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Broadband in Kansas:

The Challenges of Digital Access and Affordability

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This report is dedicated to our colleague, Genna Hurd, who worked on economic development projects for IPSR and its predecessors for 34 years. Genna retired in December 2022, and her dedication and deep understanding of Kansas helped to make this report possible.

Executive Summary

The Institute for Policy & Social Research (IPSR) at the University of Kansas received funding from the Economic Development Administration at the U.S. Department of Commerce under the CARES Act to study broadband access in the state of Kansas. To conduct this study, IPSR examined existing data, fielded our own survey of broadband speeds and access, conducted focus groups, and commissioned a chapter on the digital divide within the state of Kansas. The report discusses available data sources and introduces the speed test data collected by IPSR in order to map the broadband access landscape in Kansas. Along with speed tests, the Kansas broadband survey collected information regarding broadband access, adequacy, affordability and satisfaction. The survey data were enhanced by interviews and focus groups that allowed Kansans to share their struggles with internet access in their own words. The report also investigates digital equity using surveys and interviews conducted at public libraries that revealed the challenges faced by library patrons, including lack of digital access and literacy. The report that is summarized below indicates a rural-urban digital divide in terms of access, affordability, and satisfaction with broadband services. The data in this report indicate that up to 1,000,000 Kansans live in regions that lack access to high-speed broadband services, now considered to be 100 megabits per second (Mbps) download and 20 Mbps upload (100/20). Close to half of survey respondents (46%) report dissatisfaction with broadband services. Major findings from the chapters are summarized below.

The Challenges of Broadband Access in the State of Kansas

There is a lack of reliable data on broadband access in Kansas. We reviewed and reported available data sources and compared those with IPSR's broadband survey.

- FCC maps are misleading because they report maximum advertised speeds, and it is not clear that people can purchase this kind of service at any or all addresses represented on the maps.
- The FCC map shows a gradient of access where Eastern Kansans have access to multiple internet service providers, but in large parts of Western Kansas there is only one provider.
- Broadband access data from the American Community Survey is problematic because it is self-reported (customers often don't fully understand their service) and updated infrequently.

- Microsoft Broadband data are based on people updating Microsoft software. However, broadband is defined as the outdated 25 megabits per second (Mbps) download and 3 Mbps upload standard. Microsoft results indicate that fewer than 50% of households in Western Kansas connect at 25/3 speeds.
- IPSR created a broadband index that is a weighted average of data from Microsoft and the American Community Survey. The index indicates better access in urban counties and along the I-70 corridor and in areas with higher education institutions. Metropolitan counties and non-metropolitan counties not adjacent to a metro area (many with micropolitan communities) have the best service.
- IPSR's broadband survey indicated that many areas report connection speeds of less than 25/3, and over 1,000,000 Kansans live in regions with less than 100 Mbps download and 20 Mbps upload.

Broadband in Kansas: Access, Adequacy, and Affordability

IPSR conducted two surveys related to broadband access in Kansas with the total number of respondents being 6,895. The survey asked for information on demographic characteristics, location, type of internet access, type of internet service, affordability, satisfaction with service and costs, and willingness to pay for faster speeds. While the survey is not scientific, it reports widespread dissatisfaction with broadband service and affordability, especially in rural areas.

- Cost is the top reason that respondents living in cities do not have internet or broadband access at home. Not having internet service available at an acceptable speed is the top reason that respondents living outside of cities do not have internet at home.
- Inside city limits, respondents report cable and fiber as the most prevalent types of service, while outside city limits, satellite and fixed wireless dominate.
- Over one-third of respondents have only one internet service provider available.
- Most households connect using a cell phone and other device, while over 90% use a wireless router. Twenty percent report a data cap on service.
- Average download speeds inside city limits were over 100 Mbps, compared with only 40 Mbps outside of city limits.

• The top three difficulties encountered by respondents were streaming content (72%), video calls (66%) and downloading content (59%). Only 7% of respondents reported no difficulty with online activities.
• According to a survey conducted by Kansas State University, 25% of manufacturers surveyed had internet-related difficulties with control of manufacturing processes.
• Seventy percent report being satisfied with broadband service speed within city limits but only 46% report being satisfied outside of city limits.
• Over half of respondents living outside of cities and one-quarter of respondents living in cities are dissatisfied with broadband service speeds.
• The median monthly price paid for current service ranges between $71-80. Nearly 18% of our survey respondents pay over $100 per month for service.
• Only one-third of respondents in cities and less than one-quarter of those living outside of cities are satisfied with the cost of broadband service.
• Those who have access to only one internet service provider recorded lower average download speeds (50 Mbps) and are less likely to be satisfied with speed and cost compared to those with a choice of service providers.
• Middle income households are willing to pay $45 per month for 50 Mbps download speeds. As household income increases, willingness to pay goes up to $100 per month for 1 gigabit service.
• Half of those surveyed would keep their current service if the price increased by $20 per month, but one-third would switch to a lower cost service or live without.
• Outside of city limits, respondents would be willing to pay more for 50/10 service.
• Nearly half of those surveyed are dissatisfied or very dissatisfied with their broadband service.

Kansans Speak About Broadband Access

During 2021-2022, members of the IPSR research team conducted interviews and focus groups with various stakeholders invested in broadband access, affordability, and adoption in Kansas to help us further understand the data gathered in the surveys. These stakeholders consisted of internet users in rural and frontier communities as well as internet users residing immediately outside of city limits; representatives from Kansas-based broadband service providers and electric cooperatives; and representatives from the Kansas Office of Broadband Development and the Kansas Farm Bureau.

We also spoke with 18 Kansas-based independent service providers and summarized written survey responses. The following themes emerged.

- Respondents recognized a variety of disadvantages due to lack of broadband availability; slow speeds, data caps, unreliable internet access and a lack of options for service provision. Lack of robust and reliable broadband service in rural and frontier communities creates significant challenges for people to do their jobs, keep up with technological advancements in a variety of industries, and create jobs for the future.
- Kansans living inside and outside of city limits reported accessing speeds below what they paid for and experiencing decreased speeds at peak times. Rural residents noted the unreliability and inconsistency of the speeds they subscribed to.
- There is a patchwork of broadband access across Kansas that leaves some residents in "donut holes" with no available broadband service.
- Kansans utilized inconvenient and costly methods to get better internet access, such as purchasing mobile hotspots, paying additional fees, connecting at late evening or early morning hours, or driving long distances to locations outside of their home.
- Residents noted that a reliable broadband connection would save time and money and would allow them to continue to live in rural and frontier communities while maintaining their health, education, livelihood and well-being, and would attract new residents.
- Study participants felt that their struggles with inadequate internet access were unheard and unheeded by policymakers and internet service providers.
- Several participants expressed a willingness to pay for fast and reliable broadband service because it was perceived as a utility, even as a means of survival.
- Regional monopolies and lack of competition for internet service provision created rates and pricing that were perceived as unaffordable or expensive, especially for service that was understood as a utility or public good.
- Residents found that major telecommunications providers were unwilling to expand access to unserved or underserved areas due to cost, but Kansas has a portfolio of local and independent internet service providers that provide broadband speeds and fiber-optic connections to rural as well as urban communities and populations residing outside of city limits.

• Study participants regarded at-home broadband access as a public good or public utility. Many rural and frontier residents thought that service provision through local operators and/or service provision subsidized by the state or federal government were the only way they would be able to receive reliable and adequate broadband speeds.
• Poor or inaccurate public data on broadband service was noted as a challenge that may prevent independent internet providers from receiving funding and targeting underserved communities.
• Kansas would benefit from conducting an audit of served, unserved, and underserved areas as well as augmenting data on the affordability and quality of internet access available to Kansans as well as why people subscribe or do not subscribe to certain internet services.

"It's a Lifeline for Me": Public Library Computing Services and Digitally Marginalized Kansans

A research team from the University of Kansas conducted interviews of computer users at public libraries in northeast Kansas. Public libraries provide a lifeline of digital access for those without resources or in need of private and secure internet access.

• Researchers spent more than two years collecting data from library patrons and staff across three municipal library systems, at eight different library branch locations.
• Library patrons have different needs for computer labs based on digital literacy levels. For higher-level digital literacy users, persistent and customizable computing environments are important. Lower-level digital literacy users need dedicated library staff whose role is to assist them as they build technical competence.
• Factors other than internet access, such as lack of access to a personal computer, lack of digital literacy skills, and lack of access to people who can share their digital literacy skills and knowledge (technological capital), contribute to digital inequities among Kansas populations.
• In some cases, library computers help users apply for public benefits, find jobs, and escape from abusive relationships.
• Cost of internet access or personal computers are not the only reasons

why people regularly use library computer labs. Attention to multiple and compounding social conditions and life circumstances through which digital inequalities emerge is important.

• Community-specific initiatives should be developed in concert with state and federal agencies with a range of stakeholders involved, including public library administration and staff, digital literacy professionals, and library patrons themselves

Conclusions and Policy Recommendations

• Despite the increased reliance on broadband services resulting from the pandemic, accurate data on broadband access, speeds, and affordability is incomplete at best.

• IPSR's broadband survey indicated that many areas report connection speeds of less than 25/3, and over 1,000,000 Kansans live in regions with less than 100 Mbps download and 20 Mbps upload.

• A large urban-rural divide in broadband access and affordability is evident. Kansans living outside of cities pay more for slower service than Kansans living in cities.

• Cost is the top reason that respondents living in cities do not have internet or broadband at home. Not having internet service available at an acceptable speed is the top reason that respondents living outside of cities do not have internet at home.

• Over one-third of respondents have no choice about the type of internet service they receive.

• 46.1% of those surveyed are dissatisfied or very dissatisfied with their service. Over half of Kansans living outside of cities are dissatisfied with their broadband service.

• Survey respondents are willing to pay more for better broadband service.

• Broadband access is no longer a luxury—it is a necessity for work, economic development, and accessing public services.

• Broadband has transitioned from being a consumer luxury to an educational and employment necessity. The future of economic development will depend on broadband access, and the state should consider support for broadband as an investment in economic development.

• Broadband access in large parts of the state constitutes a market failure where the cost of providing service is high, and thus, firms are unwilling to invest in access.
• Public investments in rural electrification 75 years ago may provide a model for expanding access to broadband in hard-to-reach locations. Respondents in our interviews and focus groups consider broadband access a utility similar to electricity.
• The combination of Kansas's recent attention to broadband initiatives and policy, existing portfolio of Kansas-based service providers, active university extension organizations, and the unprecedented amount of federal funding for broadband infrastructure and rural broadband initiatives, positions Kansas to be particularly innovative in the state's approach to broadband access, affordability, adoption, and equity.

Policy Recommendations:

• Kansas needs better broadband data. The FCC is now allowing states to challenge data provided on FCC maps. We suggest that the Kansas Office of Broadband work with local governments and economic development districts to provide speed test and granular service-area data to challenge the FCC maps. More accurate data on broadband service provision and use would enhance the competitiveness of Kansas independent internet service providers (ISPs) for receiving federal funding to provide service to underserved communities.

• Efforts to collect more accurate data should include information about addresses served, but also information about quality, affordability, and experience of the internet connection and services offered.

• Lack of broadband access, especially in the western and rural parts of the state, is a market failure. The costs of providing service to sparsely populated regions will require significant public investment.

• The Kansas Office of Broadband should work with organizations within the state to develop a strategic broadband research plan for future broadband investments. This plan would include: speed test data by location through-

out the entire state, documenting pre-existing broadband infrastructure, including middle mile and dark fiber, documenting broadband adequacy for school districts, hospitals and libraries, and studying digital equity by income, geography, and other socioeconomic characteristics.

• The Kansas Office of Broadband should serve as clearinghouse or hub for related efforts to document broadband service in Kansas. Several organizations across the state have collected data on internet service provision in Kansas and issued reports or memos that have not been widely shared. In addition, several state and local organizations are interested in improving internet access, affordability, and equity in Kansas but are not in conversation with one another. The Kansas Office of Broadband can serve as a hub to facilitate partnerships and research-sharing across the state.

• Kansas investments in broadband should focus on developing better infrastructure. Investment in quality broadband infrastructure such as fiber optic networks, or broadband networks that provide similar reliability and speed, should be prioritized. Kansans expressed a willingness to pay for fast and reliable broadband service in rural as well as urban areas.

• Although significant federal resources are being allocated for broadband development, additional state funding will be necessary to build out middle-mile and last-mile access. Many of the state's rural residents are in difficult to serve locations, making private sector solutions unlikely.

• Any state investments in supporting broadband development should include a requirement for ISPs who receive funding to provide data to the state, including speed tests, addresses served, types of service plans and types of connections offered.

• The state should support increased competition among broadband providers. Survey respondents who have only a single provider experience lower speeds and are less satisfied with speed and cost of service. Competition will incentivize ISPs to provide faster broadband at more affordable prices.

• The state should invest in digital equity. Digital equity concerns take many

forms, including lack of affordable and adequate broadband, lack of devices needed to access the internet and lack of digital literacy needed to use the internet. Additional technical support at public libraries provides access to the "digitally homeless" and those who lack digital literacy skills. Public funding for libraries should be increased to support digital access and digital literacy.

• To promote digital equity, community-specific initiatives should be developed in concert with state and federal agencies and with a range of local stakeholders involved, including (but not limited to) public library administration and staff, digital literacy professionals, community members who lack adequate internet access, and local organizations working to alleviate digital divides and socio-economic marginalization.

Chapter One

Introduction

The Institute for Policy & Social Research (IPSR) at the University of Kansas proposed to study broadband access in the state of Kansas using additional funds provided to the Economic Development Administration at the U.S. Department of Commerce under the CARES Act. IPSR undertook this study because the Kansas Department of Commerce had expressed an interest in better understanding broadband availability in the state prior to the COVID-19 pandemic. That work was put on hold to allow the Kansas Department of Commerce to develop the state's economic strategic plan "A Framework for Growth" (KDOC 2021). In the "Framework for Growth" report, the plan calls for the state to:

1) Ensure consistent and reliable broadband access so that [agricultural] producers can integrate new technologies;
2) Attract data center investment in areas with strong broadband connectivity; and
3) Rise to the top of midwestern states with respect to broadband connectivity and access.

Prior to the pandemic, the state of Kansas recognized the need to improve broadband access throughout the state in the "Framework for Growth."

The COVID-19 pandemic and associated lockdowns highlighted the importance of broadband access and affordability for all Kansans. Broadband access has profoundly affected community and household resilience during the pandemic, with health, employment, and education moving partially or fully online. In August 2020, the Kansas Department of Education polled state school districts and found that 9.73 percent of students in the state did not have broadband access in their home in a time when all instruction was moved online (Kansas Department of Education 2020). Although the need for broadband was acute, understanding whether the barriers to access were driven by lack of broadband infrastructure, prohibitive cost, or other factors was not well-understood because of the lack of reliable data.

Kansas is not alone in recognizing the need for improved broadband access. Various other state and federal institutions have published related studies of broadband access. For example, a report by the University of Wisconsin-Madison used public data to investigate broadband access in the state and the relationship between broadband access and various economic and health measures (Conroy et al. 2021). The authors of the Wisconsin report found that broadband infrastructure was critically underfunded, and poor access was especially common in rural communities, resulting in adverse economic and health outcomes. The Georgia Department of Community Affairs and Georgia Technology Authority authored a report showing that 75 percent of unserved areas in Georgia are rural (Georgia Department of Community Affairs 2021). The Georgia report also found that 85-90 percent of the cost associated with fiber internet provision is so-called "last-mile" infrastructure. A report by the Pew Research Center found that states implementing stakeholder outreach and engagement, clear policy frameworks, and a robust and accountable state funding system were best able to expand access to underserved areas (Stauffer et al. 2020). States were given discretion over CARES funding and the American Rescue Plan Act (ARPA) funds. As of now, Kansas has earmarked $65 million of CARES Act and $83.5 million of ARPA funds to improve broadband access (Taborda 2022 and KDOC 2022).

In response to the pandemic and evident need for high-speed internet, the 2021 Infrastructure Investment and Jobs Act provided $65 billion for lowering costs and improving access to high-speed internet around the country (The White House 2022b). As part of a larger effort to update various aspects of the nation's infrastructure, this funding is meant to ensure that all Americans have access to broadband. The bill provides grant funding for projects to expand "middle-mile" infrastructure, which connects major internet providers to more localized distribution networks. This middle-mile capacity is crucial for bridging the gap between connectivity in metropolitan cities and in small towns and rural areas. There are also provisions for reducing the price of high-speed internet by requiring providers who receive federal funding to offer consumers low-cost plans and easy-to-use information to compare their services with other available options. Kansas is expected to receive at least $100 million in additional funds for broadband development from the Infrastructure Investment and Jobs Act (The White House 2022a). However, to make these strategic investments, the state of Kansas needs better information about broadband access, affordability, and adoption. This report investigates the importance of broadband internet access in Kansas, the availability and affordability of broadband connections throughout the state, and the attitudes and recom-

mendations of Kansas consumers. To conduct this study, IPSR examined existing data, fielded a survey of broadband speeds and access, conducted interviews and focus groups, and commissioned a chapter on digital inequity within the state of Kansas. The report that follows provides key insights on broadband access, affordability, and equity. It concludes with policy recommendations for Kansas to provide equitable access to improved broadband for all Kansans.

Chapter 2 discusses available data sources and introduces the speed test data collected by IPSR in order to map the broadband access landscape in Kansas. Chapter 3 focuses on the Kansas broadband survey results collected by IPSR and discusses the survey's findings regarding access, adequacy and affordability. Chapter 4 investigates the qualitative data IPSR collected from interviews, focus groups, and survey responses to illustrate Kansans' struggles with internet access in their own words. Chapter 5 investigates the use of public libraries for digital access and discusses the challenges faced by library patrons. Chapter 6 concludes with policy recommendations.

This study finds that broadband internet is increasingly necessary for education, work, and a high quality of life. We find that adequate internet is unavailable or unaffordable to a broad cross-section of the state population. The COVID-19 pandemic, which limited traditional in-person interactions, highlighted the importance of broadband availability and affordability. At the same time, the pandemic exposed various issues with access, affordability, and adequacy that many Kansans encounter in their local broadband marketplaces.

The combination of Kansas' recent attention to broadband initiatives, existing portfolio of local service providers, active university extension organizations, and the unprecedented amount of federal funding for broadband infrastructure positions Kansas to take a particularly innovative approach to broadband access, affordability, adoption, and equity. We hope the information and recommendations in this report will serve as a step in that direction.

Chapter Two

The Challenges of Broadband Access in the State of Kansas

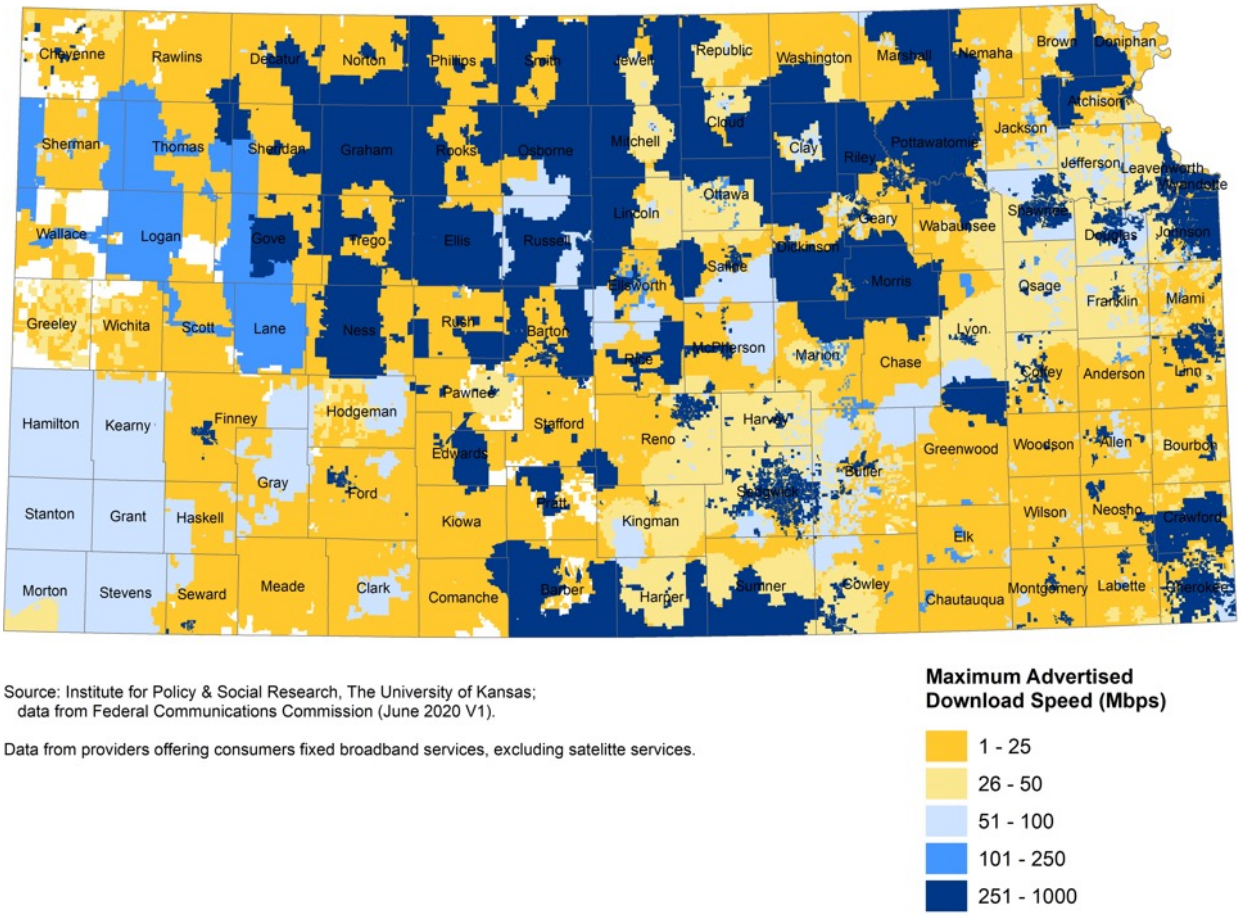
There is no single, authoritative data source on internet access and usage in the United States; therefore, this report draws from several databases to create a holistic picture of the broadband landscape. Apart from our own survey of Kansas internet users, we use access data provided by the U.S. Census Bureau and the Federal Communications Commission and usage data provided by Microsoft. To assist Kansans with understanding broadband access, we have created an online tool to provide information on access from a variety of sources. To create this tool and provide a more reliable sample size for regional decision-making, the results from the Kansas Broadband study were aggregated by EDA Economic Development District (EDD). The dashboard contains key elements from the project and highlights the disparities in internet access and affordability across our state. This project, along with the embedded dashboard, is available at: https://ipsr.ku.edu/broadband.

