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Rural Individuals' Telehealth Practices: An Overview

Peter L. Stenberg





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Peter L. Stenberg

Abstract

Telehealth—i.e., health services or activities conducted via phone, Internet, and other technologies—has emerged as a new way for consumers to meet their health care needs. The benefits of telehealth may be greater in rural areas, where remoteness and provider shortages may make accessing health care more difficult for rural residents. Using detailed 2015 household data, the report analyzes three basic telehealth activities as practiced by consumers age 15 or older: (1) online health research; (2) online health maintenance (communication with health providers, including communicating with medical practitioners, maintaining records, and paying bills); and (3) online health monitoring via devices that exchange data remotely with medical personnel. Rural residents were less likely than urban people to engage in the telehealth activities, with 17 percent of rural people conducting online health research, 7 percent engaging in online health maintenance, and 1.3 percent using online health monitoring (compared with 20 percent, 11 percent, and 2.5 percent of urban residents, respectively). Use of all of these telehealth activities increased among individuals with higher levels of education. Generally, use increased among individuals with higher household income, but income's effect varied across the telehealth activities.

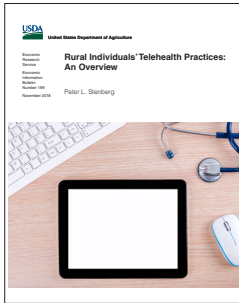
Keywords: rural health, telehealth, online health research, health monitoring devices

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Rural Individuals' Telehealth Practices: An Overview

Peter L. Stenberg

What Is the Issue?

More than traditional medical delivery systems, telehealth—i.e., health services and activities conducted via the Internet—allows people to actively participate in their health care and also facilitates more timely and convenient monitoring of ongoing conditions. These benefits may be greater in rural areas, where remoteness and provider shortages may complicate access to health care for rural residents. Despite the potential benefits telehealth holds for rural communities, little is known about telehealth's use and the factors that may affect that use from the consumer's perspective.

This report analyzes three telehealth activities as practiced by consumers 15 years of age or older: (1) online health research; (2) online health maintenance (i.e., contacting providers, maintaining records, and paying bills); and (3) online health monitoring (the transmission of data gathered by remote medical devices to medical personnel). Most of the existing studies come from the perspective of the health service provider, but this study focuses on the individual.

What Did the Study Find?

Rural residents were less likely than urban residents to take part in any of three fundamental telehealth activities, which are detailed below.

Findings by Telehealth Activity

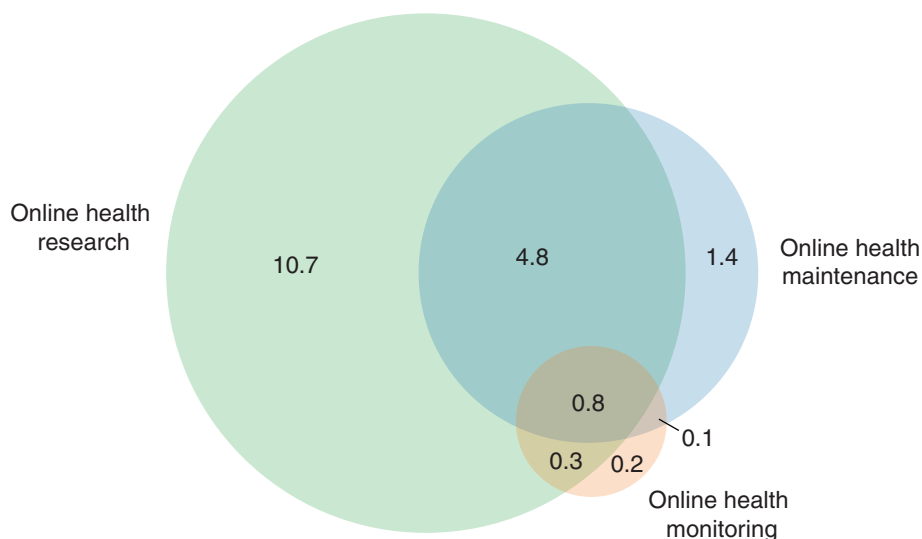
- **Online health research.** Of all survey respondents, 19 percent (including 17 percent of rural residents and 20 percent of urban residents) conducted health research online in 2015. Educational attainment had a large influence: 29 percent of college-educated respondents conducted online research (versus 13 percent with a high school diploma). Income was not a factor in online health research (unlike the other two telehealth activities).
- **Online health maintenance.** Of rural residents, 7 percent conducted online health maintenance (i.e., maintained records, paid medical bills, and communicated with their health providers) versus 11 percent of urban residents. Survey respondents with higher income and more education were more likely than those with lower income and less education to conduct online health maintenance.

ERS is a primary source of economic research and analysis from the U.S. Department of Agriculture, providing timely information on economic and policy issues related to agriculture, food, the environment, and rural America.

- **Online health monitoring.** Of rural residents, 1.3 percent used health monitoring devices (versus 2.5 percent of urban residents). Available devices range from simple automated medical alert devices to implants that connect wirelessly to the Internet for constant monitoring of such issues as heart conditions. The devices can allow individuals to stay home rather than at a hospital, hospice, retirement home, or some other health facility. Rates of online health monitoring increased substantially as income increased.

Figure 1

Rural residents' participation rates in telehealth activities in 2015 (percent)



Note: All shares are for persons 15 years of age or older. Due to rounding, displayed numbers do not add to actual estimates.

Source: USDA, Economic Research Service calculations based on data from the U.S. Department of Commerce, Census Bureau, 2015 Current Population Survey.

Access to Internet Technology

- Although smartphones are more common than personal computers (PCs) in the general population, PCs are more commonly used by rural residents who conduct telehealth activities. Seventy-five to 79 percent of rural people conducting health practices had smartphones, while 83-89 percent of rural people conducting health practices had a PC.
- Lack of Internet service in the home, whether by choice or due to lack of availability, did not deter everyone from conducting online health research: 13 percent of rural residents and 16 percent of urban residents who did not own a desktop computer still conducted online health research.
- Telehealth users will likely require high-quality broadband service to fully access all telehealth services in the future, because health providers continue to improve their telehealth offerings and the new services (such as virtual patient visits) require high-quality broadband service.

How Was the Study Conducted?

The study used data from a supplement to the July 2015 Current Population Survey that included a series of questions about telecommunication use, along with eHealth questions. The original survey consisted of over 50,000 households constituting over 130,000 individuals. The weights used were developed by the U.S. Department of Commerce, Economics and Statistics Administration. The observations represent a population of roughly 255 million people age 15 or older, of which 37 million reside in rural households. All data presented emerge from analysis of that data set. The terms “rural” and “nonmetro,” as well as “urban” and “metro,” are used interchangeably in the study. The definition of nonmetro is the same as that of the 2013 Office of Management and Budget (OMB) directive.

Rural Individuals' Telehealth Practices: An Overview

Introduction

Telehealth services are rapidly improving at an opportune moment for U.S. rural communities, which face many challenges in accessing health care.^{1,2} In all developed countries (the United States included), rural areas have faced barriers to health care access, including provider shortages, maldistribution of resources, quality problems, access limitations, and inefficient use (Weinhold and Gurtner, 2014).

Furthermore, the rural health care shortage has become more of a concern as the rural population ages, with many elderly in relatively isolated homesteads or communities hours from either primary care takers, health clinics, or hospitals. The five leading causes of death, according to the Centers for Disease Control and Prevention (CDC), are the following: heart disease, cancer, unintentional injury, chronic respiratory disease, and stroke. The CDC (2017) found that, from 1999 to 2014, age-adjusted death rates for heart disease and stroke, while declining everywhere, did not decline as much in rural areas. The rates were 43 percent higher than otherwise would be expected in rural areas as compared to 27 percent higher than expected in urban areas.³

Some additional challenges stem from the occupational hazards found in traditional rural industries of farming and mining and the recent increase in drug-induced mortality, both of which contributed to the CDC's finding that the age-adjusted unintentional death rate was 50 percent higher in rural areas than in urban areas. Part of the answer to addressing these challenges may be telehealth. Telehealth capabilities have rapidly evolved over the last few decades and are becoming more integrated with household Internet provision, offering a potential solution to some of these issues. Regarding accidents, for example, telehealth has meant better treatment can be delivered while awaiting emergency personnel. With respect to the opioid crisis, telehealth has meant better mental health treatment through the growing field of telepsychiatry.

Telehealth allows individuals to participate more actively in their own health care, as well as receive more timely and convenient monitoring of ongoing conditions, than traditional medicine has allowed. Some health policymakers argue that patients, as well as society as a whole, are better off when individuals take active, constructive roles in their own health care. Furthermore, policymakers argue that the more individuals take part in their own health care, the greater the cost savings, on average (AHA, 2016; ATA, 2017; HRSA, 2016). The economic impact of telehealth technology and procedures, however, is not clear. As Hult et al. (2016) have pointed out, the new technology has been a factor in the health sector's growth, and in the long run, costs for specific procedures are

¹Note: rural and nonmetro as well as urban and metro are used interchangeably. The definition of nonmetro is the same as the 2013 Office of Management and Budget (OMB) directive.

²For more information, see the rural health web portal of the Centers for Disease Control and Prevention (CDC).

³The expected rate, as estimated by the CDC, is computed from a base rate. The base rate is the rate of deaths in the three States with the lowest death rates.

expected to decrease. Nonetheless, an increase in rural populations' longevity because of improved health care may lead to higher gross health expenditures.

A number of studies have shown that better communication between health provider and patient leads to more accurate treatment and improved health outcomes. The University of Texas Medical Branch (UTMB Health), for example, found that its development of telehealth programs facilitated patient access to specialists, increased patient satisfaction with care, improved clinical outcomes, reduced emergency room patient visits, and resulted in general cost savings for the hospital (Vo et al., 2017).

