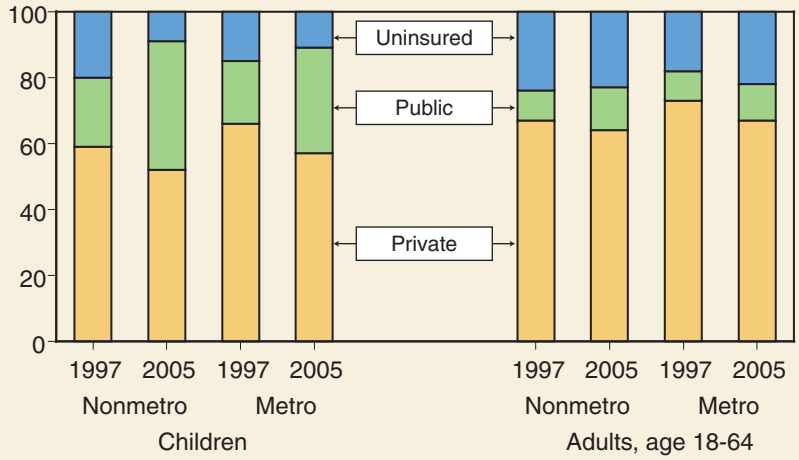
[6]In addition, all taxpayers who itemize deductions may take a deduction for health care costs above 7.5 percent of adjusted gross income.

Changing Metro/Nonmetro Patterns of Insurance Coverage, 1997-2005

The State Children's Health Insurance Program (now known as the Children's Health Insurance Program, or CHIP) was created in 1997 as a complement to Medicaid to provide coverage to low-income uninsured children not eligible for Medicaid. At the time, researchers suggested that the program could have a greater impact on lack of coverage for rural children than for urban children because more rural families were likely to be in the income range targeted by the program (between 100 and 200 percent of the Federal poverty level).

Insurance coverage for children and nonelderly adults, by metro status, 1997 and 2005

Percent



Notes: Calculations use Medical Expenditure Panel Survey (MEPS) data for December of each year. Public coverage includes Medicaid, SCHIP, Medicare, and TRICARE. Totals may not equal 100% due to rounding.

Source: USDA, Economic Research Service using Ziller and Coburn, 2009.

The share of children without insurance coverage declined substantially between 1997 and 2005. The increase in public coverage more than compensated for the decline in coverage from employment-based insurance. The net rural gains were so pronounced relative to urban gains that the rural differential was reversed: rural children now have higher insurance coverage rates.

Although CHIP was designed to improve access for children, some States used the program's flexibility to expand coverage to parents as well. This does not appear to be widespread enough to have reduced uninsurance rates among adults age 18-64 between 1997 and 2005. The small increases in public coverage were offset by reductions in private coverage. The shares of nonelderly adults without coverage increased for metro counties and decreased or were essentially unchanged for nonmetro counties through 2005. As a result, the metro/nonmetro gap became smaller but did not entirely disappear. The combined effect of CHIP has been the dissipation of the metro/nonmetro divergence in nonelderly insurance coverage.

Source: Ziller, E., and A. Coburn. 2009. *Rural Coverage Gaps Decline Following Public Health Insurance Expansions.* Research and Policy Brief, Portland. ME: University of Southern Maine, Maine Rural Health Research Center, February.

Table 4.2

Family health expenditures of all U.S. nonelderly individuals, by metro status and source of coverage, 2005 (2007$)

Metro status	All	Metro	Nonmetro
Sample size	28,617	23,682	4,935
Population (thousands)	258,708	217,441	41,267
All sources			
After-tax family income - mean*	51,709	53,458	42,493
Out-of-pocket health care spending - mean	1,377	1,353	1,505
Out-of-pocket health insurance premiums - mean	1,880	1,912	1,712
Total out-of-pocket health expenses - mean	3,257	3,265	3,216
Percent in families with high burden*	19.1	18.1	24.2
Uninsured			
After-tax family income - mean*	29,155	29,832	24,840
Out-of-pocket health care spending - mean	1,133	1,143	1,136
Out-of-pocket health insurance premiums - mean	276	286	252
Total out-of-pocket health expenses - mean	1,409	1,429	1,388
Percent in families with high burden*	15.0	14.5	18.1
Private - all			
After-tax family income - mean*	62,989	65,053	52,022
Out-of-pocket health care spending - mean	1,550	1,516	1,673
Out-of-pocket health insurance premiums - mean	2,561	2,595	2,187
Total out-of-pocket health expenses - mean	4,112	4,110	3,866
Percent in families with high burden*	20.5	19.4	23.6
Private - group (employer)			
After-tax family income - mean	63,340	65,327	na
Out-of-pocket health care spending - mean	1,517	1,490	na
Out-of-pocket health insurance premiums - mean	2,408	2,450	na
Total out-of-pocket health expenses - mean	3,925	3,939	na
Percent in families with high burden	18.6	17.8	na
Private - nongroup			
After-tax family income - mean	56,842	60,084	na
Out-of-pocket health care spending - mean	2,143	1,989	na
Out-of-pocket health insurance premiums - mean	5,247	5,226	na
Total out-of-pocket health expenses - mean	7,389	7,215	na
Percent in families with high burden*	52.9	49.1	na
Public			
After-tax family income - mean	22,680	22,618	22,919
Out-of-pocket health care spending - mean	842	813	975
Out-of-pocket health insurance premiums - mean	337	319	417
Total out-of-pocket health expenses - mean	1,179	1,131	1,389
Percent in families with high burden*	16.5	15.4	21.8

na = insufficient sample.
"High burden" refers to health expenses exceeding 10 percent of after-tax family income.
* = Significant difference between metro and nonmetro at 5 percent.
#= Significant difference at 10 percent.

Source: USDA, Economic Research Service using MEPS 2005, personal communication from Didem Bernard, USDHHS.

households is lower, nonmetro residents spend a larger share of household income on out-of-pocket health expenditures (for health care and health insurance premiums) than metro residents. Overall, for those under age 65, household health expenses exceeded 10 percent of after-tax income in 2005 for 24 percent of nonmetro households, compared with 18 percent of metro households. The metro-nonmetro differential is similar across types of insurance—with the exception of direct purchase insurance, where about half of both metro and nonmetro households have expenditures above 10 percent of after-tax income. However, small shares of U.S. metro and nonmetro households purchase private insurance.

Farm operator households spend much more on health care than all U.S. households, largely due to their greater reliance on direct-purchase private health insurance (table 4.3). In 2007, farm households spent, on average, $5,200 for both health insurance premiums and out-of-pocket health costs. For the 40 percent of farm operator households for whom farming is their primary occupation, health expenses are even higher, averaging nearly $6,000 in 2007. Primary-occupation farm households have higher health expenses than other farm households, even when they include household members working off the farm. For the primary-occupation households that rely solely on direct purchase health insurance, total out-of-pocket health expenses averaged nearly $10,000 in 2007.

Table 4.3

Health insurance and expenditures of all farm households and primary-occupation farm households by elderly status of principal farm operator and by source of coverage, 2007

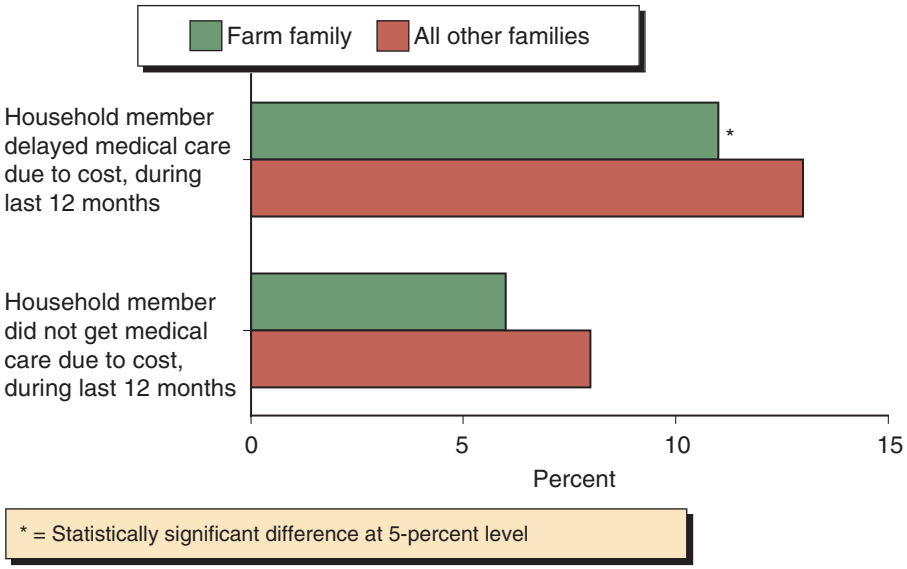
Elderly status of principal operator	Nonelderly (under age 65)						Elderly	All ages
Source of coverage	Uninsured	Only employment based	Only direct purchase	Only public	Combination of sources	All	All	All
Households of all principal farm operators								
				Average dollars				
Out-of-pocket health care spending	2,168	1,882	3,075	1,728	2,173	2,106	2,353	2,176
Out-of-pocket health insurance premiums	759	2,543	6,035	1,181	3,641	2,965	3,248	3,046
Total out-of-pocket health care expenses	2,927	4,425	9,110	2,908	5,814	5,071	5,600	5,222
				Percent				
Health care spending as a share of total household spending, net of housing and savings	12.2	12.7	24.8	13.6	19.0	15.3	22.0	16.9
Households of farming-occupation operators								
				Average dollars				
Out-of-pocket health care spending	2,778	2,325	3,608	1,087	2,553	2,603	2,533	2,577
Out-of-pocket health insurance premiums	720	2,700	6,222	1,203	4,204	3,350	3,159	3,278
Total out-of-pocket health care expenses	3,498	5,026	9,829	2,290	6,757	5,953	5,692	5,855
				Percent				
Health care spending as a share of total household spending, net of housing and savings	17.6	14.4	27.7	11.5	21.2	18.6	24.6	20.4

Source: USDA, Economic Research Service calculations using data from USDA's 2007 Agricultural Resource Management Survey, Version 1.

Self-assessed health care usage limited by cost. Though farm households report higher levels of health care expenditures, they report a lower likelihood of delaying medical care due to costs than nonfarm households (fig. 4.2). In contrast, nonmetro households report a higher likelihood of postponing or not getting medical care due to costs than metro households (fig. 4.3).

Figure 4.2

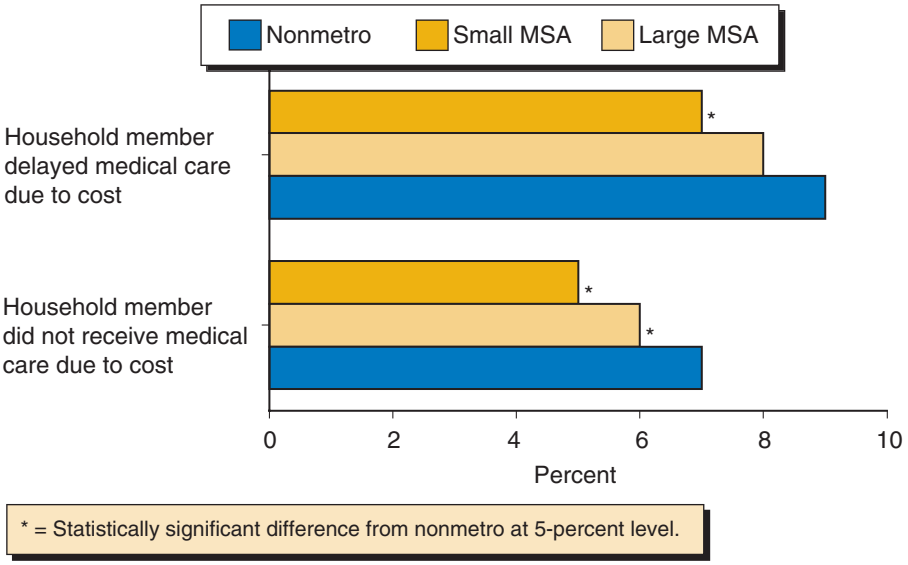
Cost-limited health care access by farm household status, 1997-2003



Source: USDA, Economic Research Service using U.S. DHHS, National Center for Health Statistics, National Health Interview Survey, 1997-2003.