We begin with the definition of broadband and an overview of available data on broadband access. Prior to 2010, broadband was defined as 200 kilobits per second for both upload and download speed (Falcon 2020). In 2015, the Federal Communications Commission raised the definition for broadband internet from 4 megabits per second (Mbps) download speed and 1 Mbps upload to 25 Mbps download and 3 upload (25/3). In 2022, the Chairwoman Jessica Rosenworcel of the FCC proposed raising this standard again to 100 Mbps download and 20 upload (100/20) (Velazco 2022). This proposal followed Congressional calls to update the definition of broadband to keep it consistent across government agencies and ensure it takes into account newer, more data-intensive internet applications. The Kansas Office of Broadband in the Department of Commerce now defines broadband as 100/20. This chapter examines access under the 25/3 definition of broadband and the newer 100/20 definition.

Mapping Broadband in Kansas

Understanding broadband access is inhibited by a lack of reliable data. While there are many sources of data on broadband access, each source has significant shortcomings. In this chapter we review sources of data on broadband access and describe the type of information that they provide.

Figure 2.1. Broadband Internet Access in Kansas, 2020
Maximum Advertised Download Speed (Mbps)



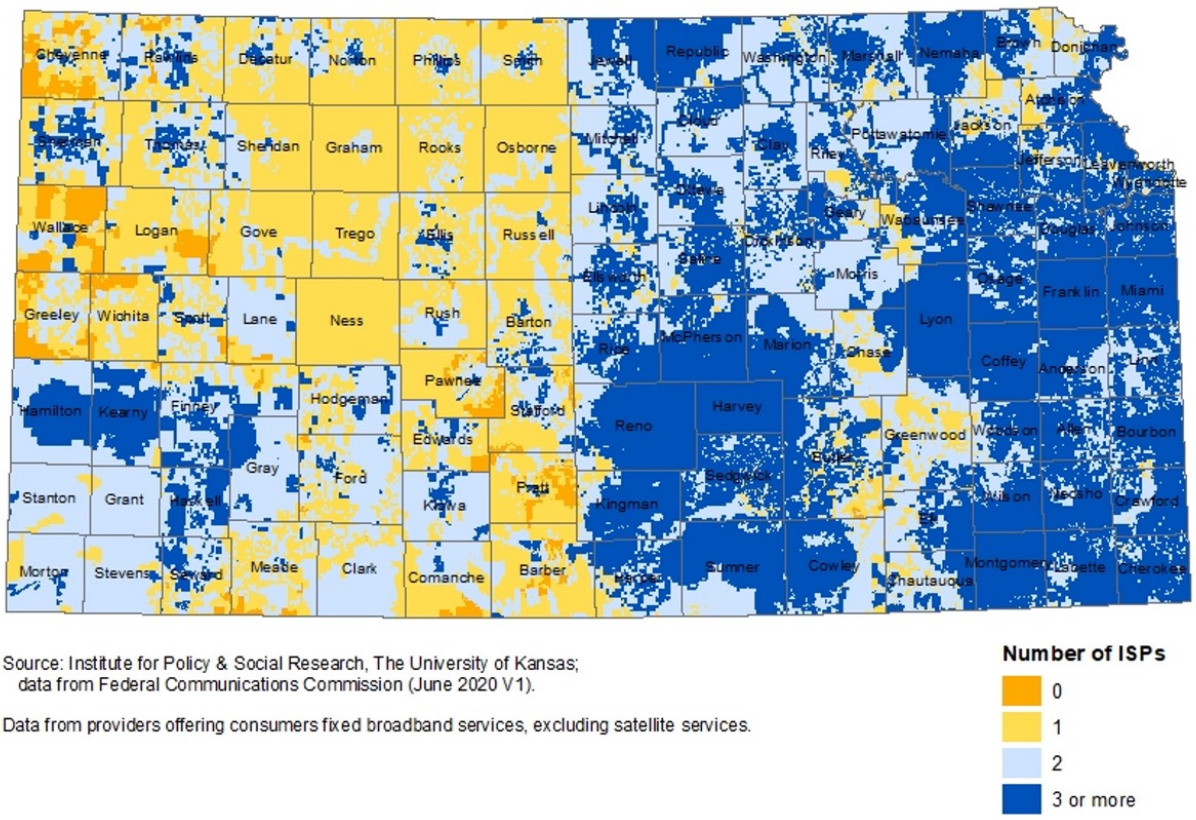
Source: Institute for Policy & Social Research, The University of Kansas; data from Federal Communications Commission (June 2020 V1).

Data from providers offering consumers fixed broadband services, excluding satelitte services.

Figure 2.1, Broadband Internet Access in Kansas, Maximum Advertised Download Speed, shows internet service provider-reported maximum advertised download speed from the FCC as of 2020 by Census block in Kansas. These data indicate maximum advertised download speeds range from 1 megabit per second (Mbps) to 1000 Mbps. In many areas of the state, the FCC data show that no provider advertises speeds greater than 25 Mbps, the FCC minimum to be considered broadband. In most of Kansas, no pro-

vider offers a maximum speed greater than 100 Mbps, which is the Kansas Department of Commerce minimum speed to be considered broadband. Maximum advertised speeds are highest in population centers throughout the state, and in many rural areas in the north central region. Maximum advertised speeds are lowest in other rural areas, particularly in the northwest and south central parts of the state. And since the FCC map represents maximum advertised speeds, it is not certain that people can actually access and purchase the services advertised for their areas.

Figure 2.2. Broadband Internet Access in Kansas, 2020
Number of Internet Service Providers



Source: Institute for Policy & Social Research, The University of Kansas; data from Federal Communications Commission (June 2020 V1).

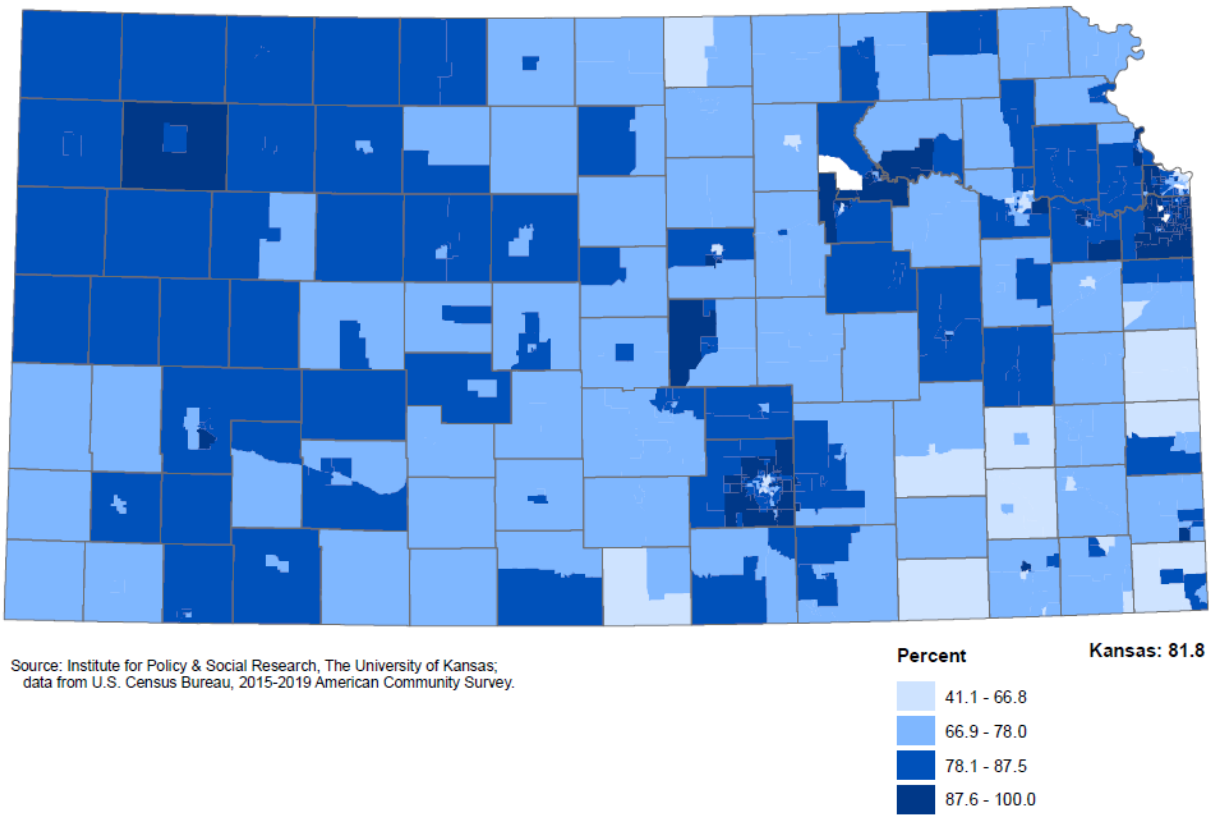
Data from providers offering consumers fixed broadband services, excluding satellite services.

According to FCC data, much of the western half of the state is served by only one service provider, and in parts of several western and central counties residents have no fixed broadband provider, excluding satellite services (Figure 2.2). There are also areas with a single service provider along the Flint Hills from Chautauqua to Marshall and Washington Counties, and in the northeast corner of the state. These data loosely

corroborate the zip code level data IPSR collected from survey respondents reporting one provider across the state (see chapter 3 for more information on survey results).

A second source of data is self-reported broadband access from the U.S. Census Bureau's American Community Survey. According to data from the 2015-2019 American

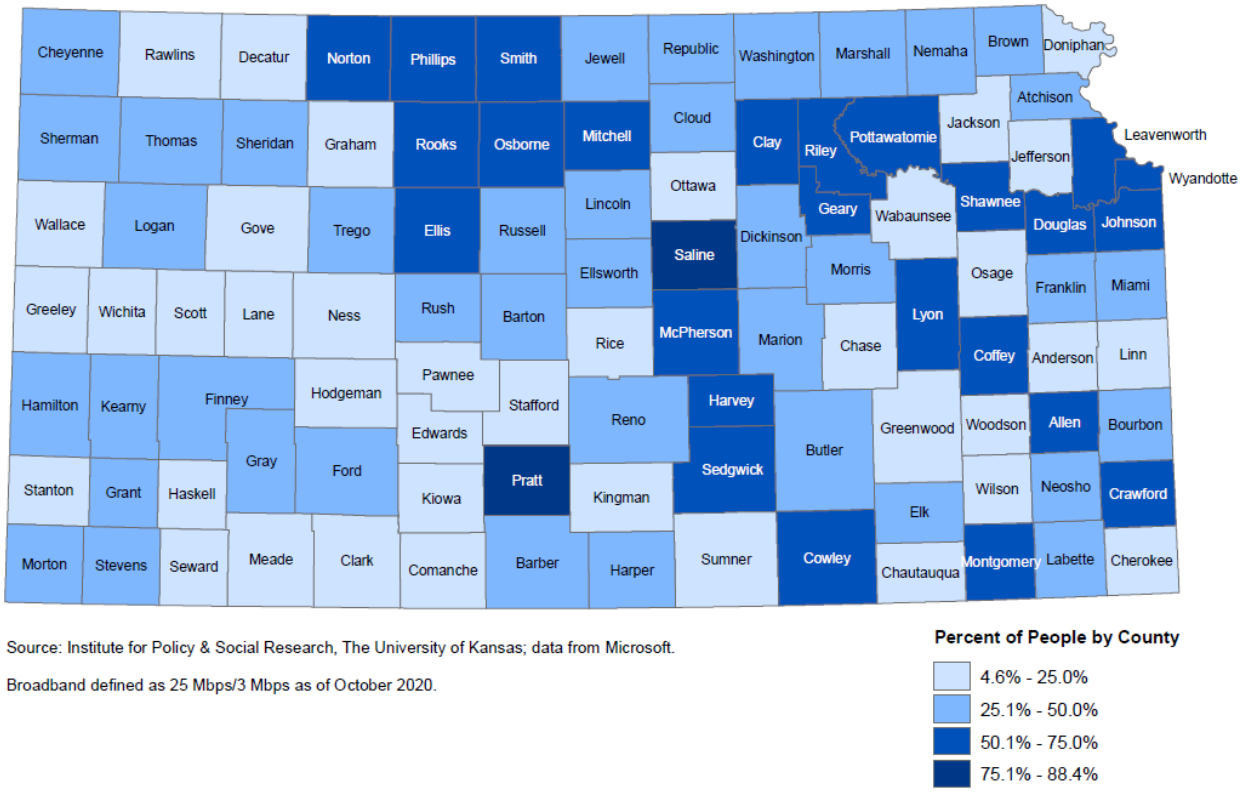
Figure 2.3. Percent of Households with Broadband Internet Access in Kansas, by Census Tract, 2015-2019



Community Survey (ACS), 81.8 percent of Kansas households reported having broadband internet access. At the Census Tract level, however, the share of households reporting broadband access ranged from 41.1 percent to 100 percent (Figure 2.3, Broadband Internet Access in Kansas, Number of Service Providers). Broadband access was lowest in larger, less densely populated tracts in the southeastern part of the state, as well as in smaller, urban tracts in the Topeka and Wichita metropolitan areas. Additionally, in much of urban Wyandotte County in the Kansas City metropolitan area, fewer households report broadband access. In contrast, suburban tracts in Johnson and Sedgewick

Counties saw the highest rates of access, showing that within our major metropolitan areas, broadband access varies widely within a relatively small geographical area. These data are five-year averages and are released with at least a year's lag and may not provide up-to-date information on broadband access.

Figure 2.4. Percent of People Using the Internet at Broadband Speeds



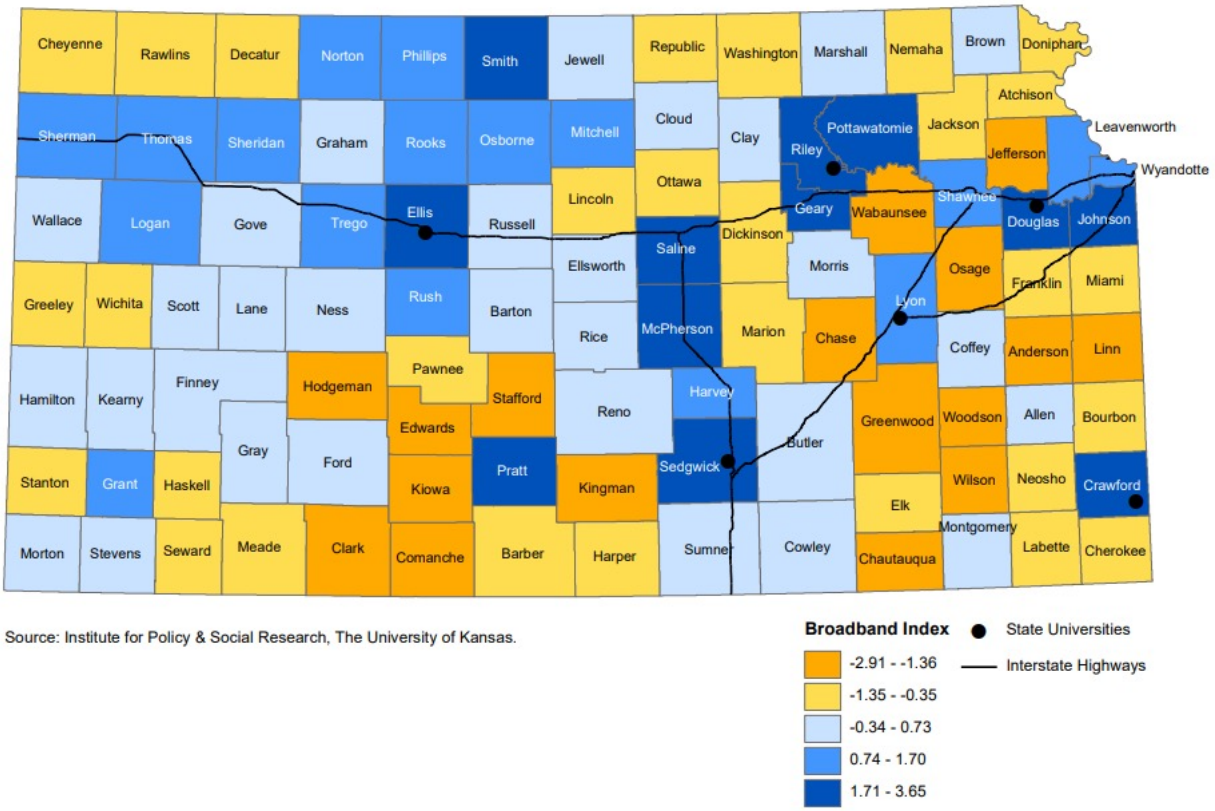
Source: Institute for Policy & Social Research, The University of Kansas; data from Microsoft.

Broadband defined as 25 Mbps/3 Mbps as of October 2020.

Another indicator of broadband access and speed at the county level comes from data published by Microsoft showing the share of Microsoft product users by county who are accessing the internet at broadband speeds as defined by the FCC (Figure 2.4) to be 25/3. These datasets are derived from estimated throughput speed from the Microsoft devices and services accessed by anonymized users. The speed of these internet connections is estimated by recording the size of files downloaded from Microsoft and the time it takes to download. Microsoft uses these findings to publish data on the share of people in each county who access the internet at or above the FCC minimum definition of broadband. In the western half of the state many counties have 50 percent or fewer residents accessing the internet at the slower 25/3 speed.

These three different data sources provide three contradictory views of the data. The ACS and Microsoft data show that the FCC data likely overstates access in much of the state. The Microsoft data are at odds with the ACS map. The Microsoft data show that although most households in a large part of Western Kansas report broadband access, fewer than 50 percent of Microsoft users in those areas access the internet at broadband speeds.

Figure 2.5. Broadband Index in Kansas, by County, 2020



Combining Measures

One way of integrating these disparate datasets is to construct an index at the county level that condenses multiple measures into an overall score. Here, we use a statistical method called principal component analysis to combine the Microsoft dataset with three measures taken from the American Community Survey to create a Kansas broadband index that can compare Kansas counties.

The county-level Kansas Broadband Index combines the share of users with 25/3 or better internet speeds from the Microsoft data with three variables from the ACS: 1) the share of households who connect to the internet via satellite connections only, 2) the share who use cell service only, and 3) the share who have no internet at all. This index shows us where—even when the Microsoft data suggests the broadband is accessible—ACS data tell a different story. Details of the method used to create this index are included in the appendix.

Figure 2.5 shows our resulting Kansas Broadband Index by county as a choropleth map. Counties with higher index values (blue) are associated with better internet access and usage, while counties with lower index values (orange) are associated with worse internet access and usage.

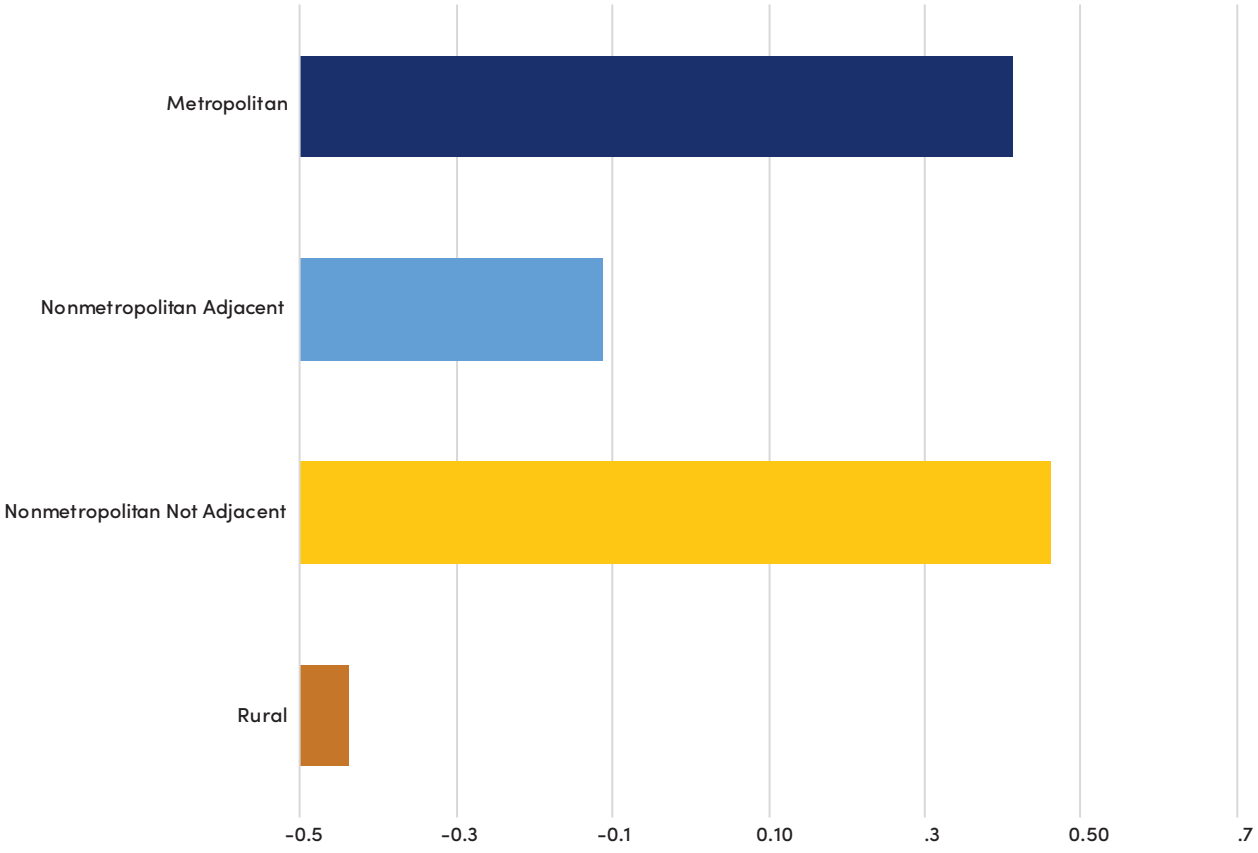
Our analysis reveals that broadband speeds and access are highest in Johnson County and in the metropolitan-adjacent counties of the Northeast, and lowest in rural counties in the southern half of the state. Counties within the I-70 corridor, which runs east to west from Wyandotte County to Sherman County, tend to have higher index values, even in rural areas, than counties to the south. This is likely due to the relative ease of installing fiber along interstate highways. Similarly, the counties along I-135 from Salina to Wichita have higher scores on the index. Rural counties that lie between urban areas and away from major highways, such as Greenwood, Woodson, Jefferson, Edwards, and Kiowa Counties, tend to have lower scores. The Flint Hills region broadband, except for counties surrounding Kansas State University and Fort Riley, also underperforms. Some rural areas away from I-70 stand out with relatively higher scores, such as Grant and Smith counties, who invested heavily in local broadband development. In southeastern Kansas, where internet access and usage is lower, Crawford County stands out because of Pittsburg State University and its integration in the Kansas Research and Education Network (KanREN).

