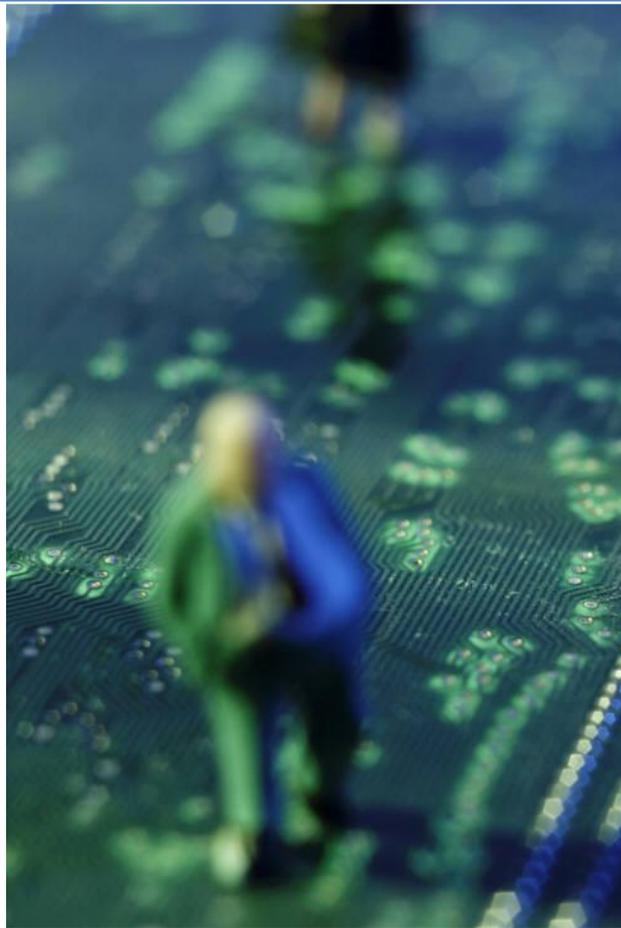




# Golden LEAF Rural Broadband Initiative Annual Evaluation Report



## EXECUTIVE SUMMARY

The purpose of the Golden LEAF Rural Broadband Initiative evaluation is to examine the impact and added value of broadband connectivity on North Carolina communities, businesses, and citizens, particularly as facilitated by the capital investment made by Golden LEAF. The identification and assessment of the changes stimulated by broadband connectivity will provide evidence about whether broadband is a worthwhile investment. This initial annual report serves as a baseline document to provide both context and data related to both pre-Golden LEAF RBI efforts, as well as to demonstrate the change that has occurred in anticipation of the efforts undertaken by Golden LEAF and MCNC. Additionally, the report offers detailed insight into the perceived importance of broadband access, coupled with quantitative evaluation of said importance. The evaluation seeks to map the infrastructure investments made in broadband connectivity with critical outputs and outcomes in the areas of market impact, economic impact, educational impact, and societal impact.

### Key Findings

There are several important findings in the initial evaluation annual report, including areas of notable statistical significance, as well as profiles of success to highlight opportunities. All information presented in the initial annual report is pre-Golden LEAF Rural Broadband Initiative data and is offered as baseline information. Key findings include:

- Slight decline in broadband providers across NC counties prior to the Golden LEAF Rural Broadband Initiative
- Slight increase in broadband connectivity (number of households connected per 1000 households) in thirty (30) counties.
  - Net loss of connectivity in only two counties in NC during the same timeframe.

- Broadband availability increases as percentage of private industry mix increases
- **Employment rate is significantly affected by broadband availability when controlling for wealth measures, population density, and industry mix\***
- Access to high-speed broadband is single most important predictor relative to school district virtual enrollments
- Statistically significant relationship between broadband availability and English standardized test scores
- Broadband availability increases with wealth measures (income, educational attainment, home ownership, etc.) and population density

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“The number one benefit of information technology is that it empowers people to do what they want to do. It lets people be creative. It lets people be productive. It lets people learn things they didn't think they could learn before, and so in a sense it is all about potential.”

*Steve Ballmer, Microsoft CEO*

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## **SECTION 1. PROJECT OVERVIEW**

### **Introduction**

High-speed broadband Internet access has become a fundamental part of improving educational opportunities, quality of life and economic performance, as evidenced by substantial financial and policy investments in improving accessibility and affordability of such access. The extensive National Broadband Plan refers to it as essential 21<sup>st</sup> century infrastructure that is “transforming the landscape of America more rapidly and more pervasively than earlier infrastructure networks” (p. 3). Furthermore, the Pew Home Broadband Adoption survey found that 43% of Americans believe lack of Internet to be a disadvantage for conducting particular activities, primarily job seeking and building career skills. North Carolina has been proactive in expanding broadband infrastructure and improving broadband speeds, primarily to underserved areas and key institutions, through the Golden LEAF Rural Broadband Initiative, among other efforts.

