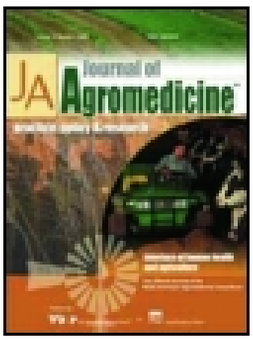

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Medical Connections: Use of the Internet and Traditional Sources of Health Information by Rural Alabama Households

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ABSTRACT. Rural household adoption of the PC and Internet for accessing medical and health-care information was investigated using survey data collected from 305 households randomly selected from non-metropolitan, rural counties across Alabama. The diffusion-adoption model for new technologies was employed to create five adoption stages relevant to this technology and its applications to communication of information in the health field. Descriptive household characteristics of age, education, income, and children revealed differences between adoption stages, with age and education having major impacts. Use of traditional sources of health information and the Internet were compared in relation to age and availability of medical services. Older, less educated households lagged behind in use of the Internet for health information. Medical professionals, doctors and pharmacists, were the most utilized information source by rural households; but those households connected to the Internet used on-line sources, even e-mail to communicate with their doctors.*[Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2005 by The Haworth Press, Inc. All rights reserved.]*

KEYWORDS. Health information sources, rural households, Internet, adoption

Rural America is often identified as a part of the country that lags behind more densely populated urban areas in social services, including health care.[1,2] Dissatisfaction with the quality of rural health care is redirecting rural residents to new modes of health information and care delivery. Some new health information channels are quite distinct from traditional office-based medical care with face-to-face doctor-patient contact.[3,4] Communication technology offers

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potential for accessing health information via the personal computer (PC) and Internet.[5,6,7] Used appropriately, this technology could be of great aid to rural residents by increasing their access to health information and enhancing their ability to negotiate with the medical system.[8] Medical and health information obtained electronically can help people modify risky behaviors and learn skills for coping with immediate and long-term health dilemmas.[6,7,9] Access to medical and health information through electronic technologies will foster a healthier population that assumes greater personal control over disease prevention and maintenance of healthy lifestyles.[9,10]

An important question is the extent to which PC and Internet use has entered rural areas and whether it is being used to ease the rural health gap. To address this need, we identified four objectives for this analysis. The first objective was to establish a consumer/patient benchmark designed to describe the current adoption of electronic technology for acquiring access to medical and health care information. A second objective was to determine what characteristics distinguished households among the various stages of PC and Internet diffusion. The third objective was to determine the kinds of medical and healthcare information sought on-line. Assessing the current level of Internet connection and its use as a source for medical or health information is essential for identifying and comprehending future impacts of computer technology on rural healthcare. And the fourth objective was to determine the primary sources of medical and health care information used by rural households to compare Internet use with more traditional individuals/organizations and text/media.

Diffusion-Adoption Process. Rogers developed a theoretical framework consisting of a set of behavioral stages that form the diffusion-adoption process that begins with the introduction of a technology and extends through its widespread adoption by a population.[11,12] This model identifies five-stages conceptualized inductively from observations of various technological innovations studied over time. We have taken this model and applied it to the diffusion of PC and Internet and its adoption as a part of rural medical and healthcare behavioral practices. This model allows for categorization of a target population of potential users of this technology along a set of adoption stages of Innovators, Early Adopters, Early Majority Adopters, Late Majority Adopters and Non-Adopters.

Rogers characterizes Innovators as venturesome, scientifically knowledgeable with extensive education and ability to comprehend abstract concepts. Such households are likely to have the highest social standing within their local community. Early Adopters are not as venturesome in their approach to new technologies; but are progressive and have above average education. In contrast, the Early Majority is somewhat conservative about trying new things and slow in making decisions about change. They hold to traditional values and practices, yet possess slightly above average education with middle-class socioeconomic status.