Figure 4.3

Cost-limited health care access by metro status, 2006



MSA = Metropolitan Statistical Area.

Source: USDA, Economic Research Service using U.S. DHHS, 2008, *Summary Health Statistics for the U.S. Population: National Health Interview Survey, 2006*. Vital and Health Statistics, Series 10, Number 236.

Geographical Access: Medical Resource Availability, by County of Residence

Due to the low density of population and small patient volumes in rural areas, the rural health care model—particularly in noncore counties or smaller rural areas—focuses on local provision of primary care and emergency care, with referrals outside the area for specialized care. The primary care physician—the backbone of medical services in rural communities—can be supported by a population base as small as 2,000 people. In contrast, typical neurosurgeons require a population base of 100,000, along with sophisticated hospitals and laboratories, and specialty colleagues, to support their practice.[7] Rural hospitals tend to be smaller and offer a more limited range of services than their counterparts in more densely populated regions—they rely on referrals to larger hospitals, which imposes higher travel costs on rural patients and may result in discontinuity of care if followup treatment is provided more locally. Alternatively, rural patients may rely more extensively on generalists rather than specialists for their treatments or forego treatment (Gamm et al., 2003). Studies report lower rural utilization of preventive health care services and higher rural rates of potentially avoidable hospitalization for conditions where timely and appropriate ambulatory care can reduce the frequency of hospital admissions (Casey et al., 2000; Casey et al., 2007).

[7] Rosenblatt, R., and L.G. Hart, "Physicians in Rural America," in Ricketts, 1999, p. 41.

This section presents indicators of the distribution of county-level medical resources in the *Rural Healthy People 2010* priority areas of primary, dental, mental, and emergency care. The first set includes standard indicators of access—county-based quantity of medical resources per 10,000 population. To assess the adequacy of health care resources, one needs a benchmark. Several researchers caution against a simplistic "more is better" approach, arguing that the urban supply of physicians is excessive and so does not provide an appropriate benchmark.[8] Though there is an extensive body of research documenting the relationship between quantity of medical resources and quality of health outcomes with data on chronically ill Medicare patients, benchmarks for local health market care are not included in these studies (see Dartmouth Medical School, 2008). An alternative approach is to identify benchmarks for shortages. The second set of indicators—population shares living in Health Professional Shortage Areas (HPSA)—captures the extent of critical shortages of health care professionals. The HPSA designation identifies populations with too few physicians for primary, dental, and mental health care. Providers in HPSAs are eligible for a broad array of governmental assistance, including Medicare bonus payments and allocations of health professionals trained through the National Health Service Corps.

[8]Ibid., p. 39.; Ricketts and Holmes, 2007; Baicker and Chandra, 2004a.

Though commonly employed for reasons of data availability, the county-based quantity per population measures is an imperfect proxy for accessibility for several reasons. For one, individuals can travel across counties, and, in fact, the closest health care may be just across a county line. More significantly, the relationship between quantity counts and travel distance and time varies with population density (population per square mile) and with transportation networks. In general, for a given level of per capita health resources, travel distance and travel time to access them increase as population density declines—particularly in remote areas that are not served by interstate highways. The exception is in the transition from the most densely

populated urban areas to outlying urban/suburban areas, where travel time actually may decline with population density as travel congestion decreases.

To address these limitations, the next section reports a third set of indicators available for a selection of States—travel times to treatment and usage rates of all generalist and specialist medical professionals.

Health Professionals

As the total number of physicians practicing in the United States grew substantially over the last few decades, numerous programs have been implemented to redistribute health professionals to rural areas. Alternative approaches include educational interventions and economic incentives for health professionals to locate in rural areas, as well as direct public provision of primary care to underserved and disadvantaged populations through Federally Qualified Health Centers and Rural Health Clinics. During this time, the supply of physicians in rural areas grew modestly—primarily in the larger rural communities adjacent to metro areas. Although most types of specialty care have become more broadly available over time, specialties with fewer practitioners are still not generally available in smaller towns (Rosenthal et al., 2005).

In this analysis, the counts of medical professionals per 10,000 persons in a county[9] are limited to the subset of professionals who are non-Federal employees and who provide patient care. Unless otherwise noted, the data are for 2005 (see box, "Calculating Household Distributions of County-Level Indicators").

Primary care physicians.[10] Primary care physicians are integral to the rural health care system. The share of total physicians providing primary, rather than specialty, care increases as population density declines and geographic isolation increases—from 35 percent in metro, to 44 percent in micro, to 63 percent in noncore counties. The concentration of primary care declines less than that of the different specialties (fig. 4.4). However, there is still a decline from nine primary care physicians per 10,000 persons in metro counties, to six per 10,000 in micro counties, and five per 10,000 in noncore counties. Following the pattern of the distribution for all physicians, farm households have lower concentrations of primary care physicians in metro counties and comparable concentrations in micro and noncore counties, relative to all U.S. households.

The HPSA threshold level of U.S. primary care physicians is 3.5 per 10,000 persons, below which a county is designated as an HPSA. The share of the population in whole-county HPSAs represents an underestimate of the total number of medically underserved.[11] Four percent of total U.S. households are in a whole-county primary care HPSA (fig. 4.5). The share of HPSA households increases substantially as rurality increases, from 2 percent in metro counties to 28 percent in noncore counties. In contrast, 17 percent of the farm population is in a whole-county HPSA, ranging from 8 percent in micro to 32 percent in noncore counties.

Maternal, infant, and child health care. In remote counties, public policy is directed to ensuring local availability of prenatal, obstetric, and neonatal services in tandem with linking higher risk women and infants with nonlocal specialized care when required. Primary care doctors are critical but so is the

[9]County designations are based on county of household residence and of office location of medical professional.

[10]Primary care includes general practice, internal medicine (general), and pediatrics (general) physicians.

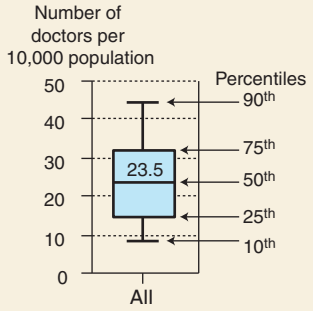
[11]There are additional persons in partial-county HPSAs or specific-population HPSAs (e.g., Native Americans or homeless in a particular county), but counting the population affected is challenging.

Calculating Household Distributions of County-Level Indicators

Health care resource data are compiled on a county basis. Because counties vary tremendously in the number of resident households, ERS researchers created a household distribution of health care resources by assigning to each household the value for the county in which it resides.

A typical approach to compare the quantities of health resources available for two populations—for example, doctors per 10,000 population—would be to compare averages for the two populations. But an average is highly influenced by the high and low ends of the distributions, particularly a few observations with a large number of doctors per 10,000. Given the great variability in resources across counties, ERS chose the median as the measure of central tendency rather than the mean. (At the 50th percentile of a distribution, half of the households have a higher value than the median, and half have a lower value.)

To display the variability of values across the distributions of farm and all U.S. households, box plots are a useful tool. The bottom, middle, and top of the box represent the 25th, 50th (median), and 75th percentiles of the distributions—which are also known as the first, second, and third quartiles. (At the 25th percentile, 25 percent of households have a lower value, and 75 percent have a higher value.) The "whiskers" above and below the box represent the 10th and 90th percentiles.



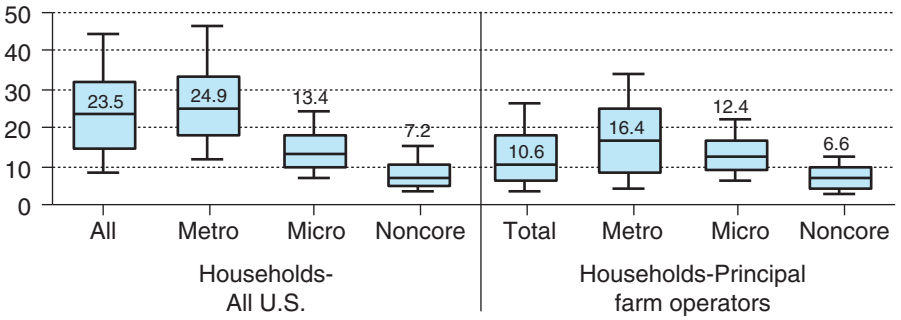
The box plot above illustrates the distribution of all doctors[1] per 10,000 population across all U.S. households. For each household, its doctor/10,000 ratio is determined by the county in which it is located. For example, the value for residents of the New York City borough of Manhattan (New York County, with a population of 1.6 million) is 96/10,000, whereas in Loving County, TX (with a population of 55), there are no doctors, and so the value is 0. From the box plot, one can see that, for the household at the midpoint or median of the distribution, 23.5 physicians per 10,000 provided patient care per 10,000 persons. The interquartile range was (15, 32), which means that 25 percent of U.S. households lived in a county with 15 or fewer physicians per 10,000 and 75 percent lived in a county with 32 or fewer physicians per 10,000.

[1]Includes both medical doctors (MDs) and doctors of osteopathy (DOs).

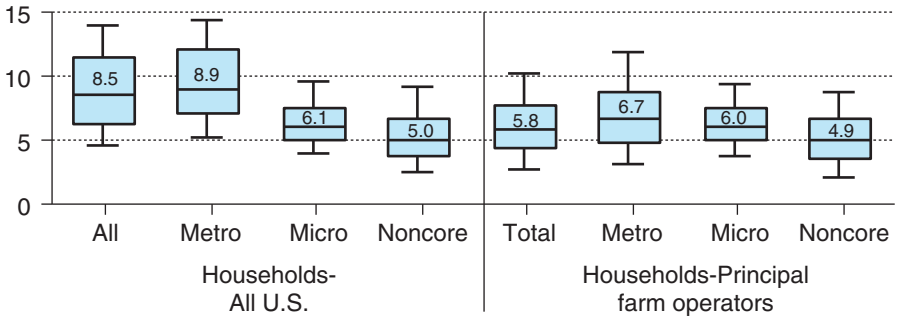
Figure 4.4

Health professionals—household distributions of county counts of non-Federal employees providing patient care, per 10,000 population

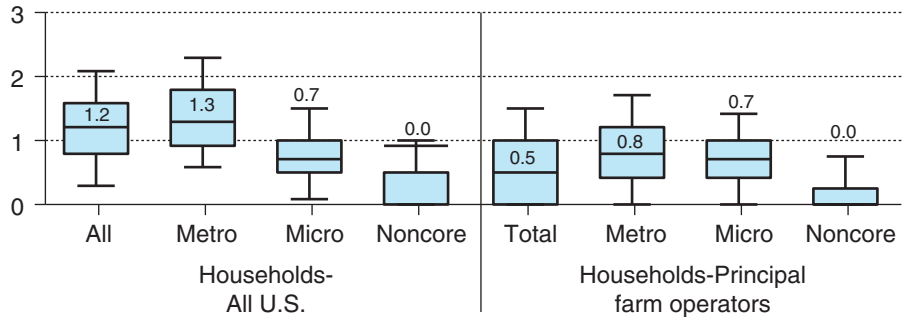
(a) Medical doctors (MD) and doctors of osteopathy (DO)



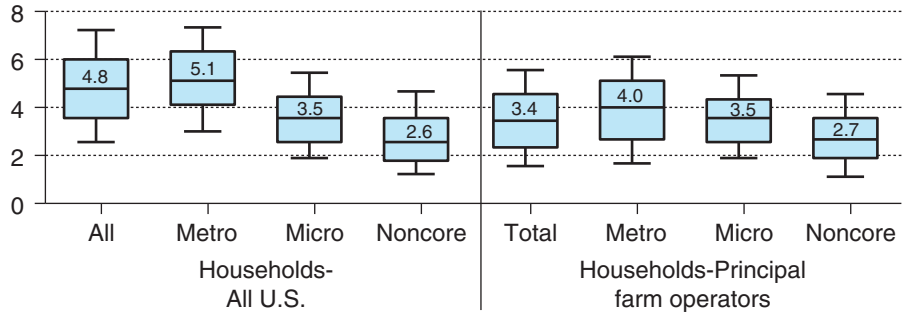
(b) MD and DO: Primary care



(c) MD: Obstetrics/Gynecology



(d) Dentists, total private practice (1998)

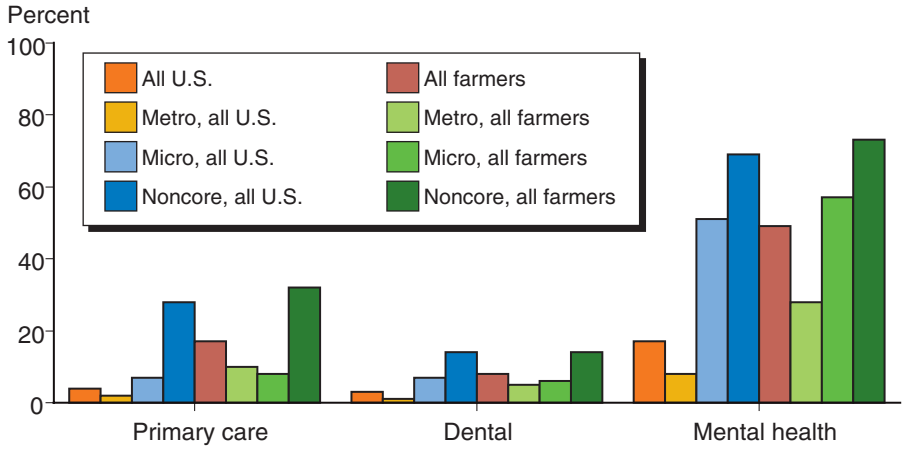


Note: The numbers in the boxes are medians represented by the lines inside, the bottom of the box represents the first quartile (25 percentile), and top of the box is the medium quartile (75 percentile) of the distribution. Unless otherwise noted, data are for 2005.