The purpose of the Golden LEAF Rural Broadband Initiative evaluation is to examine the impact and added value of broadband connectivity on North Carolina communities, businesses, and citizens, particularly as facilitated by the capital investment made by Golden LEAF. The identification and assessment of the changes stimulated by broadband connectivity will provide evidence about whether broadband is a worthwhile investment. This initial annual report serves as a baseline document to provide both context and data related to both pre-Golden LEAF RBI efforts, as well as to demonstrate the change that has occurred in anticipation of the efforts undertaken by Golden LEAF and MCNC. Additionally, the report offers detailed insight into the perceived importance of broadband access, coupled with quantitative evaluation of said importance.

## Research Design and Methods

The evaluation for the Golden LEAF's Rural Broadband Initiative and MCNC's BTOP awards is utilizing both quantitative and qualitative approaches to data collection, analysis, and presentation in order to offer a full contextual framework for evaluation. The four primary areas of evaluation focus on output and outcome metrics, with output metrics reported throughout the life of the project and outcome metrics expected to emerge in years 2, 3, and 4 (and beyond) of the project. Data is collected for all 100 counties in North Carolina to provide comparative analysis, on a monthly, quarterly, or annual basis, as determined by data source update frequency.

## SECTION 2. MARKET IMPACT ANALYSIS

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*Almost all aspects of telephony, television, video, audio, and other communication technologies are converging into single source platforms. Access to this convergence is beyond entertainment value; it is the way in which work is done, and wealth is created.*

*This newly converged medium requires robust, secure broadband infrastructure which is accessible and affordable to all.*

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In 2009, North Carolina ranks 14<sup>th</sup> among U.S. states for broadband adoption rates. As the state strives to improve its connectivity as a means to ensure economic, education, and societal equity and vitality through the Golden LEAF Rural Broadband Initiative, it is imperative to assess the level of market penetration, competition, and costs to subscribers. This section will focus on those key areas utilizing the following metrics (other metrics are being collected, as noted in Appendix A, but are not detailed or analyzed in this initial report):

- Broadband adoption rates by county (as reported to the FCC in aggregate format)
- Baseline rates of providers in each county (updated every six months)
- Baseline number of providers per county (as reported to the FCC)
- Baseline bandwidth consumption rates among community anchor institutions utilizing NCREN/MCNC services

These metrics will be used to test established hypotheses related to increased competition, provider pricing, and broadband adoption across North Carolina counties. The evaluation of market impact will test the hypotheses through the use of descriptive statistics, correlation, and time-series analysis.

## Research Questions

There are two primary research questions related to the market impact of the Golden LEAF Rural Broadband Initiative, which were established at the design stage of the evaluation plan. The first question is: Does the provision of low-cost middle-mile connectivity lower the barrier of entry for new last-mile providers in many rural communities, thereby increasing the number of providers in a given North Carolina county? There is a substantial body of research which indicates that increasing the number of providers will positively impact the broadband adoption rates of a community.

The second question is: Does the provision of low-cost middle-mile connectivity across North Carolina lead to lower costs for broadband customers, either as a function of wholesale transit costs or increased competition for the last-mile providers? Supply and demand theory would indicate that prices for services should decrease due to increased competition. However, it is uncommon to see an industry or provider lower prices due to lower capital or operating expenses without an increase in competition or a reduction in demand.

It is not plausible to document a statistically significant increase of providers or decline in provider rates at this time, due to the not-yet-completed effort of installing the middle mile connectivity. However, the initial baseline data collected during the past year will allow the two research questions to be fully tested in years 2, 3, and 4 of this evaluation effort. Beyond baseline data collection, this initial report also tests the assumptions that increasing the number of providers will increase adoption rates, as well as lower prices, by comparing inter-county data prior to the Golden LEAF Rural Broadband initiative. The following Findings section highlights the analysis of the pre-Golden LEAF RBI comparisons, as well as documents qualitative findings related to the immediate impact of the Golden LEAF Rural Broadband Initiative.

## Provider and Resultant Impact Findings

The initial assessment of the number of broadband providers in North Carolina counties, per the data reported to the FCC, indicates a net loss of providers across North Carolina counties between June 2009 and December 2010. The average loss of provider per county is one, with Orange County demonstrating the highest loss of four (4) broadband providers, while Pamlico County saw an increase of three (3) providers during the same timeframe. When assessing the data with respect to Rural/Urban split, it is encouraging to note that the rural counties see a smaller net loss of broadband providers than do their urban counterparts.