However, the performance of counties with large colleges and universities is likely overstated in the Microsoft data. This is because there are large numbers of computers running Microsoft updates at these institutions with internet connections that are probably better than average residential services in their area. Douglas, Riley, Ellis, Sedgwick, Johnson, and Crawford counties may not have residential service that performs as well as our index suggests.

Broadband Index Scores by Rural-Urban Status

Average broadband index scores among Kansas counties vary in part depending on the U.S. Department of Agriculture's Rural-Urban Continuum. This resource looks at metropolitan counties by their size and nonmetropolitan counties by their urbanization and adjacency to metropolitan areas. (See Appendix B, Map 1 for the rural-urban status of Kansas counties). Non-metropolitan counties with 2,500 or more urban population, and not adjacent to a metro area (Figure 2.6), have the highest average broadband index score. Completely rural counties have the lowest average score. Both the Microsoft speed data and the broadband index found that non-metropolitan Kansas counties adjacent to a metro area have lower average scores in the broadband index than those not adjacent to a metro area. That is, a county appears to be disadvantaged in its ability to access broadband if it is adjacent to a metropolitan area.

Figure 2.6. Average Broadband Index by Kansas County Rural-Urban Status

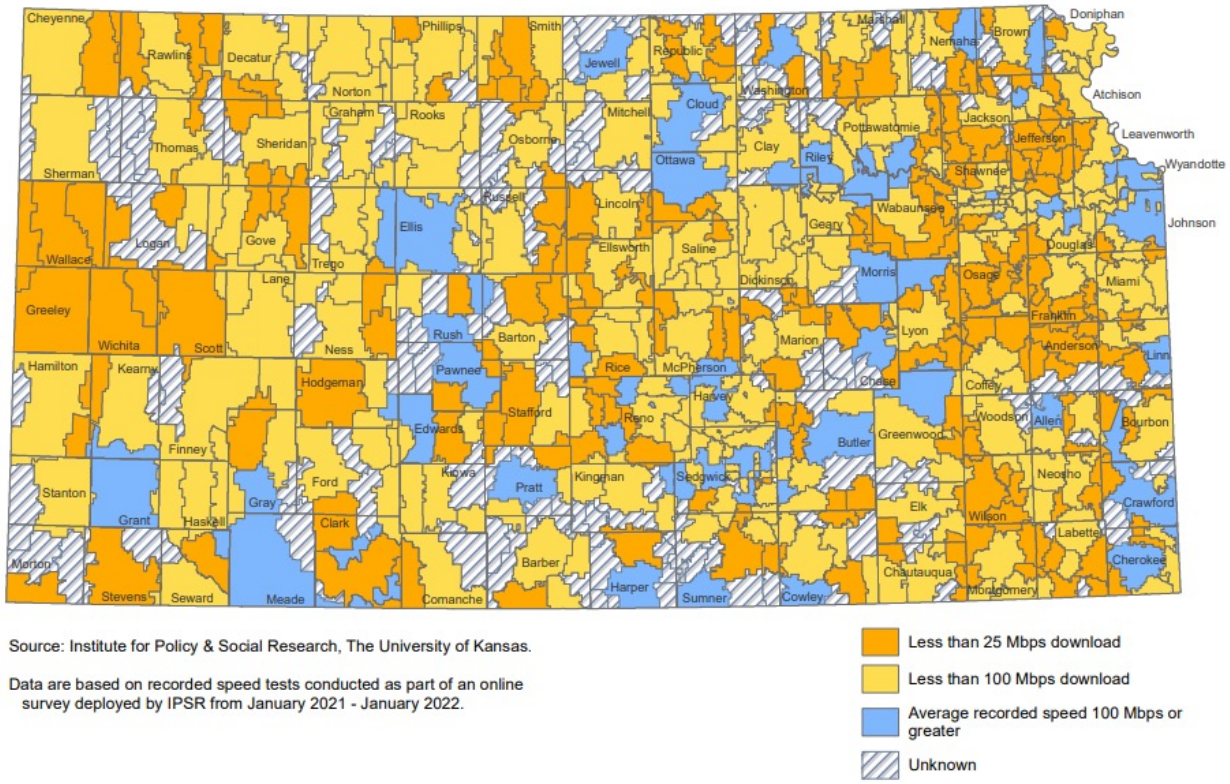


IPSR Speed Test

While the broadband index is informative, the inconsistencies between these datasets motivated IPSR to gather its own data.

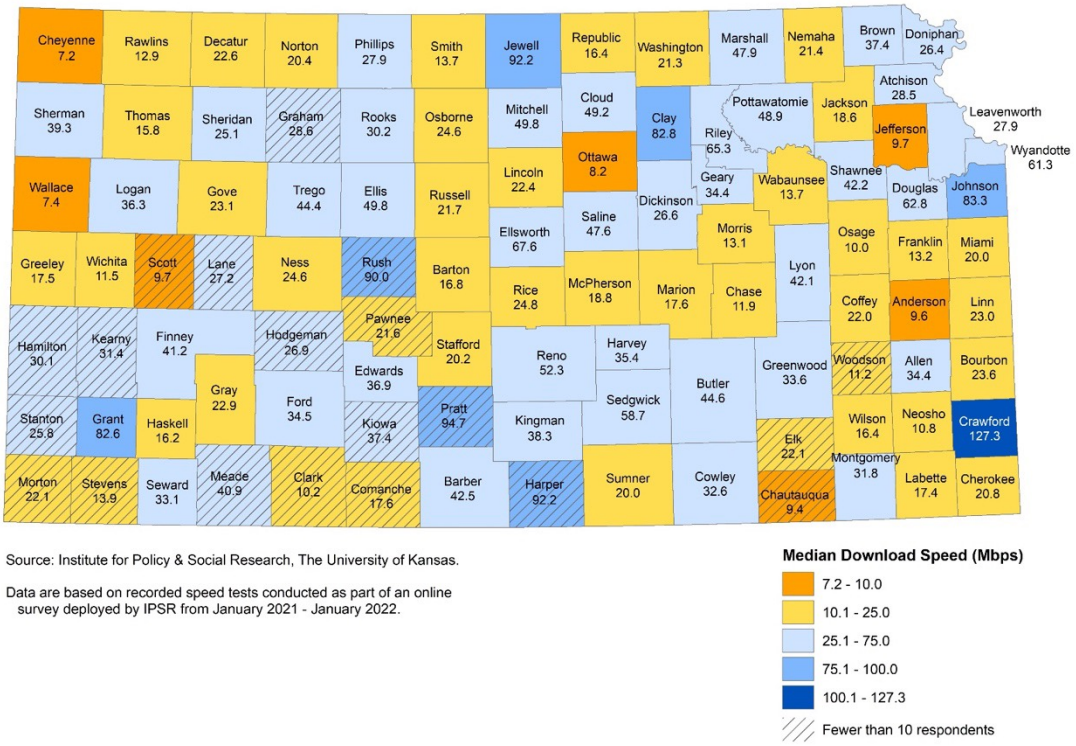
IPSR fielded two surveys that began with an embedded Ookla speed test. Ookla is a web service that administers speedtest.net, a process recognized for its objective assessment of internet speeds. Details about the survey and an analysis of survey responses appear in Chapter 3. Here we present information on broadband access by zip code. Figure 2.7 shows areas in Kansas, at the zip code level, with less-than-optimal speeds: that is, less than 100 Mbps download. The areas in yellow and orange are those areas where the average download speed is above the optimal level of 100 Mbps. We calculated the population in these areas and found that more than one million Kansans (1,009,656) live in areas where our survey recorded average speeds less than 100/20. Once again, the pattern shows an uneven distribution of internet speeds across the state.

Figure 2.7. Less than Optimal Speeds by Zip Code



Our survey also looked at adequacy of the internet service in Kansas. This included optimal speeds, both download and upload, and options available by rural-urban status, as well as difficulty participating in activities and satisfaction with home internet. For the purpose of this study, optimal speeds have been defined as 100 Mbps for download and 20 Mbps for upload.

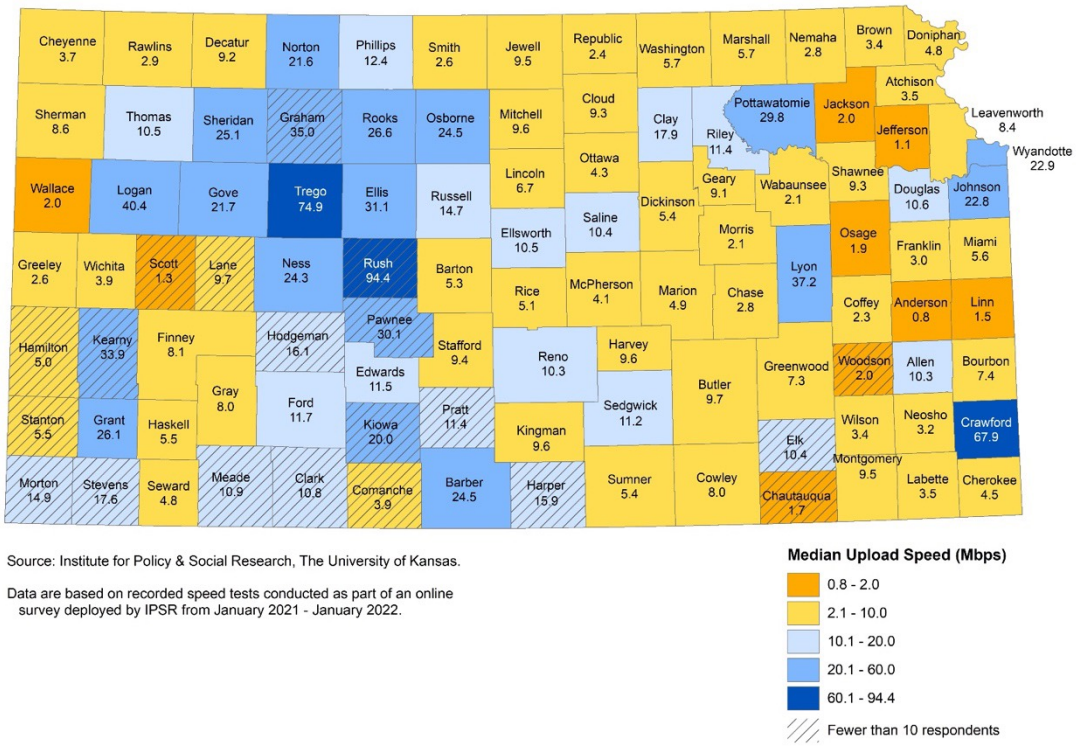
Figure 2.8. Median Download Speed Recorded by County



Figures 2.8 and 2.9 extrapolate the zip code data to the county and illustrate speeds at the county level. Figure 2.8 shows only Crawford County, home of Pittsburg State University, has a median download speed greater than the optimal speed of 100 Mbps. About one-fifth of Kansas counties have a median upload speed greater than the optimal speed of 20 Mbps (Figure 2.9).

Our speed test findings broadly correspond with the broadband index (see figure 2.5). However, the only speed-dependent variable we used to construct the index is the share of users accessing the internet at broadband speed under the current FCC definition of 25 Mbps download and 3 upload. As a result, the IPSR speed test results better illustrate broadband adequacy at the higher speeds that many applications require. Further-

Figure 2.9. Median Upload Speed Recorded by County



Source: Institute for Policy & Social Research, The University of Kansas.

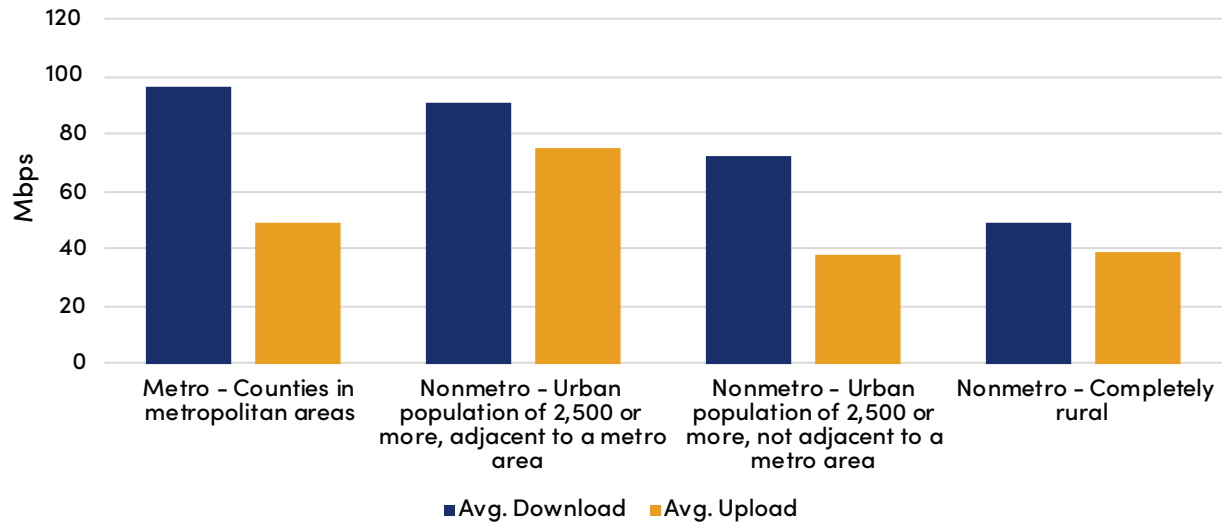
Data are based on recorded speed tests conducted as part of an online survey deployed by IPSR from January 2021 - January 2022.

more, the speed test survey data show that the broadband index overstates adequacy in areas with many users in the military and education sector, where there are likely large numbers of Microsoft devices running frequent updates on a reliable, high-speed connection. Geary County, for instance, is home to many of the government facilities associated with Fort Riley and appears to have much better adequacy based on the broadband index than the speed test results. While counties with research universities still outperform their surrounding areas in the speed test data, the difference is smaller than the broadband index indicates.

We also looked at internet speeds in counties based on USDA's Rural-Urban Continuum, which groups metropolitan counties by their size and nonmetropolitan counties by their urbanization and adjacency to metropolitan areas. (See Appendix A, Map A for the rural-urban status of Kansas counties.) The average download and upload speeds tell a different rural-urban story with average speeds much higher in metro and non-metro adjacent areas versus non-metro not adjacent and completely rural (Figure 2.10). About 57 percent of the respondents resided in metro areas and 8.5 percent in completely rural areas.

Unlike the Microsoft speed data and the broadband index (which is based on the Microsoft data), our speed test found that non-metro counties adjacent to a metro area had higher speeds than non-metro counties not adjacent to a metro area. The most likely explanation for this is that the Microsoft data reflect a share of users accessing the internet at 25 Mbps download or faster, while our speed test data are an average of all users' speeds. All categories along the rural-urban status continuum had an average recorded speed in our survey that was significantly higher than 25 Mbps download. So, the Microsoft data obscures a great deal of variation in speeds above the FCC minimum. Our data suggest that non-metro counties not adjacent to a metro area

Figure 2.10. Average Speeds by Rural-Urban Status

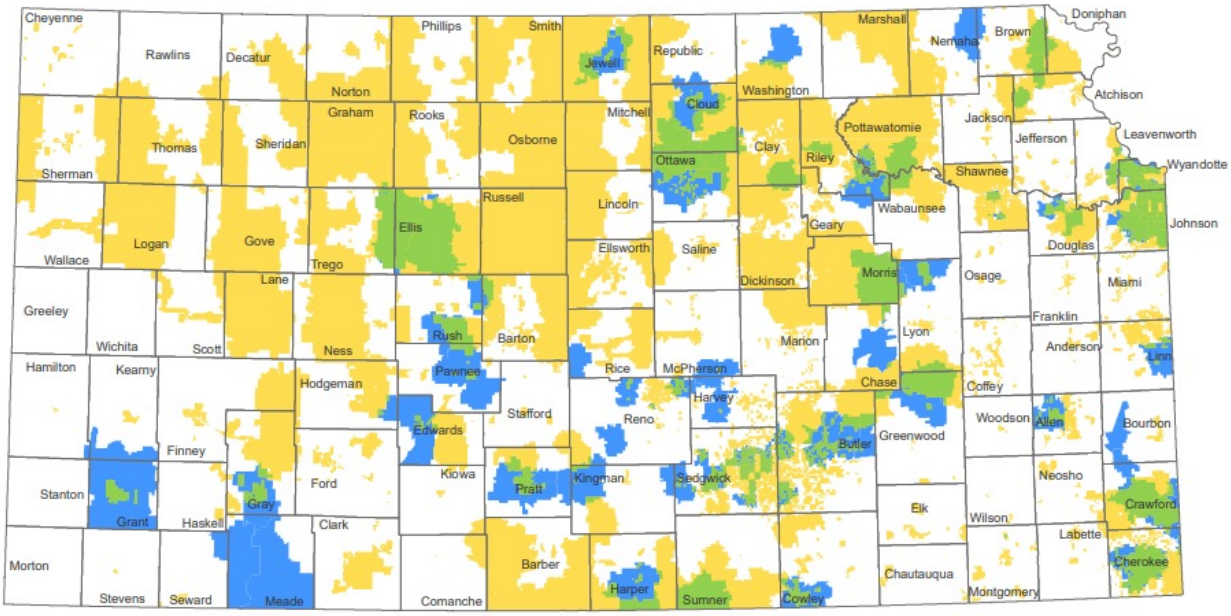


have a greater share of users accessing the internet at speeds above the FCC baseline compared to counties adjacent to a metro area. But these same non-metro counties have a lower average download speed compared with non-metro counties adjacent to a metro area. Further inconsistency between the two measures may come from differences in the sampling methodology between the Microsoft and IPSR speed test data.

In Figure 2.11, we overlaid Census blocks where the FCC reported 100 Mbps download service (in yellow) with the average broadband speeds reported in the IPSR survey (in blue). Green areas show where both sources indicate optimal speeds. The FCC data suggest 85.8 percent of Kansans live in areas that have 100+ Mbps download. Using the 2020 population for zip codes in the blue and green areas on the map, the IPSR

survey suggests that only 43.5 percent of Kansans live in areas with average download speeds of 100 Mbps or more. Furthermore, the IPSR survey and FCC data only overlap 25 percent of the time. It is interesting to note that the largest overlaps occur in Johnson, Wyandotte, Crawford, Cherokee and Ellis Counties. In the larger counties of Shawnee, Douglas, and Sedgwick, the FCC map and IPSR survey data overlap far less; most speed test data in these areas is lower than the FCC reports. With the exception of Ellis and Jewell Counties in northwestern Kansas, the IPSR survey found no evidence of average speeds exceeding 100 Mbps in areas reported by the FCC as having this kind of service.

Figure 2.11. Optimal Speeds in Kansas



Source: Institute for Policy & Social Research, The University of Kansas; Federal Communications Commission (June 2020 V1).

Survey data are based on recorded speed tests conducted as part of an online survey deployed by IPSR from January 2021 - January 2022.

Conclusions

Broadband access is difficult to measure for several reasons. There are few comprehensive sources of public data on internet connectivity, and available data do not always paint the same picture. There are also a variety of approaches to measure broadband access. Industry reported data show only the maximum advertised speed without considering the cost of these services or the speed customers finally receive. Census measures ask respondents to classify their own connection, inviting inconsistency among respondents' own definitions of broadband internet. Speed tests provide a quantifiable and consistent benchmark, but they are difficult to implement on a large scale. Furthermore, it is difficult for researchers to keep up to date, not only because speeds and services available change frequently, but also because newer technologies and expanding practical uses for the internet demand updated definitions of broadband.

This chapter has presented several data sources that, with the exception of industry-reported FCC data, largely tell the same story: broadband access is inadequate in many parts of Kansas. While rural areas have the greatest connectivity problems, even among metropolitan counties our survey found the median download speed among respondents was below the Kansas Department of Commerce's definition of broadband as 100 Mbps. At the county level, only Crawford County had a median download speed greater than 100 Mbps, and only about one fifth of Kansas counties have median upload speeds that meet the Department of Commerce's minimum for broadband. Slow speeds are most common in Southeast Kansas, as well as in rural counties without large population centers around the state. Urban counties show faster speeds, although Census tract-level data suggest that parts of our metropolitan areas also have significant issues with access.

Chapter Three

Access, Adequacy, and Affordability

The COVID-19 pandemic underscored the importance of internet access for schools, health care, and the economy. Businesses, hospitals, schools, governmental agencies, and other key institutions rely on having dependable and adequate internet connections. Our broadband study examines the extent to which better broadband access could aid in economic recovery and resilience, stimulate business, increase income, improve health and educational outcomes, and help to maintain vibrant communities and regions in Kansas. This chapter examines the results of two surveys implemented in 2021 that asked questions about internet access, adequacy, and affordability. The survey also included an Ookla[1] Speedtest to better understand the download and upload speeds experienced by respondents.

