Broadband Impact on Education and Workforce during the COVID-19 Pandemic

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Introduction

The COVID-19 pandemic emphasized the importance of broadband equity across the United States. K-12 schools and higher-education institutions, health services, and many industries moved many of their operations online to conform with the Center for Disease Control (CDC) guidelines. Broadband access became integral for students to keep up with their learning and for adults to remain productive at work, as well as for keeping connections to the world. Unequal access to broadband resources (the "digital divide") was illuminated by this increased dependence on the Internet.

At the request of local leaders in 2021, the University of Tennessee Extension partnered with libraries in eight rural counties to expand a mobile hotspot lending program that had been piloted in three counties in 2018. This program was modeled after a study by Whitacre (2019) in Oklahoma, to address the digital divide by improving internet access for underserved communities. Library patrons were allowed to check out mobile internet hotspots to use at home for a few days. When they returned the hotspots, they were asked to fill out a survey. Survey responses from 2018 and 2021 were compared to understand changes, if any, to broadband equity challenges for rural residents during the COVID-19 pandemic. Our research also sought to gauge the impacts of the pandemic on the work productivity of adults and children's educational progress.

Summary Focus and Findings

A library hotspot lending program was popular with low and middle income Tennessee residents. The primary uses of broadband during the COVID-19 pandemic were for school work, connecting with family, conducting research and entertainment purposes. Residents used the program to access broadband when faced with a lack of reliable local broadband service or high-cost subscription plans.

The Community Capitals Framework can be used as a strategy to address digital divide and improve broadband access for underserved communities that wish to replicate or expand similar programs. COVID-19 pandemic notably had a negative impact on work productivity and children's academic performance.

Summary Findings

Participant Characteristics

Between the 2018 and the 2021 programs, we found three notable changes in program participant characteristics. First, broadband use during the COVID-19 pandemic increased across all purposes, with a significant increase in broadband use for schoolwork (63% increase), work skills (58% increase), and research (36% increase), as shown in Figure 1. Second, more participants with higher incomes utilized the hotspot program in 2021, see Figure 2. In 2018, 3% of participants reported annual incomes of $50,000-$75,000. In 2021, 17% of participants reported annual incomes of $50,000-$75,000. Most participants had annual incomes less than $25,000, followed by annual incomes of $25,000-$50,000, the same as in 2018. Third, 65% of 2021 participants lived between 5-20 miles from the library, with 25% of participants living less than 5 miles from the library. This distribution changed from 2018 when participants were equally split between these distances.

Figure 1. Broadband Usage of Participants by Purpose Before (n=184) and During (n=60) the COVID-19 Pandemic in Eight TN Counties
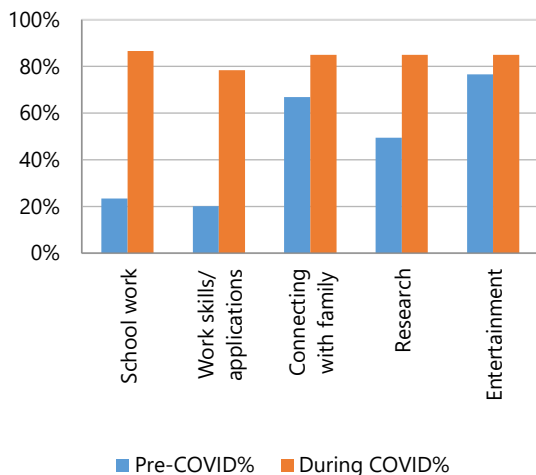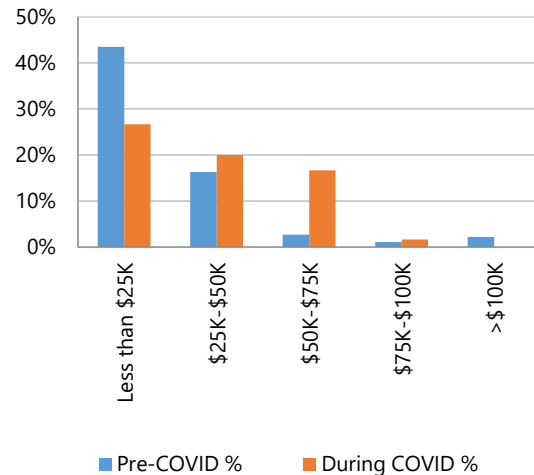