For household connectivity data, the FCC Form 477 data was used. The FCC range for household broadband connection is as follows:

0=Zero households connected per 1000 households

1=Greater than 0 and less than/equal to 200 households connected per 1000 households

2=Greater than 200 and less than/equal to 400 households connected per 1000 households

3=Greater than 400 and less than/equal to 600 households connected per 1000 households

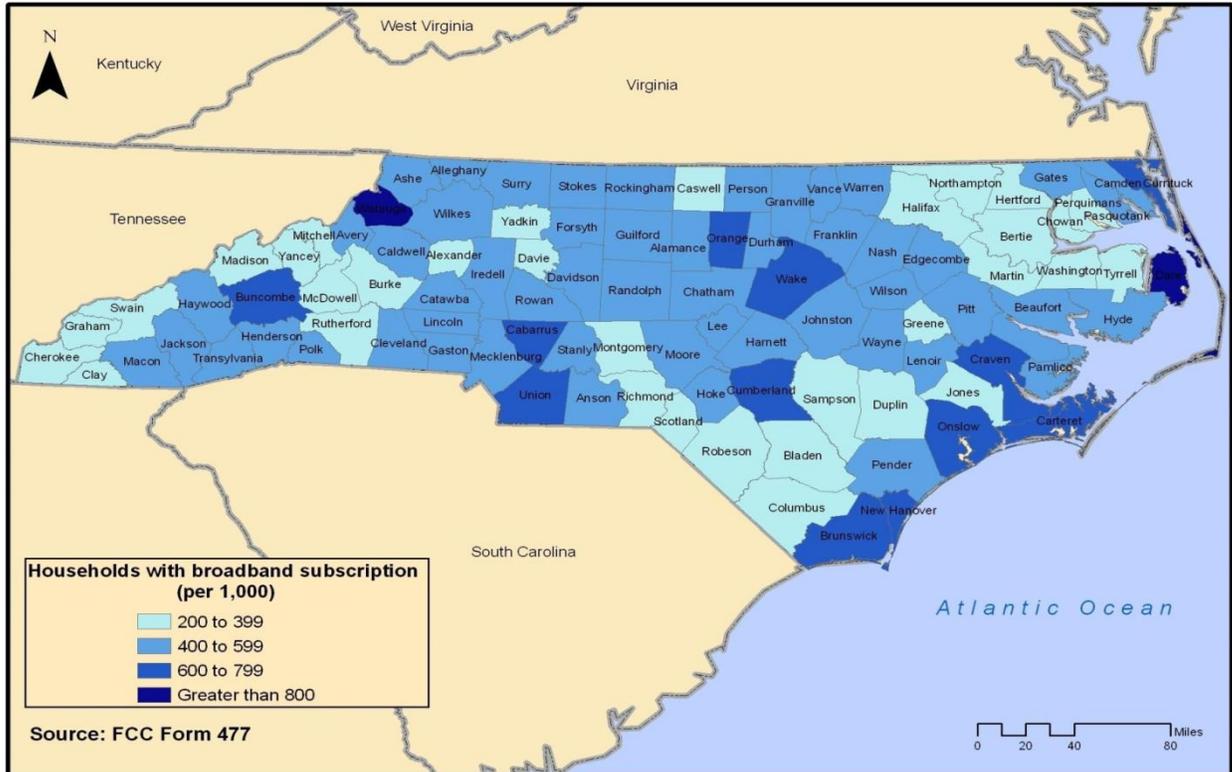
4=Greater than 600 and less than/equal to 800 households connected per 1000 households

5=Greater than 800 households connected per 1000 households

*\*For the purposes of ease of comprehension, the report will utilize percentages for reporting this data (i.e. 20-40%, 40-60%, 60-80%, and 80+% of households connected).*

The following map shows the current broadband subscribership rates (households per 1000 connected) by county.

### Broadband Adoption in North Carolina



In terms of household broadband connectivity (a ratio measure: number of households subscribed to broadband services per 1000 households, and presented as a percentage range by the FCC), there is a net increase in household broadband connections per 1000 households across North Carolina counties between June 2009 and December 2010. The average county saw an increase of one (1) range during the timeframe. For example, Jones County data reflects an increase from 20-40% of households connected to broadband in June 2009 to 60-80% of households connected in December 2010.

The following list of counties had a net increase household broadband connectivity, per the FCC data.

