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Broadband: Transforming Tennessee's Healthcare Sector



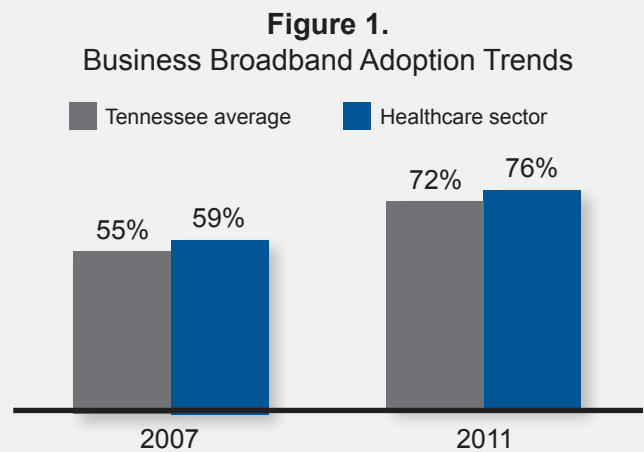
December 2012

While cryogenics, robotic surgeries, and 3-D-printed synthetic organs may not be hitting Tennessee doctors' offices just yet, broadband Internet is transforming the Healthcare sector in ways unimaginable a decade ago. Broadband supports the use of Electronic Health Records (EHR), a more effective means of exchanging accurate patient information between healthcare providers. It also empowers healthcare providers to deliver telemedicine services (medical diagnostic and treatment services) and removes geographic and time constraints for isolated communities by enabling video consultation and patient monitoring.

These "e-Health" applications are empowering Tennesseans to stay healthy while simultaneously controlling costs by delivering cost-effective services. While these applications cannot heal, they can extend the reach of healthcare professionals by transmitting medical, imaging, and health information, and enable doctors to better manage patient care through the secure use and sharing of health information.

Since 2007, Connected Tennessee has worked to develop and implement effective strategies for technology development, use, and literacy in Tennessee. As part of our core mission, Connected Tennessee is dedicated to ensuring that all healthcare providers and the patients they serve have access to and are adopting broadband services so they can utilize e-Health services effectively.

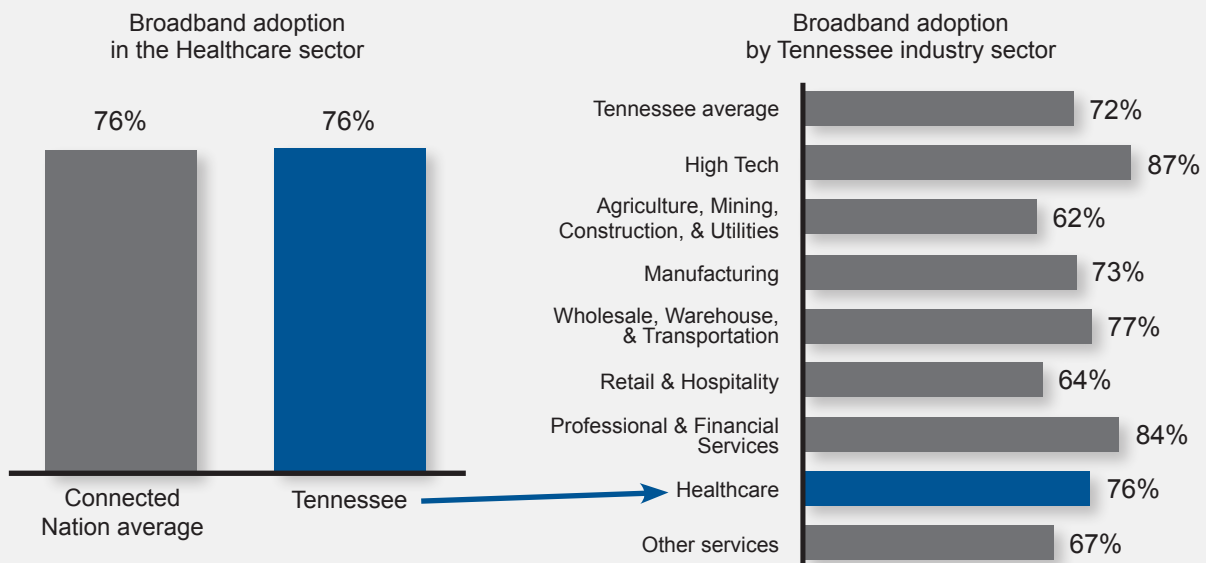
As part of these efforts, Connected Tennessee has conducted annual residential and business surveys designed to measure technology adoption and use. Since 2007, Connected Tennessee has measured the growth in broadband adoption among Tennessee's businesses, especially those in the Healthcare sector, which reported a 29% increase in usage in just four years (Figure 1). This report will explore the state of broadband adoption in Tennessee's Healthcare sector, as well as the usage of e-Health technologies by both businesses and residents.