Figure 2. Income Distribution of Participants Before (n=184) and During (n=60) the COVID-19 Pandemic in Eight TN Counties

Interest in Broadband Subscription

In 2018 and 2021, participants were asked when they planned to purchase an Internet plan for their households. Results are shown in Figure 3. In 2018, 35% of participants were planning to subscribe to the Internet within a year, and 18% had no plans to subscribe. In 2021, 72% of participants said they had no plans to get an Internet subscription, while 17% said they planned to subscribe in 1-2 years. Figure 4 shows participants' reasons for not subscribing to the Internet during the COVID-19 pandemic. Most participants were unwilling to subscribe to the Internet due to lack of reliable

service (32%) and expensive broadband service plans (25%). Other reasons included using internet data on a phone (7%), low speed (3%), and lack of devices (2%). Another 32% of the participants were not interested in subscribing to the internet. In 2021, we also asked about participants' willingness to pay for certain broadband speeds and what range they would be willing to pay. For broadband speeds of 25/3 Mbps (download and upload Megabits per second, respectively), 17% were willing to subscribe and would pay between $10-$100. For speeds greater than 25/3 Mbps, 23% were willing to subscribe and would pay for plans between $20-$100. Notably, 50% of participants had no broadband service in their area.

Figure 3. Internet Subscription Plans of Participants Before (n=184) and During (n=60) COVID-19 Pandemic in Eight TN Counties
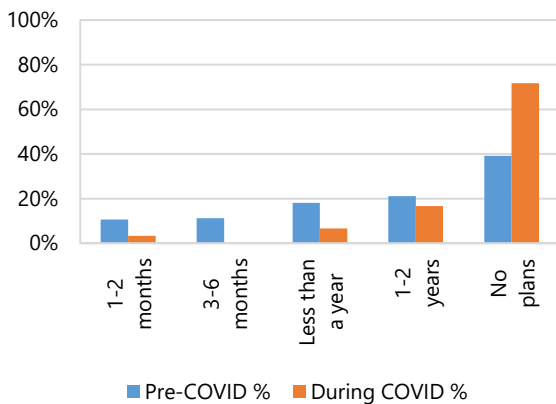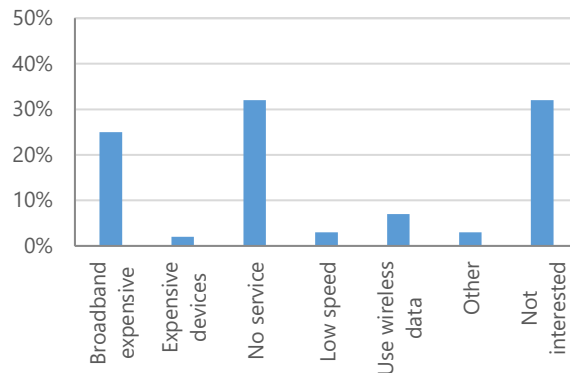

Figure 4. Participants' Reasons for Not Subscribing to Internet During COVID-19 Pandemic (n=60) in Eight TN Counties

Work Productivity and Academic Performance

This research also sought to gauge how the shift to online work and education impacted usage of the hotspot lending program during the COVID-19 pandemic. With the increase in usage of the hotspots for schoolwork, work skills, and research (Figure 1), we expected to see many participants working online or had children attending virtual school. While only 17% of hotspot users reported they were working from home, 38% reported their children were attending virtual school. Assisting children with schoolwork was the greatest change in usage of the hotspot lending program. When asked how the COVID-19 pandemic had impacted their work productivity, 76% of respondents judged their productivity to be poor, and only 22% thought it improved (Figure 5). When similarly asked about children's academic performance, 63% felt their child's academic performance was poor, and 33% felt it had improved (Figure 5).