**Counties with Positive Household Broadband Connectivity Change  
(June 2009-December 2010)**

Anson County	Hyde County
Buncombe County	Jones County
Burke County	Lenoir County
Cabarrus County	Martin County
Carteret County	Mecklenburg County
Chowan County	Moore County
Currituck County	Pamlico County
Davie County	Perquimans County
Durham County	Scotland County
Edgecombe County	Tyrrell County
Gates County	Union County
Graham County	Vance County
Guilford County	Warren County
Halifax County	Washington County
Hoke County	Yancey County

The vast majority of the counties with positive household connectivity change are located in the eastern and central portions of the state. However, it is encouraging to note that there is **not** a negative finding with respect to economic tier designations and county connectivity gains. In fact, fourteen (14) of the thirty (30) counties with net increases are Tier One counties and eight (8) are Tier Two counties. Two counties had a net loss of household connections. Watagua County moved from 80%+ of households connected via broadband in June 2009 to 60-80% of households connected in December 2010.

Craven County also noted a loss, with 60-80% of households connected in June 2009 and 40-60% connected in December 2010. It should be noted that due to the aggregated ranges reported by the FCC, it is impossible to note if the counties' respective increases or decreases are a few percentage points that take the county into a new range or if the increases/decreases are substantial (i.e. 20% shifts).

### *Provider and Household Connectivity Comparison Data*

Utilizing the baseline data to assess comparative data, both provider counts versus household broadband connections per 1000 households, as well as the change in the two respective metrics, is useful for testing assumptions laid out at the onset of the evaluation plan, as well as to provide baseline data for outcomes analysis. The data assessed in this section was collected prior to the Golden LEAF Rural Broadband Initiative being implemented.

The first comparison was conducted to test the assumption that increased providers lead to increased household subscribership. Based on the comparison data, there is no statistically significant relationship between the number of providers in a given county and the percentage of household broadband connections in a county. Nor is there a statistically significant relationship between the change in those two metrics (i.e. a loss or increase in providers does not positively or negatively affect household broadband connectivity rates). These findings indicate that, at least initially, the number of providers may be of less concern with respect to household subscribership. However, other factors, such as provider rates, may be influenced by provider density (i.e. number of providers in a given community).

### *Pricing and Competition Findings*

Currently, pricing data appears consistent across counties. There is little variation between providers within counties, as well as little variation in average price comparisons between counties. One interesting finding, which is likely to expand with the Golden LEAF Rural Broadband Initiative, is an increase in bandwidth offerings in a given pricing

tier in specific areas. Essentially, customers are being offered more bandwidth for the same prices as they had previously been offered in 2009 and 2010. This finding bodes well for the impact of the Golden LEAF efforts, particularly in rural parts of North Carolina.

### SECTION 3. ECONOMIC IMPACT ANALYSIS



A number of studies have reported economic growth related to broadband. *Measuring Broadband's Economic Impact* (2010) found that, nationwide, broadband contributed to job creation, the number of businesses (with greater growth in the IT-intensive sector in areas with more broadband), and property values, but no statistical impact was found for wages. A study by Jed Kolko (2010) also found mixed results nationwide, as broadband was not found to be associated with employment rate or wages, but did impact business activity. A study conducted in 2006 demonstrated positive economic outcomes for communities which had installed broadband connections across the United States (Lehr, Osorio & Gillett, 2006). An increase in gross sales in a community in Florida was attributed to its municipally-owned broadband network (Ford & Koutsky, 2005). Finally, a study of the commercial benefits of broadband in the rural Appalachia region found modest impact on firm productivity and wages in particular regions and scenarios (Burton & Hicks, 2005). Other studies have estimated gross economic impact, job creation, and employment rates in communities, states, and nations achieved through broadband investment and adoption.

The economic impact analysis presented in the initial annual report utilizes pre-Golden LEAF Rural Broadband Initiative data points to provide baseline econometric analysis, which will be expanded longitudinally over the duration of the evaluation. This section will focus on those key areas utilizing the following metrics (other metrics are being collected, as noted in Appendix A, but are not detailed or analyzed in this initial report):

- Gross sales
- Number of businesses (SML)
- Annual Household Income
- Average Annual Wages

- Job creation/retention
- Industry Mix (percentage of IT-intensive jobs)
- Self-employment rate
- Employment rate
- Population Density
- Percentage of Private Sector Employment
- Home Ownership

### Research Questions

The primary research question related to the economic impact of the Golden LEAF Rural Broadband Initiative is: Does increased access and adoption of broadband connectivity in households lead to positive economic outcomes in North Carolina counties? As previously noted, there is research with mixed results related to the economic impact of broadband adoption. The initial analysis of pre-Golden LEAF Rural Broadband Initiative data is offered for both baseline purposes, but also to discern any positive economic outcomes previously noted in existing research. The following Findings section highlights the analysis of the pre-Golden LEAF RBI economic indicators.