Source: USDA, Economic Research Service using *Area Resource File (ARF),* 2006. U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Rockville, MD.

Figure 4.5

Share of households in counties designated Health Professional Shortage Areas, by farm and all U.S. status, 2004



Source: USDA, Economic Research Service using *Area Resource File (ARF)*, 2006. U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Rockville, MD.

surgical specialty of obstetrics and gynecology, which operates on the borderline between specialty and primary care. Obstetricians/gynecologists (ob/gyn) are heavily concentrated in metro counties and are almost nonexistent in noncore counties. Lack of local services imposes economic and travel-time burdens on rural residents and may have an impact on perinatal outcomes.[12] Similarly, pediatric specialists (part of the medical specialist group, not illustrated here) are less well represented in noncore counties.

[12]Lishner et al., "Rural Maternal and Perinatal Health," in Ricketts (ed.), 1999, p. 134.

Dentist. The median U.S. household lives in a county with 4.8 dentists per 10,000 persons, compared with 3.4 dentists per 10,000 for the median farm-operator household. In noncore counties, the medians are 2.6 and 2.7, respectively. Relative to the distribution of primary care HPSAs, smaller shares of the population live in whole-county dental care HPSAs—3 percent of the total U.S. population and 8 percent of the farm population. Among noncore county residents, 14 percent of both populations live in HPSA counties.

In addition to fewer dentists, rural areas face other supply-related challenges to accessing dental care, including a relatively low supply of dentists who accept Medicaid or other discounted fee schedules, reluctance of dentists to participate in managed care programs, and absence of a coordinated screening and referral network (National Rural Health Association, 2001). Limited dental insurance coverage—Medicare does not cover outpatient dental care—is also an impediment (USDHHS, 2000).

Mental health professionals. Mental health care professionals are substantially underrepresented in rural areas, and farm households are disproportionately affected. The number of psychiatrists practicing in nonmetro counties is small—most micro or noncore counties have no psychiatrists.

Among the HSPA designations, mental health captures the highest shares of the population, with 17 percent of the total U.S. population covered, including 51 percent and 60 percent, respectively, among micropolitan and

noncore county households. For farm households, the share covered by mental health whole-county HPSAs is triple that for all households; the farm share in noncore counties is 73 percent.

As a result, primary care practitioners in more remote rural areas play a larger role in mental health care than do their urban counterparts. Primary care practitioners treating mental illness face a number of practice and professional constraints, including insufficient training and skills, heavy patient caseload, lack of time, and lack of specialized backup.[13]

[13]Gamm et al., p. 167.

Health Infrastructure

Across the United States, the numbers of hospitals and hospital beds have decreased over the last 30 years, reflecting a national trend toward shortening hospital stays and shifting services to other lower cost inpatient facilities—such as skilled nursing facilities—and outpatient services—such as home health care. Rural hospitals, with their lower patient volumes and consequently higher cost structure, experienced a disproportionate share of closures during this period. Rural providers are more dependent on public payers—Medicare and Medicaid—which typically have lower rates of reimbursement. Further, to contain costs, Medicare introduced in the 1980s a new reimbursement system for hospitals, the Prospective Payment System (PPS), which based reimbursements on a predetermined, fixed amount for each diagnosis, rather than the prior system, which reimbursed the allowable full cost of services provided. The move to PPS from a system that reimbursed the allowable full cost of services exacerbated the financial problems for small, low-volume rural hospitals (Ricketts 1999).

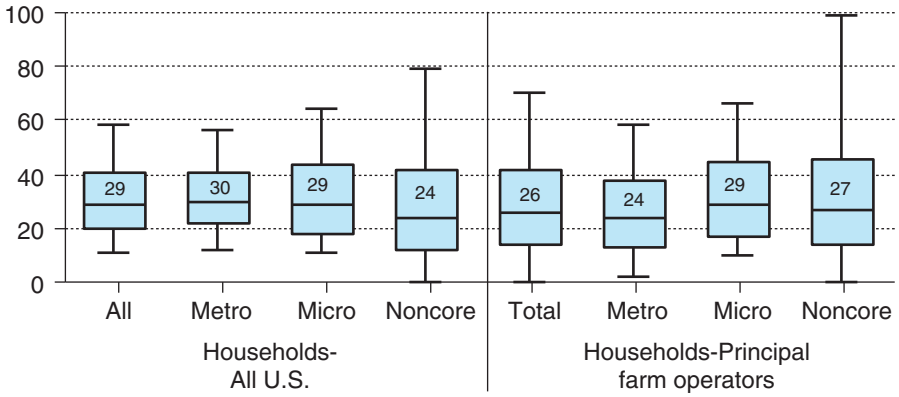
According to the National Advisory Committee on Rural Health and Human Services (2008), various Medicare policies have been viewed as 'fixes' to problems created by the prospective payment system for low-volume rural institutions. The biggest change for rural hospitals over the past two decades was legislative designation of Critical Access Hospitals (CAH), which established a cost-based reimbursement system for rural hospitals with 25 or fewer beds. The primary financial benefit of conversion to CAH status has been that these facilities no longer lose money on Medicare because they are paid for 101 percent of costs.[14] To qualify for conversion to CAH status, hospitals must provide a minimum level of emergency care inhouse; in addition, they must establish agreements with regional acute care hospitals to provide care for their more severely ill patients, including protocols for referral and transfer, communication, and emergency and nonemergency patient transportation.

[14]However, the designation does not address any financial shortfalls that occur when Medicaid or private pay reimbursement falls below hospital costs.

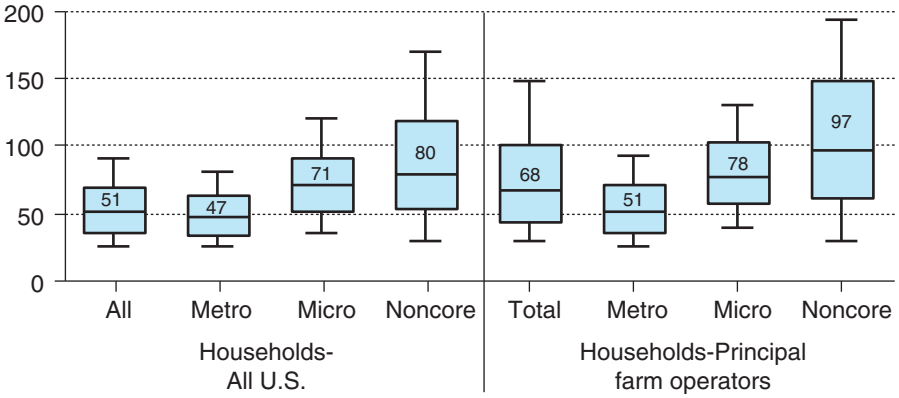
Hospital and skilled nursing facility beds. The median number of local (in the county) staffed hospital beds per 10,000 population is 29 for all U.S. households and 26 for farm households. The medians shift somewhat among rural and urban areas but are similar across metro status for the two populations (fig. 4.6). However, the range for nonmetro households is wide, particularly for households living in noncore areas. In noncore counties, the number of beds ranges from 0 at the 10th percentile to 80-100 at the 90th percentile for all U.S and farm households, respectively. For Medicare-certified skilled nursing facilities, the median number of beds consistently increases from metro to micro to noncore counties for both populations. Farm households

Figure 4.6
Health facilities - household distributions of county counts, per 10,000 population

(a) Hospital beds, all hospitals, 2004



(b) Skilled nursing facilities beds (Medicare certified), 2005



Note: The numbers in the boxes are medians represented by the lines inside the boxes; the bottom of the box represents the first quartile (25 percentile), and top of the box is the third quartile (75 percentile) of the distribution.

Source: USDA, Economic Research Service using *Area Resource File (ARF).* 2006. U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Rockville, MD.

actually have higher median numbers of beds, third quartiles, and 90th percentile values across all county types relative to all U.S. households.

Emergency medical services. Prehospital emergency medical services (EMS) represent the first stage in a full continuum of emergency care that also includes hospital emergency departments (EDs), trauma systems/centers, inpatient critical care services, and interfacility transport. EMS encompasses 9-1-1 dispatch, response to the scene by ambulance, treatment and triage by EMS personnel, and transport to a care facility via ground and/or air ambulance. In its 2007 report on the future of emergency care in the U.S. health system, the National Academy of Science's Institute of Medicine (IOM) identified major challenges faced across the country, as well as particular complications confronting rural EMS providers, including low patient volume, vast distances to travel, limited infrastructure, and inadequate funding for personnel, vehicles, and advanced medical equipment.[15]

[15]Because States and localities have the primary role in design and financing of emergency medical services, little standardized and quantifiable information exists across a wide geographical range, and most available information is localized and anecdotal (GAO, 2001).

As a result, the type and quality of available prehospital EMS services varies significantly across rural areas—to a greater extent than in urban areas. Relying more than their urban counterparts on volunteer staff with highly variable levels of expertise, training, and critical care experience, many rural programs offer only basic life support services.[16] Further, EMS response times from the instigating event to arrival at the hospital are significantly longer in rural areas than in urban areas due to increased distances. A 2002 survey found that 30 percent of rural patients fatally injured in a crash (compared with 8.3 percent in urban areas) arrived at the hospital more than 60 minutes after the crash, after the "golden hour" had expired.[17] In addition to the increased distances involved, other factors contributing to prolonged response times include the greater delay in the discovery of rural crash scenes, as well as the limits of 9-1-1 availability in sparsely populated areas.[18] Four percent of the Nation's counties, all in rural areas, still do not have access to basic 9-1-1, and 55 percent do not have advanced 9-1-1 systems that can track the location of cellular callers, which can be vital to emergency response.

[16]A recent national assessment found that 77 percent of emergency medical service personnel in rural areas were volunteers, compared with 33 percent in urban areas (Minnesota Department of Health, Office of Rural Health Primary Care, 2003).

[17]Developed from medical experience in the Korean War, the concept of the "golden hour" refers to the outer bound of time to initiate treatment following trauma or onset of acute illness to maximize potential for survival and recovery (NHTSA, 2005).

[18]For vehicle accidents, delay in discovery may be the single largest contributor to prolonged times until transport to a hospital (Esposito et al., 1995).

Travel Time and Care Usage

Data from the one major study recording actual travel times that people incur to receive medical care, by degree of rurality, complement the data documenting the lower concentrations of physicians in more remote areas (Chan et al., 2006). The study also reports data examining the relationship between travel times and usage of care, including share of primary versus specialist care.