Telehealth provisions are included in Federal programs such as the 2010 Patient Protection and Affordable Care Act (ACA) and the USDA/Rural Utility Service (RUS)-administered rural telemedicine program. The ACA includes telehealth in the insurance provisions. The RUS rural telemedicine program seeks to improve the telemedicine (or telehealth) technology employed by rural health providers (U.S. Department of Agriculture, undated). (See box "Telehealth Versus Telemedicine.") A rural individual's telehealth activity depends on his or her rural health providers' practices; hence, any improvement in providers' services is expected to result in better health care.

Telehealth Versus Telemedicine

Although some researchers use the terms telehealth and telemedicine interchangeably, we use them to refer to two fairly distinct activities. Telehealth is the health-related activity—via phone and/or Internet—conducted by the individual or the household, away from a medical facility or practice. The activities consist of researching health, communicating with the medical profession, maintaining or accessing one's personal health records, and monitoring one's own health with certified medical equipment. Telemedicine, on the other hand, is the practice of medicine by medical practitioners, medical clinics, and hospitals to communicate within the medical establishment as well as to communicate in various ways with their patients. Rural telehealth is the practice of telehealth by rural households and individuals. The particulars of each telehealth activity are discussed more completely in each of their sections.

Telehealth activities may be divided into three basic elements: (1) online health research; (2) online health maintenance (i.e., communication with health providers, including contacting providers, maintaining records, and paying bills); and (3) online health monitoring via Internet-facilitated transmission from an individual's remote medical device to a health provider. These are elements recognized by the American Telemedicine Association, American Hospital Association, and other public health organizations and are used by the Census Bureau to collect the data used in our analysis. (See box "Data Sources.")

For this report, we calculated the incidence of individuals 15 years of age or older participating in these three types of online medical activities, either as a part of preventive therapy or as part of ongoing treatment. We designated 15 years old as the youngest age at which a person begins to manage his or her health more actively, including researching some health topics such as diet.⁴

Data Sources

Our data come from the U.S. Census Bureau, Current Population Survey (CPS) monthly series—a primary source of labor force statistics for the U.S. population, measuring a large set of socio-economic factors. A special survey for July 2015 included a series of telecommunication-use questions, along with telehealth questions, for each individual in the household. The specific telehealth questions were as follows:

- Do you research health information online, such as WebMD or similar services?
- Do you communicate with a doctor or access health records or health insurance records online?
- Do you use a health monitoring service that connects to the Internet?

The CPS survey covers the U.S. population over the age of 3. We have targeted persons age 15 or over in this study of individual telehealth use. The relevant observation count for this study: 104,000 people 15 years or older of which 22,000 reside in rural households. The weights used were developed by the U.S. Department of Commerce, Economics Statistics Administration. Thus, the observations become a full population of roughly 255 million people age 15 or older of which 37 million reside in rural households.

⁴Fifteen years old is also the age cut-off at which the Census Bureau considers an individual to start taking on more "adult" activities. High school programs on personal health and hygiene also encourage online health research. In this report, all statistics for "individuals," as well as for "rural residents" and "urban residents," refer to people 15 years old and older.

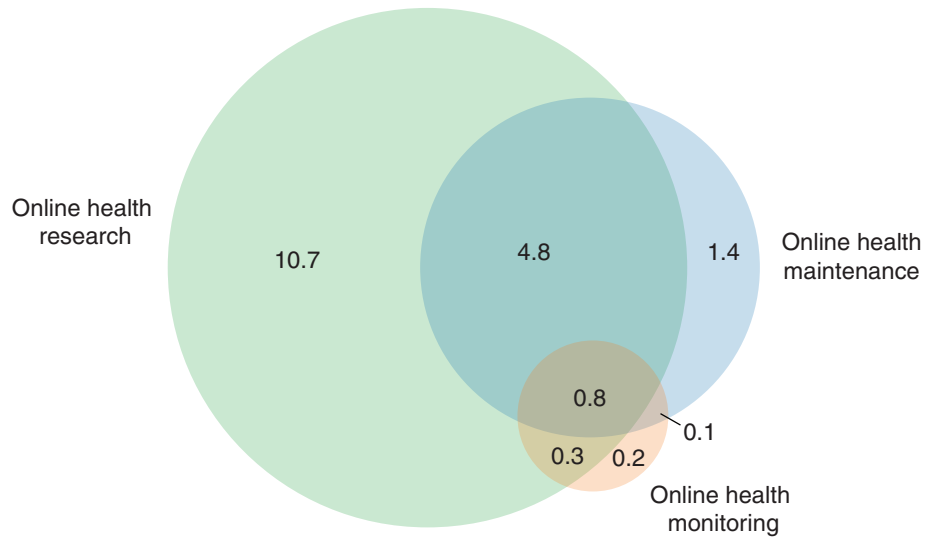
Overview of the Three Basic Telehealth Activities

Individuals had different motivations to adopt different telehealth activities. Many said they conducted only one of the activities (fig. 1); most involved in online health maintenance and monitoring, however, conducted online health research, too. In the case of both health maintenance and health monitoring, the majority also conducted online health research.

As household income increased, so did the adoption rate for the three telehealth activities we examined. Online health research, however, posed an exception: use of online health research did not increase by individuals with household incomes greater than around \$50,000 (fig. 2). Given the well-documented role income has on insurance uptake (e.g., Freedman, et al., 2015), having health insurance may have played a role in online health maintenance and monitoring. We did not control for the prevalence of insurance when examining income data.

Figure 1

Rural residents' participation rates in telehealth activities in 2015 (percent)

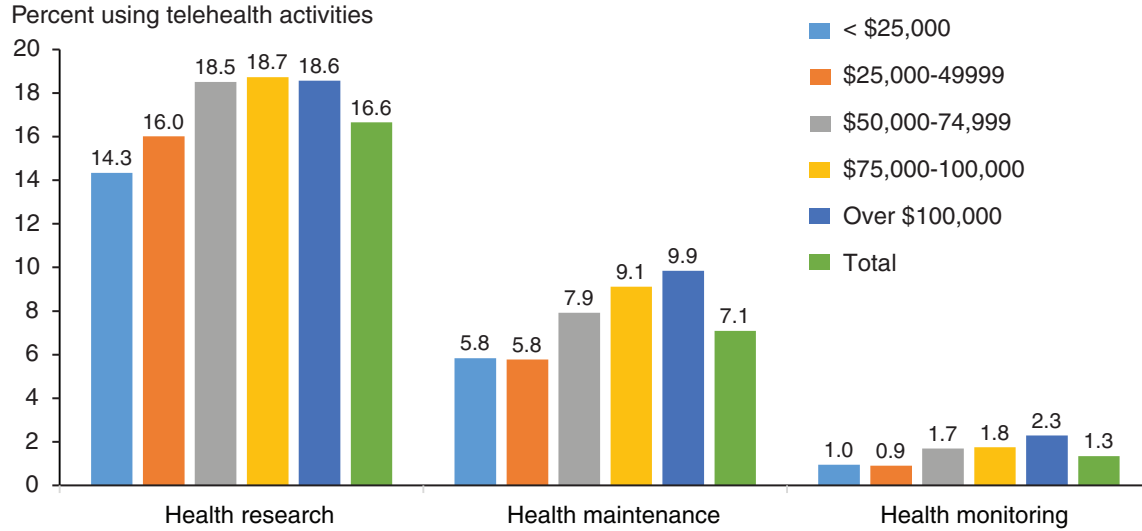


Note: All shares are for persons 15 years of age or older. Due to rounding, displayed numbers do not add to actual estimates.

Source: USDA, Economic Research Service calculations based on data from the U.S. Department of Commerce, Census Bureau, 2015 Current Population Survey.

Figure 2

Rural residents' participation rates in telehealth activities, per household income (percent), 2015



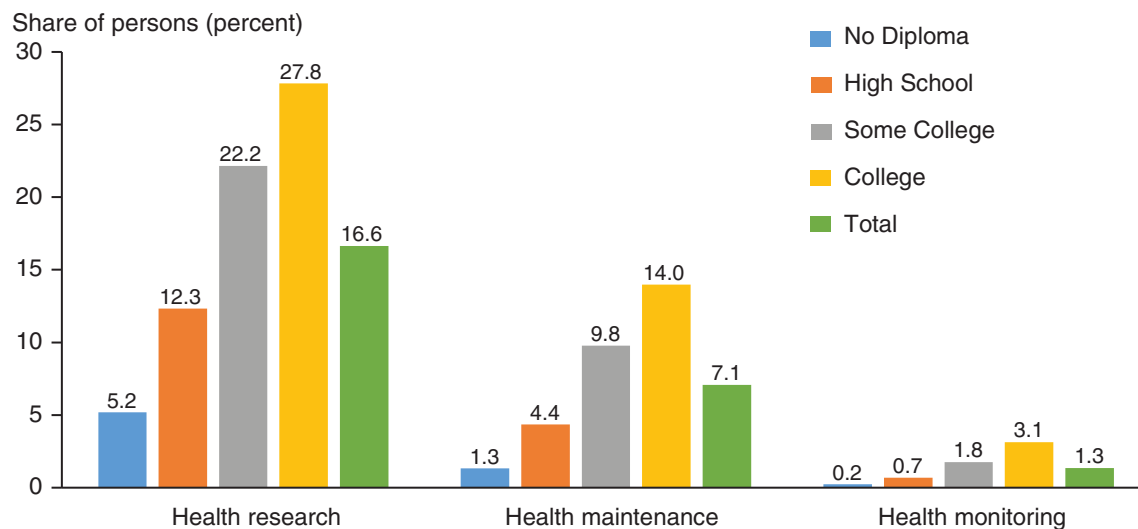
Note: All shares are for persons 15 years of age or older.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Educational attainment, however, was more strongly associated than income with telehealth activity (fig. 3). Participation rates for each category of telehealth activity increased sharply with each successively higher level of educational attainment. People with college degrees were over 50 percent more likely than the rural average to conduct online health research and much more likely than the rural average to participate in the other two telehealth activities.