IPSR deployed two surveys: the Regents Student Survey and the Kansas Household Survey. Respondents were invited to participate via email from our network of state and local partners, press releases, and social media. For both surveys, the informed consent was followed by an embedded Ookla Speedtest and a link to the survey hosted in Qualtrics.

The Survey and Its Limitations

Survey results were merged with speed tests recorded by Ookla by network ID and timestamp. Records were automatically matched where the user started the survey within two minutes of the speed test. Records without a speed test were individually researched and matched to a speed test where possible. We were able to match 5,583 surveys (85 percent of completed surveys and 81 percent of all surveys) to a speed test (Table 3.1).

The appendix provides details on how the survey was administered.

The survey data used in this study have several limitations. First, respondents to this survey should not be considered a representative sample of the entire Kansas population. This survey was conducted online, and therefore Kansans with no or very limited

[1] Ookla is a web service that provides free internet service analysis. For more information see https://www.speedtest.net/about

Table 3.1. Kansas Broadband Survey: Completions and Speed Test Matches

Survey	# of Survey Respondents	# of Respondents who Completed the Survey	# of Survey Records Matched to a Speed Test
Regents	2,617	2,404	2,038
Kansas Households	4,278	3,602	3,545
Total	6,895	6,006	5,583

internet access would have difficulty participating. Because this was a voluntary survey, response bias likely also affected the results, especially the qualitative responses. Potential respondents with particularly strong feelings are more likely to participate, which may mean that dissatisfied customers are overrepresented.

Second, survey results were collected along with respondents' zip code, and data were then aggregated by zip code and other well-defined geographic levels. This method allows us to create county and regional maps and to examine the relationship between survey results and other data available at those geographies. Zip codes do not always fit within other geographic levels, however, so the resulting figures and maps may not perfectly reflect every respondent's location.

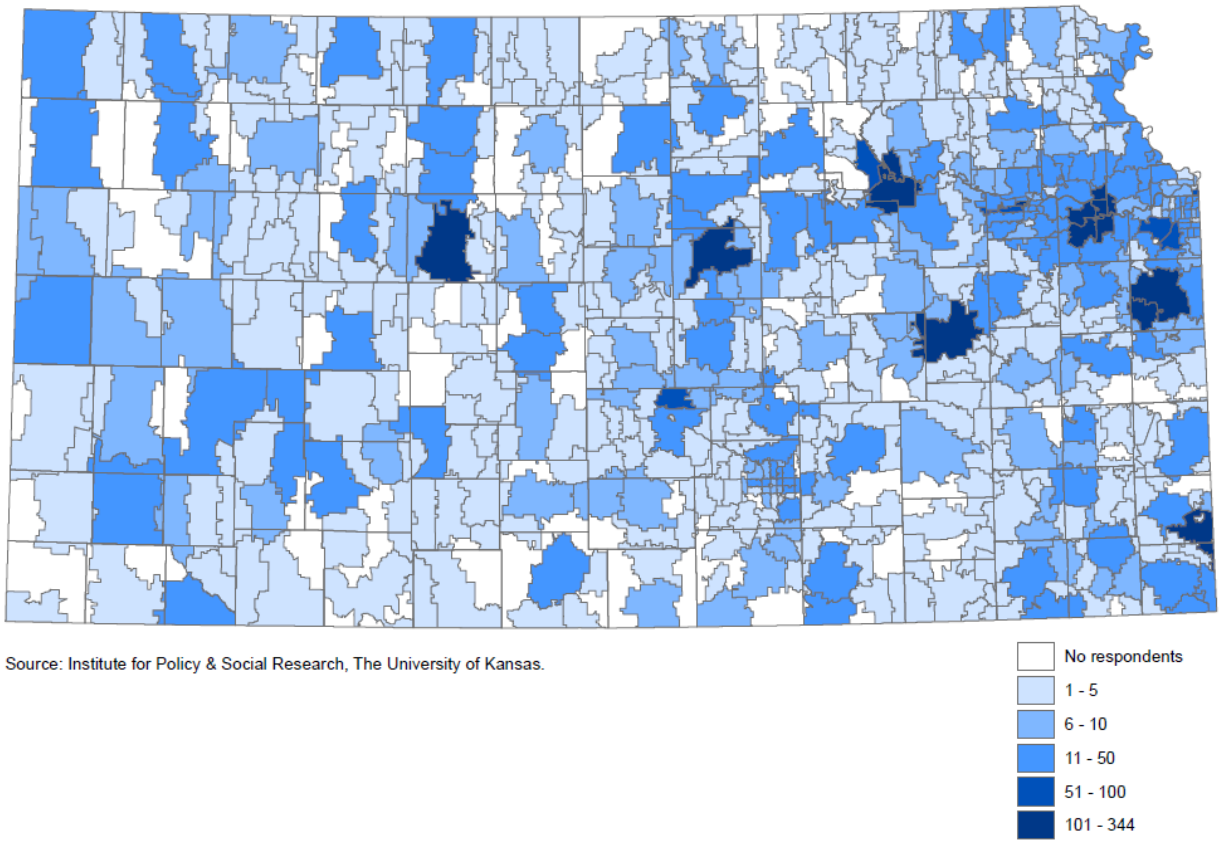
Finally, this survey sought to capture speed and customer sentiment around actual internet use, rather than investigate the best available internet service and plan in any geographic area. Internet customers may have less-than-optimal internet speeds and satisfaction with their current plan for a variety of reasons apart from availability in their area, including financial constraints, the devices they use to connect, the consumer's knowledge of services available, and the importance of internet access in their specific household. Chapter 2 of this report presents the FCC map that shows industry-reported maximum available speeds in areas of Kansas, and this map can be used to contextualize the survey data. We believe our approach best investigates a broader conception of internet access: defining access as internet connectivity under present circumstances rather than the theoretical best local option. It follows that the speed test and questionnaire data cannot be used to refute claims about maximum available speed as made by internet providers. Instead, these data give us a picture of the service that actual users in Kansas experience.

Survey Respondent Characteristics

Kansas has 712 zip code tabulation areas in the 2020 Census TIGER/Line boundary file. We received a zip code from one or more respondents in 557 Kansas zip codes (see Figure 3.1). Ninety-five of these zip codes had an average recorded speed test that was less than 25 Mbps down and 3 Mbps up and 295 zip codes demonstrated average speeds less than 100 Mbps down and 20 Mbps up. In 2020, 87,099 Kansans (3 percent) lived in zip codes where our survey recorded an average speed less than 25/3. This is comparable to the estimated 2.4 percent of Kansans living in Census Blocks where internet providers reported to the FCC maximum advertised speeds less than 25/3. More than one million Kansans (1,009,656) live in areas where our survey recorded average speeds of less than 100/20. According to the FCC, however, only 392,828 Kansans live in a Census block with a maximum advertised speed of less than 100/20.

Figure 3.1 below and map A1 in the appendix illustrate that responses were received across the state with two or more respondents from every county in Kansas, with more responses coming from the eastern half and urban areas of Kansas.

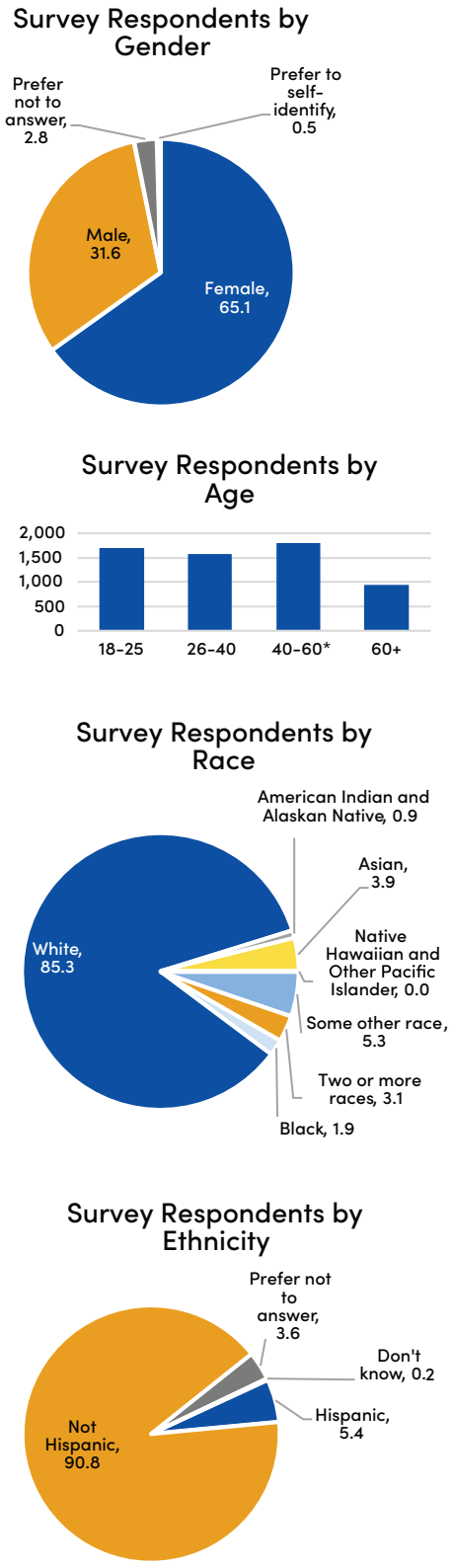
Figure 3.1. Kansas Broadband Survey Respondents by Zip Code



Source: Institute for Policy & Social Research, The University of Kansas.

In general, the respondents to the Kansas Broadband surveys were more likely to be female, and younger than the general population (Figure 3.2). The survey captured racial and ethnic diversity similar to the Kansas population for American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, white, and people with two or more races. The survey did not capture a proportion of Black or Hispanic respondents similar to the Kansas population. The Kansas median income, $59,597 per the 2015-2019 ACS, fell within the median income range for the survey respondents. Kansas women are overrepresented in the survey, with 65.1 percent of respondents identifying as female, while only 50.2 percent of all Kansas residents are female per the 2019 Single Year of Age by Sex, Race, and Hispanic Origin estimates (Appendix C, Table 1). Furthermore, survey respondents tended to be younger than the overall state population. The share of respondents reporting that they were aged 18-25 was 28.2 percent in the survey, compared to 11.5 in the 2019 Kansas single year of age estimates from the Census Bureau. This is a result of the survey being sent to students at Regents institutions. Similarly, only 15.8 percent of respondents were age 60 or older, compared with 22.6 percent of the overall Kansas popula-

Figure 3.2



tion. Additionally, only 1.9 percent of the sample population identified as Black, whereas 5.7 percent of the total state population identified as Black in the 2015-2019 American Community Survey estimates (Appendix C, Table 2). Additionally, respondents on average received more formal education than the Kansas population (Appendix C, Table 3). Further information about the survey sample and Kansas total age, sex and race/ethnicity estimates, educational attainment, and family income can be found in Appendix C, Tables 1-3.

Table 3.2. Survey Respondents: Where They Reside & Device Used

	Yes	No	% Yes	N=	% Total
Survey					
Households	2,571	1,674	60.6	4,245	62.0
Regents	2,262	342	86.9	2,604	38.0
Total	**4,833**	**2,016**	**70.6**	**6,849**	
Device Used to Complete Survey					
Computer	1,069	550	66.0	1,619	38.3
Mobile device	1,468	1,105	57.1	2,573	60.9
Other	20	12	62.5	32	0.8
Total	**2,557**	**1,667**	**60.5**	**4,224**	

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Tables 3.2 and 3.3 break down the respondents by whether or not they reside within city limits, the device they used to complete the survey, employment status, and whether or not they work from home. The majority of the respondents lived within the city limits (71 percent), completed the survey on a mobile device (61 percent), and were employed (76 percent)[2]. Almost 87 percent of the respondents to the Regents Student Survey resided in the city limits compared to 61 percent of the Kansas Household Survey respondents (Table 3.1). About 31 percent were working from home in January 2020 right before the pandemic hit and 28 percent indicated that they were currently working from home when they took the survey in 2021 (Table 3.2). Almost 46 percent said they were able to do their job from home.

[2] The employment question was omitted from the Regent Student survey.

Table 3.3. Survey Respondents: Employment Status & Work from Home

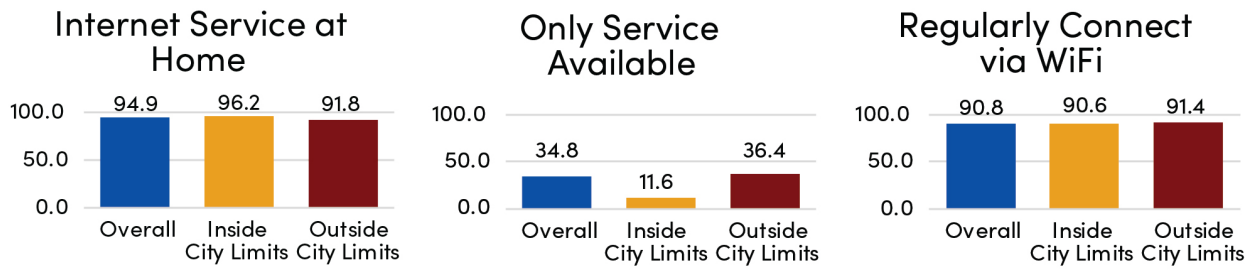
	Reside within City Limits				
Employment Situation	**Yes**	**No**	**% Yes**	**N=**	**% Total**
Currently Employed					
Yes	1,665	1,091	60.4	2,756	76.0
No	201	113	64.0	314	8.7
Retired	277	281	49.6	558	15.4
Total	**2,143**	**1,485**	**59.1**	**3,628**	
Working from Home in January 2020					
Yes	609	519	54.0	1,128	31.1
No	1,527	969	61.2	2,496	68.9
Total	**2,136**	**1,488**	**58.9**	**3,624**	
Currently Working from Home					
Yes	496	429	53.6	925	28.1
No	1,432	937	60.4	2,369	71.9
Total	**1,928**	**1,366**	**58.5**	**3,294**	
Able to Do Your Job from Home					
Yes	872	628	58.1	1,500	45.7
No	807	520	60.8	1,327	40.4
Not Applicable	243	215	53.1	458	13.9
Total	**1,922**	**1,363**	**58.5**	**3,285**	

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Access and Speeds

The survey focused on options available at home, not at their place of employment. The vast majority of our respondents have internet service at home and regularly connect to WiFi, whether or not they live inside city limits (Figure 3.3). Among our respondents, almost 35 percent said that they subscribe to the only service available in their area,

Figure 3.3.



with those outside city limits were much more likely to report no alternatives. While almost 95 percent of the respondents indicated that they subscribed to internet service at home, nearly one-quarter (23 percent) said they regularly travel outside the home to access the internet (Table 3.4). A little over one-third (34.3 percent) of respondents subscribe to cable internet service, followed by 18 percent to fiber, and about 12 percent to fixed wireless (see Table 4 in the appendix). For people living outside the city limits, satellite service is the most used option, followed by fixed wireless. Roughly 13 percent of the respondents did not know what kind of service they subscribed to at home. For those respondents that indicated they had no internet service at home, the top three reasons were that the monthly cost was too expensive, internet was not available at an acceptable speed, and internet service was not available.

Cost is the top reason that respondents living in cities do not have internet at home. Not having internet service available at an acceptable speed is the top reason for respondents outside of cities.

When asked about high-speed internet service (25/3), 40 percent of respondents said they would like to have broadband at home, 40 percent said they already have 25/3 at home, and the remaining roughly 20 percent responded they did not want or did not know if they wanted 25/3. Respondents on the Regents survey indicated the number

Table 3.4. Broadband Access in Kansas: Internet Service at Home

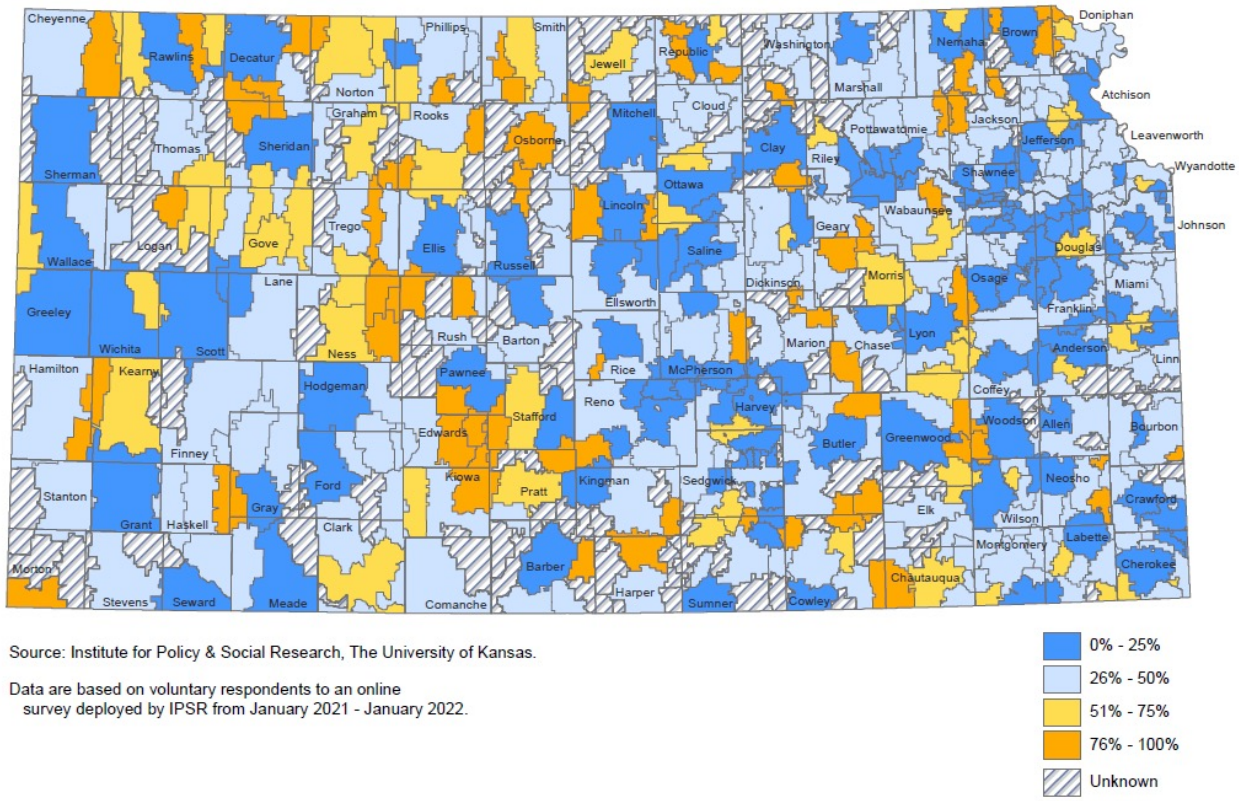
Subscribe to Internet Service at Home	Yes	No	Percent Yes	N=	% Total
Households Survey	3,927	226	94.6	4,153	63.2
Regents Survey	2,308	109	95.5	2,417	36.8
Total	**6,235**	**335**	**94.9**	**6,570**	
Regularly Travel Outside the Home to Access the Internet					
Households Survey	971	2,827	25.6	3,798	57.8
Regents Survey	453	2,058	18.0	2,511	38.2
Total	**1,424**	**4,885**	**22.6**	**6,309**	

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

one reason for not already having high-speed internet was cost, whereas respondents to the household survey indicated that service not being available was their primary reason for not having high-speed internet at home.

Figure 3.3 illustrates the percent of respondents reporting only one internet service provider. While some areas are unknown (no respondents), the map does illustrate the uneven distribution and access across Kansas. The orange areas show parts of the state where more than 75 percent of the respondents said they had only one option. The blue areas illustrate where more than one option is available. This map shows that, even in metropolitan counties such as Johnson, Sedgwick and Wyandotte, some residents have only one potential service provider.

Figure 3.3. Percent of Respondents Reporting One ISP by Zip Code



Source: Institute for Policy & Social Research, The University of Kansas.

Data are based on voluntary respondents to an online survey deployed by IPSR from January 2021 - January 2022.

Types of Internet Access

Survey respondents indicated several types of home internet connection are available. Cable, the most common type of connection, delivers service over cable television lines through a modem. Digital Subscriber Line, or DSL, connections provide internet access through landline telephone lines. Dial-up connections, which had the slowest average upload and download speeds, similarly use phone line connections, but require users to link their phones to a computer in order to access the internet. Fiber, the fastest type of connection, uses light to transmit data over fiber optic cables. Fixed wireless connections use radio antennas to connect households and businesses to a fixed wireless hub nearby that provides service for the area. Mobile internet connections use cellular telephone connections to access the internet. Satellite internet connections rely on communication satellites to relay data between end users and service providers.
Figure 3.4 shows the types of connections respondents use at home by city residency.

Over 1/3 of respondents connect with the only service available to them

Figure 3.4. Type of Internet Service at Home

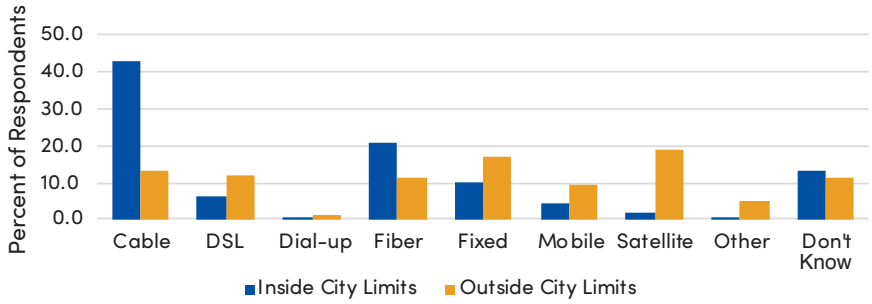
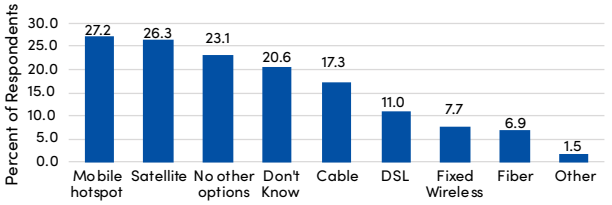


Figure 3.5. Reasons for Selecting Current Service

Figure 3.6. Other Options for Home Internet Service



Inside city limits, cable connections were by far the most common connection type. In rural areas, however, responses were more mixed, with the largest portion of respondents using satellite internet at 19 percent. For more detailed data on survey respondents' types of connections, see Table 4 in the appendix.