While rural locations are attractive to some because of their less congested conditions, various studies have indicated that usage of preventive care is adversely affected by longer travel times. Patients have been observed to forego free mammograms if the travel distance is greater than 20 miles (Brustrom and Hunter, 2001). Several State health departments have proposed a standard whereby rural residents should not have to travel more than 30 minutes to see a physician (Bosanac et al., 1976). For more severe illnesses, the regionalization of services is designed to provide greater access to specialists. However, it represents a tradeoff in greater travel time burden, which may impose difficulties for severely ill patients, and which may impair outcomes and/or discourage use. In addition, there may also be indirect impacts if care is not effectively coordinated during transition to more local caregivers for post-operative outpatient care. If EMS transport is involved, the travel times reported here measure only a portion of the time from onset of the emergency to arrival at hospital because they do not include time to call, and time to arrival on scene.

Travel times to care. Chan et al. (2006) studied a population of Medicare patients in five States in different regions. For their rurality measure, they aggregated the system of RUCA codes to create four categories: urban (a census-defined urbanized area of population 50,000 or greater); large rural city (in or associated with a large rural city of 10,000-49,999); small rural town (in or associated with a rural town of 2,500-9,999); and an isolated rural town (in a town of less than 2,500 population and/or not associated significantly with a large town via work commuting flows).[19]

For general medical exams (an indicator of preventive services), median travel times for all visits across the four groups were less than the 30 minute

[19]The data are from Medicare billing records of patients seen in the fee-for-service environment during 1998 in Alaska, Idaho, North Carolina, South Carolina, and Washington. Travel distances and travel times were estimated from ZIP Code data for patient residence and provider location of service, using ARC-View Network Analyst, which calculates the shortest travel time (and the associated distance) between the centroids of the origin and destination ZIP Codes. Because of the relatively unique spatial dispersion of population in Alaska relative to other States—with 52 percent of the population in frontier counties—the more extreme measures of the distribution are unlikely to be representative; consequently, this analysis does not illustrate the 10th and 90th percentile whiskers associated with the box plots.

standard (fig. 4.7). Residents of large rural cities had the shortest median travel times; their times were shorter—though more variable—than those for urban residents. Residents of both small rural towns and isolated rural towns had upper quartile travel times that exceeded 30 minutes; more than 25 percent of these groups' visits did not meet the 30 minute standard. This relative pattern was observed across most categories of visits disaggregated by diagnosis or procedure, except that the rural city median was higher than the urban median for intubation, kidney dialysis, and pulmonary function tests.

Among emergency services, however, median travel times for small and isolated rural communities are 41 and 53 minutes, respectively, with travel times exceeding 75 minutes for 25 percent of patients. For cardiopulmonary resuscitation and critical care services, which generally occur in hospital coronary care, intensive care, respiratory care, or emergency care units, median travel times are less than 30 minutes across all groups. However, 25 percent of patients in small and isolated rural areas have travel times greater than 30-40 minutes for CPR and greater than 44-50 minutes for critical care services, respectively.

For mental health services (depression, anxiety, and dementia), median rural times were somewhat higher, though all were under or met the 30-minute mark. However, 25 percent of isolated rural patients experienced travel times over 50-60 minutes.

For various specialized diagnoses or treatment procedures, including treatments for vascular diseases of the heart and brain (ischemic heart and cerebrovascular) and cancer (malignant neoplasms), diagnostic tests for lung and heart disease, and specialized treatments, including kidney dialysis and digestive surgery, the median rural times exceeded 30 minutes and third quartiles times were close to or exceeded 60 minutes.

Use of health care. In this sample of Medicare patients, long median travel times are observed in small and isolated rural towns for some emergency care procedures, some mental health diagnoses, and some specialized diagnostic tests and treatments. To make inferences about health impacts, the researchers look at data on patterns of usage of care to identify possible behavioral responses of recipients to the long travel times. They are interested in the extent to which rural residents substitute primary care providers for specialists, or forego such care altogether.

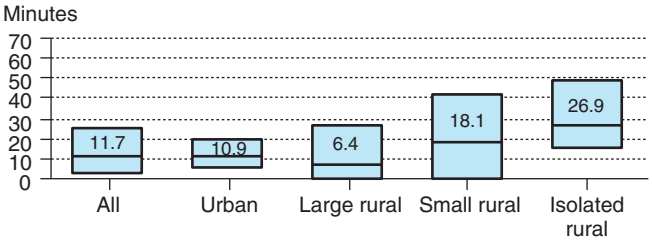
The data on actual visits by Medicare patients indicate that the share of visits to generalists rather than specialists increases with rurality, but the differences are far less than implied by the county availability data because rural patients travel out of county, particularly for specialty care not available in local health care markets. As noted earlier, the share of total physicians in the county providing primary rather than specialty care increases from 35 percent in metro, to 44 percent in micro, and to 63 percent in noncore counties. In contrast, for this sample of actual Medicare patient visits, 18 percent of visits by metro county residents were to generalists, relative to 22 percent for residents of large rural cities and 26 percent for residents of both small and isolated rural towns. Rural residents do not travel to urban areas for the majority of their care; only about 30 percent of visits from residents of small

Figure 4.7

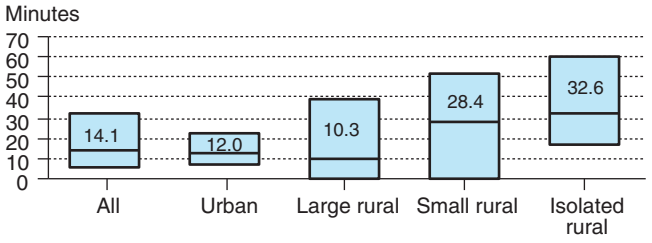
Median Medicare patient travel time from residence to care provider in selected States, 1998

For selected diagnosis

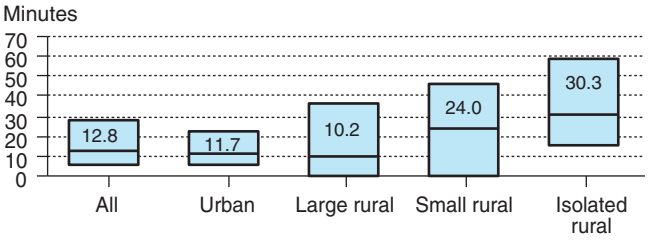
(a) All medical visits (20.6 million visits)



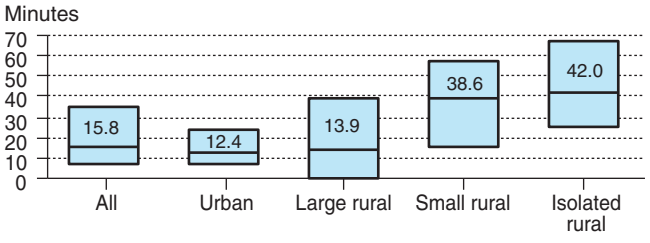
(b) Ischemic heart disease (774,628 visits)



(c) Depression and anxiety (154,454 visits)

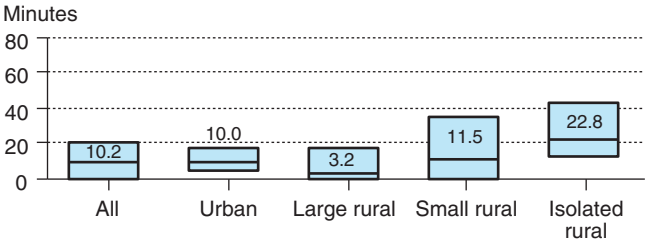


(d) Malignant neoplasms (861,340 visits)

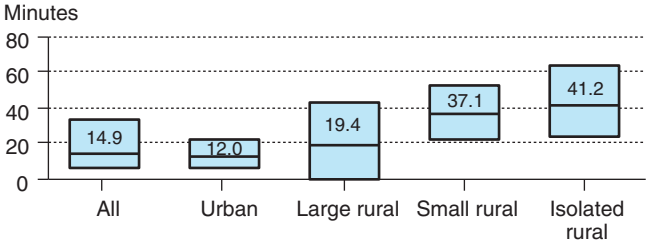


For selected procedures

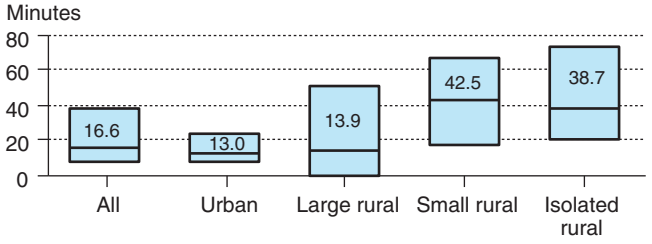
(a) General medical exam (75,790 visits)



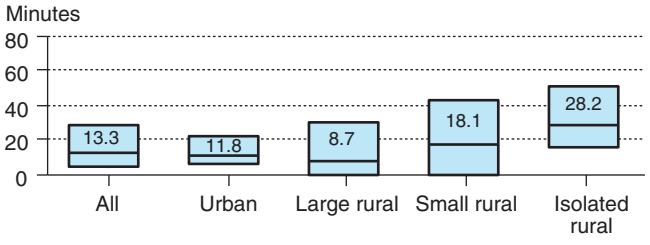
(b) Dialysis (699,542 visits)



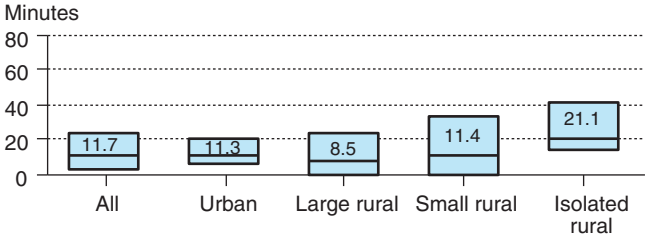
(c) Pulmonary function tests (26,571 visits)



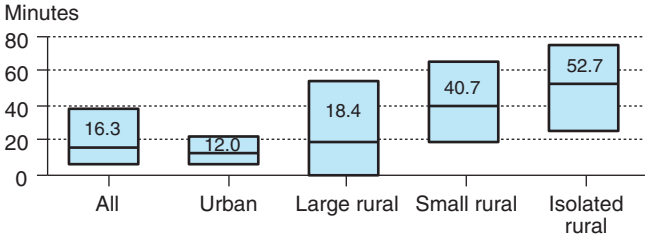
(d) Critical care services (41,506 visits)



(e) Cardiopulmonary resuscitation (2,333 visits)



(f) Intubation for emergency (4,814 visits)



Note: The numbers in the boxes are medians represented by the lines inside the boxes; the bottom of the box represents the first quartile (25 percentile), and top of the box is the third quartile (75 percentile) of the distribution. Data are reported for Alaska, Idaho, North Carolina, South Carolina, and Washington.

Source: USDA, Economic Research Service using Chan et al., 2006.

and isolated rural areas were to urban areas. The share dropped to 20 percent for residents of large rural areas.

The median number of trips per patient was the same (seven trips) across all rural and urban areas. However, urban areas had a larger share of patients with large numbers of trips, and so the average number of trips was higher in urban areas.

Implications for Quality of Rural Care

For traumatic injuries or episodes, longer times to emergency treatment are likely to have a negative effect on health outcomes. For other forms of care, longer travel times represent a higher cost of care, in addition to the financial costs. Does the lower rural average usage of total visits and of specialist visits found in this study signal lower quality care? For total visits, there is a longstanding basic presumption that more is better. For the usage of specialists, Chan et al. (2006) cite epidemiological studies suggesting that health outcomes are better for certain diseases (rheumatoid arthritis and congestive heart failure) when treated by specialists (Reis et al.,1997; MacLean et al., 2000). A major thrust of medical practice has been to promote increasing regionalization of services for which care-efficacy research indicates that higher volumes are associated with lower mortality.