### Economic Impact Findings

The baseline data analysis resulted in interesting findings related to economic impact. First, household broadband availability has a positive, statistically significant relationship with wealth measures. Specifically, broadband adoption rates increase as home ownership, median household income, gross sales, and annual average wages. These findings are not surprising, given the well-documented link between personal wealth and broadband availability.

Additional findings reveal that broadband availability increases as population density increases in North Carolina counties. This is also not surprising, given the

demonstrated connection between population density and provider willingness to offer broadband services in a given community due to lower costs per household for service provision (i.e. economies of scale). More interestingly, the research on pre-Golden LEAF Rural Broadband Initiative broadband and economic data indicates that broadband availability increases as private sector industry mix increases. Namely, the more jobs in a given county provided by the private sector, the more likely to have high levels of broadband adoption. This finding is particularly salient as Golden LEAF works on both economic development and broadband connectivity throughout North Carolina.

### KEY FINDING

The most substantial finding related to economic impact deals with employment rate. Unlike other national studies, where broadband adoption had no impact on employment, North Carolina counties demonstrate the opposite effect.

Employment rate is **significantly affected** by broadband availability when controlling for wealth measures, population density, and industry mix (these measures typically influence broadband adoption so they were controlled for in the analysis).

Broadband availability explains thirty-one percent (31%) of the variance in employment rate across North Carolina counties, when other traditional impact variables are controlled.

This finding is very promising for the state of North Carolina because of the substantial Golden LEAF investment in broadband, which will theoretically translate into more favorable employment rates across our counties.

## PROFILE OF ECONOMIC IMPACT: RUTHERFORD COUNTY

Like much of North Carolina, broadband services have drastically expanded and improved in Rutherford County over the past decade. However, Rutherford County's strategies and successes in using their broadband infrastructure for expanding and improving economic development efforts are unique. The primary fiber infrastructure was funded and installed through a partnership with the county, the Golden Leaf Foundation and other funders, and local non-profits PANGAEA and Foothills Connect.

Based out of Polk County, PANGAEA or the Polk Area Network for Government, Academic and Enterprise Activities, provides and sells fiber fostered broadband services to local government agencies, education facilities, healthcare providers and other non-profits (<http://www.pangaea.us/company/history.php>). Foothills Connect Business and Technology Center was founded by local citizens and funded by the e-NC Authority in 2004. Both PANGAEA and Foothills Connect have been at the forefront of the broadband expansion as well as the utilization of broadband as an economic development tool. Foothills Connect is involved in a host of efforts aimed to improve the local economy through technology. Interviewees believe the increased broadband services are partly responsible for the location of businesses such as Facebook and the State Data Center in Rutherford County, according to County economic development staff.

In addition to the assistance they provided in administering the grant from the Golden LEAF Foundation for the original fiber, Foothills Connect is now establishing a high-speed wireless network for residents. The wireless network will serve as the "last-mile" connection needed to reach as many residential units as possible. The current broadband infrastructure serves, between 200 and 400 residential connections per 1000 households, according to FCC data. Most notably, interviewees perceive the low residential connection rate to be an impediment to education and economic development efforts and thus are now focusing on improving the rate.

Rutherford County is unique because it has multiple different organizations working towards expanding broadband services throughout the county with the goal of improving their economy. Located in western North Carolina, Rutherford County, NC is an economically depressed, Tier 1 County. Primarily a rural county, Rutherford's economy historically heavily relied on agriculture and then textile manufacturing. When textile manufacturers relocated, Rutherford County's economy suffered dramatically. Today, due in part to the expansion of broadband services, Rutherford County hosts several high-tech firms. As the county and its partners continue to improve this infrastructure and use it in innovative ways, they will continue to improve economic development efforts in Rutherford County.

## SECTION 4. EDUCATIONAL IMPACT ANALYSIS

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*"If we teach today as we taught yesterday, we rob our children of tomorrow."*

*John Dewey*

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Research demonstrates that broadband connectivity in schools leads to increased stability and reliability of operations (Crabtree and Roberts, 2003; Underwood *et al.*, 2003; 2004). Other studies have linked reliable operations to positive impacts on teacher confidence in using technology in the classroom. Although the primary focus of the longitudinal Golden LEAF Rural Broadband Initiative evaluation will focus on examining the impact of broadband connectivity on virtual education, it will also examine school performance data and teacher attitudes about technology to determine if additional educational benefits are derived. The education impact analysis uses quantitative research methods, such as descriptive statistics, regression analysis, and time-series analysis. Qualitative methods, such as case studies, are also underway to add perspective and depth to the evaluation.