Broadband Adoption in Tennessee's Healthcare Sector

According to Connected Tennessee's 2011 Business Technology Assessment, 76% of the businesses in Tennessee's Healthcare sector use broadband for their business functions, which is comparable to healthcare establishments in other states surveyed by Connected Nation (Figure 2). Within Tennessee, the Healthcare sector has a higher-than-average broadband adoption rate.

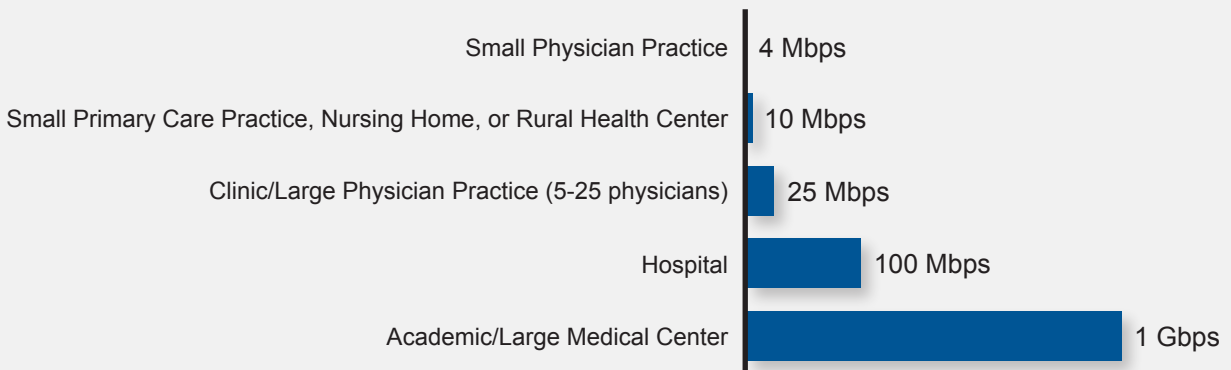
Figure 2.
Broadband Adoption in the Healthcare Sector



However, having access to broadband is not sufficient to ensure that healthcare providers can fully leverage the benefits of e-Health innovations. It is also essential that healthcare providers can access broadband that is fast enough for their needs - healthcare providers' broadband needs are largely driven by the rapidly increasing amount of data that is collected and exchanged digitally. Although some e-Health applications can function at slower speeds, many applications are straining under increasing demand and are unable to support needs likely to emerge in the near future. But how fast is fast enough?

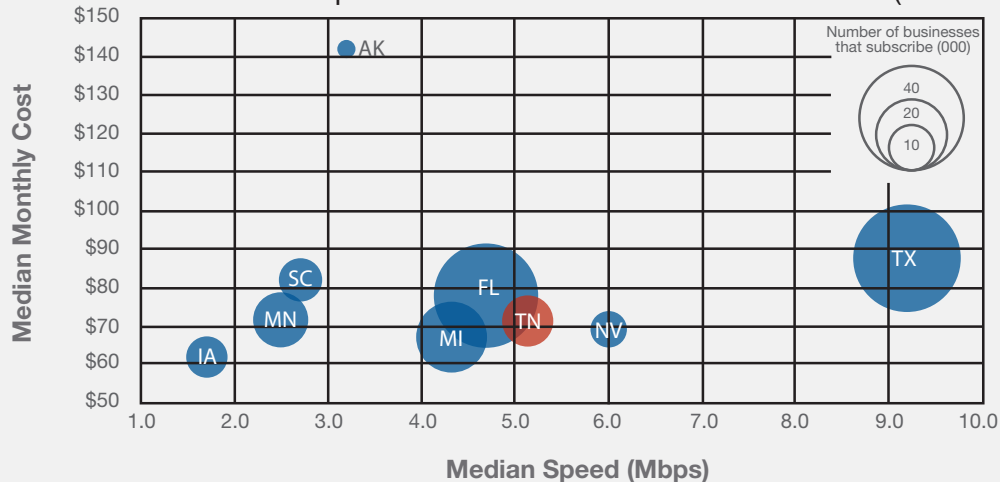
The connectivity needs of different health delivery settings vary depending on their type and size – a small-town general practitioner will probably need less bandwidth than a teaching hospital that offers cutting-edge tools that may not be available anywhere else in the state. Figure 3 presents estimates from the National Broadband Plan of the required minimum connectivity and quality metrics to support the deployment of e-Health applications today and in the near future at different types of healthcare settings.¹ For example, smaller providers can achieve satisfactory e-Health service with a download speed as low as 4 Mbps for a single-physician private practice, even though that level of bandwidth would not suffice for larger practices with multiple physicians, let alone for larger clinics or hospitals.