Figure 3

Rural residents' participation rates in telehealth activities, by educational attainment (percent), 2015



Note: All shares are for persons 15 years of age or older. The education groups in the legend are not cumulative. For example, the “High school” group includes people with a high school diploma, but it does not cover people included in the “No diploma” group (i.e., those with only a partial high school education). Likewise, the “College” group includes people with a bachelor’s degree, as well as those who completed any amount of graduate study, but it does not cover people included in the “Some college” group (i.e., those who attended college but did not earn a bachelor’s degree), nor does “College” include people included in the “No diploma” or “High school” group.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Next, we turn to discussing the three telehealth activities in more detail and how they vary between rural and urban residents. Rural areas have historically lagged in both the provision and the adoption of broadband Internet technologies. In 2015, 61 percent of rural households and 72 percent of urban households had purchased broadband Internet services—a difference, which in turn, accounted for part of the rural-urban telehealth dichotomy.

Online Health Research

As home Internet access has improved, so, too, household research on health has become increasingly easy. Many sources of health information exist, including from leading research medical institutions such as the Mayo Clinic and Johns Hopkins Medical. Although the practice of personal online research on health is in flux and the net outcome remains in question, such research has been promoted as a way to reduce costs and improve quality of health services. The key arguments in favor of personal online health research are as follows:

- It reduces the need for medical service because more minor issues may be dealt with directly by the individual, and
- Office visits, when they occur, may result in suitable treatment—earlier than without the online research—because the individual’s self-education results in better understanding between patient and practitioner.

Even after recognizing that some online health research information comes from less than reputable sources, researchers have argued that, on balance, an individual’s research benefits the person and society as a whole (Mehrotra, 2014; West, 2016). Given rural communities’ quickly aging populations (relative to urban populations) remotely located from medical services, rural communities may benefit even more than urban communities from the trend toward conducting personal health research online, even if older residents are less likely to adopt the new technology.

Two other studies investigated consumer behavior in online health research. A 2013 Pew Research Center study provided some detailed understanding of what individuals do in their online research.⁵ The McDaid and Park (2011) study offered an understanding of user behavior and developed an international ranking of the top websites searched. Websites of the U.S. National Institutes of Health (NIH) and WebMD ranked first and second worldwide, respectively, with other well-respected sites such as the Mayo Clinic and Johns Hopkins falling well below NIH’s and WebMD’s traffic volume in the 2010 ranking. The studies found individuals’ use of online resources ranged from general research of health issues to active attempts to self-diagnose.

Online Health Research by Income

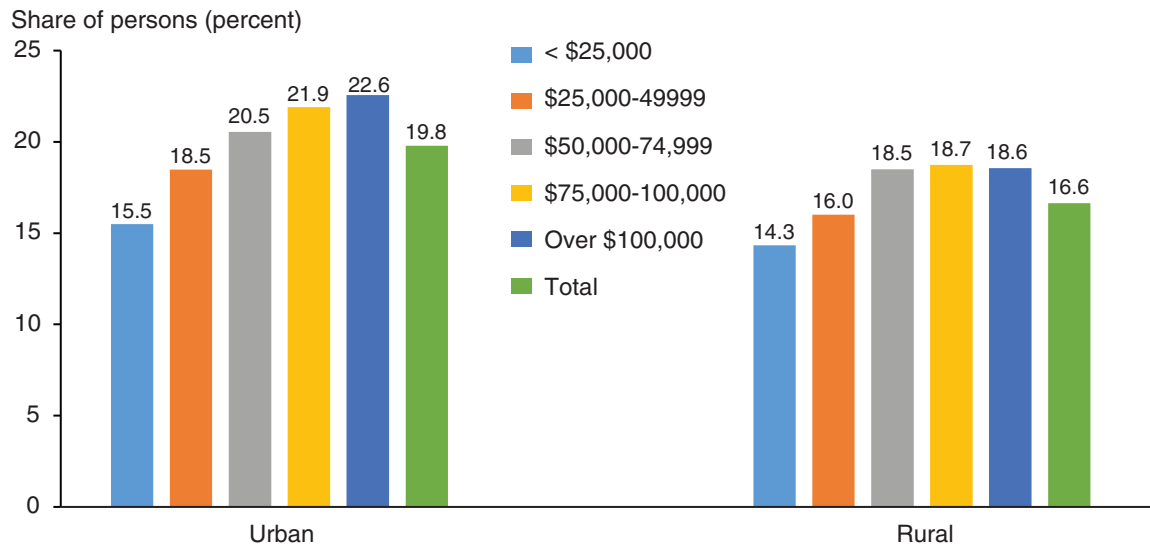
Of rural residents, 17 percent conducted online research versus 20 percent of urban residents—a statistically significant difference between the two groups. Although the prevalence of home Internet access increases as household income levels rise (Stenberg and Morehart, 2011), rates of conducting online health research did not appear to increase greatly with income (fig. 4). The shares of metro population who researched health issues online remained relatively flat beyond the lowest income group (\$50,000 in household income), ranging from 18 percent for the second lowest income group to 23 percent for the highest income group. Among rural residents, although the prevalence of online health research was slightly higher for higher incomes, income appeared to be a minor factor in predicting rates of online health research, because these rates did not statistically significantly differ

⁵The data from the Pew Research Center study on health research are not directly comparable to the U.S. Census Bureau, Current Population Survey (CPS) data employed here because of their more restrictive population for study (limited to people who use the Internet), a much smaller sample size (3,000 people compared to 130,000 individuals in the CPS sample), sampling methods, and other differences.

from one another among several rural income groups.⁶ Rural residents across the income spectrum were uniformly less likely to conduct online research than their urban counterparts. The fact that even the rural residents among the highest income group were less likely than the national urban average to research health issues online (a statistically significant difference) suggests that rural residence may provide a physical or cultural drawback with respect to this telehealth activity.

Figure 4

Use of online health research, by household income, 2015



Note: All shares are for persons 15 years of age or older. Differences were not statistically significant (at the 95-percent level) for incomes over \$50,000 either among rural income groups or among urban income groups, but the differences between the rural and urban households for the same income groups were statistically significant.
 Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Online Health Research by Educational Attainment

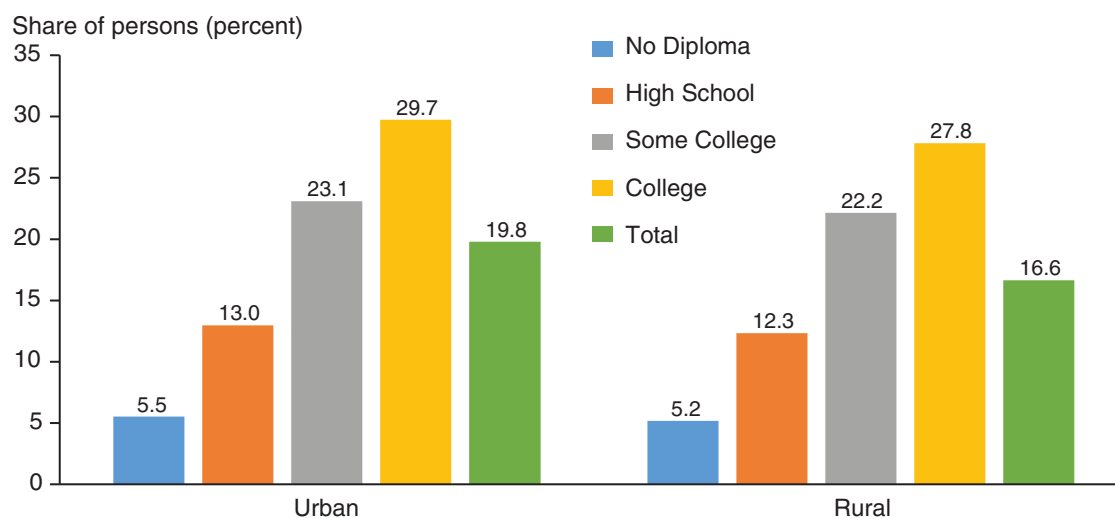
Unsurprisingly, levels of educational attainment do influence online health research rates (fig. 5). The online research rate for those with a college education was more than double that of people whose education did not continue past high school.⁷ The rural-urban difference largely disappeared across education-attainment levels, showing statistically significant difference only within the college-educated group—an indication that, at least among people of comparable education, rural residency may not pose much of a barrier to online health research.

⁶Statistically significant differences at the 5-percent level are noted in figures of this report.

⁷It is a challenge when analyzing education effects to select appropriate age cutoffs, as schooling can continue throughout a lifetime. People 15 to 19 years old are unlikely to have completed college, though they may intend to, and even many people older than 25 may still be completing college. We have tried different age cutoffs in our sample to assess their influence on our results. An age cut-off of 25 years old and older, for instance, increased the adoption rates of online health research by lower education groups by no more than 1 percent. Our results for the effect of education are thus not very sensitive to different age cutoffs.