New research is examining the tradeoffs more closely, including both the travel burden, which may affect health outcomes directly, as well as potential negative indirect effects on health outcomes if care is not effectively coordinated during transition to more local caregivers for post-operative outpatient care. The Dartmouth Atlas project has documented the extensive variation in the quantity of care and the specialist share of care given to chronically ill Medicare beneficiaries in different parts of the country, and examined its relationship with the quality of care. Project researchers have found that people who live in areas with more medical resources receive more intensive inpatient care, including higher rates of specialist use, but do not enjoy improved survival, better quality of life, or better access to care.[20] However, their study focuses on the performance at the level of hospitals, States, and health resource regions. Additional analysis would be required to evaluate the health implications for the rural local health care context.

[20]Dartmouth Medical School, 2008, p. 17. See also, Fisher et al., 2003a and 2003b, and Baicker and Chandra, 2004a and 2004b.

Chapter 5

Health Care Quality: Accountability and Coordination

In recent years, initiatives to improve the quality of health care have been gaining momentum, due in part to a series of landmark studies by the National Academy of Science's Institute of Medicine. The two initial reports in the series, *To Err is Human (2000)* and *Crossing the Quality Chasm: A New Health System for the 21st Century* (2001), provided evidence documenting the high number of medical errors resulting in fatalities[1] along with other serious shortcomings in the U.S. health care system. Concluding that health care was a decade or more behind other high-risk sectors in attention to ensuring safety, these reports called for a fundamental redesign of the Nation's fragmented health care delivery system.

[1]*To Err is Human* (2000) estimated that more people die in a given year as a result of medical errors (44,000-99,000) than from motor vehicle accidents (43,458), breast cancer (42,297), or AIDS (16,516).

Two major themes for the redesign of health care have been articulated by the IOM and other health experts as a way to reduce errors, improve quality, and reduce costs: improving the coordination of care across a currently fragmented system of service providers, and creating transparency and accountability for the performance of service providers. To help the system accomplish these goals, current and proposed policies are designed to promote adoption of health information and communication technologies, including telemedicine, and implementation of public reporting systems for indicators of the quality and cost effectiveness of Medicare services to the public, envisioned as the foundation for future pay-for-performance reimbursement systems.

Rural Opportunities and Challenges With Use of Performance Indicators

As the payer for all Medicare and Medicaid services, which represented 34 percent of total U.S. health care expenditures in 2007, the Centers for Medicare and Medicaid Services (CMS) of the U.S. Department of Health and Human Services have articulated a roadmap for the development of performance-reporting initiatives to enhance the quality and efficiency of medical services provided to beneficiaries. CMS's goal is to develop a wide range of indicators of quality of care and effective resource use, and to cover all types of service delivery for Medicare patients. Starting in 2006 with indicators of process-based quality of care in the hospital reporting system, Hospital Compare, as of 2009 the performance-reporting system covers nearly all types of care institutions and a wide range of indicators.[2]

[2]The only settings not covered as of 2009 are those with the smallest shares of Medicare expenditures (hospice, labs, and durable medical equipment, with each representing 2 percent of total expenditures).

This section reports data for the first set of hospital quality indicators, process-based quality of care measures, by metro Prospective Payer System (PPS), nonmetro PPS and Critical Access Hospital (CAH) status. (CAHs, small hospitals located in more remote nonmetro regions, are reimbursed by Medicare on a cost-basis rather than through the standard PPS, which bases reimbursement on a predetermined, fixed amount per diagnosis. See discussion in chapter 4). These consensus-based indicators, developed by professional organizations, cover hospital procedures that have been identified as

"effective care": indicators that are relatively inexpensive, known to have desirable medical benefits, and rarely contraindicated.

Hospital Performance on Process-of-Care Quality Indicators

By the beginning of 2006, the pay-for-reporting system for PPS hospitals included 22 indicators, covering treatment of heart attacks, congestive heart failure, pneumonia, and prevention of infections following surgery.[3] These conditions represent major sources of chronic morbidity and/or mortality and health care expenses.[4] Among eligible PPS hospitals, 93 percent participated and met requirements; 6 percent failed to meet requirements; and 1 percent chose not to participate. Among the 1,286 nonmetro hospitals with CAH status as of December 2006, 63 percent were participating in Hospital Compare nationally.[5] Unlike PPS hospitals, CAHs can choose voluntarily to submit data for any or all of the specified measures; because they are reimbursed by Medicare on a cost basis, they do not have a financial incentive under the quality initiative to submit the quality measures.

Based on 2006 hospital performance data (shown in table 5.1), none of the three hospital groups (metro PPS, nonmetro PPS, and nonmetro CAH) is substantially in compliance with most of these process-of-care quality measures. This is surprising given that these "effective care" measures are selected because they are relatively inexpensive, are known to have desirable medical benefits, and are rarely contraindicated. For example, performance rates for providing discharge instructions to heart failure patients ranged from 58 percent of CAHs to 70 percent of metro hospitals. These low rates are observed, despite the fact that substantial improvements in compliance rates have occurred for some of the measures over the first 3 years of reporting, 2004-06.

For heart attack ("acute myocardial infarction (AMI)") and heart failure measures, metro PPS hospitals generally had the best performance and nonmetro CAHs the worst, with nonmetro PPS hospitals rated intermediate—and, in many cases, closer in performance to metro PPS hospitals than CAHs. In contrast, for pneumonia and surgical infection prevention, each hospital group, including CAHs, scored as well or better than the others on some measures, and not as well on other measures, but the differences are generally not large enough to be of import. Exceptions were the indicators for pneumonia smoking cessation advice, and for surgical infection prevention pre-surgery antibiotics, for which CAH performance was lowest. Because improvements tended to occur across all three groups during the first 3 years of reporting, relative patterns of performance across hospital type were similar during these years.

Challenges With Use of Quality Indicators in Rural Local Health Care Market Areas

In 2007, the hospital indicators were expanded beyond process-of-care measures to include quality outcomes (including morbidity and 30-day mortality), structure (use of electronic health records), and patient assessments of care. Additional categories of indicators to be included in the future include physician and provider resource use. In 2007, CMS submitted to Congress a plan to implement a pay-for-performance system in hospitals (value-based

[3]Acute care hospitals paid under the Prospective Payment System that did not report the required data faced a 0.4-percent reduction in their annual payment update from Medicare in fiscal years 2004 through 2006 and a 2.0-percent reduction in fiscal years 2007 and 2008.

[4]The first three constitute more than 15 percent of Medicare hospital medical and surgical admissions; heart disease is the top cause of death, representing a quarter of all deaths; pneumonia combined with influenza is in the top 10 causes of death. A 2007 study found that in 2002, 1.7 million hospital-acquired infections were associated with 99,000 deaths (see Klevens et al., 2007).

[5]This total does not include 289 CAHs that submitted quality measure data for 2006 discharges to Q-Net Exchange, the national Quality Improvement Organization data warehouse, but did not allow the data to be publicly reported to Hospital Compare.

Table 5.1

Share of Medicare patients receiving recommended hospital care, by hospital type, 2006

Type of hospital	Metro PPS[1]	Nonmetro PPS	CAHs
Sample size	2,431	1,004	812
		Percent	
Quality measure			
Heart attack (acute myocardial infarction, AMI)			
Aspirin at arrival	96.9*	94.2*	88.8
Aspirin at discharge	97.0*	93.3*	86.0
ACE inhibitor or ARB for LVS dysfunction[2]	86.7*	85.6*	79.0
Smoking cessation advice	96.7*	95.0*	66.8
Beta blocker at discharge	96.5*	93.5*	86.8
Beta blocker at arrival	94.0*	90.1*	83.1
Fibrinolytic w/in 30 minutes of arrival	43.3	42.0	37.4
PCI w/in 120 minutes of arrival	60.4*	56.0*	**
Heart failure			
Discharge instructions	69.7*	67.4*	58.4
Assessment of LVS function	94.2*	85.9*	71.4
ACE inhibitor or ARB for LVS dysfunction	85.8*	82.5*	80.1
Smoking cessation advice	92.2*	88.1*	72.3
Pneumonia			
Oxygenation assessment	99.7*	99.3	99.3
Pneumococcal vaccination	74.7*	75.8*	72.8
Blood culture prior to first antibiotic	90.0*	91.1	91.4
Smoking cessation advice	89.3*	86.5*	74.0
Initial antibiotic(s) within 4 hours	78.3*	82.7*	85.2
Most appropriate initial antibiotic(s)	86.6*	83.1	82.7
Influenza vaccination	70.2*	73.1*	71.6
Surgical infection prevention			
Preventative antibiotic(s) 1 hour before incision	85.4*	81.3*	79.5
Received most appropriate preventative antibiotic(s)	92.1*	90.8	91.3
Preventative antibiotic(s) stopped within 24 hours after surgery	76.4*	74.8*	77.6

* Statistically significant difference from CAH value.

** Insufficient sample.

[1]Critical Access Hospitals (CAH), which are small and located in remote rural areas, are exempt from the Prospective Payment System (PPS), a method of reimbursement in which Medicare payment is made based on a predetermined, fixed amount.

[2]LVS (left ventricular systolic) function is an indicator of heart performance; ACE (angiotensin converting enzyme) and ARB (angiotensin receptor blockers) are medicines used to treat heart attacks, heart failure, or decreased heart function; PCI (percutaneous coronary interventions) procedures open blocked blood vessels that cause heart attacks.

Source: USDA, Economic Research Service using Casey et al., (2008).

purchasing) that builds from its pay-for-reporting program and ongoing demonstration projects evaluating incentive payments for improved performance. To implement the plan, CMS needs additional legislative authority.

According to the National Advisory Committee on Rural Health and Human Services, the reporting systems represent an opportunity to promote quality improvement in rural care delivery but will pose challenges unless tailored to the rural context. Hospitals face competing demands for many different reporting programs, which serve complementary roles in encouraging quality improvement. The programs, however, tend to be poorly coordinated and

command sizable resources, which poses particular burdens on smaller rural institutions. Health information technology is seen as a key to achieving efficiencies in reporting. But the reporting systems do not currently take into account the distinctive features of rural health care, including the lower volume of patients, fewer acute cases, and high rates of transfers to larger tertiary hospitals though activities are currently directed at addressing this issue. Implementing the program may test the financial viability of rural hospitals as CMS shifts to pay-for-performance systems based on these indicators (NACRHHS, 2008; RUPRI Health Panel, 2009).

Three design elements may need to be addressed to tailor the system to rural areas: determining suitable indicators, addressing the challenge of small numbers of patients (small sample size), and setting suitable baselines for rural communities (calibrating to low economies of scale).

Given that rural hospitals are smaller, less complex, and more reliant on generalists, the set of indicators suited for evaluating rural health care diverges somewhat from those suited for urban settings. Indicators for specialized medical treatments, for which rural residents typically travel to more urban areas, will have small numbers of cases (as seen with the indicators for AMI and, to a lesser extent, prevention of surgical infections). Further, additional indicators are needed for processes that are especially pertinent to rural settings, such as triage, stabilization, and transfer of emergency patients (Moscovice et al., 2004). CMS is working with Rural Hospital Flexibility programs to develop more tailored measures.

Analysis of the data for CAHs and other rural hospitals is limited because of the low numbers of patients for particular procedures at small hospitals. Additional research is needed to evaluate alternative methods of assessing and comparing quality performance at small rural hospitals.

Finally, low rural volumes of care have implications for cost structures, and for resource quantity benchmarks. As future pay-for-performance systems incorporate performance criteria based on the efficiency of resource use, rural areas may be severely disadvantaged in the absence of rural benchmarks. The 1983 introduction of a new Medicare prospective payment system that shifted the payment basis from cost-plus to predetermined, fixed amounts for services had unintended negative consequences for rural hospitals. Intended to promote cost savings, the program did not take into account the different cost structures in urban and rural hospitals, resulting in deleterious effects on rural hospital viability. To address the negative effects of the prospective payer system on rural hospital viability, the Medicare program made midcourse corrections, including creating new categories of care centers with more favorable payment provisions, such as cost-based reimbursement and bonus payments.[6]

[6]Ricketts, 1999, pp. 101-112.

Rural Opportunities and Challenges With Health Information and Communications Technology

Health care is an information- and knowledge-intensive enterprise. New health information and communications technologies are widely regarded to have tremendous promise for increasing patient safety, quality of care, and organization efficiency, while reducing the costs of patient care (IOM, 2001; Rand, 2005). In addition, telemedicine applications show particular promise

for improving care in remote areas unable to sustain local medical and pharmaceutical services due to low population density.