This section will focus on those key areas utilizing the following metrics (other metrics are being collected, as noted in Appendix A, but are not detailed or analyzed in this initial report):

Student Performance	Teacher/Classroom Performance	Virtual Enrollments	Societal Controls
<ul style="list-style-type: none"> <li>•EOG/EOC test scores</li> <li>•AP placements</li> <li>•Dropout rates</li> <li>•SAT/ACT scores (% students taking)</li> <li>•Student connectivity at home</li> <li>•Discipline incidents</li> <li>•Attendance</li> </ul>	<ul style="list-style-type: none"> <li>•Usage of technology</li> <li>•Advanced degrees</li> <li>•NBCT</li> <li>•Certified Media Coordinators</li> <li>•Certified Instructional Technology Facilitators</li> <li>•1-1 Computing</li> <li>•Students per Internet-connected device</li> </ul>	<ul style="list-style-type: none"> <li>•Virtual enrollments in K-12</li> <li>•Virtual community college enrollments</li> <li>•Virtual university/college enrollments</li> </ul>	<ul style="list-style-type: none"> <li>•Educational attainment levels</li> <li>•Poverty level</li> <li>•Median household income</li> <li>•Etc.</li> </ul>

These metrics will be used to test established hypotheses related to increased broadband adoption in households and educational attainment metrics across North Carolina counties.

### Research Questions

There are two primary research questions related to the educational impact of the Golden LEAF Rural Broadband Initiative, which were established at the design stage of the evaluation plan. The first multi-stage question is: Does an increase in high-speed access (increased reliability and stability of operations) improve teacher confidence in technology, and subsequently increase utilization of technology in the classroom? The second question is: Does increased high-speed access led to better educational outputs, such as test score increases, in part due to improved attendance and reduced discipline incidences?

Due to the nature of educational outcomes and their associated lag effect, it is not plausible to document a statistically significant impact on educational metrics resulting from the Golden LEAF Rural Broadband Initiative in this initial report. However, initial analysis was conducted to determine baseline information and outcomes. Qualitative case studies were also performed to demonstrate outcomes in specific areas of educational impact. The following Findings section highlights the analysis of the pre-Golden LEAF RBI comparisons, as well as documents qualitative findings related to the educational impact of the broadband availability and adoption.

### **Educational Impact Findings**

One significant finding related to education and household broadband adoption is related to virtual enrollments. The analysis revealed that access to high-speed broadband in the household is the single largest predictor of virtual enrollment, from a LEA perspective. Broadband adoption explains almost forty-five percent (44.9%) of the variance in virtual enrollments in a given county, when controlling for all other influencing variables, such as wealth metrics, etc). This finding highlights the need for the Golden LEAF Rural Broadband Initiative, as it will help ameliorate the digital divide that is ever growing between the rural and urban communities. This digital divide not only impacts economic opportunities, but also affects the classroom and students in substantial ways. In effect, the students in counties with the greatest need for virtual classroom offerings are less likely, on the whole, to have access to those offerings due to limited household broadband adoption. While MCNC has made significant strides in their efforts to connect the school systems to broadband, their combined efforts with the Golden LEAF Rural Broadband Initiative are critical for both school and community anchor institution connectivity, as well as new opportunities for last-mile connectivity to the students' homes.

In terms of broadband adoption's impact on student achievement, as measured by test scores, there is a positive relationship between broadband adoption and English test

scores within counties, when controlling for traditional variables impacting test scores (parents' educational attainment, etc.). This finding is interesting, as there is no demonstrated correlation between other test score increases (science and math). Over the course of the longitudinal evaluation, the relationship between broadband adoption and student achievement will continue to be assessed.

Additionally, there is no demonstrated statistically significant relationship between technology use in the classroom and discipline incidents. However, during case study analysis, there were clear examples of such outcomes at the individual county level. For example, one county school system noted that attendance for students and teachers and discipline incidents decreased markedly when new technology (i.e. laptops, iPods, and iPads) were brought into the classroom. It is possible that this type of positive effect is temporal in nature, and as the technology-generated excitement fades, the attendance and discipline issues return.

Despite the modest educational findings related to broadband connectivity (pre-Golden LEAF Rural Broadband Initiative data), there is substantial evidence of its importance found across the North Carolina school systems. The following case study excerpts demonstrate the critical educational need for high-speed access in the schools and in the homes.