Figure 3.
Recommended Bandwidth Speeds by Location Category (Not to Scale)



Of the approximately 11,000 businesses in Tennessee's Healthcare sector that subscribe to broadband, the self-reported median download speed was 5.1 Mbps for a median monthly price of \$71.49 (Figure 4). Although these speeds appear to be inadequate to meet the recommendations set by the National Broadband Plan, it does appear that businesses in Tennessee's Healthcare sector enjoy higher speeds than similar businesses in Florida, Minnesota, Alaska, South Carolina, Michigan, and Iowa.

Figure 4.
Median Broadband Download Speeds and Prices in the Healthcare Sector (Self-Reported)



¹ Federal Communications Commission, (2010). *National Broadband Plan*. Retrieved from website: <http://download.broadband.gov/plan/national-broadband-plan-chapter-10-health-care.pdf>

How the Healthcare Sector Uses the Internet

As a major area of innovation and entrepreneurial activity, Tennessee’s Healthcare sector serves as an engine for job creation and global competitiveness. Beyond enabling new models of healthcare delivery, broadband is empowering businesses in the Healthcare sector to use more efficient processes, new methods of communicating with patients, and effective recruiting and advertising tools. For example, more than four out of five Internet-connected businesses in Tennessee’s Healthcare sector (82%) are using their connections to purchase or place orders for products or services, nearly two-thirds (65%) are researching ways to make their businesses more efficient, and 62% are using the Internet to market or advertise their products and services. Furthermore, almost half (48%) are using the Internet to recruit employees by advertising job openings online.

The benefits of the Internet are also passed on to healthcare consumers. For example, 65% of Internet-connected businesses in Tennessee’s Healthcare sector report communicating with their current customers and patients via the Internet, 52% offer the convenience of online billing, 36% provide customers support for their products or services via the Internet, and one-third (33%) accept real-time payments for services and products.

As Table 1 indicates, Tennessee’s Healthcare sector reports higher utilization of many of these online applications than markets in other states surveyed by Connected Nation.

Table 1.
How Businesses in the Healthcare Sector Use the Internet for Business Functions

The percentage of Internet-connected businesses in the Healthcare sector that use the Internet to:	Connected Nation avg.	Tennessee
Purchase or place orders for products or services	78%	82%
Communicate with current customers	59%	65%
Research ways to make their business more efficient	64%	65%
Market and advertise products and services	52%	62%
Bill customers or accept bill payments	50%	52%
Advertise current job openings	39%	48%
Accept job applications	34%	42%
Provide customer support for products or services	31%	36%
Accept real-time payments such as credit card and debit payments	30%	33%
Sell or accept orders for products or services	23%	30%
Bid on contracts	14%	12%

Residential Usage of e-Health Applications

Many Tennessee communities, especially those that are rural or low-income, face a shortage of all types of healthcare providers and services. This often means that residents have to travel long distances to reach a specialist, which can be quite hazardous if the patient is elderly or in serious need of medical attention. Fortunately, innovations in technologies, like videoconferencing and digital stethoscopes, are empowering these communities with the ability to consult with specialists in urban centers.