Figure 5

Use of online health research, by educational attainment, 2015



Note: All shares are for persons 15 years of age or older. Differences were not significant (at the 95-percent level) between rural-urban education groups, although difference between rural and urban for total population was significantly different. Differences across education groups within rural and urban households were statistically significant. For definitions of education groups in the legend, see note under figure 3.
 Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

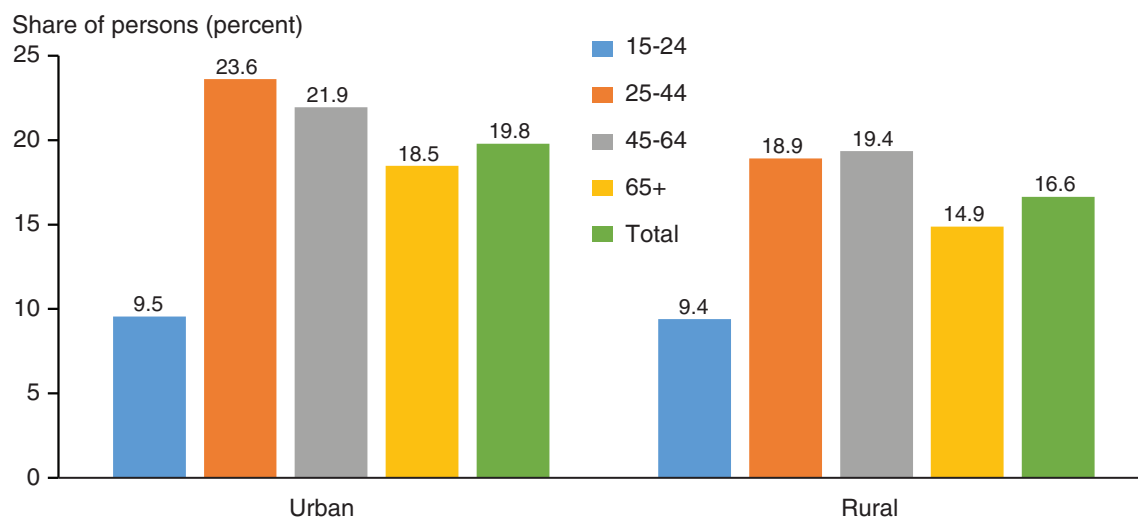
Online Health Research by Age

Conducting online health research was more common among adults over 24 years old than among people 15 to 24 years old, but prevalence did not uniformly increase with age (fig. 6). At a certain age, the tendency to conduct online research increased, likely for two reasons: (1) the desire to have healthier lifestyles and outcomes and (2) the desire to learn new things. As people approach and enter adulthood, they are more likely to care more about their own health, more likely to have family health concerns related to child-bearing and child-raising, and as a result, more likely turn to online health research for answers.

Older adults (i.e., over 45 years old), however, appear to be less likely than younger adults to take on new activities or learn new processes. Adults who did not research online earlier in life (because the Internet had not been available) were less likely to take it up now. The result: a negatively skewed distribution. At younger ages, learning dominated more, and at a later ages, resistance to new activities and processes became dominant. As in income- and education-group breakdowns for online health research, the rural-urban difference appeared within the age-group breakdown. If, however, generational differences in Internet use resemble the trends in use of previous new technologies, then the skewed distribution will disappear over time.

Figure 6

Use of online health research, by age, 2015



Note: Differences were statistically significant (at the 95-percent level) between rural and urban age groups, except for the 15- to 24-year-old age group. Differences across all urban age groups and between the lower and upper age groups in rural areas were statistically significant.

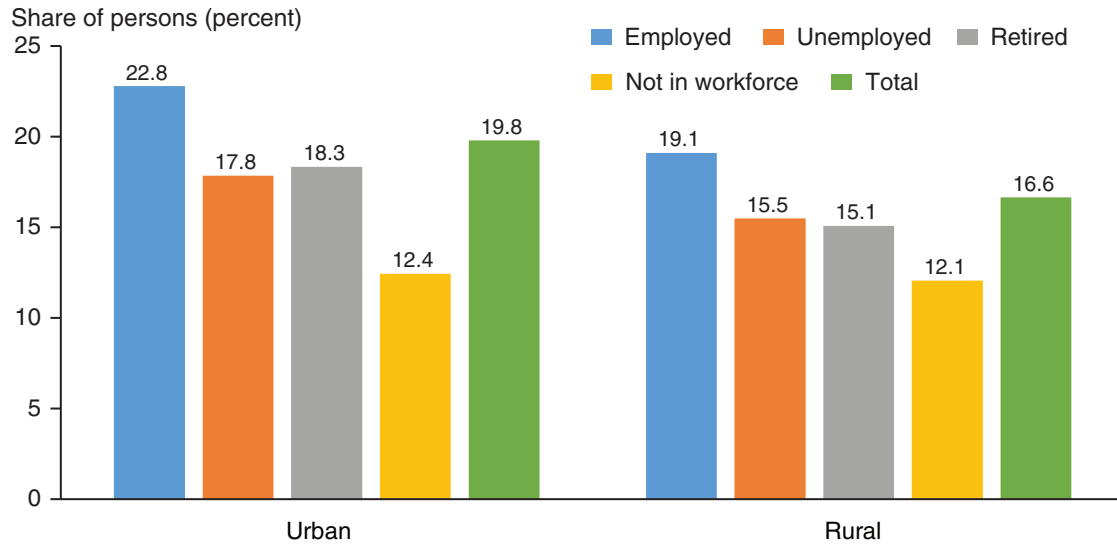
Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Online Health Research by Employment Status and Type

Employed persons were more likely to conduct online health research than unemployed or retired people or those not in the workforce for reasons other than retirement or forced unemployment (fig. 7). Individuals employed outside of the agricultural sector were more likely to conduct online research than those employed in agriculture (fig. 8).

Figure 7

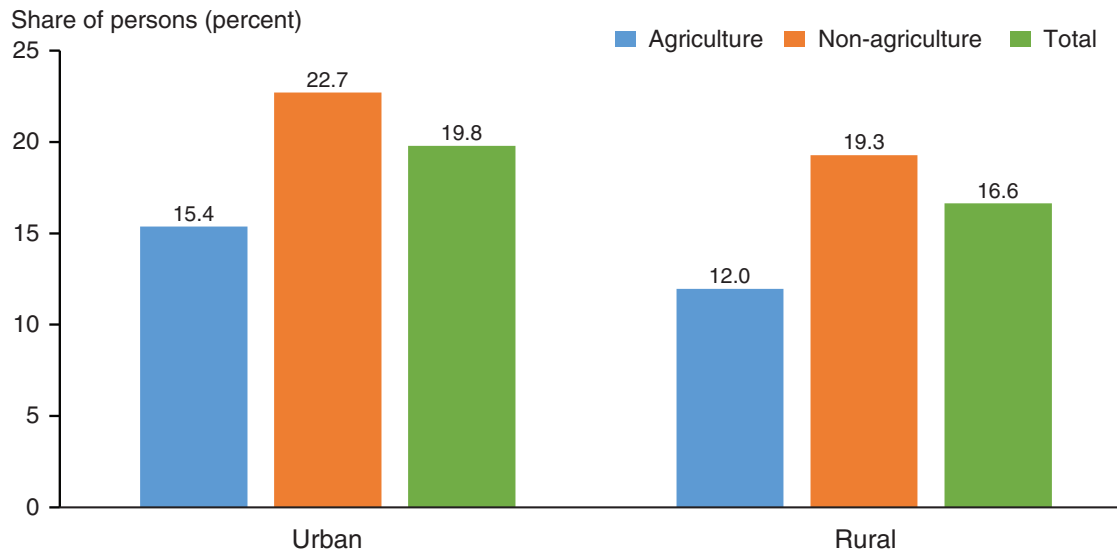
Use of online health research, by employment status, 2015



Note: The difference between rural and urban households was statistically significant (at the 95-percent level) only for employed households and total households.
Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Figure 8

Use of online health research, by type of employment, 2015



Note: Differences between rural-urban employment groups were statistically significant (at the 95-percent level).
Agriculture includes all individuals who work on farms and ranches that produce crops and livestock.
Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Employed people were the most likely to conduct online health research, whether residing in rural or urban areas, although employed urban residents were still more likely to do so than employed rural residents. Retired individuals were as likely as the unemployed to conduct research.

In both rural and urban areas, those employed in the (Federal, State, and local) government sector were more likely than those employed in other sectors to conduct health research, and government employees did so at rates of 23 percent in rural areas and 27 percent in urban areas. The government employee rate was much higher than that of the private sector and somewhat higher than that of the self-employed sector—differences that, likely, largely reflect government employees' higher average level of educational attainment.⁸ Apart from differences in education, the remaining discrepancy may reflect differences in health coverage across the groups, although the variance in health coverage within groups may also be substantial, for some other reasons.⁹ For instance, 65 percent of urban residents and 52 percent of rural residents had private health coverage.

Nationally, 22 percent of veterans and 18 percent of nonveterans (both groups, over the age of 25) conducted online health research—perhaps, veterans' higher rate reflects the fact that they had health coverage while nonveterans may not have had any.¹⁰ Rural veterans appeared slightly more likely than rural nonveterans to research health online, although the difference was not statistically significant.

Online Health Research by Other Factors (Gender, Marital Status, Race, Disability)

Women were more likely than men to conduct online health research, in both rural and urban areas. Again, there was a rural-urban difference, with rural women less likely to conduct online research than urban women and rural men less likely to conduct online research than urban men.

Marital status was also a factor showing a great deal of variance, although some of the differences were likely due to different age distributions. Never-married and widowed had the lowest rate of online health research, but never-married was also the youngest of the marital-status groups, and widowed was the oldest (both consistent with the age pattern). Interestingly, the divorced group had the greatest propensity for online health research, possibly because only one spouse had done the research within married couples.

Individuals with a disability were more likely to conduct online health research than those without a disability. Rural disabled residents had lower rates than urban disabled residents. Rural nondisabled residents had the lowest rates of all the disability-status groups.

Within all racial-status groups, rural residents had lower rates of online health research than urban residents (fig. 9). The White non-Hispanic population had the highest rate, although a significant shares of all racial groups conducted online health research. Rural White non-Hispanics were as likely, or more likely, to conduct online health research than any non-White ethnic group, urban or

⁸Over 50 percent of all government employees, in our analysis of the 2015 CPS data, have a college degree. Less than 1/3 of private sector employees, on the other hand, have college degrees.