Late Majority households tend to be highly skeptical of new technology and are resistant to change. These households question both the need for and the benefits of new technologies. They refuse to try innovations until circumstances virtually force them to do so. These households typically have below average education and hold low or modest social standing in the community. Finally, Non-Adopters commonly are very conservative in their adoption behavior and possessing limited human and economical capital. They are older in age and have a low level of education that results in low social status and difficulty envisioning technology benefits.

Application of the Model. The first step in the adoption of any new technology is to learn about it by seeking and gaining access to information. Obviously some members of a population at any point in time have not and may never take this initial step. These households that have not taken initial steps towards adoption are Stage I, Non-Adopters. In the current study, entering into electronic communication requires gaining access to a PC. Over time, many will initiate the process and by doing so, enter the adoption process. Stage II, Late Majority Adopters are those who fail to advance beyond gaining PC access. The next logical step is to expand the capabilities of the technology. Stage III, Early Majority is entered when the Internet is adopted. The remaining stages, IV and V, are

specific to health and medical uses of the Internet. We conceive of Stage IV, Early Adopters, entered when the Internet is used for seeking information about medical and healthcare issues. Stage V, Innovators are those who adopt e-mail for connecting with health professionals and particularly the family doctor and/or specialists.

METHODS

A mail survey was employed to obtain data on PC and Internet adoption and use for accessing medical and healthcare information. The desired unit of analysis for this study was the rural household. All Alabama counties classified as non-metropolitan were selected and a household population frame that included a sufficient number of farm households was sought. Such a list was available from a special file of more than 21,000 Alabama farm households compiled by the *Progressive Farmer* staff. While heavily oriented toward farming, this population was not the magazine's subscriber list, but a much broader representation of rural farm and non-farm households.

This file was sample stratified by north and south regions. The Alabama Department of Public Health distinguishes between this regional divide to reflect differences between the Appalachian and Black Belt geography, history, culture and distinctive health needs. The original sample included 1,400 households, 700 from 21 rural north counties and 700 from 25 rural south counties. The two-sample lists were then examined to eliminate any obvious inappropriate addresses, such as estates, agencies, businesses, or organizations. Due to the amount of inappropriate addresses, a random selection process was used to reduce the two sub-samples to 600 from both the rural north and rural south.

A 40-question survey was reviewed and approved by the University of Alabama Institutional Review Board. It was then mailed to all 1,200 randomly selected households. Of the 1,200 households mailed questionnaires, 150 were completed and returned (12.5 percent) from the first mailing. A second mailing to the 950 non-responding households brought forth an additional 155 returns (12.9 percent). Undeliverable questionnaires totaling 73 were returned due to faulty addresses or deceased addressee. Completed questionnaires from the two-stage procedure resulted in 305 useable questionnaires for an adjusted response rate of 27.1 percent. Adjusted return rates for the rural north and rural south were 29.6 and 24.8, respectively. No information was available on non-respondents to examine whether they were similar to respondents or to the population of the state.

Measurements of Diffusion-Adoption. Stages in the Diffusion-Adoption process for PC and Internet use for health needs were defined operationally by answers to a series of four questions. First, "Do you or other adults in your household use a PC?" Responses of "No" indicated the household was Stage I, Non-Adopter. Second, "Do you or any member of your household who use a PC access the Internet?" "No" responses placed the household in Stage II, Late Majority. Third, "Do you or any adult member of your household use the Internet to obtain health information?" "No" to this question identified Stage III, Early Majority households. Fourth, "Do you or members of your household use the Internet to communicate with your family or specialist doctor?" "No" signified an Early Adopter in Stage IV. A "Yes" response to this question indicated Stage V, Innovator.

Descriptive Variables. Three broad sources of health information were identified and measured frequency of use: (1) individual/organizational, (2) text/media, and (3) the Internet. First, respondents were instructed to, "Rate how often members of your household go to each of the following individuals or organizations for health information." A list of nine sources was provided for rating. A second list of six kinds of printed text/media sources of health information was rated. Households were then asked to rate how often they used the Internet for seeking health information. Those with Internet access were asked to what extent members of their household searched the Internet for information about specific health problems.