### *Alleghany County Schools*

“The significance of high-speed connectivity in our district is immeasurable. High speed connectivity has enhanced every level of education from Pre-K through high school in Alleghany County Schools. It has helped our teachers to obtain advanced degrees through distance learning programs, and it offers our students various opportunities that would not be available without the high speed connections. This form of communications technology has extended educational experiences for our kids far beyond the walls of their classrooms here in rural Alleghany County.

Given that we live in a very rural community, the high speed connections play a critical role in providing our students exposure to the rest of the world in a way that was not even imaginable a few short years ago. As advances in technology turn into tomorrow’s standards, the vision for students in Alleghany County Schools must be one that includes the rapid changes that take place in all areas of technology. We cannot be blind to the fact that, as educators, if we do not keep abreast of all of these rapid changes, our students will not be prepared for the world of commerce as it exists today and will exist in the future.”

### *Harnett County Schools*

“As a result of high-speed connectivity, administrative and instructional computing have both realized a multitude of benefits:

- Ubiquitous computing is becoming the norm.
- Streaming video is used seamlessly and appropriately in instructional presentation
- Web 2.0 tools are used to facilitate collaborative learning activities.
- Online resources are used as opposed to direct software purchases and installations. This practice minimizes technical support time and saves additional financial resources.
- NCWise has been effectively implemented and puts data in the hands of end-users at the point-of-need.
- Video conferencing has been harnessed to connect schools to one another as well as to the global society.
- Online course opportunities have grown in popularity allowing high school students to take courses that typically would not be available in a face-to-face setting. Many high school students have taken advantage of free college courses.
- Online opportunities are allowing middle school students to begin second language studies as opposed to waiting for high school. Additionally, middle school students are earning high school credits while in middle school.”

### *Rockingham County Schools*

“First, many of our students do not have access to the myriad high quality information resources which are now available via the Internet in their daily home lives. Those that do have access have, in many cases, gravitated towards using them for social purposes outside of school. In school, both of these groups of students learn how access and apply resources in a productive and safe manner. In one instance, a student (who was using Facebook to harass another student) learned in his Civics class the value of allotted time that senators use to make comments on a proposed bill, gaining knowledge about the power of persuasion, instead of intimidation in any communications. He then began to moderate his online discussions and began to use peer mediation techniques to propose solutions to common misunderstandings he held with his classmates.

Second, our state curriculum has established high standards for 21st Century skills including information literacy, computer technology, and global citizenship. High speed connectivity allows all of our students the best opportunity to develop these skills in any and every classroom. In one classroom, a teacher uses a distance video application called Skype to connect to a classroom in Chile and to subject matter experts in geology. The teachers in both classrooms are currently using the trapped miners’ story as a context for a STEM project where both classrooms are collaborating on an engineering solution that would extract the miners. Students research other efforts made in previous mining disasters and consider geology, life safety issues, funding needed, and other relevant considerations. An enrichment activity allows more interested students to extend their learning to develop future preventative safety policies while another deals with the PR necessary to effectively relate to the public and support the miners during the ordeal.”

## SECTION 5. SOCIETAL IMPACT ANALYSIS

Ruiz (2004) found that broadband access is an important part of enhancing rural community development by improving the economy, health care, and general quality of life. The societal impact analysis assesses the transformational impact on individuals within communities as a function of the Golden LEAF Rural Broadband Initiative.



Variables included in the societal impact evaluation are:

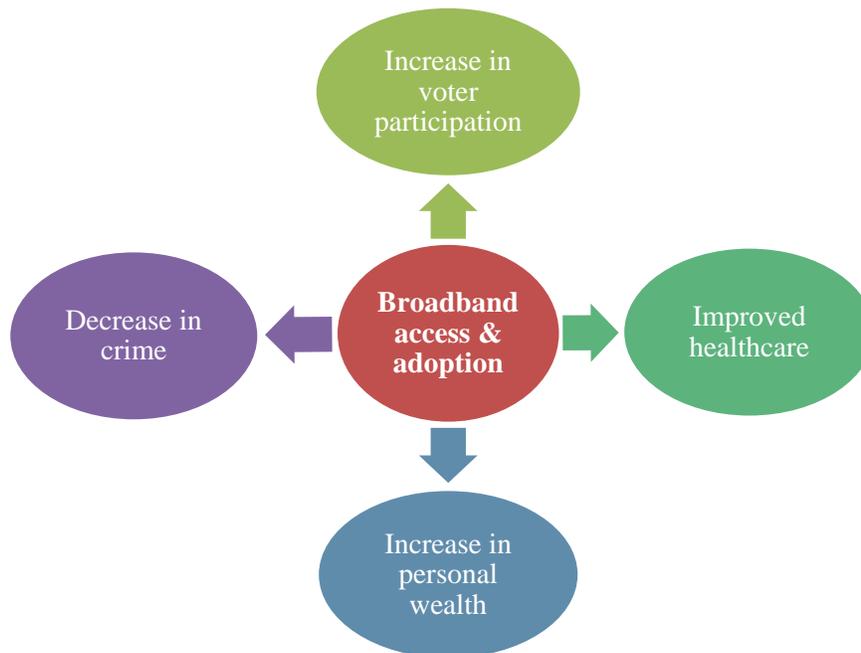
- Mortality rates
- Voter participation
- Total Number of Households
- Home ownership rate
- Housing rents
- Median income
- Bandwidth consumption rates at Community Anchor Institutions
- Public Internet access facility usage (libraries, etc.)
- Crime Index