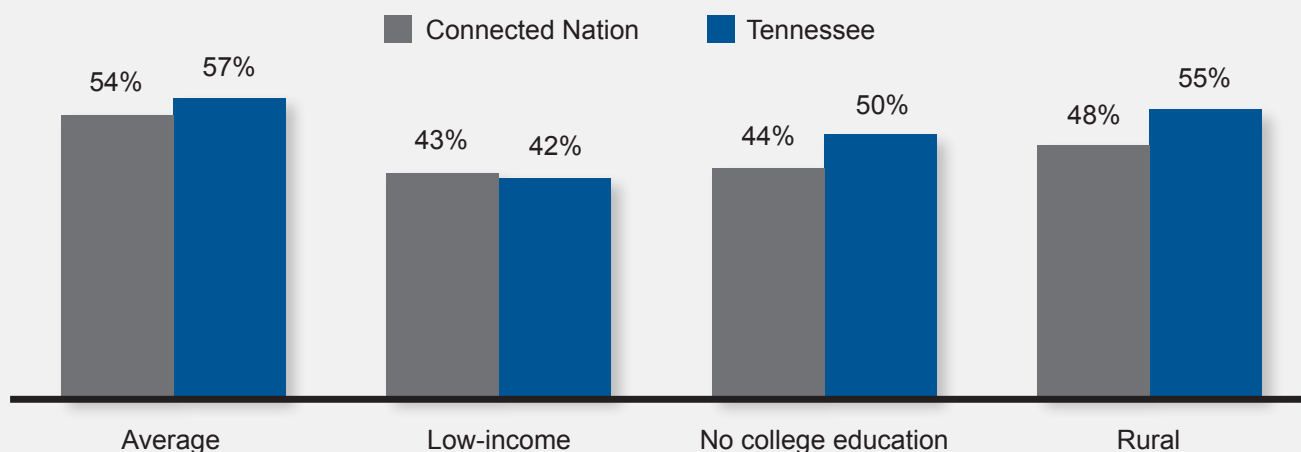
Such is the case in Sevier County, Tennessee. Perhaps best known as being the home of the mountain resort city of Pigeon Forge, Sevier County is situated in east Tennessee's Appalachian Mountains, with 13.5% of the population living under the poverty level.² Due to the economic and geographic challenges of the community, when many children get sick, they often remain ill longer and miss more school than they would if they had greater access to medical attention.³ Hoping to solve this problem, officials at Sevier County Schools initiated a telemedicine program as a cost-effective way of providing better medical assistance to its underprivileged students.⁴

Developed in collaboration with Cherokee Health Systems, the Sevier County Student Medical Assistance Response Team (S.M.A.R.T) offers telemedicine services at seventeen schools in the district.⁵ Assisted by a Sevier County School System registered nurse, students can be examined, diagnosed, monitored, and even given written prescriptions by a nurse practitioner in Knoxville via a secure, two-way video image link. Since the program was initiated in 2008, over 4,000 students have already been seen for a variety of ailments.⁶ Now when a student complains of not feeling well, the teacher knows that an evaluation is only a short walk to the nurse's office.

Connected Tennessee's 2011 Residential Technology Assessment indicates that well over one-half of Tennessee's Internet users (57%, or approximately 2.2 million adults) utilize e-Health services. This includes searching for medical information or communicating with healthcare professionals like doctors or insurance offices. In comparison, among all Internet users surveyed by Connected Nation in 2011, only 54% report utilizing these e-Health services.

Perhaps not surprisingly, many of the most vulnerable population segments, those who could benefit most from e-Health services, use these e-Health applications less often. For example, across the ten states surveyed by Connected Nation in 2011, low-income Internet users whose annual household incomes were less than \$25,000 had no college education, or lived in rural areas were significantly less likely to utilize e-Health services than the Connected Nation average (Figure 5).

Figure 5.
Residential e-Health Usage among Internet Users



2 United States Department of Commerce, U.S. Census Bureau (2010). *Sevier county quickfacts*. Retrieved from website: <http://quickfacts.census.gov/qfd/states/47/47155.html>

3 Education Networks of America, (2009). *Telemedicine to the rescue: Sevier county schools, TN finds newfangled solution to age-old problem*. Retrieved from website: http://www.ena.com/wp-content/uploads/2011/11/Networked-for-Life-Learning_SevierTN_11-09.pdf

4 Ibid

5 Sevier County Schools, (2012). *Coordinated school health in Tennessee*. Retrieved from website: <http://www.sevier.org/csh/index.html>

6 Downey, R. GlobalMed Telemedicine, (2011). *Tennessee county expands successful school-based telemedicine program*. Retrieved from website: <http://blog.globalmed.com/2011/10/06/tennessee-county-expands-successful-school-based-telemedicine-program/>

This held partly true in Tennessee, where both low-income Internet users and those with no college education were significantly less likely to utilize e-Health than the state average. There were no significant differences between rural Internet users in Tennessee and the state average, though. In fact, Internet users in rural parts of Tennessee were significantly more likely to utilize e-Health services than the Connected Nation average of rural adults, indicating that rural Tennessee Internet users are ahead of the curve when it comes to e-Health.