Figure 3.5 lists the reasons why individuals selected the service option they did; respondents could select more than one option. About 35 percent of respondents indicated that their current internet service was the only option available. One in four respondents said it was the fastest option available, 24 percent said it was the best-priced option available, and 22 percent said it was the most reliable option available. When asked about other options for home, mobile hotspot and satellite were listed by nearly a third of respondents (Figure 3.6). About 23 percent said there were no other options. About one in five did not know what other options were available for home internet service. The most common other option for internet service among our respondents was a mobile hotspot, with 27 percent of respondents indicating that it was available (figure

Table 3.5. Broadband Access in Kansas: Internet Service Options

Reasons Why Selected	Number	Percent
Only service available	1,293	34.8
Fastest option available	934	25.1
Best priced option available	903	24.3
Most reliable option available	815	21.9
Best option bundled with other services	490	13.2
Other	291	7.8
N=*	3,717	
Other Options for Home Internet Service		
Mobile hotspot	988	27.2
Satellite	955	26.3
No other options	840	23.1
Don't Know	747	20.6
Cable	629	17.3
DSL	400	11.0
Fixed Wireless	280	7.7
Fiber	252	6.9
Other	55	1.5
N=*	3,629	

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

* Number of persons answering the question; does not sum to total as a household can have more than one reason.

3.6). This was followed by satellite (26 percent) and cable (17 percent).
Table 3.6 looks at how people are connecting at home and provides a breakdown by city residency. Over half the respondents indicated that they connect both by cell phone and another device equally. Over 90 percent regularly connect using a wireless router. About 20 percent have a data cap on their service at home and a little over 30 percent do not know if they have a data cap.

Table 3.6. Broadband Access in Kansas: How Connect at Home

	Reside within City Limits			
How Connect	**Yes**	**No**	**Total**	**% Total**
Both cell phone or other device* equally	2,289	884	3,173	52.9
Mostly on cell phone	852	426	1,278	21.3
Mostly on some other device*	797	409	1,206	20.1
Depends	198	28	226	3.8
Other	65	48	113	1.9
Total	**4,201**	**1,795**	**5,996**	
How Regularly Connect	**Yes**	**No**	**Total**	**Percent Total**
Use a wireless router	3,839	1,567	5,406	90.8
Do not use a wireless router	199	95	294	4.9
Other	21	8	29	0.5
Do not know	178	44	222	3.7
Total	**4,237**	**1,714**	**5,951**	
Data Cap on Service at Home	**Yes**	**No**	**Total**	**Percent Total**
Yes	805	369	1,174	19.7
No	1,966	960	2,926	49.2
Other	12	20	32	0.5
Do not know	1,453	366	1,819	30.6
Total	**4,236**	**1,715**	**5,951**	

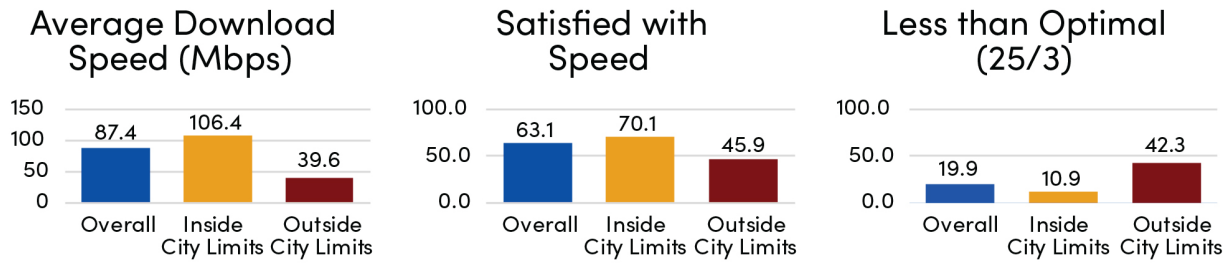
Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Other device includes desktop, laptop, or tablet computer

Broadband Speed Adequacy

Figure 3.7 shows survey respondents' average download speed and satisfaction with their speed by location within or outside city limits. Inside city limits, the average download speed for respondents was 106 Mbps, and 70 percent reported satisfaction with the speed of their connection. Outside city limits the average download speed was less than 40 Mbps and only 46 percent of respondents were satisfied. Additionally, only around 11 percent of respondents within city limits recorded less than optimal speeds (25 Mbps download and 3 Mbps upload), compared with 42 percent outside city limits. This illustrates the disparity in adequate internet access between urban and rural Kansans.

Figure 3.7.



We also looked at internet speeds in counties based on the USDA's Rural-Urban Continuum (see Chapter 2, Appendix B for the rural-urban status of Kansas counties). Table 3.7 shows the responses to whether or not higher internet speed options are available based on this rural-urban status. Regardless of whether the respondent lived in a rural or urban area, 40 to 42 percent indicated that higher speeds were available and 23 to 30 percent did not know. Respondents in completely rural areas were the least likely to know whether or not higher speeds were available.

Furthermore, we asked people who were not completely satisfied with their home internet speeds about their difficulties participating in certain activities (Table 3.8). Respondents could select multiple activities, and here we report the percentage of respondents who identified each activity as difficult to participate in because of internet speeds. The top three reported activities with which people had the most difficulty were streaming content (71.5 percent), video conferencing or video calls (66.1 percent), and downloading content (58.6 percent). Only 7 percent of the 3,405 respondents who provided an answer indicated that they had no difficulties. These results, based on the survey, contradict download speeds reported by Microsoft that show higher download speeds

Table 3.7. Broadband Adequacy in Kansas: Higher Internet Speed Available by Rural-Urban Status

	Higher Speeds Available Percent N=			
Rural-Urban Status	**Yes**	**No**	**Don't Know**	**N=**
Metro - Counties in metropolitan areas	40.0	35.6	24.4	1,722
Nonmetro - Urban population of 2,500 or more, adjacent to a metro area	42.5	34.8	22.7	865
Nonmetro - Urban population of 2,500 or more, not adjacent to a metro area	41.3	30.1	28.6	1,935
Completely Rural	40.6	29.8	29.6	1,057
Total	**40.7**	**32.7**	**26.7**	**3,657**

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Rural-Urban combination of Rural-Urban Continuum Codes (RUCC), an official classification scheme that distinguishes counties by their metropolitan size and nonmetropolitan counties by their degree of urbanization and adjacency to metro areas.

in counties not adjacent to a metropolitan area. These results are consistent with the speeds measured by our speed test.

We partnered with the Docking Institute at Fort Hays State University which conducts the Kansas Speaks Survey to ask two questions about broadband adequacy. We compared our results on difficulties with the internet to those found in the Kansas Speaks Fall 2021 Statewide Public Opinion Survey (Zollinger et al. 2022). The Kansas Speaks survey yielded the same top three difficulties: streaming content (26.2 percent), downloading content (25.2 percent), and videoconferencing (21.6 percent). While the surveys asked these questions differently, it is important to note that nearly half of Kansas Speaks respondents reported no difficulties. This discrepancy may be attributable to sampling bias in our broadband survey. Those who participated in our survey likely have stronger opinions on their internet access than respondents to the more general Kansas Speaks survey.

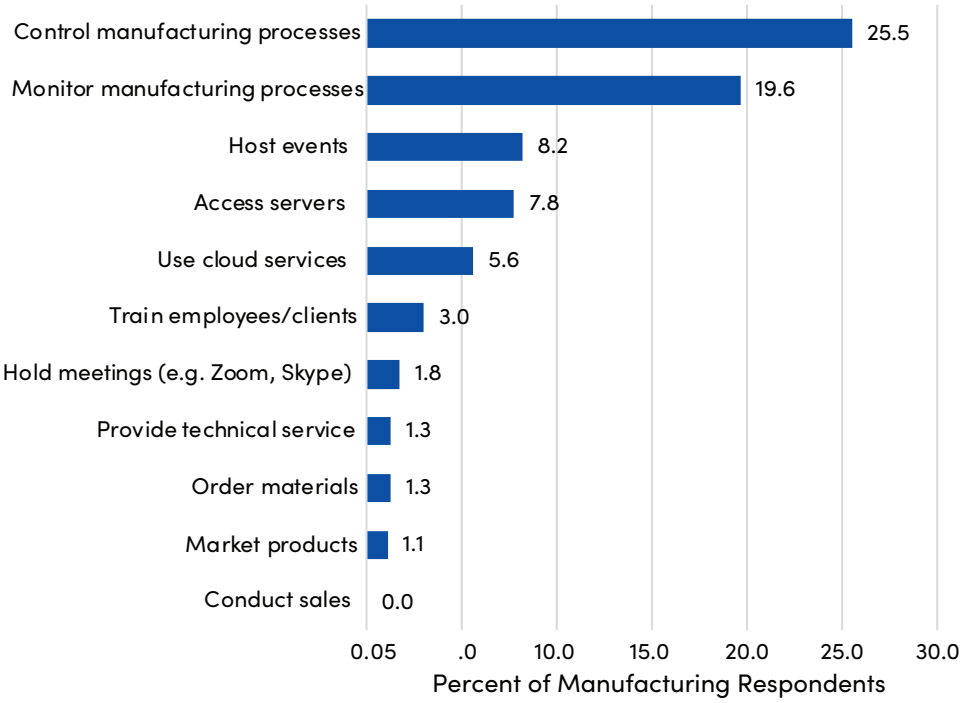
We also partnered with Kansas State University in their survey of manufacturers. They asked 129 manufacturing companies about the difficulties they had with their broadband service. Figure 3.8 shows that 25 percent of respondents had difficulty with controlling manufacturing processes and another 20 percent experienced problems with monitoring manufacturing processes due to inadequate internet. This is important to note, because although this report is mainly concerned with household broadband connections, poor broadband affects Kansas businesses as well.

Table 3.8.
Broadband Adequacy in Kansas: Difficulties Participating in Activities

	Reside within City Limits			
Activities that are Difficult to Participate	**Yes**	**No**	**Total**	**Percent**
				N=3,405
Streaming content	1,400	1,035	2,436	71.5
Videoconferencing or video calls	1,316	934	2,251	66.1
Downloading content	1,102	895	1,997	58.6
Uploading content	940	768	1,709	50.2
Participating in real-time discussion or collaborative documents	671	566	1,238	36.4
Gaming	655	418	1,073	31.5
Audio calls	514	424	939	27.6
Social media	524	389	913	26.8
Email	447	342	789	23.2
No difficulties	184	57	241	7.1
Other	81	62	143	4.2

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.
N is number of respondents. Table shows percentage of respondents indicating they had difficulty with each activity.

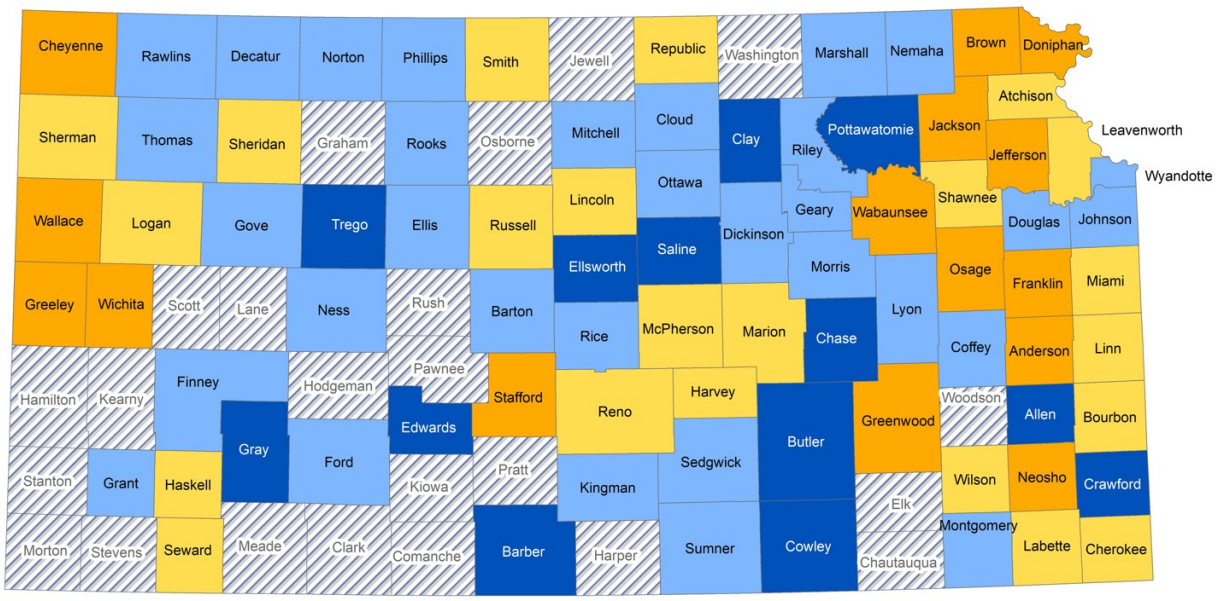
Figure 3.8. Inadequate Broadband for Manufacturing



Satisfaction with Broadband Speeds

Figure 3.9 shows the percent of respondents who said they were satisfied or somewhat satisfied with their internet speed at home by county. Respondents were generally satisfied or somewhat satisfied with their internet speeds at home. In more than half of the Kansas counties, more than 50 percent of the people are satisfied with their internet speeds. About 22 percent of the counties did not have enough responses to reliably determine satisfaction. There is no clear pattern across the rural-urban continuum in terms of respondents' satisfaction with broadband speed. At least 74 percent of those in two metropolitan counties, Pottawatomie and Butler, were satisfied with internet speeds at home. Respondents in several rural counties across the state, such as Trego, Gray, and Barber Counties, reported similar rates of satisfaction, as did some respondents in non-metro counties adjacent to a metro area and non-metro counties not adjacent to a metro area. Most of the counties with fewer than 45.5 percent satis-

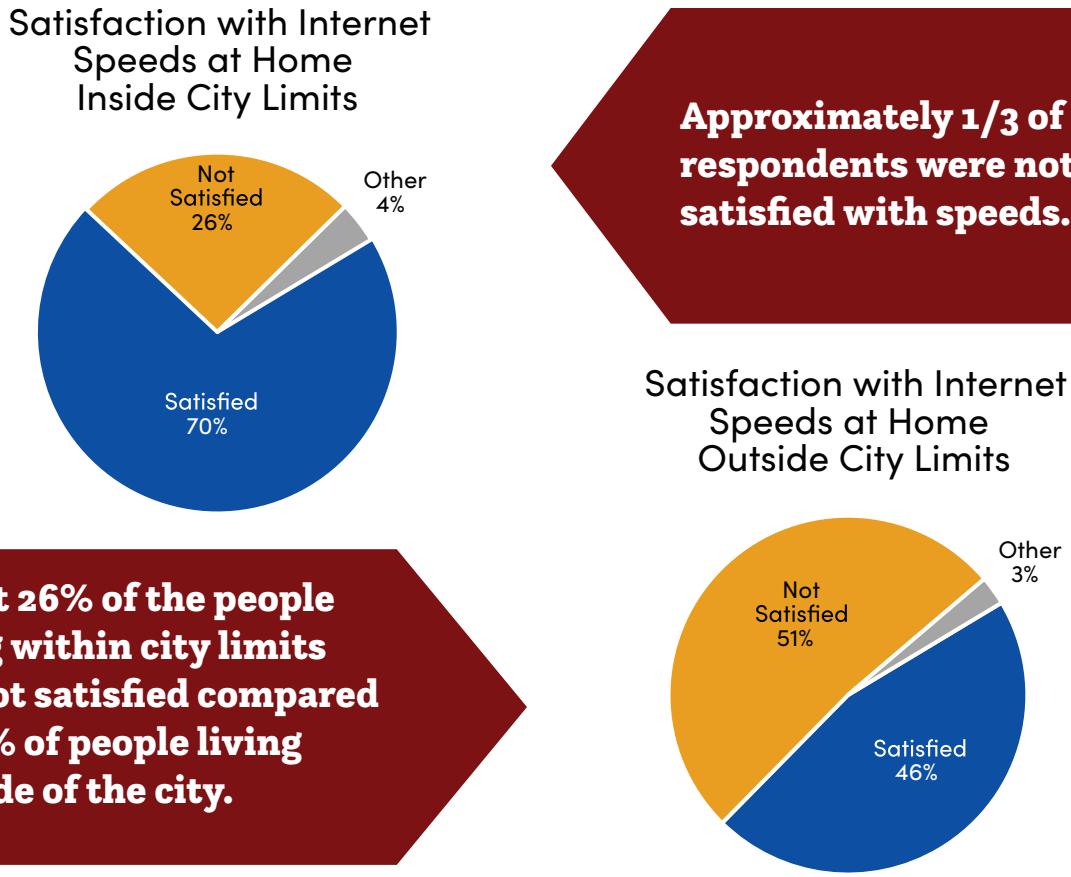
Figure 3.9. Percent of Respondents Satisfied or Somewhat Satisfied with Internet Speeds at Home



fied were in the greater Kansas City metropolitan area or adjacent to it. Rural counties in the far west also saw low satisfaction rates, as did Stafford County in central Kansas. This shows that dissatisfaction with broadband speeds is not exclusively a rural issue.

A breakdown of satisfaction with home internet speeds by city limits can be found in Figure 3.10. Looking at satisfaction by city limits, 70 percent of the respondents in the city limits are satisfied compared to 46 percent of the respondents that live outside the city. About 26 percent of the people living within the city limit are not satisfied compared to 51 percent of the people living outside the city.

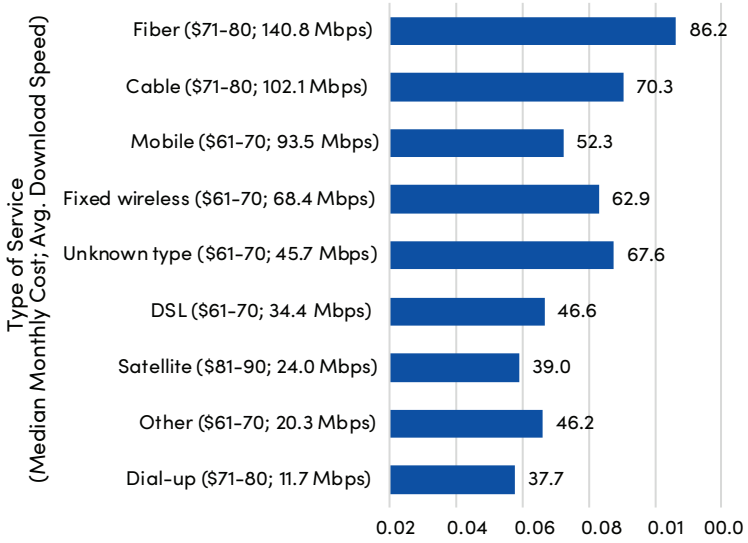
Figure 3.10.



We examined people's satisfaction with their internet speed and cost by type of service (Figure 3.11). Satisfaction was highest for the service that provided the fastest speeds. People are most satisfied with the speeds of fiber (86.2 percent), cable (70.3 percent) and fixed wireless connections (62.9 percent). These are also the three most frequently reported types of service, with cable and fiber more common among respondents within city limits and fixed wireless more common outside. Almost 12 percent did not

know what type of service they had but about two-thirds were satisfied with the speed of their unknown service. Satellite internet, the most common type of connection among respondents living outside city limits, had second lowest satisfaction among survey respondents by type of service. Although respondents with satellite had relatively low speeds, they reported the highest monthly cost. Dial-up internet saw the lowest share of satisfied users, but represented less than 1 percent of the survey sampled.

Figure 3.11. Percent of Respondents Satisfied with Current Speed by Type of Service



Affordability

Less than 1/3 of respondents were satisfied with the cost of broadband. Less than 1/4 of respondents outside of city limits were satisfied with cost, despite being willing to pay more for better service.

With regard to affordability, our survey asked questions about cost per month for service and looked at breakdowns by city limits, average speeds, willingness to pay for service and sensitivity to price increases. We also looked at satisfaction with the price paid.

Half of respondents pay between $41 and $80 per month for internet service (Table 3.9). Around 18 percent of the respondents paid more than $100 for monthly service. A little over 6 percent of the respondents did not know what they paid monthly for internet

Figure 3.12.

service. Our findings suggest that respondents who pay more receive better service, i.e. higher average download and upload speeds. None of the price ranges had an average download speed greater than the 100 Mbps optimal download speed, however. All the average upload speeds for each price range are greater than the 20 Mbps optimal upload speed.

Table 3.9.
Broadband Affordability in Kansas: Amount Paid and Average Speeds

Monthly Amount Paid	Respondents	Avg. Download	Avg. Upload	Percent of Total
$10-40	215	40	26	5.8
$41-60	944	49	25	25.4
$61-80	909	81	52	24.4
$81-100	733	82	38	19.7
Over $100	680	96	49	18.3
Don't Know	237	69	44	6.4
Total	3,718	73	40	

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Table 3.10 breaks down the monthly amount paid for internet service by total family income. Around 13 percent of the respondents had a total family income of $150,000 or more in 2020. This table shows that people at all income levels pay different amounts for internet service. In general, however, higher-income households spend more on service. While the internet is a critical service for all families, those with higher-income have more options for internet packages which may be out of reach for lower-income households.