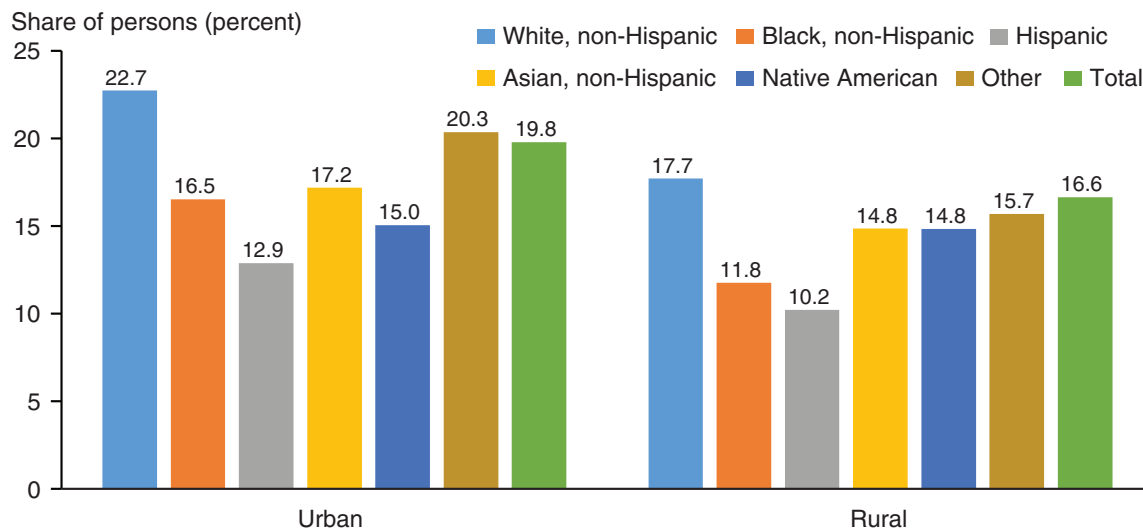
⁹Tables 102 and 103 from National Center for Health Statistics (2016) report many demographic indicators related to health insurance coverage.

¹⁰Persons who served on active duty of at least 24 months (or less if injured on active duty, etc.) were eligible for Federal medical coverage.

rural. Of Asian-Americans, 73 percent had private health coverage (the highest rate of all racial-status groups), but Asian-Americans did not have the highest online-health-research rate. Of Native Americans, 35 percent had health coverage (the lowest rate of all racial-status groups).

Figure 9

Use of online health research, by race/ethnicity, 2015



Note: Differences were not statistically significant (at the 95-percent level) between rural and urban counterparts of Hispanic and Native American groups, but were statistically significantly different between the rural and urban counterparts of the other groups.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

With only 19 percent of people conducting research online (as of 2015), much potential exists for further increases in rates of personal online health research. Higher rates of online health research may benefit the national economy by providing a healthier labor force and reducing health care costs. Although rural residents showed uniformly lower rates of online health research than urban residents—after controlling for the effects of other factors, such as educational attainment—rural residency turned out to be a fairly marginal factor in determining use of online health research.

Online Health Maintenance

Online health maintenance services can allow individuals to make appointments, examine and maintain medical records and accounts, pay medical bills, communicate with their health providers, and have direct online interaction with medical staff, including doctors (Mold and de Lusignan, 2015). The adoption of electronic medical records has been found to have a positive effect on patient safety indicators (Freedman et al., 2015).¹¹ Online health maintenance also changes the systems in place to renew or refill medical prescriptions. In more technologically advanced patient-doctor relationships, individuals may have a “virtual” medical appointment that takes place entirely online.

Individuals who tap into these services may reduce the need for support staff and decrease overhead costs. In the long run, medical offices may experience lower overhead costs (offsetting investing in new technology). Consumers’ online health management, therefore, could lead to greater economic efficiency and better patient outcomes within the health sector and help slow increasing health care costs. More directly than overall health-sector savings, which may eventually filter down to customers, individual consumers can reduce their own personal costs by reducing their need for office visits and, in some cases, by responding to health conditions sooner than they would have without the aid of online resources. Rural residents face a greater challenge than urban residents in obtaining health care; therefore, rural residents may be more motivated to make use of online health maintenance services than urban residents.

Overall, our data show that individuals practiced online health maintenance less commonly than online health research. One reason: many health practices have not become fully integrated with the Internet (Avizia, 2016). Another reason online health maintenance is less common than online health research: unlike online health research, which can be assumed to be a self-directed and mainly preventive activity, online health management combines self-initiated activity with activity, suggested by medical personnel, related to treatment of ongoing or changing health conditions. Of those who practiced online health maintenance, 83 percent also conducted online health research. Only 46 percent of those who conducted online health research, however, also carried out online health maintenance.

Patient online health maintenance is in its infancy, although many laws and policies—including the Affordable Care Act and the 2009 Health Information Technology for Economic and Clinical Health Act (HITECH Act)—have motivated medical establishments to adopt more online services. Nonetheless, only 7 percent of rural residents and 11 percent of urban residents maintained their health records or communicated with medical staff and practitioners online.

Online Health Maintenance by Income

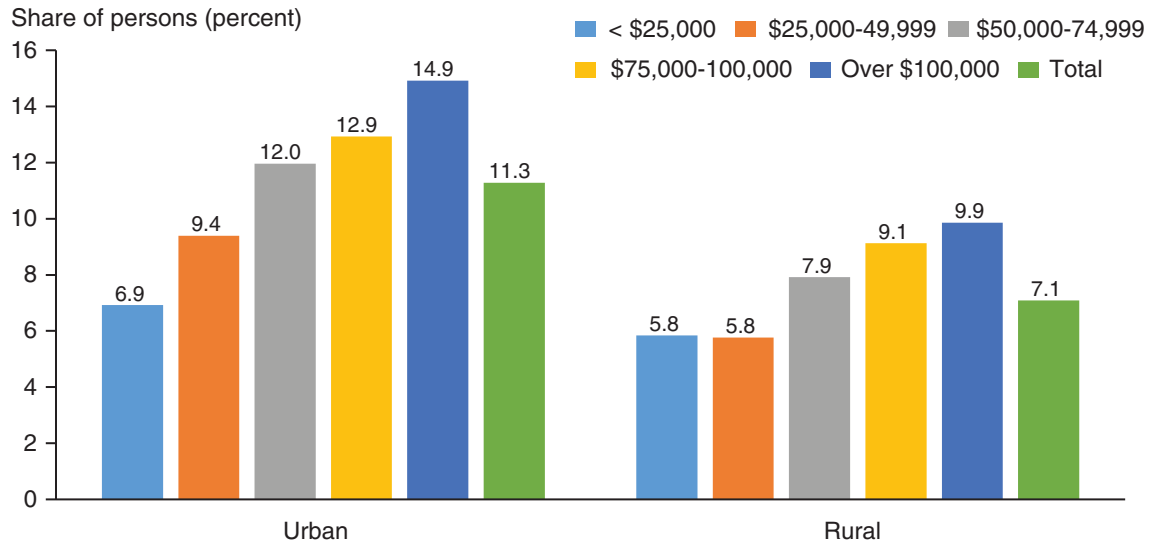
Family income was strongly correlated with differing rates of online health maintenance, which ranged from 6 percent for the rural poor to 15 percent for the upper income urban residents (fig. 10). Figure 10 also suggests differences between rates of online health maintenance and online health research. Although household income seemed not to be a barrier for online health research, household income did appear to be more of a factor for online health maintenance. The results were consistent with low household income being a barrier to obtaining health service (National Center

¹¹Patient safety indicators are measurements of misdiagnoses, treatment errors, and medical prescription errors.

for Health Statistics, 2016). The rural-urban gap in rates of online health maintenance was also consistent with the rural-urban gap issue in obtaining medical services (National Center for Health Statistics, 2016).

Figure 10

Use of online health maintenance, by income, 2015



Note: Differences were statistically significant (at the 95-percent level) between rural and urban counterparts of each income group.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

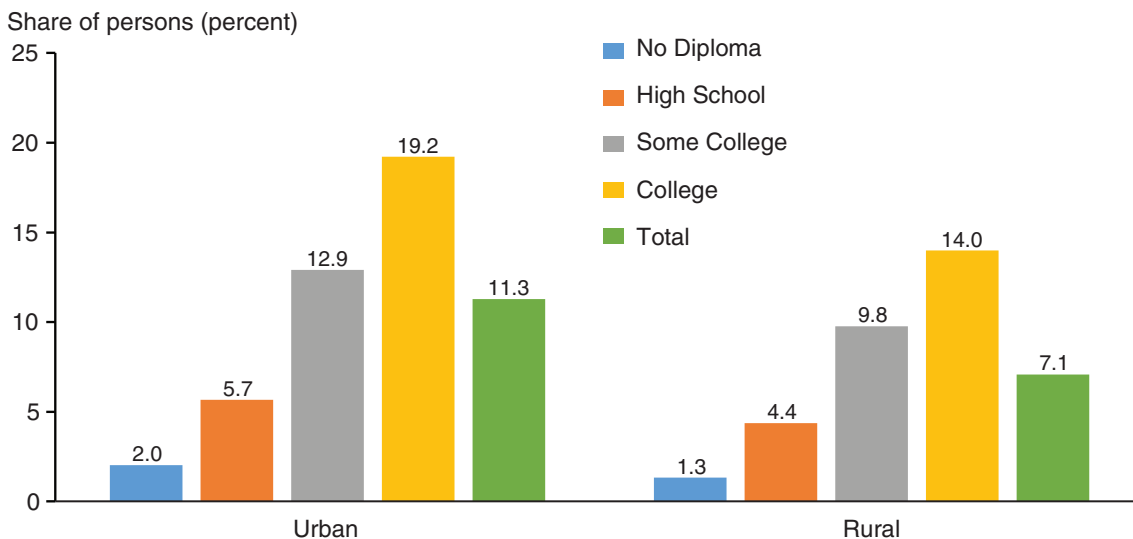
The rural-urban gap was statistically significant and was larger for rates of online health maintenance than for online health research; rural residents were less likely than urban residents to participate in online health maintenance.