Selected Independent Variables. Key household characteristics selected for analysis were age, education and household income. Because the household was our unit of analysis, we av-

eraged the age of household adults; and we used the education level of the adult member with the highest level of formal schooling. When there was only one adult householder, respondents' age and education was used.

Children in the household were determined by asking the age of household members. Anyone under the age of 20 was considered a child.

Household income was measured in $10,000 increments, ranging from under $10,000 to $100,000 or more.

Design of Analysis. This is a descriptive study. Descriptive findings are reported using frequency distributions with percentages and simple measures of central tendency, such as mean scores. When nominal and some ordinal attributes are tested for statistical significance, the non-parametric Chi-square procedure was used.

RESULTS AND DISCUSSION

The first objective was to apply the diffusion-adoption stages of electronic communication for health use by rural Alabama households. Distribution of the 305 rural households across the five stages is reported in Table 1. Non-Adopters of the PC represented the largest proportion (39%) of the sampled rural households. These households reported having no access to a PC. Moreover, when adding the 8 percent of households with PC access but lacking access to the Internet, almost half (46 percent) lacked access to the communication and health knowledge potentials of the web. Since this rural sample appears to have a middle-class and farm bias, by virtue of the sampling frame used, it is highly likely that the actual portion of Alabama rural households without PC and Internet access is much larger.

Just over half (54%) of our participating households had access to the Internet. Of these, a small portion of households (18%), reported access to the Internet but were not using the Internet to obtain medical and health information. The adoption model labels these households as the Early Majority. However, most Internet connected rural households (34%) did use the Internet as a source of medical and health information and had advanced to the Early Adopter stage. Very few, only 5 households (2%) could be labeled Innovators for using e-mail to communicate with a doctor about their medical or health needs.

The majority of respondent households are currently in one of three adoption stages. They are either Non-Adopters of information technology, with no PC or Internet experience (39%), or in the trial stages of PC and Internet use (26%), or in the adoption stages where available Internet technology is being explored for its potential applications to their health information needs (36%). In future years, diffusion of the PC and Internet into rural households has the potential to provide greater access to health information and medical professionals, much like the telephone once did. Both medical professionals and patient/consumers could find it expedient to explore how this technology can be used to accommodate their needs and interests. Today, the health information arena from websites is being used, but e-mail may be the future medium of choice and convenience.

TABLE 1. Classification of Rural Alabama Households by Diffusion-Adoption State of PC and Internet Use for Health Information, 2001.

Diffusion Categories	Stages of Adoption	Number†	Percent
Non-Adopter	Does not have access to a PC	118	38.7
Late Majority	Has access to a PC but not to the Internet	24	7.9
Early Majority	Accesses the Internet through the PC	54	17.8
Early Adopter	Uses the Internet to obtain health information	104	34.3
Innovator	Communicates with family physicians via e-mail	5	1.7
Total Households		305	100

†1,200 total surveys were sent out.

A second study objective was to analyze selected characteristics of Alabama rural households currently at each stage in the communication technology diffusion-adoption process. Due to the clustering of households into three of the five stages, we will combine stages and focus attention on Stage I-Non-adopters, Stages II and III-Experimenters who use the PC/Internet, and Stages IV and V-Adopters who use the Internet for health information. Five descriptive characteristics relevant to the diffusion of technology and its adoption by a user population were examined in relation to these three key adoption stages.

Our findings reveal that four of the five descriptive characteristics contributed to household placement in the three Diffusion-Adoption stages (Table 2). Only place of residence, either the rural northern or southern region of Alabama, failed to differentiate significantly between adoption stages. Lack of regional difference may be a result of sample limitations that under-represent minority and lower socioeconomic households.

A strong negative association was found between household age and adoption stage. The older the household the less likely the household had progressed through the PC and Internet adoption stage to application of the technology for obtaining medical and health information. Households with an average age of 71 or older account for 46 percent of Non-Adopter households, but only 13 percent of Experimenters using the Internet, and 5 percent of Adopters who search for the Internet health information. Households with head(s) 50 or younger represent 34 percent of Internet Experimenters and 44 percent of Adopters. These

TABLE 2. Selected Characteristics of Rural Alabama Households Classified by Diffusion-Adoption Stage of PC and Internet Use for Health Information, 2001.