Key elements of health information and communications technology (HICT) include electronic records of clinical and administrative information for each individual, a system of networks to exchange health information, and the IT and communications technology and standards to support both. Standardization of the technologies is still in progress.

Opportunities and Challenges to Adoption

Given the fragmented U.S. health care system, electronic health records (EHR) have the potential to improve the coordination of care across providers, which can provide particular benefits for patients with multiple chronic conditions who account for a large portion of health care expenditures. Accessing clinical decision-support technology, in tandem with patient data, can facilitate disease diagnosis and treatment management and generate reminders for appropriate preventive services, such as vaccinations and screenings, based on patient risk factors. Use of computerized physician order entry systems can help prevent medication errors, provide warnings of harmful drug interactions and possible allergic reactions to prescribed medications, and reduce costs by reducing the duplication of tests and prompting use of generic medications rather than more costly name brands.

Drawing upon electronic data sources, telemedicine applications of HICT can reduce costs and improve health care by allowing remote health care facilities to consult with primary care physicians and specialists at other hospitals or regional medical centers through the use of high-resolution cameras, digital-imaging equipment, and high-speed connectivity. This technology can reduce the need to transfer patients and possibly save lives. And, remote patient monitoring systems (for example, of blood glucose or heart ECG) linked with electronic health records can transmit data to providers to facilitate early identification and quick response to potential problems (IOM, 2005; USDHHS, 2008). The benefits of these applications are not limited to rural patients.

Though the promise of these technologies is high, experts have identified a number of challenges that must be addressed for them to be effective. Some impediments are driven by the intensive investments required to adopt the technologies, both in financial capital and skilled labor. Rural areas in particular face challenges from limited access to capital, weak information and communications infrastructure, and lack of workforce expertise (Casey et al., 2006). Further, those who invest in the technology do not receive the related savings. Patients benefit from better health, and payers benefit from lower costs. However, providers pay in both higher costs for implementation, and lower revenues after implementation (Rand, 2005). Reimbursement for telemedicine services is expanding but not universal. Medicare pays for some procedures but not for others. State Medicaid programs also have differing policies on telemedicine reimbursement, as do private insurers. The 2009 stimulus program provides $19 billion to improve the HICT infrastructure, including $17 billion in temporary incentive payments starting in 2011 for doctors and other providers who can demonstrate “meaningful use” of a certified electronic records system. In 2015, the incentives shift to financial

penalties for failure to use such a system. The remaining $2 billion in stimulus monies are allocated to various programs to promote HICT adoption, including community-based extension services.

The current lack of specificity about government standards and patient privacy rules has delayed adoption of some technologies. The development of clear protocols for unified technological infrastructure will help ensure effective transfer of information across sites. Professional licensure regulations for physicians or pharmacists will promote the practice of telehealth. Protocols for safeguarding the integrity and reliability of the record system will help protect patient confidentiality (Blumenthal et al., 2008).

Adoption Rates

Over the past few years, several surveys estimating HICT adoption rates have generated a wide range of estimates due to different approaches to accounting for the many potential features that may be included in the electronic health record, use of nonrepresentative samples, and low survey response rates. To evaluate the effectiveness of policies aimed at accelerating adoption and interoperability, the Office of the National Coordinator for Health Information Technology (DHHS) implemented an HIT Adoption Initiative to develop consensus-based guidelines for what features an electronic health record (EHR) must include to be counted, and then to collect consistent measurements over time. Findings from two national surveys of adoption supported by the initiative are presented in this section—one of hospitals and the other of physicians' offices. Table 5.2 identifies the functionalities associated with full and basic implementation of the EHRs in both. The findings indicate that U.S. health care providers have been slow to adopt electronic health records.

Hospitals. Among acute care hospitals that are members of the American Hospital Association, 1.5 percent reported having a fully implemented electronic record system and an additional 7.6 percent reported having a basic system (Jha et al., 2009). Hospitals that are larger, system-affiliated, have teaching status, and have a coronary care unit were more likely to report they have fully implemented EHRs. As a result, it is not surprising that EHR implementation also varies with metro status; metro hospitals were twice as likely as nonmetro hospitals to have either a basic system (8.4 percent versus 4.0 percent) or a fully implemented system (1.9 percent versus 0.6 percent). Due to high costs, implementation of HICT often occurs in stages, starting with a subset of functions, and a subset of departments within the hospital. Administrative functions to support financial reimbursement are generally the first to be adopted. Among the clinical functions, the functions most frequently adopted in all units are electronic laboratory and radiology reporting systems (75 percent of hospitals) (Jha et al., 2009).

A survey conducted solely among rural hospitals found that, consistent with the national pattern, adoption of EHRs in rural areas tends to be lower in smaller and stand-alone hospitals, including CAHs, relative to larger and system-affiliated rural hospitals. As of 2006, 58 percent of non-CAH rural hospitals had started implementing EHRs, compared with 45 percent of CAHs (Schoenman, 2007). Though the level of adoption is lower in rural

Table 5.2
Electronic health records: Functionalities of "basic" and "full" systems, 2009

	Physician offices		Hospitals	
	Basic	Full	Basic	Full
Electronic clinical information and data				
Patient demographics	x	x	x	x
Physician notes	x	x	x	x
Nursing assessments			x	x
Problem list	x	x	x	x
Current medications	x	x	x	x
Medical history and followup		x		
Discharge summaries			x	x
Advance directives				x
Order entry management				
Prescription orders	x	x	x	x
Lab orders		x		x
Radiology orders		x		x
Prescription orders sent electronically		x		
Lab orders sent electronically		x		
Consultation requests				x
Nursing orders				x
Results management				
View lab results	x	x	x	x
View imaging results	x	x	x	x
Images returned		x		x
View diagnostic test results				x
View diagnostic test images				x
View consultant report				x
Clinical decision support				
Drug warnings		x		x
Drug-lab interactions				x
Drug-dosing support				x
Out-of-range levels highlighted		x		
Clinical guidelines				x
Clinical reminders		x		x

"Full" implementation indicates that all marked features were present in all clinical units; "basic" implementation indicates that marked functionalities were present in at least one clinical unit.

Sources: USDA, Economic Research Service using DesRoches et al., 2008; Jha et al., 2009, and U.S. DHHS Health Information Adoption Initiative website, http://healthit.hhs.gov/portal/server.pt?open=512&objID=1152&parentname=CommunityPage&parentid=8&mode=2&in_hi_userid=10741&cached=true (accessed June 1, 2009).

areas, the pattern of staging adoption of functions is similar in both urban and rural hospitals (Jha, 2009; Schoenman, 2007).

Also lagging is the sharing of data across institutions and with patients. About one-half of hospitals shared electronic patient data with others in both 2005 (53 percent) and 2006 (49 percent). They most commonly share data with private-practice physician offices, laboratories, payers, and other hospitals (AHA, 2007).

Broadband. By enabling high-speed transfer of information across sites, broadband connectivity is essential for achieving effective coordination across providers, including telemedicine consultations. High-speed connectivity to the Internet is becoming less of a stumbling block for rural hospitals,

with nearly all reporting that high-speed service is available in their area. Well over three-fourths of rural hospitals reported using T-1 and/or T-3 lines, and over two-thirds reported having wireless capabilities (Schoenman, 2007). Transmittal of data for review by specialists was most common for radiology, with two-thirds of both urban and rural hospitals indicating they currently transmit radiological images for remote review (AHA, 2007).

Telemedicine. Networked telemedicine programs link tertiary care hospitals and clinics with outlying clinics and community health centers in rural or suburban areas. Approximately 200 such networks are estimated to currently be operating, involving close to 2,000 medical institutions throughout the country. However, it is estimated that about half are actively providing patient care services on a daily basis, while the others are used primarily for administrative or educational use.[7]

[7]American Telemedicine Association, http://www.americantelemed.org/i4a/pages/index.cfm?pageid=3333, accessed March 23, 2009.

More than half of hospitals in both urban and rural areas used some form of telemedicine in both 2005 and 2006 to consult with physicians and medical personnel at other hospitals or regional medical centers. Among rural hospitals, a quarter reported participating in telecardiology, and about 1 in 10 reported participating in tele-emergency services (AHA, 2007; Schoenman, 2007). Technologies used include high-resolution cameras, digital-imaging equipment, and high-speed connectivity, with 24 percent indicating full implementation. Among rural hospitals, a quarter reported current use of video teleconferencing for patient consultations. Less than a tenth reported remote monitoring of hospital inpatients by another site, or by the hospital of off-site patients. Similar patterns were observed for CAHs and non-CAHs (Schoenman, 2007).

Physician offices. Among physicians providing care in an office setting, 4 percent reported having an extensive, fully implemented electronic records system, and 13 percent reported having a basic system during 2007-08 (DesRoches et al., 2008). In a regression analysis controlling for multiple variables, DesRoches et al., found that adoption was higher for primary care physicians, those practicing in large groups, hospitals, or medical centers, those practicing less than 30 years, and those practicing in the West; adoption did not vary with metro status.

Three-quarters of physicians with a fully functional system (or 3 percent of total physicians' offices) reported that their system was integrated with the electronic system at the hospital where they admit patients, as compared with 56 percent of those with a basic system (or 7 percent of total physicians' offices).

Other settings. For both urban and rural areas, HICT adoption rates have been found to vary across care settings. The highest rates of adoption are for hospitals; the lowest rates are for the nonacute care settings—skilled nursing facilities, rehabilitation hospitals, and home health agencies (Poon et al., 2006). Consequently, patients are affected by the lack of coordination across the care settings, such as when patients transition from acute care in the hospital to nonacute care settings. While these nonacute facilities are often small in size, they deliver the bulk of medical care in the United States (USDHHS, 2002).

Chapter 6

Implications for Research and Policy

Important research questions remain for understanding the disparities in health outcomes for rural and farm populations. It has been widely observed that rural populations have higher rates of disability and chronic diseases, even controlling for the fact that the rural population is older. Recently published findings show that poorer health carries through to higher age-adjusted mortality rates (i.e., lower life expectancy) in rural areas: a gap in life expectancy between metro and nonmetro counties opened up in 1990 and has grown continuously since then. In addition, there is substantial variation across regions in total mortality rates, as well as in metro-nonmetro differentials. Further research that explores the heterogeneity within nonmetro (and metro) areas, in a regional context, would be helpful to better understand the extent and determinants of these geographical patterns. Because nonmetro populations are small relative to their metro counterparts, lack of data has been a challenge. A useful contribution to the research would be additional survey data that would allow greater disaggregation within nonmetro areas, including separate reporting for more remote areas, which face particular challenges in health care access as well as in economic opportunities.

At the same time, farmers and other family members who live on farms face particular health and safety challenges associated with farm-related activities—including one of the highest occupational fatality rates, as well as a high fatal accident rate among farm children. Further research that takes into account the heterogeneity of farm environments would improve the understanding of the relationship between specific activities and exposures and the resulting patterns of occupational accidents and diseases. With an improved understanding, it could be possible to develop more effective strategies for prevention of farm-related accidents and diseases.

The U.S. debate on health care reform has focused on expanding health insurance coverage, improving health care quality, and achieving greater efficiencies and sustainable financing. The distinctive characteristics of farm and nonfarm rural populations, and of rural health care systems, need to be taken into account if proposed policies are to achieve these goals in rural areas. The nonmetro population as a whole has lower socioeconomic status, higher average age, and greater geographical dispersion than the U.S. population as a whole; in contrast, nonmetro farmers have greater economic resources but are more likely to be located in the more remote counties. Due to low population densities and small patient volumes in rural areas, geographical access to care—particularly for smaller and more remote counties—is more challenging; furthermore, rural hospitals and other rural providers tend to be small and more marginal financially than their urban counterparts because low population density leads to lower patient volume, which, in turn, leads to higher costs per patient.