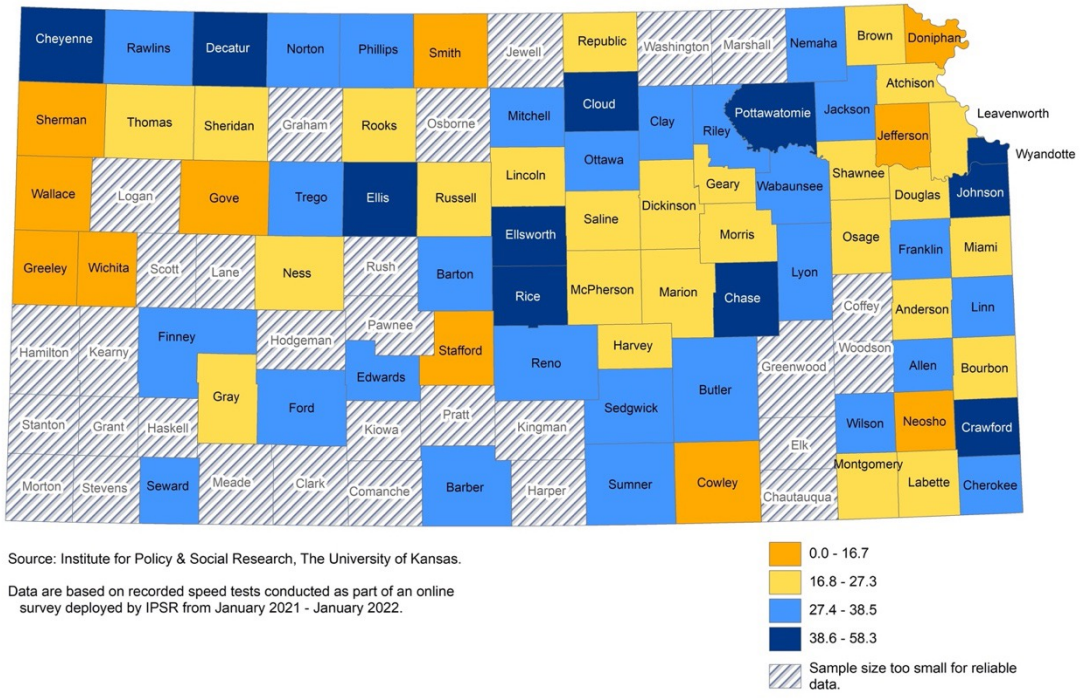
Table 3.10. Broadband Affordability in Kansas: Amount Paid by Family Income

			Total Family Income in 2020 from All Sources before Taxes						
Monthly Amount Paid	Number	% of Total	Under $30,000	$30,000 to under $50,000	$50,000 to under $75,000	$75,000 to under $100,000	$100,000 to under $150,000	$150,000 or More	Don't Know
$10-40	186	5.7	39	25	32	48	19	16	7
$41-60	848	25.9	74	160	200	147	130	83	54
$61-80	798	24.3	75	124	174	144	142	96	43
$81-100	654	20.0	47	90	114	119	138	104	42
Over $100	611	18.6	49	74	90	118	131	108	41
Don't Know	181	5.5	10	26	33	27	28	19	38
Total	3,278		294	499	643	603	588	426	225
% of Total			9.0	15.2	19.6	18.4	17.9	13.0	6.9

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Figure 3.13 displays satisfaction with the price paid for home internet by Kansas county. As in the map showing satisfaction with internet speed, even in many urban areas respondents were not satisfied with the price of their service. Less than 27.4 percent of

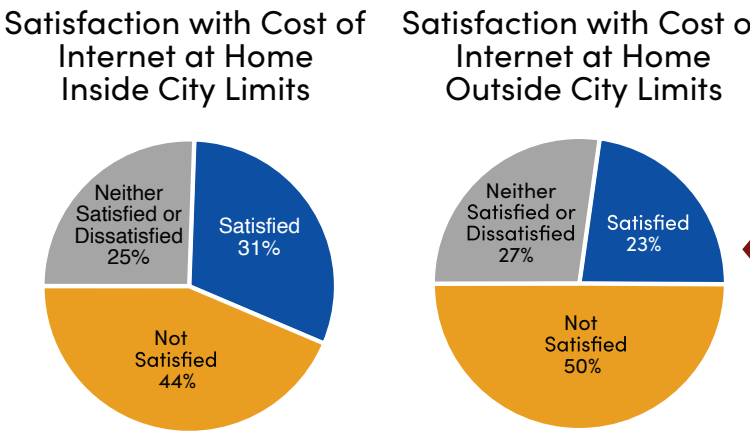
Figure 3.13. Percent of Respondents Satisfied or Very Satisfied with Monthly Cost of Internet Service at Home



respondents in most counties of Northeast Kansas, including the urban areas of Topeka, Lawrence, and parts of the Kansas City metro region were satisfied or very satisfied with their monthly internet bill. In rural Kansas, the counties on our western border report the greatest levels of dissatisfaction. all saw Fewer than 16.7 percent of respondents in Sherman, Wallace, Greeley, and Wichita Counties indicate that they were satisfied or very satisfied with service costs.

A breakdown of satisfaction with home internet costs by city limits can be found in figure 3.14. This shows that close to half (46 percent) of respondents are not satisfied with the cost of their internet service. With regard to respondent satisfaction by city limits, 31 percent of the respondents in the city limits are satisfied with their service, compared to 23 percent of the respondents that live outside the city. About 44 percent of the people living within city limits are not satisfied with their internet service compared to 50 percent of the people living outside the city.

Figure 3.14.



Close to half of respondents were not satisfied with costs. About 44% of people living within the city limit are not satisfied compared to 50% of the people living outside the city limit.

We also looked at price satisfaction and found that people that are more dissatisfied with their service are paying more for their service, and their average speeds are lower. The most dissatisfied were paying $91 to $100 per month for average download speeds of 57 Mbps. (Table 3.11). Unsurprisingly, respondents indicating that they are very satisfied with the price they pay have the lowest median monthly price paid ($51 to 60) and the highest average speeds (134 down/112 up).

Figure 3.15 reports satisfaction with cost of service. Customers with fiber reported the highest rate of price satisfaction (50 percent) at $71-80 but also the highest speed of

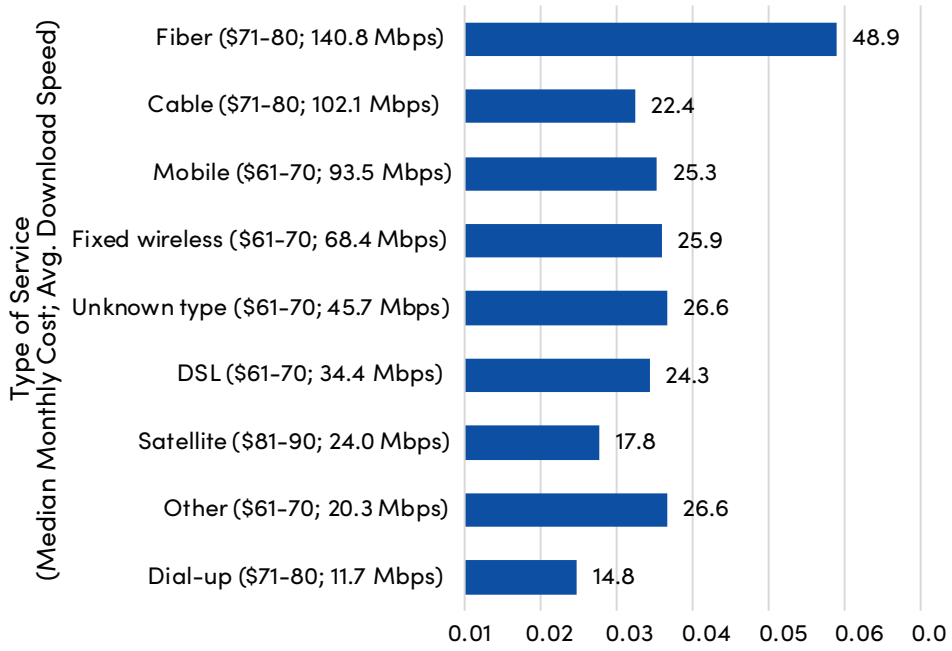
Table 3.11. Broadband Affordability in Kansas: Price Satisfaction at Home by Price Paid and Speed

Satisfaction of Price	Number	Percent of Respondents	Median Monthly Price Paid	Avg. Download	Avg. Upload
Very dissatisfied	535	14.4	$91-100	57	22
Dissatisfied	1,179	31.7	$81-90	65	26
Neither satisfied or dissatisfied	975	26.2	$61-70	67	34
Satisfied	742	19.9	$61-70	76	48
Very satisfied	292	7.8	$51-60	134	112
Total	3,723				

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

141 Mbps download. Those with cable have costs similar to fiber, but the speed performance is lower at 102 Mbps, and the rate of satisfaction is only at 22 percent. Satellite service is the most expensive ($81 to $90 per month), but with much lower speeds of 24 Mbps (this does not even count as broadband under the outdated measure). This combination leads to one of the lowest rates of satisfaction (18 percent).

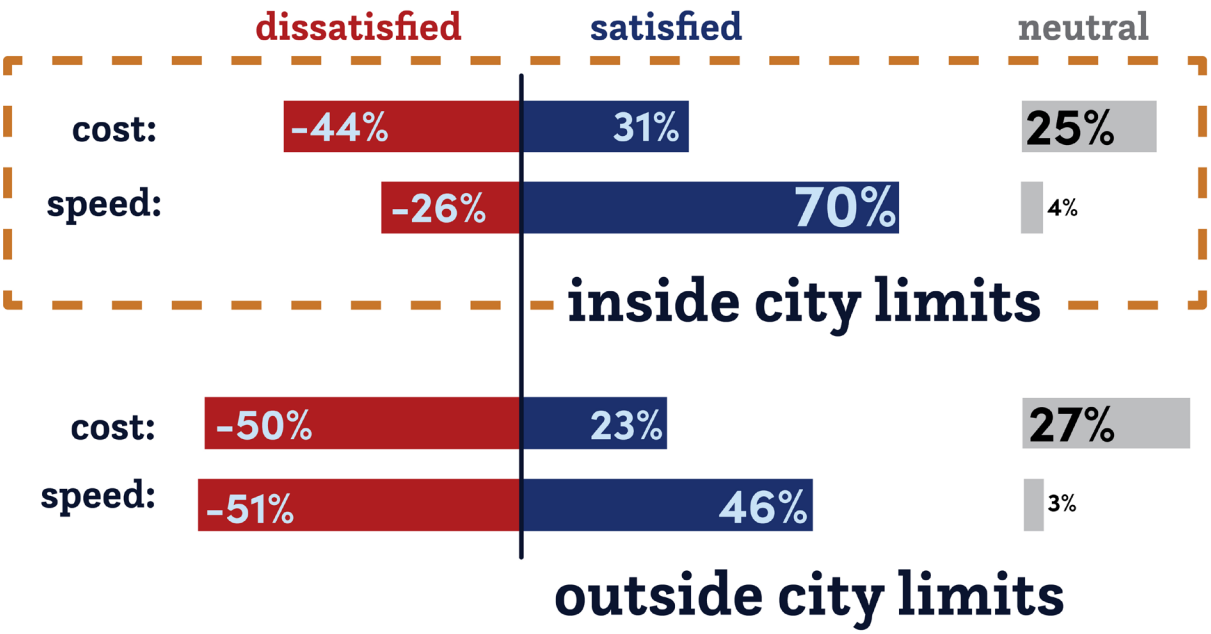
Figure 3.15. Percent of Respondents Satisfied with Current Monthly Cost by Service Type



Satisfaction with Both Speed and Affordability

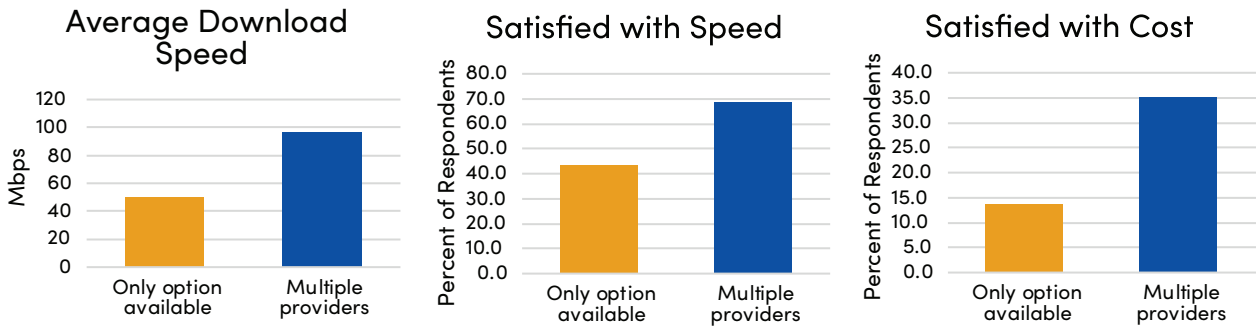
Survey respondents' satisfaction with the cost of home internet service inside and outside of city limits is compared with satisfaction with speed in Figure 3.16. Outside city limits, 50 percent of respondents were not satisfied with the cost of their service, compared with 44 percent in the city. Similarly, 31 percent of our respondents who lived within city limits were satisfied with their internet bill, compared with only 23 percent outside city limits. When it comes to speed, 51 percent of those outside of city limits are dissatisfied compared with only 26 percent inside the city limits. Although the disparity between satisfaction levels with cost was smaller than with speed, these findings support the conclusion that rural residents pay more and receive slower service. It is noteworthy that customers within city limits were more likely to say they were dissatisfied with cost, while half of those outside city limits reported that they were dissatisfied with both speed and cost.

Figure 3.16. Home Internet Satisfaction Across Kansas



Another way to evaluate satisfaction is associated with choice. Figure 3.17 shows the share of respondents satisfied with speed and cost, as well as average download speed, among those who had other providers for service and those who only had one option. Average download speeds were significantly faster for those with multiple options, at 96 Mbps, compared with 50 Mbps for those with only one potential service provider. Among those with only one option, 43 percent were satisfied with their connection

Figure 3.17.



speed and 14 percent were satisfied with cost. Among those with multiple options, 68 percent were satisfied with their connection speed and 35 percent were satisfied with cost.

These findings suggest that having multiple providers to choose from positively affects both the quality of internet service and its cost to consumers.

Willingness to Pay for Broadband

Our survey asked for respondents' willingness to pay for various hypothetical service packages and evaluated their responses by total family income (Table 5 in the appendix). Most notable is that families making less than $30,000 a year are still willing to pay more than $100 a month for fast internet service, indicating that fast service is worth it, even on a tight budget.

Figure 3.18 shows respondents' median family income by the package they chose. Middle income households were willing to pay $45 per month for 50 Mbps down and 10 Mbps up. As the packages get more expensive, the median family income of those willing to pay for them increased; that is, higher-income families were willing to pay for better service. The most popular packages among the entire sample were the $65 per month option with 100 Mbps down and 20 Mbps up and the $100 per month option with 1 gigabit down and 20 Mbps up. The option between these two packages attracted fewer respondents even though median family income was constant across all three, suggesting that consumers are generally not willing to pay more than $65 a month without getting significantly better service. Despite this, figure 3.19 shows that some people do not want to see any price increase at all. Even a $20 price increase elicited a few responses that people would move to another location with other options. About

Figure 3.18. Willingness to Pay for Service

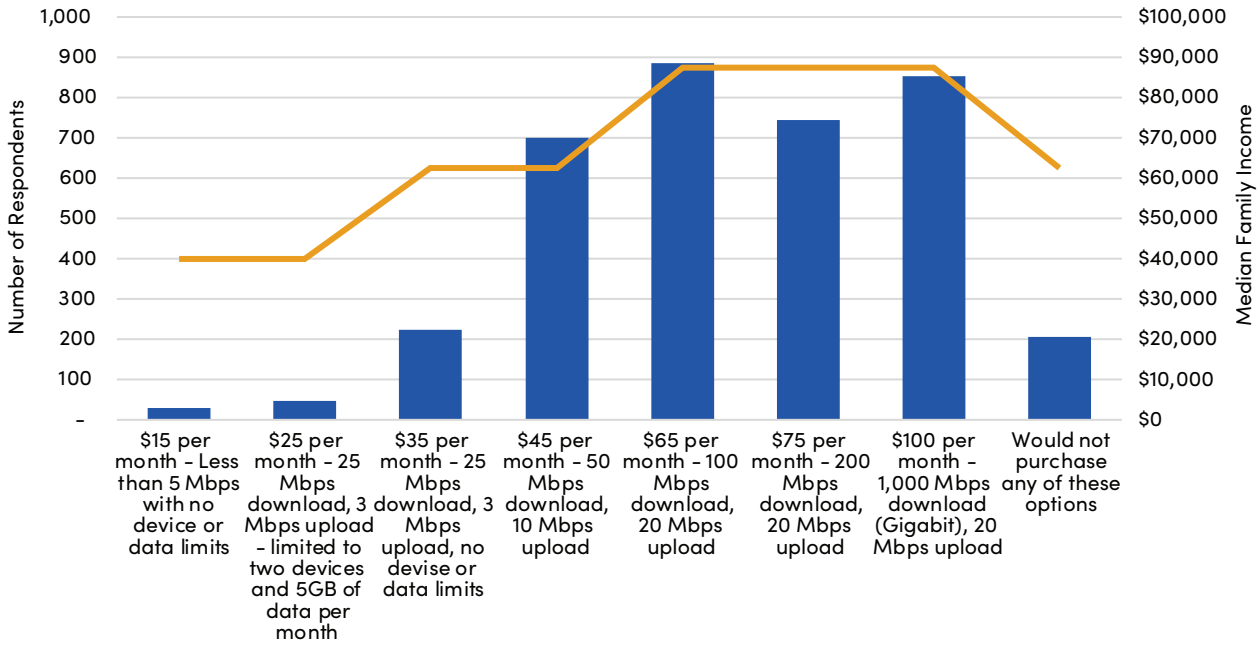


Figure 3.19. Reaction to $20 Price Increase

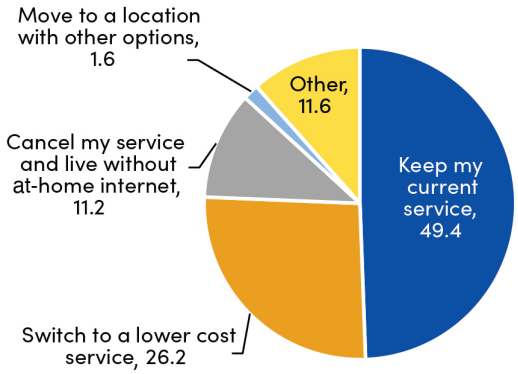
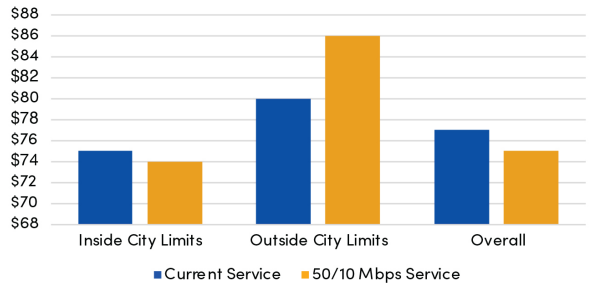


Figure 3.20. Most Willing to Pay



11 percent would cancel their service and live without internet at home. About half of people would just keep their same provider and service.

People who reside outside the city limits are willing to pay more for internet service than people who live within the city limits (Figure 3.20). When asked about the most they are willing to pay for 50/10 Mbps service, those outside the city limits are willing to pay about $15 to $16 per month more than those that live within a city. Respondents within city limits expressed a higher willingness to pay for their current service than a hypothetical 50/10 Mbps service, whereas respondents outside the city limits were willing to pay more for a hypothetical 50/10 Mbps service than for their current service.

Conclusions

Our survey results show that there are large disparities between urban and rural Kansans in terms of both the quality of service they receive and their monthly bills. Despite this, even in metropolitan and metropolitan-adjacent areas, many respondents are underserved. Residents in cities who had no home internet service were most likely to cite cost as the main reason they were not connected. In rural areas, a lack of any service option at an acceptable speed was most likely to prevent households from signing up. Among those with internet service at home, over one-third of respondents said that their current internet service was the only available option in their area. Furthermore, residents with only one option for internet service were more likely to be dissatisfied with both the cost and speed of their service. Our survey also found that people at higher incomes were willing to pay for more expensive, higher-speed packages, and that people living outside city limits were willing to pay more for both their current service and a hypothetical package providing 50 Mbps down and 10 up.

Chapter Four

Challenges and Potential for the Kansas Broadband Landscape

The survey findings described in the previous chapter offer important insights into the broadband landscape in Kansas. To help us further understand the data gathered in the surveys we conducted, members of the IPSR research team conducted interviews and focus groups with various stakeholders invested in broadband access, affordability, and adoption in Kansas. These stakeholders consisted of:

- **Internet users in rural (3 rural customers) and frontier communities as well as internet users residing immediately outside of city limits;**
- **Representatives from Kansas-based broadband service providers (18 representatives) and electric cooperatives (3 representatives); and**
- **Representatives from the Kansas Office of Broadband Development and the Kansas Farm Bureau (2 representatives).**

Our surveys included write-in and open-ended questions asking participants to elaborate on their experiences with and concerns about at-home internet access. The findings in this chapter draw on the 5,348 write-in responses to our survey question, "are there any additional complaints or concerns that you have regarding your at-home internet access that you would like us to consider?" as well as survey respondents' write-in responses entered throughout the surveys. The findings presented in this chapter provide detailed accounts of everyday experiences and attitudes about the Kansas broadband landscape. We have particularly focused on Kansans who are dissatisfied with their internet access options and quality of connection in this chapter.

Living with Inadequate Broadband Access

Respondents recognized or experienced a variety of substantial disadvantages due to lack of broadband availability, slow speeds, data caps and reports of throttled speeds, unreliable internet access as well as a severe lack of options for service provision. Several interviewees called in to our Zoom meetings by phone because they could not use Zoom with their current at-home internet connection. Several interviewees noted that they filled out the survey very early in the morning **"because our internet will be unusable later in the day."** Furthermore, respondents said that regional monopolies

and lack of competition for internet service provision led to rates and pricing they perceived as unaffordable or expensive, especially for a service that was understood as a utility or integral to all aspects of daily life.