Online Health Maintenance by Educational Attainment

The rate of online health maintenance for rural individuals with at least some college experience was nearly double that of individuals whose education did not continue past high school (fig. 11). The rural-urban difference was statistically different (at the 95-percent level) within the some-college and the college-educated groups—another indication that the relative isolation of rural areas and, possibly, the slower uptake of information technology in rural practices deterred participation in this health-related activity among rural residents with more education.

Figure 11

Use of online health maintenance, by educational attainment, 2015



Note: Differences were not statistically significant (at the 95-percent level) between rural and urban counterparts of the education groups, except for the no-diploma group. For definitions of education groups in the legend, see note under figure 3. For definitions of education groups in the legend, see note under figure 3. Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

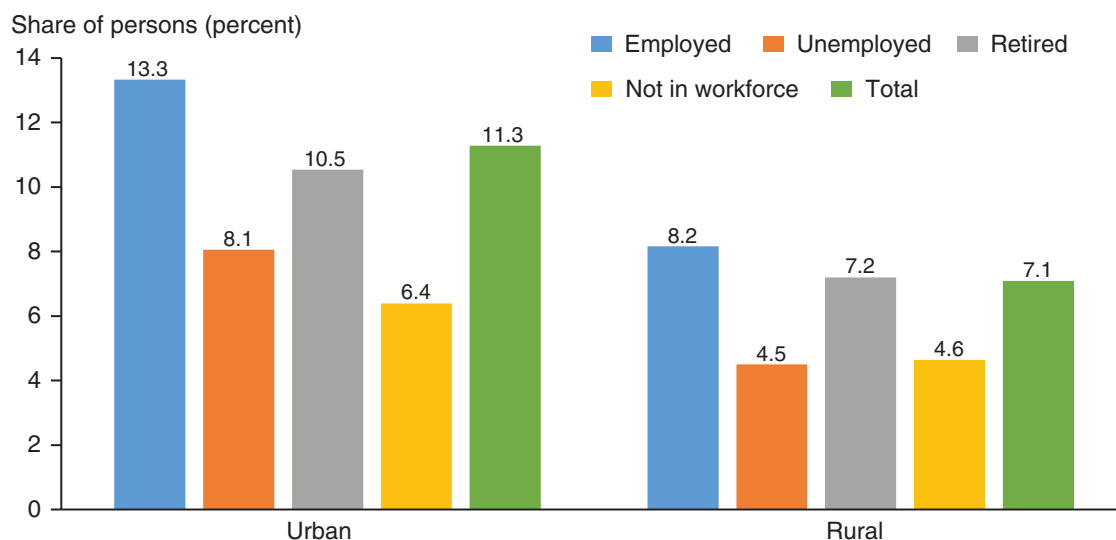
Online Health Maintenance by Other Factors (Employment, Gender, Marital Status, Race, Disability)

Overall, other factors besides income and education showed effects on participation rates of online health maintenance. As in the case of rates for online health research, these factors’ effects varied in magnitude and showed patterns similar to those observed for income and education. Rates of online health maintenance did not show much variation across age groups after age 25.

For rates of online health maintenance, rural-urban differences by work-type were larger than they were for rates of online health research (fig. 12). The type of employer had little effect on rates of online health maintenance. Among urban residents, use of online health maintenance ranged from 13 percent in the private sector to 16 percent for government employees. For rural residents the range was 7 percent in the private sector to 10 percent for government employees. This private/public-sector difference largely reflects the higher education levels of government employees. And, as in the case of use of online health research, the remaining private/public-sector difference in rates of online health maintenance may reflect differences in health coverage across the groups.

Figure 12

Use of online health maintenance, by employment status, 2015



Note: Differences were statistically significant (at the 95-percent level) between rural and urban counterparts of the employment groups.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

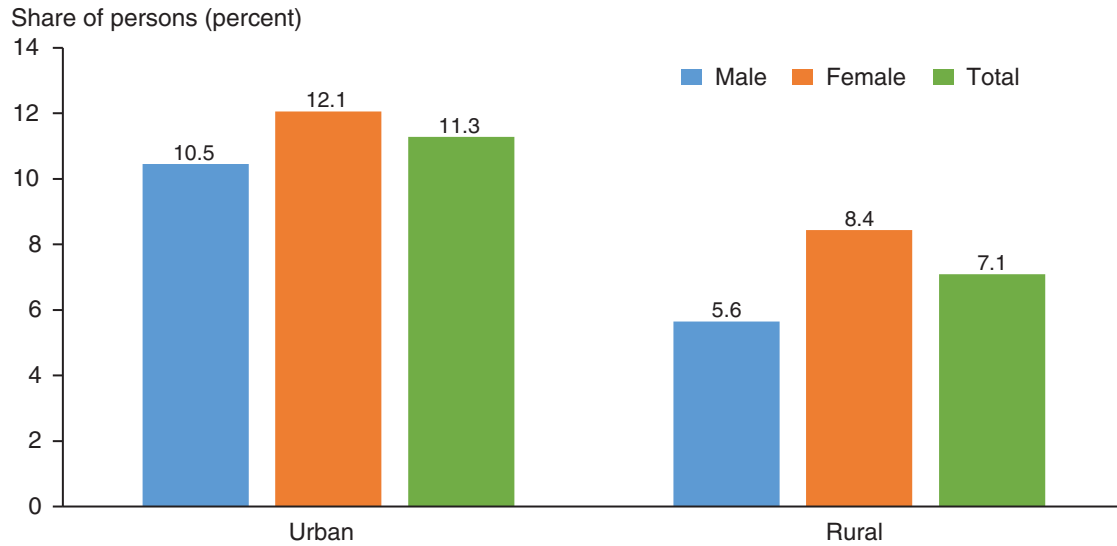
Women were more likely than men to conduct online health maintenance, and urban men and women more likely to do so than their rural counterparts (fig. 13). Rates of online health maintenance by marital status varied widely. As in the case of online health research by marital status, some of the differences in rates of online health maintenance by marital status were likely due to different age distributions across the marital status groups.

Disabled individuals were less likely to conduct online health maintenance than those who were not disabled, despite potentially being more involved with medical practices than the nondisabled.

Within all racial groupings, rural residents were less likely than urban residents to maintain health online (fig. 14). The White non-Hispanic population had the highest rate of online health maintenance; the Asian population, nearly as high; and the Hispanic population, least likely to conduct health management online.

Figure 13

Use of online health maintenance, by gender, 2015

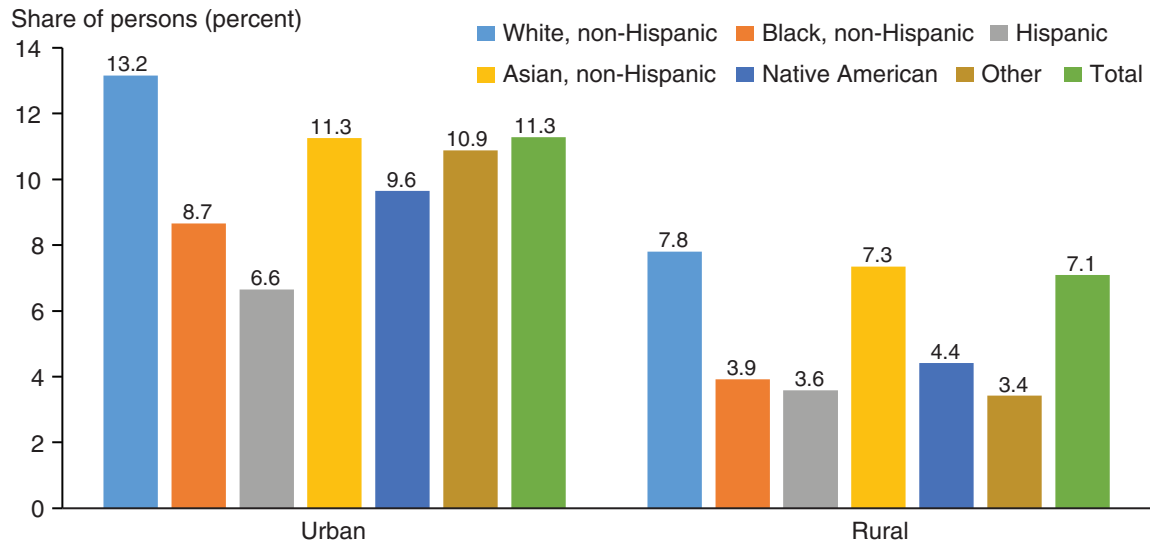


Note: Differences statistically significant (at the 95-percent level) between rural and urban counterparts of the gender groups.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Figure 14

Use of online health maintenance, by race/ethnicity, 2015



Note: Differences were statistically significant (at the 95-percent level) between the rural and urban counterparts of all racial groups.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

With only 7 percent of rural and 11 percent of urban people conducting online health maintenance, a great deal of potential for expansion remains. One new telemedicine technology that may help realize more of that potential—virtual reality patient check-ups—is in the early stage of implementation. The method shows promise, according to the American Telemedicine Association and others, for remote or house-bound patients. Virtual checkups require broadband capabilities that are already largely available in rural areas, but may need greater speeds as the technology and its use evolve. Often, though, it is the issue of acceptance and/or remuneration levels by the health insurance industry and government health support programs—and not technology—that is cited as an impediment to implementation (Dranove et al., 2014).