A major goal articulated for current health care reform proposals is to achieve health care coverage for the 46 million individuals in the United States who are uninsured for all or part of the year. Proposed approaches typically include elements that build upon the current system, with its mix of

employer-based and direct-purchase private insurance, combined with public insurance, including means-tested (Medicaid and related programs) as well as targeted-population (Medicare and military/veterans insurance) programs. Nationally, most of the uninsured are in working families lacking access to employer-sponsored insurance. Because the rural economy has a disproportionate share of small businesses and self-employment, this is particularly the case for rural residents. Most proposed or enacted employer-based reforms have excluded firms below a certain size (e.g., COBRA and employer mandates). Consequently, expansion of employer-based policies is less likely to increase coverage for either farm or nonfarm rural households relative to the typical urban household.

For nonmetro households, policies to expand public insurance may be more effective in increasing insurance coverage than policies to promote expansion of direct purchase coverage. This is because the nonmetro uninsured are more likely than the metro uninsured to have either low income, a member of the household receiving Medicaid or CHIP, or an elderly member of the household receiving Medicare. For farm households, expansion of private direct purchase coverage and Medicare buy-ins are more likely to yield an increase in coverage than means-tested public insurance. The uninsured in farm—compared to nonfarm—households are more likely to have resources that would disqualify them from means-tested public insurance and enable direct purchase of insurance, and they are more likely to have a member of the household on Medicare.

With current coverage options, affordability is an issue for both farm and nonmetro households. How can the United States make health care more affordable while expanding current coverage? For direct purchase of insurance, affordability could be improved if participants were able to gain access to the advantages of group-rate insurance policies that offer lower costs due to risk pooling. Comparably priced direct-purchase policies typically cover a smaller share of the insured individual's healthcare spending than do employment-based policies. For public insurance (Medicaid, CHIP, and Medicare), a critical issue is balancing the adequacy of program coverage with sustainability of the programs.

Other reforms proposed to improve quality and reduce costs include promoting adoption of health information and communication technologies and establishing pay-for-performance payment systems, building from current Medicare performance-reporting systems. The rural health community generally views both strategies as providing potential opportunities for improving rural health care. At the same time, these strategies pose challenges unless current approaches are adapted to take into account the distinctive characteristics of rural health care providers.

Adoption of health information and communications technologies—widely promoted to increase patient safety and health, while reducing costs—holds particular promise for improving access in remote areas by facilitating coordination of care across geographically dispersed providers. Adoption rates remain low at this point, with rural hospitals lagging behind their urban counterparts. Health care organizations may be reluctant to adopt new information systems due to the current lack of technology standards and patient privacy

liability concerns, as well as the intensive investments required to adopt these new technologies, both in financial capital and skilled labor.

In rural areas, hospitals and other providers may face particular challenges due to limited financial resources and workforce expertise. Smaller organizations, more typical in rural areas, are likely to have greater needs for not only financial assistance, but also technical assistance to implement the systems and adjust workflow to achieve the potential efficiencies. The 2009 economic stimulus package (the American Recovery and Reinvestment Act of 2009) allocated $19 billion to reduce some of these impediments, including $17 billion in incentive payments through Medicare and Medicaid reimbursements to reward health providers that can show meaningful use of new information technologies. In 2015, the incentives shift to financial penalties for failure to use such a system. The remaining funds support various programs to promote technology adoption, including community-based regional extension services.

Designed to promote greater public accountability, public performance-reporting systems for Medicare services are in place for indicators of quality process-of-care, quality outcomes, structure (for example, use of electronic health records), and patients' assessments of care. Though nonmetro hospitals, particularly the small, nonmetro Critical Access Hospitals, have not performed consistently as well as their metro counterparts on the first set of quality indicators included in the system (process-of-care measures), their performance has improved during the first 3 years of the hospital reporting system. (The relative pattern of urban/rural differentials remains comparable because improvements generally occurred across all types of hospitals.) The proposed next step is to shift the reimbursement system away from payment for quantity of services and toward payment for performance—for example, quality of care, quality of outcomes, and effective use of resources. Some of the proposals build from the current Medicare public reporting systems. However, the current system design does not fully reflect the distinctive features of rural care—lower volume of patients, fewer acute cases, and high rates of patient transfers to larger regional hospitals. A major challenge is to establish indicators and benchmarks suited to rural care providers; otherwise a payment-for-performance system may create unintended consequences for rural providers whose economics do not match those of the "typical" provider. Adaptations needed to tailor systems to small rural institutions could include incorporating indicators that reflect the different mix of rural services, addressing the challenge that small numbers of patients leads to small sample sizes, and setting baselines that are calibrated to low-volume, high-cost economics.

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Appendix A: Data Sources

Agricultural Resource Management Survey

Sponsored jointly by USDA's National Agricultural Statistics Service (NASS) and Economic Research Service (ERS), the Agricultural Resource Management Survey (ARMS) is the only national-level U.S. survey that provides annual observations of a nationally representative sample of all U.S. farms as defined by USDA in the 48 contiguous States. The survey data support estimation of household income and wealth, business income and performance measures, farm sector income and value-added, production costs for crop and livestock enterprises, and chemical use by farmers in the production of crop and livestock commodities. To collect the different kinds of information, ARMS employs a complex, multiphase, stratified sampling procedure using multiple survey instruments. NASS creates weights for each observation to address sampling, nonresponse, and undercoverage by calibrating to independent USDA estimates.[1]

[1]For more information about ARMS, see http://www.ers.usda.gov/Data/ARMS/

Analysis samples. ARMS data were used for measures of farm household demographics, economics and geography, as well as for health insurance coverage. The ARMS sample was drawn from the population of all farms, as defined by USDA—any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the census year. Because the study's focus is on farm households, the 2007 sample was limited to the 98 percent of all farms that are "family farms," defined as those in which the majority of ownership of the farm business is held by the operator and related individuals. Farm household data were reported for all farm households (N=17,465) and for the subset of farm households whose operator cited farming as his or her primary occupation (N=12,834). The selection criteria for the latter subset are more comparable to the National Health Information Survey sample. Primary-occupation farm households accounted for 40 percent of total farm households. See Appendix table 1 for data broken down by metro status.

Most of the farm household information is collected on all versions of the survey; the health insurance and expense information is only collected on version 1. Hence, for the health information, the study used only the version 1 observations with their unique weights. The sample size for version 1 was 5,736, excluding the 435 households who refused to respond to the health-related items.

National Health Interview Survey

The National Health Interview Survey (NHIS) is the source of multiple measures of health status and health care usage for U.S. households. The sampling is designed to represent all U.S. households for the civilian noninstitutionalized population. The basic survey consists of the three components. The first is the Family Core, which collects limited information on all family members in each sample household, as well as household finances and health insurance coverage. In addition, each year, one adult (18+ years) and one child are selected from each sample household to interview indepth to collect information on health status, use of health care services, and health behaviors. The survey is conducted continuously throughout the year.

Analysis samples: NHIS data were used for measures of health status and health care access. Two samples were analyzed. The first one is based on a subsample of working adults (from the Adult sample file). Information was obtained about the workers' families from the linked Family sample file. Workers were classified as farmers or other workers, based on the major occupation of the interviewed adult. The second sample, based on published data for 2006, covered all adults and their families. Using this sample, health indicators were measured by metro and nonmetro status. Metro status was further broken down by whether the Metropolitan Statistical Area (MSA) was larger or smaller than 1 million.

Due to the small number of farm families, data were pooled for the 1997-2003 period (following procedures outlined in National Center for Health Statistics, 2003, pp. 93-94), yielding a sample with 774 farm families and 135,291 nonfarm families. The weighted population of farm households of 812,255 is comparable to the ARMS estimate of family farms headed by primary-occupation farm operators (803,793 in 2007). Due to the small number of farm families, the analysis was not disaggregated by metro or regional status.

For comparison with ARMS data on farmers, descriptive statistics are reported in Appendix table 3. Technically, to compare characteristics of the NHIS farmer sample against a comparable farmer sample, one would need to look at all operators (not just principal operators) who identify farming as their principal occupations. However, ARMS only collects data on households of principal operators. The distributions across education and minority status are reasonably comparable. The NHIS regional shares diverge somewhat—the Midwest share (53 percent) is 13 percent higher, and the Southern share (28 percent) is 9 percent lower than that for the ARMS farm-occupation sample (Appendix table 1B). A substantial divergence occurs in the age distribution; while the share of all farm-occupation operators age 65 or older is 33 percent in ARMS, it is 15 percent in the NHIS sample. To compensate for this difference, the indicators reported are adjusted for age differences across the populations to a standard age distribution, using the direct method outlined in Klein and Schoenborn (2001).

American Community Survey

The American Community Survey (ACS) is the source for demographic information for all U.S. households by metropolitan status. The ACS is a large, nationwide household survey recently begun by the U.S. Census Bureau to replace the long form in future censuses and provide roughly the same data every year instead of once in 10 years. It uses a continuous measurement technique, combining monthly samples of 250,000 housing units to yield data on age, race, education, income, migration, commuting, housing characteristics, and other characteristics. The ACS enables researchers to break down demographic data by micropolitan and noncore counties between the decennial censuses. See the U.S. Census Bureau's website (www.census.gov) for more information. This study uses ACS data for descriptive statistics for the U.S. population by metro status.

Current Population Survey, Annual Social and Economic Supplement

The Annual Social and Economic Supplement (ASEC) of the Current Population Survey (CPS), conducted by the Census Bureau, is designed to provide timely and detailed estimates of income, poverty, and health insurance coverage, and to measure change in those estimates at the national level. The sample is scientifically selected to represent the civilian non institutional population living in the United States. The unit of observation is the household. For the supplement, a single interview is conducted with about 70,000 households each year. This study used CPS ASEC data on health insurance coverage and sources of insurance for the U.S. population, by metro status.

Medical Expenditure Panel Survey – Household Component

The Household Component (HC) of the Medical Expenditure Panel Survey, co-sponsored by the Agency for Healthcare Research and Quality (AHRQ) and the National Center for Health Statistics, both of the U.S. Department of Health and Human Services, collects detailed information on health care spending and use of services, insurance coverage by type, sources of payment, health status, employment, and other socio-demographic measures. The HC is based on an overlapping panel design in which data covering a 2-year period are collected through a preliminary contact, followed by a series of five rounds of interviews over a 2.5-year period. Data on medical expenditures and use for 2 calendar years are collected from each household. Table 4.2 on page 21 reports a special tabulation prepared by Didem Bernard, using 2005 data for a sample of 28,617 nonelderly households, and weighted to provide nationally representative estimates. The 2005 estimates of income and health expenditures were adjusted to 2007 levels. For income, the study used the CPI-U-RS (see http://www.bls.gov/cpi/cpiurs1978_2007.pdf). To adjust measures of out-of-pocket expenditures on care and insurance premiums, the study used the rate of increase in household expenditures for those measures reported in table 5, National Health Expenditures, by Source of Funds, Type of Expenditure and Sponsor: Calendar Years 2002-2007, Centers of Medicare & Medicaid Services, Office of the Actuary, National Health Statistics Group. (http://www.cms.hhs.gov/NationalHealthExpendData/downloads/tables.pdf)

Area Resource File

The Area Resource File (ARF) is a county-level file developed by U.S. Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professionals. It contains county-level data relating to health issues from a wide variety of sources. This study drew from the 2006 ARF: county infant mortality rates from Vital Statistics; physician data from the American Medical Association directory; and hospital data from the American Hospital Association; Medicare-certified skilled nursing facility beds from Centers of Medicare and Medicaid Services; and Health Professional Shortage Areas from Bureau of Primary Health Care.

Vital Statistics Mortality Series

Mortality data are from the National Center for Health Statistics Compressed Mortality File.

Sources of Data for Area Weights

For county weights, the study used counts of farm households by county from the 2002 Census of Agriculture and counts of all U.S. households from the 2000 Census of Population, Summary File 1.