	Technological Stages				
	Stage I	Stages II and III	Stages IV and V		
Characteristics	Non-Adopter	Experimenter	Adopter	Total†	χ^2
			….Percent….		
Region					
Rural North	52.5	30.9	56.0	54.4	
Rural South	47.5	69.1	44.0	45.6	
(Number)	(118)	(139)	(109)	(305)	0.28
Age of Household (mean)					
50 and under	2.7	34.2	43.8	25.7	
51-60	9.9	31.6	32.4	23.6	
61-70	41.4	21.1	19.0	28.1	
71 and above	45.9	13.1	4.8	21.9	
(Number)	(111)	(76)	(105)	(292)	108.67**
Education of Household (mean)					
High School Grad or less	49.5	19.2	8.3	28.6	
Some College	19.5	34.6	29.3	27.0	
College Grad or more	31.0	46.2	62.4	46.3	
(Number)	(113)	(78)	(109)	(300)	52.76**
Household Annual Income (total)					
$29,999 and below	52.6	25.3	15.5	31.8	
$30,000-$59,999	34.8	31.7	31.9	32.9	
$60,000 and above	12.6	42.9	52.6	35.5	
(Number)	(95)	(63)	(97)	(255)	45.14**
Child in the Household					
Yes	2.5	27.0	34.9	20.3	
No	97.5	73.1	65.1	79.7	
(Number)	(118)	(78)	(109)	(305)	39.36**

†1,200 total surveys were sent out.
**p < .01.

data indicate the critical part age plays in determining household adoption of this communication technology and its use accessing medical and health information by rural residents.

A positive association was observed between household education and adoption stage. The higher the educational attainment of the household and spouse, the more likely the household was to a use a PC and Internet and to use this technology to seek medical and health information.

The majority of technology Adopter households (62%) had at least a head or spouse with a college degree, in comparison to Non-Adopter households where only 31 percent had a college graduate. More important, half of Non-Adopter households had no more than a high school degree. Experimenters were a distinct middle group from either Non-Adopters or Adopters. This category had the largest portion with some post-high school education but no college degree.

Wealthier households were more likely to have advanced farther in the adoption process by applying the PC and Internet to their health information needs. More than half the Adopter households (53%) had annual incomes above $60,000 compared to only 13 percent of Non-Adopters. Conversely, more than half the Non-Adopter households reported annual incomes below $30,000. Households in the Experimenter stage had incomes more consistent with Adopters than with Non-Adopters. This suggests that the initial cost of the PC and the continuing monthly cost of Internet access may be serious concerns and barriers to adoption of this technology. Once this cost constraint is breached, other types of barriers may influence the adoption of the Internet.

Household composition is another often-believed factor impacting the diffusion-adoption process.[13] Households where children reside are more likely to be aware of electronic communication technology through their children and to take the first steps in adoption. Households without children in the home lack the technology awareness children provide and the pressure they create for adoption. Only 20 percent of survey participants had children in the home, but the presence of children was clearly a positive factor in the adoption of information technology for health use. We found that 97 percent of Non-Adopter households have no children in the home. By comparison, 27 percent of Experimenters and 35 percent of Adopter households have children living at home. This supports the contention that children are an important but not necessary factor in household adoption progress.

The strong inverse relationship between age and education in adoption and application of electronic communication technology is of interest to explore. Is one factor more critical than the other? To investigate for age/education interaction, we controlled on four age levels. When this was done, the education and income variability became insignificant across adoption stages except for three age scenarios. The significant scenarios are revealed in Table 3.

When controlling for age, all young households had progressed at least to the Experimenter stage and had attained Internet access. Moreover, the majority of the Experimenters (77%) had some college and 45 percent were college graduates. Among the Adopters, progress was even more pronounced with 98 percent having some post-high education and 65 percent with college degrees. Thus, we conclude that among middle-age and young households, education is an important contributor to adoptive behavior for electronic communication and its application to household health needs.