Conclusion

Connected Tennessee's research indicates that broadband use in Tennessee's Healthcare sector has helped doctors and medical offices provide instant information to patients, faster diagnoses and treatments, and encourage collaboration between specialists across the state and across the globe. Yet across the state, approximately 3,000 Tennessee healthcare establishments still do not tap into broadband as a tool to reduce costs and improve services. Despite this gap, more than half of Tennessee's Internet users go online to access e-Health tools, indicating an awareness of and demand for e-Health.

e-Health is enabled by broadband, so the most critical prerequisite for effective usage will involve making high-speed broadband available to every community in Tennessee. Furthermore, as emerging e-Health applications become more prevalent and the importance of bandwidth capacity grows, it will be critical that Tennessee's broadband infrastructure is adequate to meet these growing needs. Finally, proper education and awareness measures should continue to be taken in order to encourage adoption of broadband and e-Health services in Tennessee. When every Tennessee healthcare provider and resident has broadband, every Tennessean will have more healthcare options as well.



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Methodology

2011 Residential Technology Assessment

Between June 30 and August 15, 2011, Connected Tennessee conducted a random digit dial telephone survey of 1,201 adult heads of households across the state. This sample included 1,007 adults age 18 or older who were contacted via landline and 194 adults who were contacted via cell phone.

The survey was conducted by Thoroughbred Research Group in Louisville, KY. On average, the survey took approximately 12 minutes to complete after the respondent agreed to participate. Based on the effective sample size, the margin of error = $\pm 2.99\%$ at a 95% level of confidence for the entire population. As with any survey, question wording and the practical challenges of data collection may introduce an element of error or bias that is not reflected in this margin of error. For this report, "rural" residents are defined as those living in counties that are not part of a Metropolitan Statistical Area (MSA). Low-Income households are defined as having self-reported annual household incomes less than \$25,000. Weighting and research consultation were provided by Lucidity Research LLC, and the survey results were reviewed by Dr. John Horrigan, head of the Media and Technology Institute at the Joint Center for Political and Economic Studies.

2011 Business Technology Assessment

Eight hundred seven (807) Tennessee businesses were contacted by telephone between October 5 and November 1, 2011. Data were collected by Thoroughbred Research Group in Louisville, KY. The error interval or sample tolerance for the survey is $\pm 4.72\%$ at the 95% confidence level. This sample error accounts for sample weighting, using the effective sample size. Weighting of the survey data enables the total sample to also be representative of all employer business establishments in Tennessee, according to the U.S. Census Bureau County Business Patterns (CBP) data. Weighting and research consultation were provided by Lucidity Research LLC, and the survey results were also reviewed by Dr. Horrigan.

These surveys were conducted as part of the State Broadband Initiative (SBI) grant program, funded by the National Telecommunications and Information Administration (NTIA). The SBI grant program was created by the Broadband Data Improvement Act (BDIA), unanimously passed by Congress in 2008 and funded by the American Recovery and Reinvestment Act (ARRA) in 2009.

APPENDIX A:
Select questions and sample size

2011 Business Technology Assessment

Industry Sector	Connected Nation (n=)	Tennessee (n=)
Total	7,004	807
High Tech	795	86
Agriculture, Mining, Construction, Utilities	895	104
Manufacturing	849	102
Wholesale, Warehouse, and Transportation	845	97
Retail and Hospitality	895	106
Professional and Financial Services	898	106
Healthcare	861	98
Other services	966	108

2011 Residential Technology Assessment

Demographics – Internet Users	Connected Nation (n=)	Tennessee (n=)
Total	12,004	1,201
Low-Income	2,281	267
No College Education	4,171	488
Rural	3,923	401