### Research Question

The primary research question related to the societal impact of the Golden LEAF Rural Broadband Initiative is: Does increased access and adoption of broadband connectivity in households lead to positive societal outcomes in North Carolina counties? Measures of societal outcomes include infant mortality rates, voter participation, personal wealth measures, and crime rates. Additionally, this evaluation will assess connectivity and usage rates of public Internet access facilities and bandwidth consumption rates at community anchor institutions, as proxies for increased use of pertinent high-bandwidth

applications. The e-NC Authority and Strategic Networks Group conducted a study of North Carolina residents, governments, and businesses and noted that high-bandwidth applications are critical to major gains in economic, educational, and societal spheres.

### Research Model for Societal Impact



As previously noted, there is a limited body of research indicating positive impacts on societal outcomes due to broadband adoption. More importantly, the work previously done in North Carolina by MCNC, the e-NC Authority, and the NC Telehealth Network clearly demonstrate the impact of such broadband availability to critical services, particularly health-related offerings, across the state of North Carolina. The initial analysis of pre-Golden LEAF Rural Broadband Initiative data is offered for both baseline purposes, but also to discern any positive societal outcomes previously noted in existing research. The following Findings section highlights the analysis of the pre-Golden LEAF RBI societal indicators.

## Societal Impact Findings

The societal impact analysis noted very few statistically significant relationships between the pre-Golden LEAF Rural Broadband Initiative data and the societal metrics. Not surprisingly, broadband adoption rates have a strong positive correlation with personal wealth measures, including home ownership rates, median income, and housing rents. As previously noted in the Economic Impact section, these findings mirror those found in other broadband studies and speak to the issue of the digital divide, particularly in rural North Carolina.

All other measures of societal impact did not have a statistically significant relationship with broadband adoption at the county level. In subsequent years, this data will be tracked longitudinally to determine if impacts do occur, and under what conditions these impacts can best be brought to fruition. While the data does not reflect any significant findings, possibly due to lag effects in outcome production, significant evidence from MCNC, the e-NC Authority, and the NC Telehealth Network indicate important societal impacts from broadband availability.

## **SECTION 6. CONCLUSION**

Several key policy implications are discerned from the initial baseline evaluation, which demonstrate the salience and criticality of the work of the Golden LEAF Rural Broadband Initiative. First, the significant influence of broadband availability on virtual enrollment provides empirical evidence that the digital divide is impacting access to quality educational resources outside of the school walls. This is an issue that Golden LEAF and MCNC are working diligently to address and the evaluation will continue to assess this topic annually.

Second, the evaluation also empirically demonstrates the startling impact of broadband on employment rate in North Carolina counties. This result is directly opposite findings by Kolko (2010), and speaks to the importance of increasing access to affordable broadband to help combat the economic recession and allow the treasured rural communities of North Carolina to be competitive and thriving.

The Golden LEAF Foundation, MCNC, the State of NC, and communities across the state have long recognized the value and impact of coordinated effort in deploying high-speed connectivity at reasonable costs to our citizens and businesses. The evaluation of the financial investment in broadband connectivity throughout North Carolina via the Golden LEAF Rural Broadband Initiative is providing a holistic, longitudinal understanding of the true economic, educational, and societal impact of broadband. It will provide a useful model for recognizing the key attributes and deterrents to fully realizing positive impact in communities, thus creating a roadmap for future investments, over the course of the evaluation. The findings presented in this report are baseline analysis, given the implementation progress of the Golden LEAF Rural Broadband Initiative efforts. Future analyses will continue to build on time-series data, including employment growth indicators, to determine the effective market, economic, educational, and societal impacts of broadband availability and adoption across all North Carolina counties.



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