Among households 61-70 years of age, education had a strong independent impact on adoption. Fifty percent of Non-Adopters were high school graduates or less, compared to only 25 percent of the Experimenters and 5 percent of Adopter households. Conversely, 40 percent of Adopter households in this age category were college graduates. Households in the retiring years showed significant variation in household income across adoption stages. While half of the Non-Adopters reported annual incomes below $30,000 and only 11 percent more than $60,000, more than one-third of Adopters reported $60,000 plus incomes. A possible reason for income variation at this age is the transition to retirement associated with 65 years of age. When age is held constant, having children in the household is inconsequential at all age levels. This indicates the collinear association between age and family status.

Internet Use for Health Information. A third objective was to determine the kinds of medical and health information rural households seek on the Internet. For this purpose, the sample was reduced to include only the sub-sample of 109 households that had adopted the Internet for obtaining health information.

We found that rural Internet users who seek health information are most likely to go on-line in search for information about medications, i.e., prescription drugs (Figure 1). Almost three-fourths (74%) used the Internet for this purpose, followed by information on diet and nutrition (59%). Conversely, information on heart disease, which health authorities consider a major health concern in rural areas, as well as the leading cause of death in the U.S., is sought by fewer than half of these rural households (40%).

Many rural households across all age groups search the Internet for health information on diet and nutrition. Over half of the households younger than 71 years of age use the Internet for diet and nutrition information. This documents a widespread interest among rural households for preventative and healthful behaviors, as well as possible disease management. Households 50 years of age or younger are more likely to search for health topics that were not provided in our survey list.

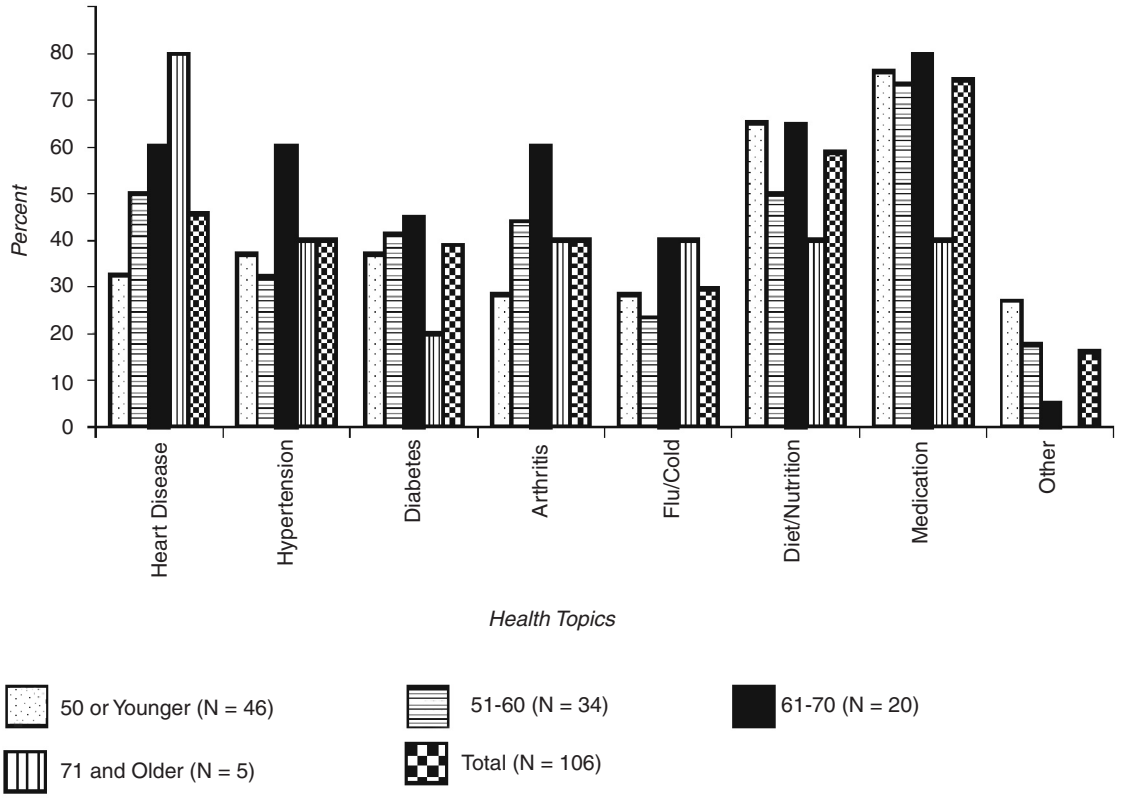
As with the onset of almost all new technologies, challenges exist that must be identified and addressed. The reality of PC and Internet expansion into the medical and health information arena, as well as its implications for rural areas lacking availability of local information sources, suggests a number of public concerns. One critical concern involves the quality of health information available on the Internet.[14] The open and uninhibited nature of the Internet allows everyone and anyone freedom, whether credible or not, to make information accessible to the public. In such an open information system, consumers need to be equipped with sufficient knowledge to judge the quality of the information available or provided with some filtering process that can provide a modicum of credibility, i.e., fact from non-fact.