Figure 5. Work Productivity and Academic Performance of Participants During (n=54) COVID-19 pandemic in Eight TN Counties
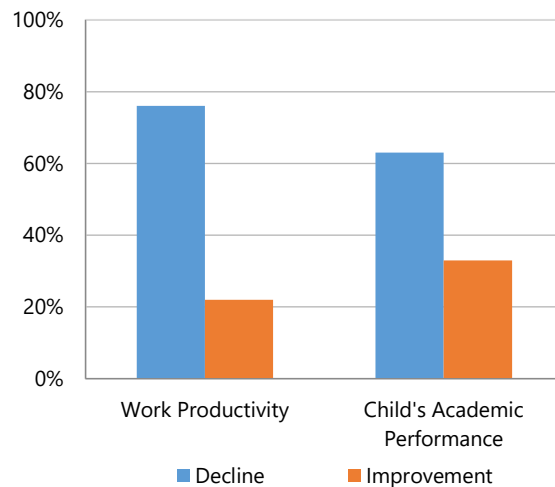
Recommendations

Community Capitals Framework

The Community Capitals Framework (CCF) has become a way to view community development and can be utilized as a strategy to address broadband access and adoption using the capitals present in a community (Emery & Flora, 2006). The framework for broadband access would be: Human Capital, people using broadband service to connect with family and friends and increase their education; Social Capital, use of libraries, social networks, and cooperatives for shared broadband access; Cultural Capital, use of broadband for promotion of community cultural events, such as arts, reading, cooking, crafts, and more; Financial Capital, using federal, state, and local funds or applying to public and private grants to improve broadband access; Political Capital, leadership and the county and city level in conjunction with federal and state can pass regulations and laws to improve broadband access and adoption; Natural Capital, optimal use of land, hills, valleys, and tree coverage, which can facilitate or limit broadband access; and Built Capital, infrastructure improvements through the installation of fiber-optic cable, fixed wireless, Digital Subscriber Line (DSL), and other technologies to support access. All seven capitals together serve as resources that can effectively address the broadband challenges faced by residents in rural areas in Tennessee. With better broadband access, we can level the playing field for underserved residents to access information that can improve their educational attainment, work skills, health, and overall quality of life.

Community Push for Public Broadband Programs
Using the social and financial capitals of the CCF, community leaders can work together to apply for federal and state programs and secure resources to expand local broadband access. The library mobile hotspot lending program was expanded in 2021 due to community requests during the COVID-19 pandemic; this could be undertaken at a larger scale in collaboration with state libraries for more sustainable programs. The Federal E-Rate program is one such initiative available for schools and libraries to receive discounts for broadband connections (Federal Communications Commission, 2021). Given the usage and popularity of the hotspot lending program, we support expanding or replicating the hotspot lending program at libraries in other communities.

This program was studied in Tennessee, and the Tennessee Department of Economic and Community Development provides grants for broadband access to underserved areas (Tennessee Department of Economic and Community Development, 2021). Other states may have similar programs or organizations that provide grants for communities to expand access in their areas. During the COVID-19 pandemic, more families including ones with relatively higher income were dependent on a library mobile hotspot lending program for broadband access but were also less likely to subscribe to broadband services than before. Expanding cost-effective broadband access would be a major step in supporting communities.

Data and Methods
The library mobile hotspot lending program was established in public and school libraries in eight economically distressed rural Tennessee counties: Hancock, Bledsoe, Wayne, Bradley, Morgan, Cannon, Grundy, and Perry Counties. Of these counties, all, except Bradley County, are below the Tennessee rate of Broadband Internet Subscription of 81.50%; all, except Cannon County, are below the Tennessee state median income of $55,411; and all, except Polk County, exceeded Tennessee poverty levels of 5.3% of the population (U.S. Census Bureau, 2020, 2021). Paper surveys were completed voluntarily by adult participants who were returning mobile hotspots to the libraries. In 2018-2019, 184 surveys were completed. In 2021-2022, 60 surveys were collected. The surveys collected socioeconomic information, as well as data on the participant's willingness to pay for broadband, and their general usage of the Internet while using the mobile internet hotspot. While participants' racial demographic information was collected, over 99% of 2018 respondents and 100% of 2021 respondents were white. Racial equity to broadband access was not a primary focus and is a limitation of this study. We would encourage further research in this area.

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Acknowledgements

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