Internet users residing inside and outside of city limits, even just 0.5 miles outside of city limits, described what it felt like to lack reliable or any internet service at home:

"helpless," "frustrating," "abandoned," "disastrous," "infuriating," "not dependable at all," "feel like we live in a black hole," "we lack access when we need it," and "our hands are tied."

Farm Bureau members had difficulty participating in livestock video auctions and uploading and downloading information which affected their livelihood. College and high school students needed to drive into town to complete their homework or take an exam in a parking lot. Children couldn't connect to online education options when schools closed. People used the internet at night or early morning while family members or roommates slept in order to access faster speeds. Offices sent employees home at the beginning of the COVID-19 pandemic only to have them return a few days later because they lacked adequate internet access at home. One survey respondent said that they applied for permission to work remotely during the early stages of the pandemic due to health concerns, but their request was denied because their internet speed was too slow. A real estate appraiser elaborated on a common experience among residents who lacked internet access at home:

"On weekends I still try to do work. I still have email access on my phone, but I have no way to respond to reports. So, I literally have to drive to [the city] and do my work and respond to people. There's nothing I can do out there. You feel helpless and frustrated. You have to get in the car and drive. And that's not practical. Even looking for a recipe. My phone internet is not dependable enough to even pull up a recipe. Or to find a substitution because I'm in the middle of nowhere without a grocery store. I can't imagine if we still had kids at home how they would be able to do schoolwork. They couldn't do their classes. You're just sitting out there helpless and disconnected."

The shift to online education during the COVID-19 pandemic made several residents with K-12 or college students more aware of their limited service options as well as the inadequacy of the speeds or quality of service they were already subscribed to. A parent of three K-12 children explained how the COVID-19 pandemic strained their regular internet access and costs:

"I feel like if there were more than one option of provider, costs would be less. I had to call every few months and basically beg for a temporary discount for our cost to be lower, otherwise I would not have been able to afford the cost of the speed needed to keep all 3 kids distance learning during the pandemic. It will be better in the fall when they aren't learning from home but more and more things (telehealth visits, remote learning days which might happen occasionally in the future) require high speeds to function well."

Another survey respondent explained the difficulties of both teaching and learning online during the COVID-19 pandemic:

> **"Our wireless is so poor that it goes [out] every time the wind blows. It is infuriating to try to teach online as well as monitor two kids online when half the time you can't even connect. It led to my retirement due to being unable to do my job. I did go back to teaching in a rural area that made sure their community had total internet access, but unfortunately, I don't live in that community. 20 years ago, high speed internet was 5 miles away; 20 years later, high speed is 5 miles away. It is infuriating that in this day and age more hasn't been done. COVID truly exposed the inability to access the world during a pandemic."**

And several other participants commented on the unique frustration of knowing your neighbor was able to access broadband services while your household fell further behind:

"We only have one provider that will service our house. We live in a rural area and don't get the best service. [A broadband service provider] services the house across the street but not my house. I'm a single mom of 4 kids and with COVID going on still and kids being quarantined sometimes the schools only do work on computers now and my kids fall behind on homework because of internet access."

Kansas residents living both inside and outside of city limits complained about accessing speeds below what they paid for and experiencing decreased speeds when more than one user signed on to a signal. However, rural residents in particular complained about the unreliability and inconsistency of the speeds they subscribed to. Speed and quality of service could vary significantly throughout the day, which required customers' time and attention and rendered the internet unusable for hours or even days. Discrete online tasks such as uploading a single YouTube video (~500 mb) could take over 2.5 hours, or **"something that I could do at work in an hour or two takes literal days for my computer to upload at home."** As one rural internet subscriber summed up, even if you can access and pay for speeds higher than 25/3, **"the problem is you never know when it will work."**

As was recounted to us by Kansas Farm Bureau representatives, inconsistent, unreliable, or non-existent broadband service could create significant financial burdens for rural and farming communities. One Farm Bureau member who lives just outside a broadband service area in southeast Kansas arranges their schedule to upload photos of cows for auction overnight when dial-up speeds are not as impeded by heavy internet traffic. If the connection is interrupted and the upload fails, which it often does, then they must wait until the next auction and hope the overnight upload works next time.

Lack of robust and reliable broadband service in rural and frontier communities creates significant challenges for people to do the jobs they have. This problem also creates challenges for keeping up with technological advancements in a variety of industries and creating jobs for the future. For example, several precision agriculture advancements – robotic dairies, commodities and livestock trading, and cybersecurity to protect industry operations and data – need robust and readily available wired connection or fiber-to-the-premises (FTTP) as well as wireless connections to operate. As farms and agricultural industries situated in rural and frontier counties increase the amount of data, bandwidth, and types of infrastructure needed to run their daily operations, the opportunities to maintain and advance in these industries may be stifled by the lack of adequate access to wired and wireless broadband connection. Even on farms where operations are not dependent on data and bandwidth, farmers often have a secondary business or occupation to supplement income. These populations need reliable broadband connection to work from home after hours. As one farmer explained:

"It just sucks that we live in 2021, and we can't have reliable, fast enough, internet access to do business. Our farm has to upload precision farming data, and we have to be in the right place at the right time and it takes forever. And at home it's just ridiculous that we only have one unreliable slow option for internet. When I have Zoom meetings for work from home, the screen freezes and/or the audio doesn't work, and it's not conducive to conducting business either."

Farm Bureau representatives noted that the safety and health benefits that come with broadband connection are as important as the social and economic impact of having reliable connection:

> **"We are working in rural areas, we're working with animals, with implements of animal husbandry and farm machinery and equipment. We all know someone who has been bulled by the cow or fallen off a tractor and broke their leg or who has a heart condition, etc. So, immediately you need to have the safety connectivity aspect so that you can call 911 and they know your location and get first responders there."**

Safety was also a theme among residents who were not involved in agriculture. Several survey respondents mentioned that they couldn't install and run home alarm systems or security cameras in their homes. Other participants residing in rural and frontier communities emphasized the benefit and need to connect to telehealth services. Rural residents noted that as rural hospitals close and people continue to drive long distances to utilize hospitals and healthcare services, telehealth becomes even more important and completely inaccessible without reliable and robust broadband services. A theme emerged through comments from rural and frontier residents: because rural residents often live far from educational opportunities, hospitals and health services, retail and banking, they needed reliable broadband access to connect to these amenities and opportunities. Residents saw reliable broadband connection as a way to save time and money and as a utility that would allow them to continue to live in rural and frontier communities while maintaining their health, education, livelihood and well-being.

Interviewees repeatedly voiced their concern that people and industries will leave rural and frontier Kansas for urban and suburban locations or move to other states or counties that offer reliable broadband connection. Several interviewees recounted stories of agricultural families who have ceased to live on the homestead because they don't

have an internet service provider (ISP) that can connect them to broadband services. These families may move from a township or unincorporated area to smaller towns (like Hugoton or Eudora for example) where they can subscribe to broadband service.

"I do know that for some of our rural agricultural businesses, whether they want to expand, whether it's the opportunity to truly live on the farm or to or live in town, those decisions, or one of the pillars of that decision, are being made based on access to broadband quality and speed and to a lesser degree, especially in rural areas, affordability."

For frontier counties, broadband access is a utility that supports safety, healthcare, economic development, education, well-being, and quality of life for those already living there. Broadband also creates opportunities to attract new residents and to encourage people to stay in rural and frontier areas. Several survey participants noted that they would like to move to rural communities or smaller towns, but they're concerned about the lack of broadband access.

"We've got some growing areas and we know what those are, but without question we have a lot of rural areas that continue to lose population very drastically. . . .Certainly if you have access to broadband and connectivity as well as healthcare or telehealth, there's just so many ways that you can at least hold the line if you have some sort of reliable broadband in your community."

A theme that emerged across all conversations and survey responses was that lacking adequate or any internet or broadband connections affected nearly every aspect of daily life and was detrimental to quality of life. People described difficulties doing their jobs and attending school but also connecting with friends and family, streaming news and entertainment content, and accessing telehealth services that became available during the COVID-19 pandemic. Lacking broadband speeds or reliable internet connection had a chilling effect on Kansans' internet use. People knew that their internet connection might fail during a video call, that they would have to drive long distances to use the internet, or that they wouldn't be able to connect to the websites, files, people and information they needed. So, they would sometimes choose not to participate in certain online activities, or they would rearrange their schedules in order to do so.

Uneven Access

Several respondents experienced unstable or unreliable access at home as well as uneven access across the state. Survey and focus group participants were surprised to find that their address was not served by broadband providers when their neighbors or nearby towns were able to subscribe to broadband internet service. Some participants who moved outside of city limits or to more rural communities assumed that any household would be able to have some access to an internet connection since it is so essential to daily life. Residents were unpleasantly surprised to find that they resided in an area without broadband or internet access options. As one participant explained:

> **"We seem to be in a dead spot between [two towns]. We had no idea when moving here that the fast internet available in [Town A] was not available here. We knew [Town B] had good internet and were shocked to discover there was no wired internet 3 miles north of [Town A] and that our connection would be so bad. It was extremely disappointing and affects our jobs and personal life. This problem has been a battle for the [number of] years we have lived here and for all our neighbors."**

One participant recounted the story of an agricultural appraiser that lives in a "donut hole" where he is surrounded by neighbors who can subscribe to broadband but he resides in an area without broadband service. His ISP claims that it is not profitable to expand or upgrade service in his area. Instead of broadband, he uses a mobile hotspot (MiFi) or his phone for basic internet connection at home. However, when his school-aged kids are home, or when he needs to upload or download appraisal documents, he drives to the nearest incorporated community with his children and sits in a restaurant parking lot to send attachments and upload schoolwork through the restaurant's WiFi. Participants noted that activities like working out of their cars or sitting outside of businesses were not viable options during winter months.

Remote work was often conducted at spaces other than respondents' primary residence. A respondent who lives in the Flint Hills noted that due to unreliable speeds and data capped service, their husband drives 20 miles to his mother's house to work "from home." Another respondent who commuted to his mother-in-law's house daily during the pandemic quipped: **"I work from home, but not my home."** Farm Bureau representatives recounted the story of a rural resident who was connected to an AT&T copper line and was dropped by her provider when they decided it was not profitable to upgrade service. She drove into a nearby city at night or stayed there after

hours when she could get the highest speed connection to upload large files. As was recounted during an interview, instead of going home at 5pm to eat dinner with her family or help on the farm, she was miles from home to use the broadband services she lacked at home.

Affordability, Cost, and Willingness to Pay

Participants in focus groups, interviews, and surveys described a willingness to pay for fast and reliable broadband service because it was perceived as a utility, even as a means of survival.

"I don't know too many farmers who say well, I'm not going to buy it because it's too expensive because it very much is a needed utility to conduct their business. So, they're willing to pay what they can, but it has to be reliable, and it has to be a decent speed."

Mobile hotspot users noted that their data plans were expensive or that they had ISP or self-imposed data caps (due to cost) that limited their internet use. As one rural resident explained, **"if we stream one movie, we go over our monthly data limit."** Other respondents noted that data caps prevented them from working remotely and that having only a wireless connection prevented them from obtaining or continuing remote work due to security concerns by employers (i.e. wireless connections are considered less secure than fixed connections). However, mobile hotspots were mentioned by rural survey and interview participants as preferred broadband options if fiber-to-the-premises (FTTP) was not available – especially as compared to satellite connections. During our focus groups, rural residents suggested mobile hotspots to other rural residents struggling with inadequate internet connection. However, due to poor cell phone service in rural areas throughout Kansas, mobile hotspots are not always an option for internet access (see Kansas Farm Bureau crowdsourced cell phone maps for more detail). Respondents also mentioned that they need to utilize 2-3 hotspots and 2-3 cell phones to access enough bandwidth per month for two professionals working from home. Due to data caps on their mobile plans, customers run the risk of "going over" their allotted data usage and/or choosing to use more data in a given month, both of which incur additional costs.

However, many farmers and rural residents remain willing to pay for expensive yet reliable broadband plans and overage charges. One rural internet customer succinctly stated, "we pay more for less internet." As representatives from the Kansas Farm Bureau explained:

"We have heard from some members that when they go over their 5 GB on their MiFi [mobile hotspot], they are paying a very pretty penny to get that 6th or 7th and 16th and 25th gig because their four kids were watching Netflix when they shouldn't have been. We hear those stories but for most people, if it's going from $30 to $60 or $60 to $150 dollars per month, it's just the cost of doing business. It's the cost of living in rural areas in the lifestyle and doing the profession that they know and love and want. I don't want to say cost is not an issue, because that would be untrue. But I do think that farmers, ranchers, people living in rural areas, from what we've heard, they are willing to pay $100, or $200 or $250 a month if it is reliable. And that's one of the biggest challenges we continue to hear. We often hear that they have broadband but it's out every third hour, or we have broadband but it's 10/1 and I need 25/3 or I'd love 100/25. When you start getting into some of the bigger data packages, our members know they're just going to have to pay for it."

Although rural residents may feel a strong willingness to pay for broadband services, their ability to pay was sometimes limited based on the availability of reliable internet services in their areas. Survey participants who subscribed to a variety of ISPs were frustrated by the cost of bundled services or service packages and contracts that required customers to pay for services they wouldn't use such as a landline telephone connection. In terms of cost, participants were frustrated that they paid for speeds that they did not consistently receive.

Participants understood that the geography and topography of their areas contributed to their lack of broadband availability but also perceived their communities as undervalued by for-profit ISPs. Although participants were willing to pay for broadband or any stable internet connection, they recognized that many ISPs weren't willing to pay to connect them. For example, one interviewee explained:

> **"I live a few miles north of Topeka and I don't have high speed internet and I've lived there for 25 years. I can access it through dish network or one of those but it's not true high-speed internet. Early on we had dial-up. But if you look at the sheer cost of burying fiber there, and when you look at the large ISP providers, there's just not enough people to make that investment."**

Several participants shared this concern that service providers did not see their houses and communities as lucrative enough to connect:

"I talked to their technicians and they came out and surveyed my house and said we can't serve you. Their antenna's not high enough. I only live about a half mile from the city limits. They're going to the small towns, putting towers up and serving where there is a high density of population. They did say they'd like to put towers in rural areas and serve the people out in the country but they said that right now financially they can't do it. That kind of cuts me out of the loop and I have to look somewhere else or hope that someone else comes up with a plan."

One participant even described being dropped by their DSL service provider because of the cost of providing service to his area. He now has a 5 Mbps connection over his phone line which he chose to subscribe to because he perceived it as being more reliable than his satellite provider – the only other option for internet service in his area. Many rural residents complained about satellite as a subpar service that promised undeliverable speeds as well as an expensive, unreliable connection that didn't work in bad weather. For example,

"They're supposedly guaranteeing 25 down 4 up, well, it's all over the map. When this low pressure came through, it was zero down and zero up. It's both expense and then there's the on and off frustration [of lacking reliable connection]."

Other participants described the unique frustration of living on the edge of broadband connectivity and how this experience intersected with the cost of connecting rural communities. (Note: the quotes below are from three different participants):

"I know there's fiber within a half mile from our house, but nobody's going to drag that half mile. Even though the functionality could be there it just isn't worth it for the major phone companies to do anything with it."

"Running fiber [would improve our internet access but], we're at the end of a dead-end road. The expense would be incredible. I'm not sure the companies would do that and I'm not sure we would be able to afford that."

"Fiber is available within three miles of our home, but the provider won't bring it to us. That three miles is the difference between advancing my career (finding a remote job that I can do while living on the family farm) and falling behind."

Some of our survey respondents and interviewees have investigated the cost of expanding internet or broadband service to their areas. As one respondent noted, they received a quote of $17,000 from a major telecom company to extend a pre-existing fiber optic cable 50 yards from the road to their farmhouse. Other respondents were frustrated by the fact that they knew fiber optic cable was buried a few hundred feet from their house but was not available at their residence, or that they dealt with construction due to fiber installation along their road or yard yet were only able to subscribe to fixed wireless service with a data cap or no broadband service at all. According to our respondents, the variation between households where broadband service was available and unavailable could vary by block or even within the same cul de sac. As one respondent explained:

> **"Fiber ends approximately 1 mile from our home. We know from employees working for that company that there is availability to hook into/extend that line. The cost per 1 household to pay for 1 mile is unrealistic. Yet, the opportunity for reliable, high-speed internet is so, so close. It is extremely disheartening."**

Residents noted that they need reliable and affordable access "when times are tough" such as when the weather is bad or during emergencies. Participants noted that some information is only available online, especially regarding precision agriculture or when dealing in commodities markets and livestock auctions. As participants explained: **"The functionality isn't there when it needs to be."** And **"It's our livelihood. If we can't work, we're out of a job. I have to have internet to work."**

Write-in responses to a survey question asking why residents signed up for the service they currently have noted a lack of choice due to a lack of competition within ISP markets. The service rural participants subscribed to was considered the "best out of all the bad options available" and often the only option available. Some of the frustration expressed centered on having limited, inadequate, and/or expensive options for internet connection at home, such as satellite or mobile hotspots. Respondents also expressed frustration about limited or inadequate options for internet connection outside of their homes, citing issues like a lack of privacy at libraries or in public spaces with WiFi connections, or when using parking lots or outdoor spaces for internet access.

Connecting Kansas Communities: Independent Internet Service Providers

Kansas has a portfolio of local and independent internet service providers that provide broadband speeds and fiber-optic connections to rural as well as urban areas and populations residing outside of city limits. Local providers offering fiber-optic service at optimal and reliable speeds often serve communities in locations that other telecommunications providers bypass due to the cost of connection and lack of return on investment (Condos 2022).[1]

There are independent service providers based in Kansas including Kansas Electric Cooperatives that are not exclusively "driven by the business case" and profitability of internet service provision and offer internet and broadband services to rural and other underserved or unserved residents and businesses. As one electric cooperative representative explained, "we don't have a profit motive, we have a service motive":

> **"We're there to serve [members] an electrical service at the lowest possible cost to provide that critical infrastructure. That same mentality is going to have to apply again to broadband. From our perspective, we want to make sure that all of our communities have an opportunity to thrive. . . Now I can keep my small community regional hospital open, if my small rural businesses and ag producers now have access to high-speed internet, they now have business opportunities they might not have otherwise. That keeps our consumer members in their communities."**

The local, independent providers that we spoke with shared this perspective of working to connect communities and privileging this value above "the business case." As one independent provider explained: "Smaller companies, yeah, we want to make a profit, but we also want to solve a problem for these communities."

Electric cooperatives are member organizations in which a utility's customers also own and operate the utility, typically as a private nonprofit corporation. This model seems like a promising approach for helping connect rural and frontier customers to broadband. But with the average rural electric cooperative only serving 1-2 members per

[1] The efforts of Kansas-based rural broadband providers such as Ideatek and Pioneer Communications to connect rural communities have been covered in regional and national news outlets.

mile, the cost of providing internet service to previously unserved or underserved rural populations is prohibitive, especially without public funding or subsidies. As one electric cooperative employee explained, **"the sheer cost in the rural parts of the state to push out broadband or internet at scale"** is one of the biggest challenges; **"because the return on investment is $10-15,000 per mile and with 1-2 members it's going to be a long time before that's recouped."**

Unlike larger, legacy telecommunication providers, independent internet service providers are based within the rural and/or unserved or underserved communities that they intend to connect, which gives these providers a unique perspective on the problems these communities face, what viable solutions might be available, and potential obstacles for broadband initiatives. Employees of these service providers sometimes lived in rural communities that lacked internet service options or subscribed to the same subpar internet service as other residents. One rural ISP noted that during the first wave of the COVID-19 pandemic, he worked out of his motorhome in the parking lot of his closed office building so that employees could maintain social distance while accessing an internet connection. He needed to use this workaround because he lived outside of his own service area and didn't have access to a stable, robust internet connection at home.

Some survey respondents noted a preference for local providers as a reason they subscribed to a particular internet service. Respondents expressed gratitude toward local ISPs who offered broadband (often fiber-based) services in areas that have been bypassed by major telecommunications companies. In some cases, survey participants noted that they appreciated the customer service provided by these local companies – that the independent providers had a storefront or location in town that was visible and accessible to local residents or that they saw technicians and ISP employees at the grocery store or in their community. During an interview, an executive from an electric cooperative that offers internet service mentioned the warmth and gratitude he receives from residents while running errands in his neighborhood:

> **"I wear my [Electric Cooperative] shirt around quite a bit and the thing that's amazed me the most is that whether I'm in rural [Kansas] or walking in a store in [urban Kansas], people come up to me and say: hey, thanks for [internet service]. Thanks for making this happen. . . .We've just had an overwhelming response."**

This gratitude for local, independent ISPs providing fiber optic service was echoed in the write-in sections of our surveys. Several comments extended thanks to independent providers for providing high-speed service to their rural areas. For example,

"My home in rural [Kansas] was without an internet connection since we moved there 2 years ago. My office was working remotely during the pandemic, but due to not having a connection, I had to come into my office in [town] to use the internet. In early 2021, I was able to get [local, independent ISP's] fixed wireless service. I do feel like it's expensive, but I also chose to upgrade to the highest-level service, and to connect my shop ($25 a month extra). I want to thank everyone who worked to get the CARES funding out to broadband providers so we could have a quality option. My husband and I are both so grateful! It makes a huge difference in our lives. I hope more opportunities become available to help other rural people in a similar situation."

Based on the survey comments, many rural residents perceived that fiber optic service provision through local operators was the only way they would receive reliable and adequate broadband speeds. This perception was shaped by residents' previous experiences and correspondence with legacy telecommunications providers that forego service in their area, their disappointing experiences with satellite or fixed wireless providers, and the perception that independent providers have been able to adequately serve neighboring communities.

While some independent telecommunication companies and electric cooperatives are willing to expand and take on additional territory, they run into significant issues in doing so. Aside from cost, service providers noted potential service territory issues with legacy telecommunication companies who already provide some sort of telecommunication service in a particular region. Local ISPs interested in providing broadband service to a community already served by large telecommunication companies, may have to coordinate with these companies because of their pre-existing service footprint. As one provider explained, it's additionally challenging when "larger companies will come in and serve the anchor in a small community and that demolishes the ability to make the business case. Because those anchors, maybe a large business, a school, a hospital are the only path forward, sometimes even with subsidies to make it work. So, when they eliminate those, that's a problem." In addition, the ability to build partnerships and

share resources and information between public and private entities or between private entities was referenced as a challenge to middle-mile and last-mile infrastructure installation and internet service provision.