TABLE 3. Significant Characteristics of Rural Alabama Households Classified by Diffusion-Adoption Stage of PC and Internet Use for Health Information When Controlling for Age of Household, 2001.

	Technological Stages				
	Stage I	Stages II and III	Stages IV and V		
Characteristics	Non-Adopter	Experimenter	Adopter	Total†	χ^2
			….Percent….		
50 or Younger					
Education of Household (mean)					
High School Grad or less		24.1	2.2	10.7	
Some College		32.6	32.6	32.0	
College Grad or more		44.8	65.2	57.3	
(Number)		(29)	(46)	(75)	9.35*
51-60					
Education of Household (mean)					
High School Grad or less	50.0	25.0	5.0	34.1	
Some College	17.4	50.0	55.0	32.9	
College Grad or more	32.6	25.0	40.0	32.9	
(Number)	(46)	(16)	(20)	(82)	17.11*
61-70					
Household Annual Income (total)					
$29,999 and under	50.0	7.7	26.3	35.7	
$30,000-$59,999	39.5	61.5	36.8	42.9	
$60,000 and above	10.5	30.8	36.8	21.4	
(Number)	(38)	(13)	(19)	(70)	11.56*

*p < .05.
**Due to the limited number of non-adopter households in the age category 50 and younger, Stage I was combined with Stage II and III.
†1,200 total surveys were sent out.

FIGURE 1. Type of Health Information Sought on the Internet by Rural Alabama Households, 2001.†



†1,200 total surveys were sent out, 305 surveys were returned.

Traditional Sources of Health Information. The fourth study objective examines how the Internet fits into the mesh of traditional sources of health information. Figure 2 reports the household use pattern for 16 specific types of health information sources.

The primary information sources used by rural Alabama households are the family doctor (97%) and pharmacist (93%), followed by specialty doctors (82%). All are individuals perceived by rural people as having knowledge about diagnosis and treatment of medical and health problems. Other medical professionals, such as nurses and nurse practitioners are not sought nearly as often (31%) for medical and health information.