Appendix table 1A

Demographic and socioeconomic characteristics of households of all principal farm operators of family farms, by metro status, 2007 (ARMS)

Item	All	Metro	Nonmetro		
			Total	Micro	Noncore
Number of households	2,143,398	837,730	1,305,668	531,056	774,612
Percent of households	100	39	61	25	36
Sample size	17,465	6,888	10,577	4,194	6,383
			Column percent		
Region					
Northeast	7	8	6	8	4
Midwest	37	28	42	39	44
South	42	44	41	41	42
West	14	20	11	12	10
Demographics, principal farm operator					
Age (years)					
Less than 35	5	4	6	6	6
35-44	37	35	38	38	37
55-64	31	33	29	27	30
65 and older	28	28	28	29	27
Race/ethnicity					
White, non-Hispanic	91	90	92	90	93
Non-White or Hispanic	9	10	8	10	7
Educational attainment					
Less than high school	10	9	10	12	9
High school grad., including some college	67	65	67	66	69
College grad., including more	24	25	22	23	22
			Dollars		
Household economic status					
Median household income	53,952	54,125	53,492	56,27	51,944
Median household wealth	537,540	559,851	523,805	525,090	521,951

Source: USDA, Economic Research Service calculations using data from USDA's 2007 Agricultural Resource Management Survey (ARMS), all versions.

Appendix table 1B

Demographic and socioeconomic characteristics of households of farm-occupation operators, by metro status, 2007 (ARMS)

Item	All	Metro	Nonmetro		
			Total	Micro	Noncore
Number of households	884,903	349,510	535,393	323,297	212,096
Percent of households	100	39	61	37	24
Sample size	12,834	5,000	7,834	4,768	3,066
			Column percent		
Region					
Northeast	7	10	5	2	10
Midwest	40	31	46	49	42
South	37	36	37	38	35
West	16	22	12	11	13
Demographics, principal farm operator					
Age (years)					
Less than 35	4	3	4	4	5
35-44	27	27	28	28	27
55-64	34	35	33	34	32
65 and older	35	36	35	34	36
Race/ethnicity					
White, non-Hispanic	88	86	90	91	89
Non-White or Hispanic	12	14	10	9	11
Educational attainment					
Less than high school	13	14	12	11	13
High school grad., inc. some college	68	66	69	70	69
College grad., inc. more	19	20	19	19	18
			Dollars		
Household economic status					
Median household income	43,473	43,467	43,473	43,608	42,669
Median household wealth	712,275	707,592	714,680	698,896	748,700

Source: USDA, Economic Research Service calculations using data from 2007 USDA Agricultural Resource Management Survey (ARMS), all versions.

Appendix table 2

Demographic and socioeconomic characteristics of all U.S. households, by metro status, 2007 (ACS & SCF)

Item	All	Metro	Nonmetro		
			Total	Micro	Noncore
Number of households	112,377,977	93,095,789	19,282,188	11,710,762	7,571,426
Percent of households	100	83.8	17.2	10.4	6.7
Sample size	1,937,659	1,459,951	477,708	253,308	224,400
			Column percent		
Region					
Northeast	18.3	19.9	10.9	13.1	7.6
Midwest	22.9	21.0	32.2	30.5	34.9
South	36.8	35.5	43.3	41.7	45.7
West	21.9	23.2	23.2	23.2	23.2
Demographics, household head					
Age (years)					
Less than 35	20.7	20.9	19.6	20.6	18.1
35-54	42.0	42.7	38.2	38.5	37.6
55-64	16.8	16.7	17.5	17.1	18.0
65 and older	20.5	19.6	24.7	23.8	26.3
Race/ethnicity*					
White, Non-Hispanic	71.8	69.1	84.7	83.8	86.1
Black	11.8	12.7	7.4	7.7	7.0
Hispanic	11.0	12.3	4.5	5.1	3.5
Other	10.4	11.4	5.1	5.4	4.8
Education					
Less than high school	13.7	13.0	17.3	16.3	18.9
High school grad., inc. some college	57.0	55.4	64.8	64.3	65.6
College grad., inc. more	29.3	31.7	17.8	19.3	15.5
			Dollars		
Household economic status					
Median household income	50,740	53,066	40,080	41,367	37,844
			Percent		
Poverty rate	12.3	11.6	15.7	15.1	16.5
			Dollars		
Median household net wealth	120,430	133,700	99,200		

Sample covers all 50 States, including Alaska and Hawaii.

* Hispanics may be counted in both the Hispanic as well as in the Black or Other categories, so race/ethnicity shares add up to more than 100 percent.

Sources: USDA, Economic Research Service calculations using data from the American Community Survey (ACS), 2007, and for wealth (only), from the Survey of Consumer Finance (SCF), 2007 (metro/nonmetro breakout is from personal communication with A. Kennickell, Federal Reserve Board).

Appendix table 3A

Demographic and educational characteristics of all U.S. adults, 2006 (NHIS)

Population (1,000s)	220,267	
Sample size	24,275	
	Population count (1,000s)	*Percent of population*
Metro status		
Large MSA	110,233	50
Small MSA	70,790	32
Not in MSA (Nonmetro)	39,243	18
Region		
Northeast	39,033	18
Midwest	51,565	23
South	83,511	38
West	46,157	21
Age (years)		
18-44	110,391	50
45-64	74,203	34
65 and older	37,674	17
65-74	19,081	9
75 and older	16,593	8
Race		
White	179,456	81
Black	26,223	12
Other	12,081	5
More than one race	2,506	1
Hispanic	28,664	13
Educational attainment		
Less than high school	31,750	14
High school diploma or GED	54,586	25
Some college	51,159	23
College degree, inc. more	51,863	24

Source: USDA, Economic Research Service using U.S. DHHS, 2008, *Summary Health Statistics for the U.S. Population: National Health Interview Survey (NHIS), 2006*. Vital and Health Statistics, Series 10, Number 235.

Appendix table 3B

Demographic and educational characteristics of farmers and all other adult workers, 1997-2003 (NHIS)

	Farmers	Other workers	All
Population	812, 255	126,178,827	126,991,082
Sample size	774	135,291	136,065
		Percent of population	
Metro status			
Metro	32.0	80.4	80.1
Nonmetro	68.0	19.6	19.9
Region			
Northeast	6.3	19.1	19.0
Midwest	52.5	26.5	26.6
South	28.3	35.7	35.7
West	12.8	18.8	18.7
Age (years)			
18-24	4.0	13.4	13.3
25-34	10.2	23.4	23.3
35-54	48.7	49.8	49.8
55-64	22.2	10.4	10.4
65 and older	15.0	3.0	3.1
Race/ethnicity			
White, Non-Hispanic	95.5	74.3	74.4
Black, Non-Hispanic	1.1	10.7	10.7
Other, Non-Hispanic	1.0	4.1	4.1
Hispanic	2.3	10.8	10.8
Education			
Less than high school (HS)	16.0	11.8	11.9
HS grad., inc. some college	68.4	60.3	60.3
College grad., inc. more	15.6	27.9	27.8

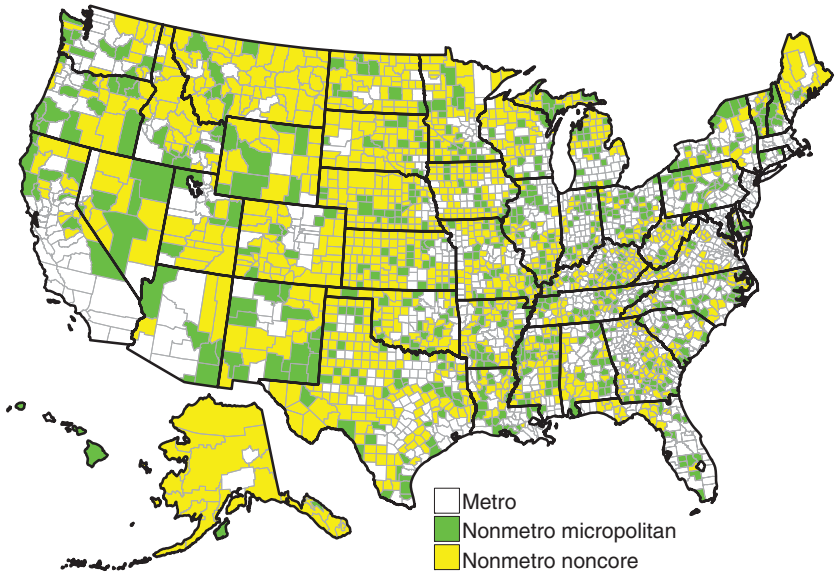
Note: Adults age 18 and older who report working in the week prior to the interview with occupation coded as “farm operators and managers” and class of worker coded as “self-employed in own business/professional practice/farm or working without pay in family business or farm” are identified as farmers. The rest of working adults are classified as other workers.

Source: USDA, Economic Research Service calculations; National Health Interview Survey (NHIS) sample.

Appendix B: Maps Illustrating Measures of Rurality and Regions

Appendix figure B.1

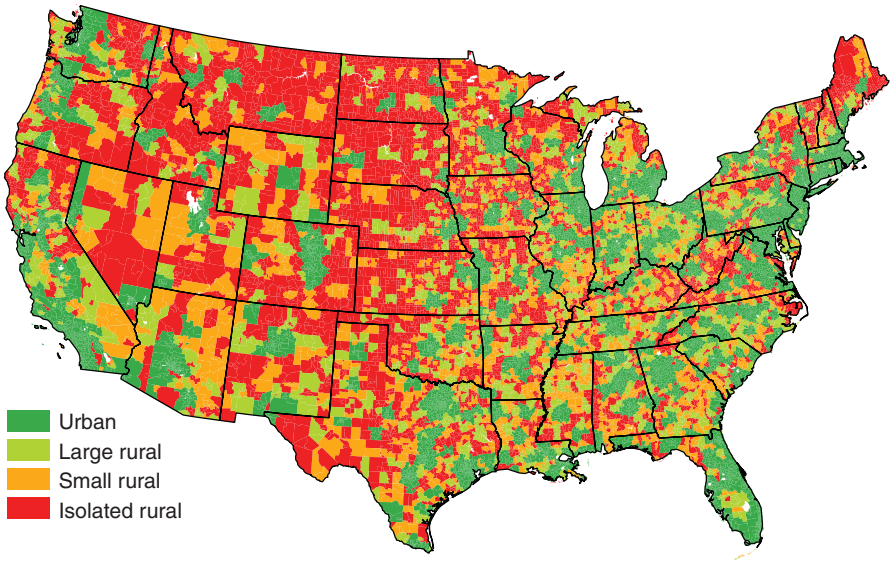
Metropolitan, micropolitan, and noncore counties, 2003



Source: USDA, Economic Research Service.

Appendix figure B.2

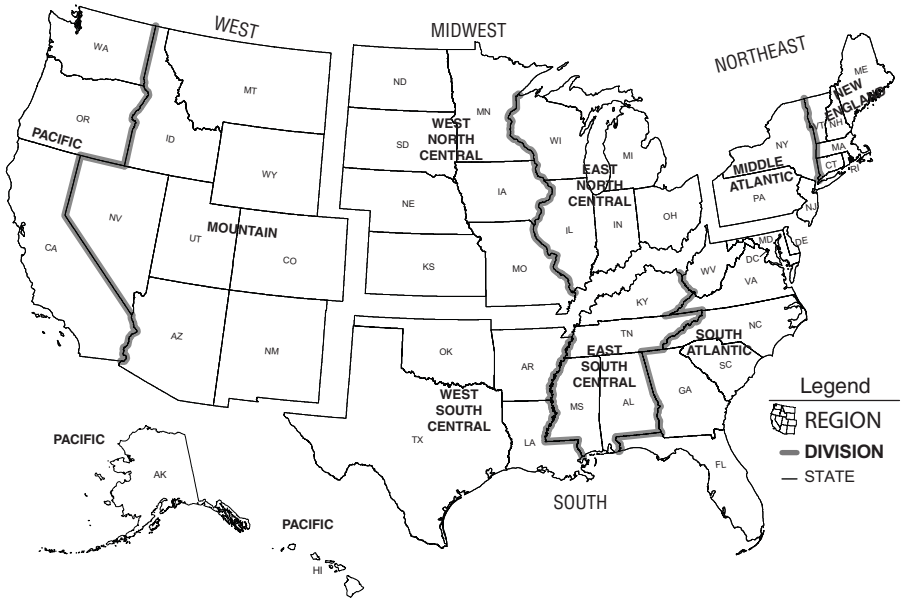
Rural-urban commuting area codes by ZIP Code, 2004



Note: See box, "What Is Rural?" on page 5 for definitions of categories.
Source: USDA, Economic Research Service.

Appendix figure B.3

Census regions and divisions of the United States



Source: U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau. Prepared by the Geography Division.