After we controlled for income, education, and age factors, rural people were much less likely to take part in online health maintenance than urban residents. As new technology (which is more readily accessible in urban areas and often introduced there first) drives the demand for online health management activities, the question becomes *will the rural-urban difference in use of online telehealth grow?*

Online Health Monitoring

Online health monitoring services offer medical devices ranging from simple self-actuated or automated medical alert devices—such as fall detection for the elderly or monitoring devices for women experiencing difficulties in their pregnancies—to implants that constantly monitor medical issues such as heart conditions, pregnancies, and diabetes. The medical devices connect to the Internet either directly, or through dedicated communication equipment (sometimes through existing phone lines as an intermediary system). In all cases, health monitoring via the Internet can allow some patients to be at home instead of the hospital, hospice, retirement home, or other health facility. In many cases, in-home monitoring affords a more pleasant environment and broader social experiences than the alternatives, leading to better outcomes.

With their older and more geographically isolated populations, rural areas may benefit more than urban areas from the evolution in the health monitoring system. Of urban residents, 2.5 percent used Internet-connected health-monitoring devices that transmitted data to medical staff and practitioners, while 1.3 percent of rural residents did the same. The rural-urban difference was statistically significant.

Wearables were not part of these numbers (see box, “Wearables”), but for comparison, in 2015, 1.6 percent of urban residents and 0.8 percent of rural residents had wearables connected to health providers through the Internet for their personal use. (Many more had wearables for their personal use without connecting to health providers, or that they did not use.) The shares were significantly different from zero and each other. Only 9 percent of persons who used a health monitoring system also used wearables. Of those who used a health monitoring system, however, 83 percent conducted online health research and 74 percent performed online health maintenance activities.

Wearables

Wearables are accessories or clothing that incorporate advanced technologies. They include a wide range of devices that individuals can use to monitor their health use, both for personal use and for providing data to health providers. Wearables may or may not be “monitoring devices,” which, in this report, we define as devices that connect to the Internet and report to the medical system.

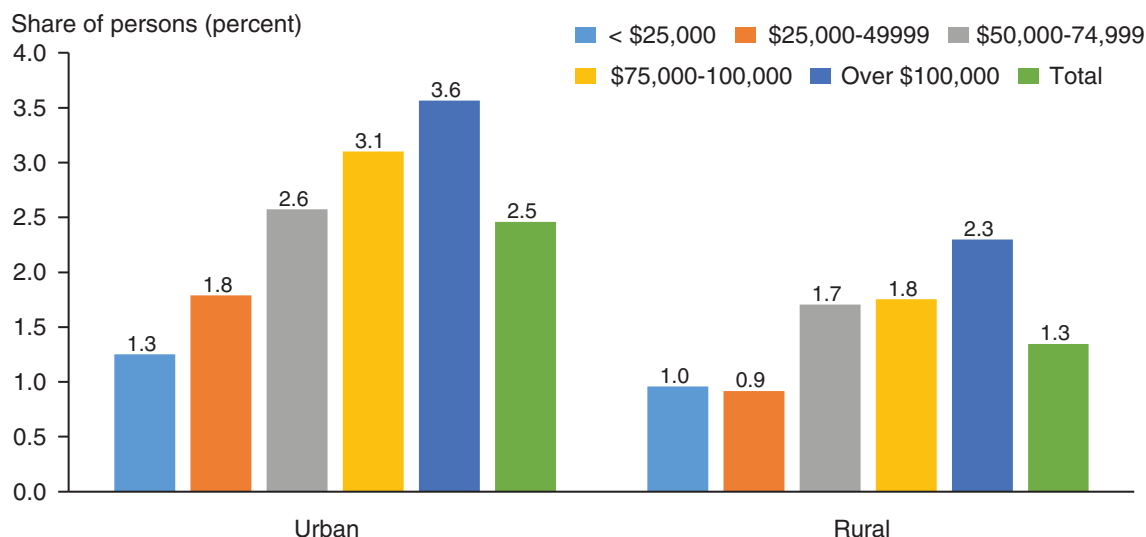
In the Current Population Survey (CPS), wearables are devices worn by the respondent that may connect to the Internet, such as fitness devices that track running distance, smart watches, smart clothing, and smart glasses, but do not transmit through the Internet to medical service providers. Wearables do not generally encompass smart phones, although various devices can potentially connect via smart phones to the Internet.

In 2015, roughly 25 percent of individuals had a wearable, and the market has grown rapidly, but actual consumer use fluctuated greatly—after the initial purchase many consumers stop using the device or use it only irregularly, according to eMarket and other sources.

Use of online health monitoring increases with income, from 1 percent of the urban and rural poor to 4 percent of the upper income urban residents (fig. 15). Rural residents were consistently less likely than urban residents to have their health monitored online. More than the two previously discussed online health activities, online health monitoring is limited by issues of affordability and health plan coverage. The previously discussed activities are done more on a voluntary and deliberate basis.

Figure 15

Use of online health monitoring, by income, 2015



Note: Differences statistically significant (at the 95-percent level) between rural-urban for all income groups, except for the less-than-\$25,000 group.

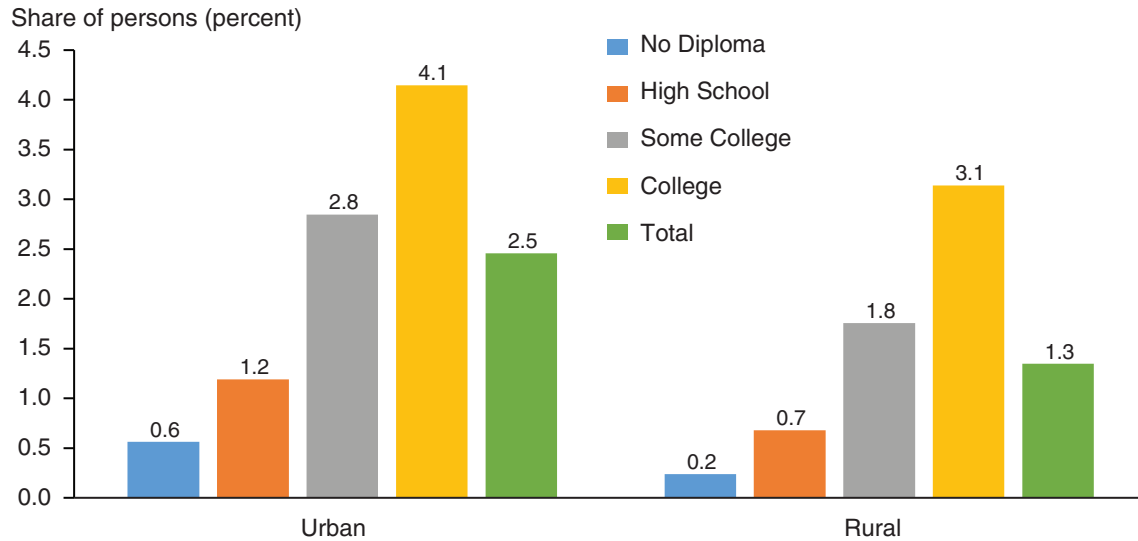
Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Irrespective of education, age, rural-urban location, or other factors, income had more influence on rates of online health monitoring (rates of use increased as incomes increased) than on the rates of the other online health activities.

Education also had an effect (fig. 16). The share of people who used online health monitoring more than doubled between those whose education did not continue past high school or were still in school and those who had some college or had received a college degree. The rural-urban difference was statistically different across all education attainment levels—another indication that the relative isolation of rural areas may have constrained the use of this health-related activity.

Figure 16

Use of online health monitoring, by educational attainment, 2015



Note: Differences statistically significant (at the 95-percent level) between rural-urban for all education groups, except the no-diploma group.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

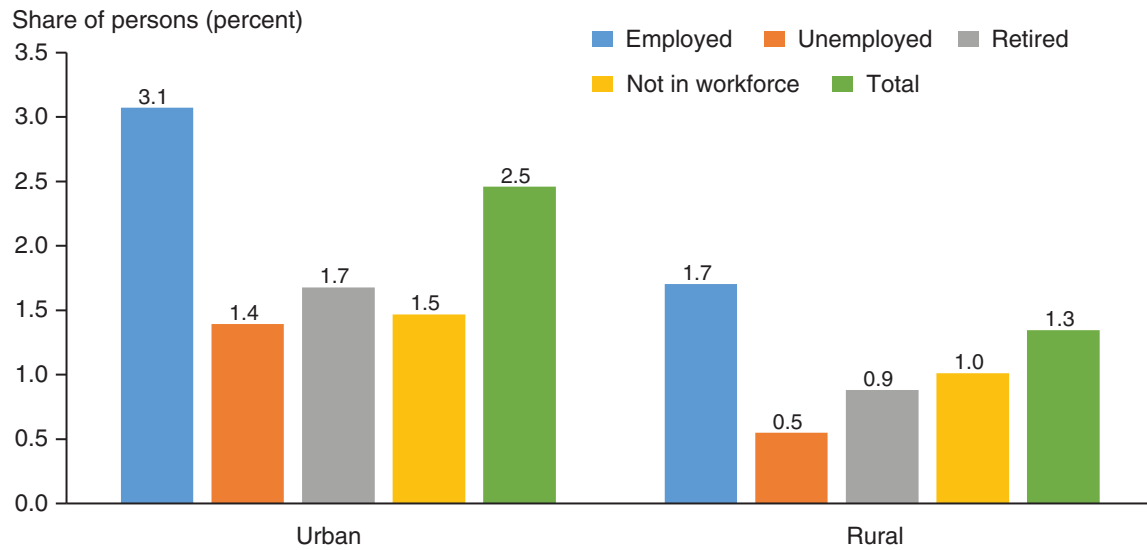
Within each work category, a smaller share of rural residents than urban residents used online monitoring, and this rural-urban difference (within work categories) was much greater than for the other telehealth activities. Employed people were the most likely to use online health monitoring, and retired individuals were the next most likely (fig. 17). Unemployed people were the least likely to have their health monitored remotely. As online monitoring was costly, the results largely reflect who had or did not have health insurance.