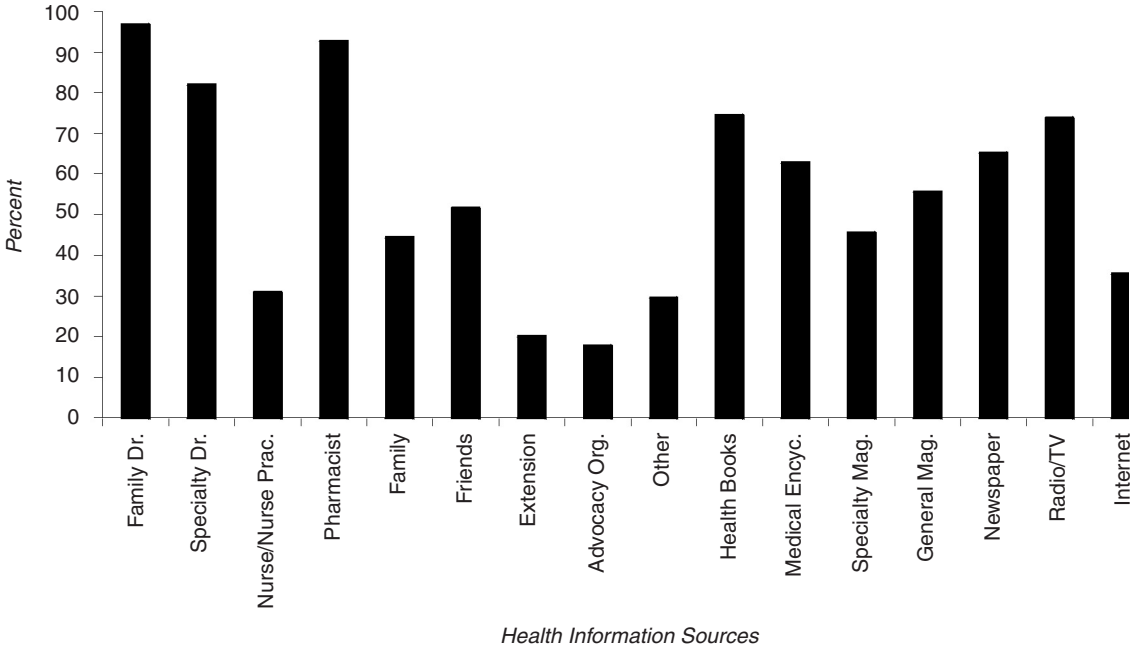
Shifting to text and media information sources, health related books and radio/television (both with 74%) were most often used. A second tier of text and media sources included newspapers (65%), medical encyclopedias (63%), general purpose magazines (56%) and specialty magazines (46%) that provide medical and health related articles. Clearly, media in its various forms remains an important information source for most rural households.

Limitations. Due to sample and response limitations of these data, further research must include more minority and younger households. Older, middle, and higher income groups were over represented while younger households and minorities across the state are underrepresented. Nevertheless, the study is fairly reflective of aging rural farm households across Alabama. Considering these limitations caution should be used in generalizing.

CONCLUSION

Traditional sources of health information, including family and specialty doctors and pharmacists remain the primary sources of medical and health information. Rural households use a

FIGURE 2. Sources Used for Health Information by Rural Alabama Households, 2001.†



†1,200 total surveys were sent out, 305 surveys were returned.

wide range of resources for obtaining health information. Some are traditional sources tied to family and community while others are indirect sources accessed through text/media, and now the Internet. Most importantly, in this report we document the arrival and growing acceptance of the electronic access through the PC and the Internet for obtaining health information.

By creating a diffusion-adoption model for the use of the PC and Internet technologies to access medical and health information we can describe where rural households are in the adoption process. The fact that only about half of our sample of primarily middle-class, rural households had access to the Internet documents the need for caution in assuming universal access. Yet, some on-line rural households reveal that they have used the Internet for medical and health information. This application of the Internet to the health arena will undoubtedly continue among better educated and younger rural households. The concern that must be addressed is for those segments being left behind. Our analysis clearly documents older and less educated as critical groups. Also, undocumented by our data is the plight of the rural poor and minority population segments. The information gap could widen as Internet use and e-mail communication potentials spread within the medical industry.

In rural America, the most legitimate mediator of Internet information is the family or specialty doctor and pharmacist who direct consumer/patient care. This study shows the high regard with which rural households hold these health professionals. Thought should be given to how medical providers might enhance the role of information technology. Links between health professionals and reliable information sites on the Internet seems a most obvious connection.[15,16]

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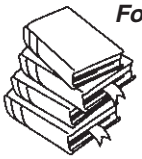

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