An individual’s type of employer (i.e., public, private, or self-employed) had little influence on the tendency toward online health monitoring. Of urban residents, 3 percent in the private and self-employed sectors conducted online health monitoring and 4 percent in the government sector did so. Of rural residents, the range among all employer-type categories was 1 to 2 percent.

Veterans were as likely as nonveterans to use online health monitoring technology. Men were nearly as likely as women to have their health monitored online, and both male and female urban residents more likely to do so than their rural counterparts. Marital status was a significant factor showing some variance across marital-status categories, although some of the differences were due to different age distributions across categories.

Figure 17

Use of online health monitoring by employment status, 2015



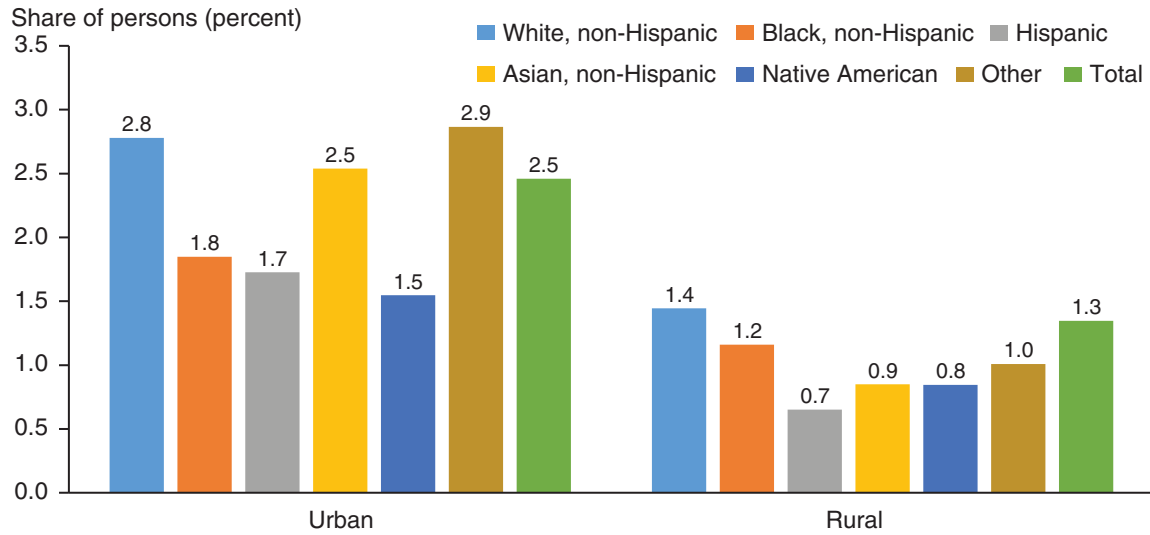
Note: Differences were statistically significant (at the 95-percent level) between rural-urban for all employment groups, except the not in workforce group.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Disabled individuals were less likely to have their health monitored than those who were not disabled, despite having a potentially greater need or greater involvement with medical personnel than the nondisabled. Online health monitoring seemed roughly equally accessible to all racial/ethnic categories, ranging from 2 to 3 percent across all categories in urban areas and averaging roughly 1 percent for all categories in rural areas (fig. 18). The rural-urban difference also remained statistically significant.

Figure 18

Use of online health monitoring by race/ethnicity, 2015



Note: Differences were statistically significant between rural and urban for White and Asian non-Hispanic groups, but not for other racial and ethnic groups.

Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Once we considered income, education, and age factors, rural residents were much less likely than urban residents to conduct online health monitoring. This rural-urban divide was reflected throughout the demographics and work characteristics and contrasted with rural-urban use rates for online health research, for which rural residency was less of a barrier. Although varying broadband access explained some of the rural-urban difference, not all online health monitoring technology required the high-end Internet connections more common in urban areas.

Access to Technology

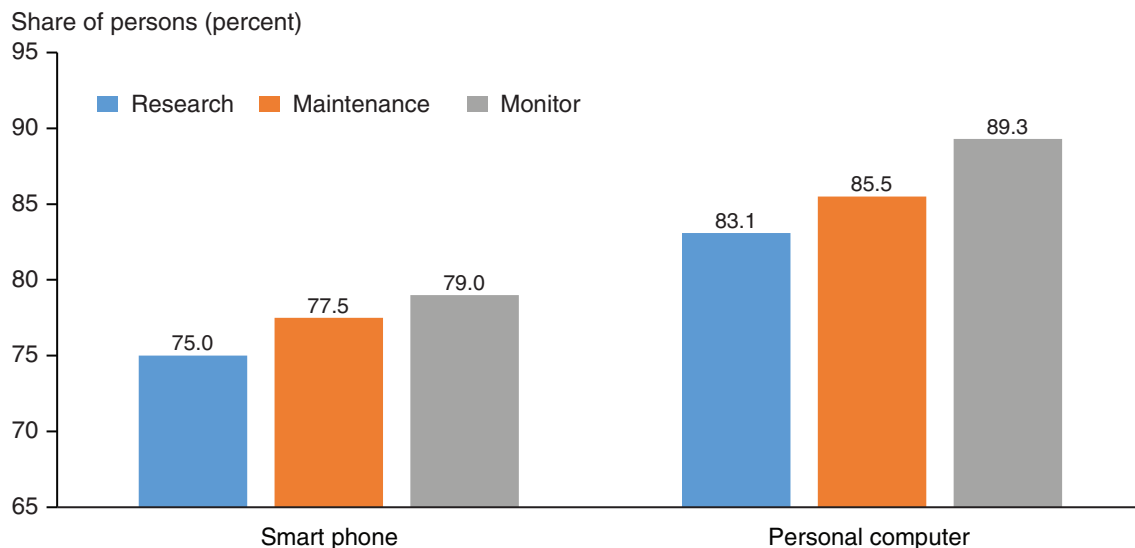
Not owning some type of a personal computer (PC) and having no Internet subscription did not deter everyone from conducting online health research. Owning a PC (i.e., a microcomputer, desktop computer, laptop, or tablet) increased the chance an individual did online research, but 16 percent of urban residents and 13 percent of rural residents who did not own a PC still conducted online research. Among those who did not possess a mobile phone, 10 percent of urban residents and 8 percent of rural residents still conducted online research. For online health maintenance, access to technology was a more significant factor than for online health research: a PC owner was twice as likely as a nonowner to conduct online health maintenance, although, again, many nonowners still found resources to do so.

Most individuals conducting online health monitoring had smart phones and PCs. The particular types of technology owned were not as influential to use rates as simply having some kind of relevant technology—many people had a smart phone capable of doing much of what was necessary for online health monitoring. As the online health monitoring system evolves, home PCs, which are critical elements in the current trial runs, may become more necessary. Still, a lot of monitoring can be done with a smart phone (with all the consequences of using a smaller screen) or, as is commonly practiced, by using a dedicated communication device that mediates the monitoring device's connection to the Internet.

While smartphones are more common than PCs in the general population, PCs are more common than smartphones for those conducting telehealth (fig. 19).

Figure 19

Rural use of technology to conduct telehealth, by telehealth activity, 2015



Source: USDA, Economic Research Service calculations based on data from the U.S. Census Bureau, 2015 Current Population Survey.

Conclusion

Resolving the challenges to providing rural health care may be vital to ensuring continued rural growth and prosperity. Rural telehealth, which has rapidly integrated with Internet technologies, may pose one solution. Although telehealth remains in its infancy with relatively low rates of regular use, those rates will likely increase as service and technology continue to improve and people become aware of the improvements.

This report examines data on rates of use for three telehealth activities: (1) online health research; (2) online health maintenance (i.e., communication with the health provider, including contacting the provider, maintaining records, and paying bills); and (3) online health monitoring (i.e., by transmittable systems reporting back somewhere in the medical system). Rural residents were less likely than urban residents to take part in any of the three telehealth activities. In 2015, 17 percent of rural residents and 20 percent of urban residents did online health research. Seven percent of rural residents and 11 percent of urban residents conducted online health maintenance, and 1.3 percent of rural residents and 2.5 percent of urban residents did online health monitoring.

In-home broadband Internet access, whether by choice or happenstance, may not have been a significant factor in 2015 for either rural or urban residents. Many still conducted health activities although they had no Internet subscription. Health providers, however, continue to improve their offerings, so needs for high-quality household broadband service will likely increase if patients are to avail themselves of these new services, especially in rural and poor areas where lower quality broadband Internet service tends to be more common.

For rates of online health research, educational attainment was a key influence while income (once household income is above \$50,000) was a minor factor for both urban and rural residents. For rates of online health maintenance, income and education were larger factors than for rates of online health research. Of urban residents, 2.5 percent used health monitoring devices, and 1.3 percent of rural residents used them.

Monitoring devices range from simple self-actuated or automated medical alert devices to implants that communicate wirelessly to the Internet and constantly monitor serious medical issues such as heart conditions, pregnancies, and diabetes, thus allowing patients to stay at home instead of at a hospital, hospice, or other health facility. Rates of online health monitoring—dependent on individuals' having health providers that offered online monitoring technologies—increased significantly as income increased.

The Federal Government is active in many ways that may facilitate rural telehealth service, including programs to (1) improve access to the Internet (e.g., Federal Communications Commission (FCC)'s High-Cost Program, the USDA Farm Bill Broadband Loan Program, and the August 2018 USDA pilot rural broadband loan/grant program); (2) reduce the cost of going online for poorer households (e.g., the FCC's Lifeline Program); (3) improve rural telehealth provider facilities (e.g., USDA's Distance Learning and Telemedicine Grant program); and (4) provide education to facilitate individuals' use of the Internet (e.g., the Department of Education's Impact Aid Program and the Department of Interior's Education Native American Network). This current and future research can inform these efforts.

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