A representative from a small, rural electric cooperative that would like to provide internet service to members outlined some of the challenges in doing so, which included lack of financial and human resources. As one of the smallest electric cooperatives in Kansas, overall cost and the cost of serving a small number of members (three or fewer houses per mile and no towns within their service area) was a major issue that prevented the coop from providing internet service. With only three staff members, including the CEO, the cooperative had their hands full. The cooperative lacks the staff to administer and maintain internet service let alone the number of staff members to research funding opportunities to provide internet service. As the coop representative explained:

> **"Even after you find grant money, there's so much paperwork and nonsense to put up with it. . . . Every once in a while it works out, but very seldom. You see grants going to certain states year after year and you wonder: how did they do that? It's amazing."**

Or, as a representative from another independent ISP noted:

> **"I've been involved in a couple projects in my locality and when it gets right down to it, by the time you find out about [available money] it's already too late. They've already given that money away or distributed it. We're always the last ones to find out about anything."**

A small electric coop doesn't have the financial or staffing resources or technological capacity for broadband provision and often doesn't have the time or human resources to apply for funding. At the time of writing this report, it seems that there are only two electric cooperatives in Kansas that provide internet service to rural communities: Butler County Electric Cooperative (Velocity) and Wheatland Electric Cooperative. There are 26 electric distribution cooperatives in Kansas (plus three generation and transmission cooperatives), which means that only 7% of the state's electric cooperatives have been able to develop and maintain broadband initiatives for their members and service areas.

Inaccurate and Insufficient Data and Definitions

Poor or inaccurate public data on service areas and households served was noted as a challenge that might prevent independent ISPs from receiving funding and targeting underserved communities. Poor or inaccurate data on internet service provision was also regarded as an issue by residents who were trying to receive service at their address. Independent ISPs noted that due to the lag in mapping, difficulty collecting service area data, as well as inaccuracies or inadequacies in this data (such as measuring service area at the census block level rather than address; lacking information on adoption, speed, affordability, or quality of access) it may be difficult to decipher which areas benefit from more or different service options. As one electric cooperative representative explained:

"From our perspective the biggest risk is either not being awarded an area because [the FCC broadband availability map] says it's served and we know it isn't or having something awarded that we know is served but it's just not properly updated. That's our biggest concern and risk."

Inaccuracies and inadequacies in broadband service and usage data are not exclusively a rural issue but apply to urban and suburban areas as well. As one independent provider and rural resident noted regarding FCC broadband availability maps:

"The biggest challenge as you look at those maps is that they are not completely accurate. They're not even close! . . . That's the first challenge, especially with any program that you're going to apply funding to, to make sure that you know exactly those areas that have [broadband connection] against those who really don't have it."

Residents who relied on pre-existing data on broadband availability, including FCC maps, before buying their homes were surprised and dismayed to find that they were not accurate. Survey respondents and interviewees also noted that there is a common expectation that an area in or near a highly populated city or town would have broadband access. For example, one interviewee who lived a few miles outside of Topeka city limits noted: **"People would say, what do you mean you don't have it? You live that close to the city and you don't have it? Well, we don't have it."** The interviewee continued to explain that according to the FCC Broadband Availability Map, his neighborhood and household do have options for broadband service and he was very concerned that ISPs wouldn't invest in his area because the maps indicated that his neighborhood was already serviced.

In addition to data and maps that were understood as inaccurate, the definitions of what constitute broadband speeds and what counts as "rural" were mentioned as insufficient and in need of updating. Survey participants and interviewees noted that the 25/3 Mbps definition was already outdated based on the needs of the average household, even before the COVID-19 pandemic. Study participants noted that the speeds and bandwidth their households needed and expected for daily, routine internet use far exceeded 25/3 Mbps. One independent ISP summarized a perspective we heard several times about how this static and unrealistic definition affects an ISP's ability to provide meaningful connection to residents and businesses:

"When policymakers define broadband at an inadequate level for one year and that definition is in place for a decade, it's this static, stagnant definition that isn't reflective of how quickly the needs for bandwidth and speeds are growing. . . . When you have a definition like that [25/3 for example] you create policy around who gets the grants, so if an area has "adequate" speed, which isn't even adequate, and the mapping isn't adequate within that inadequacy, then they aren't even eligible for "real" broadband, or the broadband speeds that they need, because the grants aren't available. And they're already in an area of market failure if it's in a rural area, so you're going to have to have subsidies to make the business work. And that's been frustrating, that policymakers aren't really in tune with what's needed and how to set that minimum threshold that keeps up with demand."

The redefinition of baseline broadband speeds was not the only definition that affected independent ISPs' ability to serve rural communities. As one local, independent service provider explained:

"I grew up in a small town about 11,000 people, and I live in the country now. I know what rural is, and I know what a small town is. When they get to passing money out, especially the government, they say they give Southeast KS "X" number of dollars for rural development, but all the money goes to the bigger towns like Parsons, Coffeyville, Pittsburg, it doesn't come to the rural areas out in the county. And that always kind of irritates me when they say 'well, we've done this for rural areas.' It's really not the rural areas as I would classify it. It scares me when the government says they have $500 billion that they're going to give out for rural internet or rural broadband, I don't think it's going to come to us [frontier counties]. It's going to go to the bigger areas. And there's really not much you can do about it."

Compounded with the lack of financial and human resources faced by small ISP or electric cooperatives was the implication that the definition of "rural" by legacy ISPs, federal and state governments creates obstacles for frontier or "true rural" communities to obtain broadband funds and benefit from rural broadband initiatives. As mentioned by several participants, highly populated areas are more profitable for ISPs to serve, which means that rural communities that include towns or relatively higher population counts might be served more readily by for-profit internet companies with rural broadband funding or rural broadband initiatives, leaving frontier communities with limited broadband service options. Several participants expressed concern that frontier communities would be sidestepped or left behind in rural broadband initiatives because these areas were costly and more difficult to serve than relatively larger rural communities.

Lack of resources and competitive disadvantage were also noted regarding the state's recently established Office of Broadband Development. Several participants considered Kansas as lagging behind other states in terms of developing a cohesive broadband plan, strategy, grant programs, and policies. However, participants who were aware of the newly established office were enthusiastic about its potential to attend to broadband access, adoption, equity, and affordability throughout the state. In fact, participants who were aware of the Office of Broadband suggested that the state would benefit from allocating more funding and resources to this office.

> ***"Our Broadband Office has only recently been 2 people. Before that it was 1. Seriously, two people could read for 8 hours a day and still couldn't keep track of everything going on at the federal level about this. We have criminally underfunded our Broadband Office."***

Independent service providers mentioned the lack of resources allocated to the state broadband office as a challenge for competing for national grants and other resources:

"[Other states being on top of broadband policy and issues] became more of a problem during the pandemic when you're having to pull resources from neighboring states even to get projects done under very difficult time constraints

that were defined in the grant. This infusion of broadband money is amazing, outstanding, and hopefully going to solve the broadband divide once and for all, but [Kansas-based broadband providers] are going to be competing for resources, and those states that have established broadband strategy plans and relationships with contractors and fiber vendors, etc. are going to be at an advantage and we're going to be at a disadvantage and maybe paying more money or taking more time to establish those relationships, which leaves us less time to build out, which means it's going to be more costly. So, it doesn't pay to cry over spilled milk, but it's going to hurt us."

In addition, a recurrent observation by local ISP providers was that the state government has not been proactive in establishing policies that could encourage or facilitate broadband access and investment throughout the state. For example, one interviewee noted:

"By not having had policies in the state for open access when the ground is open for highway projects, not putting in conduit. Having a rich history of ignoring opportunities in public-private partnerships, there is a lot that has happened in our state that is not the broadband problem but hasn't happened for decades that will be affecting our ability to catch up."

In addition, it's important to attend to the fact that last-mile access speed is only one of several aspects that affect quality of connection. Although last-mile speeds are upheld as metrics for quality of access, middle-mile infrastructure also influences quality of connection in rural environments and elsewhere. As one independent ISP explained:

"If there are other issues in the path end-to-end, then 25/3 isn't there. And I don't see anybody in the entire broadband picture, nationwide, recognizing that there are other aspects to make the service useable and you can't just look at that last mile access speed."

While more and better data regarding last-mile infrastructure access, quality and cost of broadband service are needed, an inventory or audit of middle-mile infrastructure location, ownership, and capacity as well as a review of policies regarding middle-mile infrastructure construction and innovation may also be necessary to fully understand the broadband landscape.

Participants' Message to Policymakers

The challenges, inadequacies, and obstacles described by our interview, focus group, and survey participants emphasized a lack of broadband options which affected their quality of life and livelihoods. Notably, participants felt that their daily struggles with inadequate internet access were unheard and unheeded by policymakers and internet service providers. In terms of a lack of understanding issues that face rural and frontier communities, one participant explained: **"It's like explaining tornadoes to them. . . .They have no concept and it's getting more difficult to get that concept across."** There was concern that stories from, and experiences of, rural and frontier residents and businesses weren't being heard or understood and that these communities would remain perpetually excluded from the benefits of broadband connectivity: **"I think there are a lot of rural people that maybe are not speaking up or don't even have the access to speak up and they're just going to get left behind."**

Other participants from west and southeast Kansas who lacked adequate at-home internet connection said that they felt forgotten or abandoned by policymakers and internet service providers: **"They don't know we're down here [in SE Kansas]. That's the truth. They kind of ignore us. . . . They really don't realize where you live or what kind of area you live in."** Participants living in or familiar with rural and frontier communities in western Kansas described being disconnected from or having to drive long distances to access healthcare, school, a movie theater, or even to get a beer, and saw this as a sign of what might happen with internet access. Respondents worried that rural communities just wouldn't get connected and that these populations would fall behind or be excluded from services, resources, and infrastructure that would benefit their lives. Some felt **"discriminated against"** by internet service providers who didn't see their smaller communities as worth connecting.

"We understand that since we're in a sparsely populated area the economics of providing fast internet are troublesome. We feel as if we've been left behind out here in the country when neither our internet service provider nor our long-time cell service provider have made improvements to increase coverage and speed."

The sense of being forgotten or disregarded by policymakers was felt in infrastructure issues more broadly and that residents in rural and frontier counties were **"out of sight and out of mind."** For example, one interviewee cautioned:

"The running joke in Western Kansas is that people have been trying to socially distance since 1861 or before, and that's why they've been trying to homestead in whatever county they settled in 5, 6, 7 generations ago. I think the bigger challenge is that agriculture is an economic engine in Kansas. And very similar to rural electrification, the cities are going to get it, they already had it. And if that's really where we are as a society, that if you live a major metropolitan area, if you live in a county seat community, you deserve broadband. But if you choose to live out in the "hinterlands" and you're 15 miles outside civilization then good luck, you're on your own – then I think we're going to have major challenges producing food, fiber, and fuel for the coming generations."

One rural resident had this message for policymakers:

"Don't forget us!"

Several interviewees who felt forgotten in debates about the state and future of internet service provision in Kansas were grateful for an opportunity to voice their concerns and experiences. For example, **"We, the rural folks, feel very forgotten and left behind. Again, thank you for the opportunity to voice our concerns and I really hope to see progress in bringing 'the forgotten ones' into the 21st century."** Participants suggested that more surveys, interviews, and reports like this one were needed. For example, one resident noted: "**Now listening to us with this study, you [policymakers] can be just as frustrated as we are."**

Broadband as Public Good

Rural Kansas populations have noted the various ways in which having internet connection serves as a lifeline in terms of providing access to telehealth and stable connections for work and school. Stable and reliable internet connection would allow them to remain in their communities and for residents and businesses in their communities to thrive. Survey respondents noted that rural fiber optic service allowed them to complete online activities in seconds or minutes (rather than hours or days) that were previously impossible. Stories from independent and cooperative internet service providers and the residents and businesses who benefit from their services recounted the ways in which internet service has improved their lives and livelihoods.[2] At-home broadband connection was broadly understood as a necessity, rather than a luxury, and was considered a public good or a service that should be regulated and subsidized as a utility like electricity or water.

Study participants often compared internet and broadband connection to other utilities claiming that at-home internet connection was as essential to daily life as running water or electricity. For example, one participant summarized a common perception: **"I believe high speed broadband connection should be a public utility available to everyone, just like clean water."** While others noted that the cost of connection should reflect the fact that internet access functions like a public utility in everyday life: **"Internet costs more than my electric or water bill. It isn't an optional part of life. It needs to be free or under $20."** Participants who thought of internet access as a public good or public utility also pointed out that there is a market failure around the maintenance of internet infrastructure as well as cost: **"Allowing a public utility provider to neglect infrastructure to the extent that [major telecom provider] has done is harmful to families and businesses in this state, and harmful to the state itself."**

Survey respondents and interviewees compared rural broadband to rural electrification in terms of need and funding, pointing out that like rural electrification, private companies could not be counted on to connect rural residences. The tendency of corporate, profit-driven broadband providers to cherry-pick or selectively serve highly populated or otherwise profitable areas creates further discrepancies and challenges

[2] For additional accounts, see a series of PSA-style YouTube videos produced by the Kansas Farm Bureau in 2020.

for rural service providers. Rural unserved or underserved communities may be the most difficult and expensive to provide service to, to the point where "it just doesn't make economic sense." Rural ISPs noted that the cost to connect rural communities would be prohibitive without public funding.

The resounding fear among the Kansas residents we heard from is that relying on profit-driven markets to provide internet service provision to residents in economically and geographically difficult to reach places means that these residents will be left behind. One independent broadband provider elaborated on this concern from an ISP perspective:

"As we get this funding [for rural broadband] there becomes an obligation to serve. Meaning you can't just pick the easy to reach in the census block and forget about the hardest to reach in the census block. Maybe that policy is already evolving but historically that hasn't been the case. As long as you serve one [address] in the census block you're considered compliant. Well then, you've left the rest of the folks out and it just compounds the problem even further."

The disparities between the populations and regions for-profit telecommunication companies serve and those that are considered high-cost and low return on investment were recognized by residents as well:

"I would be willing to pay more for my internet service if I was able to get faster and more reliable service. My current service is incredibly slow, which has caused problems for over a year now while I worked from home. Cost is not as much the issue as availability is. I wish I had more options for faster, reliable service. I would gladly pay more for better internet service at home. Living in a rural area, it seems like we are pushed down the priority list because less people are affected than the same size of space within a city. It feels like the internet companies really care about profit over spreading their range into rural areas where there are less houses and less opportunities for more profit."

Survey participants noted several market failures that prevented them from subscribing to affordable at-home broadband connection. One of the most common observations by study participants was the lack of competition in regional ISP markets which negatively affected cost, choice, access, and quality of service. One Wichita resident was frustrated by the fact that they had only 3-4 providers in Wichita as compared

to dozens of potential providers they could choose from while living in a "semi-rural" region abroad. Another study participant described the effect that monopolies and lack of competition within service territories had on their ability to access reliable internet service:

> **"The only reliable and affordable option for internet when we built our new house was using a cellular service for home internet. We live within 30 minutes outside of an urban area, and within 1/4 of a mile of a quality rural cooperative. We are unable to connect to that cooperative, as our home is in the AT&T territory. Unfortunately, the big company makes their money in urban areas, so their customer service and products available for rural customers is less than acceptable."**

Other participants reflected on how the reality of reliable and affordable internet access as a public good and public necessity contrasts with how internet infrastructure is currently regulated, funded, and deployed. Survey participants relayed disapproval and disappointment about the piecemeal or competitive funding sources for rural internet infrastructure rather than a federal or state prioritization of steady and substantial funding for affordable internet access.
For example:

> **"Infrastructure to bring better internet to rural areas seems so contingent on your local government being timely and proactive in taking advantage of grant, state, or federal opportunities. They lack capacity to get this job done. We need equitable delivery across the state managed through a system that doesn't create more local-based disparities."**

Participants pointed out several inadequacies of the for-profit model of internet service provision and that they would like to see not-for-profit models prioritized on essential services like broadband, especially in the case of serving rural and low-income communities. Nearly all participants saw the state and/or federal government as the main actor to potentially intervene in broadband service provision to unserved and underserved communities that were not regarded as profitable by telecommunication providers.

Interviewees and focus group participants from all stakeholder groups proposed that broadband service provision had to be understood as a utility and thought that turning

to local and state governments to incentivize service and public-private partnerships to provide service might be a viable option.

> ***"It has to be the government. There isn't anybody else going to do it. You're at the end of a dead-end road but you got a road, don't you? Your township maintains that road. Who pays for that road, well you and I pay for that road. . . . This is just as much a part of everyday life as everything else we do that needs access like our roads. Whatever it takes. I just don't know what the whatever is."***

However, participants were also dubious that the state or federal government would step in to regulate internet infrastructure, access, and affordability. One participant summed up a common sentiment:

> **"I think the problem is that this problem is big enough that legislators aren't willing to take a bite of that apple. It doesn't look like a winner to them. Even though they think it's a big need. I think it's apprehension on their part. And I think the other half of them don't understand it at all. . . . They don't understand the technology behind it or the demands that are going to be required to really hook this all up."**

Aside from, or in addition to, government intervention to provide broadband as a utility, participants suggested some solutions that they noticed in their neighborhoods and communities: water towers that could host antennae, installing fiber when digging to install other utilities (dig once), allowing and incentivizing more ISPs in a given area.

What Kansans Want

Study participants requested broadband service that was **"dependable and stable," "accessible," "affordable,"** and **"functional."** As one participant explained: **"When you need access, you need good access…that's what we're lacking."** Several people noted that they wanted to be able to stay in their home in western Kansas and participate in telemedicine or to be able to retire to their country home and still be able to communicate with friends and family and use the internet for daily activities. As previously outlined, participants understood broadband access as a lifeline, they also understood broadband access as a necessary foundation for maintaining and growing their communities – to "survive for another generation." While some participants prioritized aging in place, others spoke about fostering economic development, retaining and attracting families and combating population loss in rural and frontier communities. Locations with robust broadband access attract and support businesses. As one participant explained,

"If we can expand a local fabrication, a manufacturer or local welding shop and they're able to go from 2 employees to 5 employees or from 10 to 15 employees, that is economic development and quite frankly, the kind of economic development that our rural communities would love and cherish and welcome. But I think in order to do that it does take a knowledge of existing broadband providers, who is willing to service it, what expansion opportunities look like, because are you going to build the new shop on the north side of the road or on the south side."

In terms of state-wide economic development and wholescale transformation of productivity within the state, one participant noted: "With rural electrification we turned the lights on for a lot of farmsteads across the nation and look at what that did for economic development. I think we're at a critical tipping point yet again with broadband." But they added that their experience has been that broadband access has been politicized and policymakers aren't willing to intervene.

While participants would like to see affordable high speed, fixed, wired broadband to every home, ranch, and building in urban and rural Kansas, they also know that this is potentially a blue-sky request.

As one interviewee explained:

> **"I was born at night, but not last night. So, I know in some [rural areas] we're not going to trench 25 miles of broadband just to hook up one ranch in the middle of the [rural area], so some of it has to be the middle mile where you get the tower and your broadband is going to have to be wireless."**

But even modest requests illustrate the gap between the internet access and adoption people want and what they have. For example,

> **"It would be nice to have internet that does not have lags and not have to worry about the time spent online to save and watch the usage based on work schedule/need. It would also be nice to have internet that the whole family can use that will not slow down when more than one person is using it. And also, that we can all use the same internet and not have to worry about what not having to use multiple options to have work and school."**

Conclusions

In response to our survey, interviews, and focus groups, Kansans who lacked reliable, affordable, or any broadband service at home shared that they face substantial disadvantages in nearly all aspects of their daily life. These Kansans live in a world where routine and consistent broadband access is expected for work, education, leisure, and maintaining relationships and access to necessary services, but they lack the capacity to fully participate in these activities due to lack of broadband access. The frustration and helplessness noted by our study participants who were not able to subscribe to broadband due to lack of availability in their area, subscription cost, or who "paid more for less internet," was fueled by the fact that they perceived broadband access as a public good or akin to a utility like electricity or water. Reliable and robust internet access has become essential to participate in society and many Kansans are merely making do, sometimes in creative and costly ways, with the internet services available to them.

Respondents highlighted several instances of market failure in the broadband realm. Regional monopolies and lack of competition for internet service provision led to rates and pricing that were perceived as unaffordable or expensive in rural, suburban, and urban areas. These corporate, profit-driven telecommunication providers often failed to provide service to rural and frontier communities because of the financial cost of serving areas where they would not see a return on their investment. Local, independent ISPs throughout the state tend to step in to fill gaps in broadband service to communities that prove costly to other providers. While the availability of competitive funding for rural broadband service provision has increased, potential service providers such as small electric cooperatives do not have the time and resources to compete for funding.

Additionally, the data available about broadband availability, quality of access, affordability, and adoption (or lack thereof) are inaccurate as well as insufficient regarding which households, businesses,

and communities are unserved or underserved. Without accurate or adequate quantitative and qualitative data about broadband availability, affordability, and adoption throughout the state, it is difficult to know where additional funding and resources could be provided. The state government has taken initiative to expand opportunities for broadband service provision and has established an Office of Broadband Development. However, these are recent initiatives that do not override a previous lack of investment in broadband infrastructure maintenance and expansion and lack of attention to broadband equity and inclusion.

With an unprecedented amount of federal funding devoted to broadband infrastructure and expanding internet access in rural communities, a newly established broadband office, and a wealth of local, independent internet service providers and electric cooperatives, Kansas is in a unique position to think and act innovatively toward serving the broadband needs of its reusdents and investing in and growing Kansas communities. Listening to and learning from Kansans who lack adequate and affordable internet access as well as Kansans who are satisfied with the quality of their broadband access is essential in the pursuit of more equitable broadband access across the state. This survey and interviews were a step in that direction, but we strongly suggest that the state invest in, incentivize, and/or partner with local organizations and researchers who are based in Kansas communities and can continue the work of qualitatively and quantitatively accounting for and understanding the Kansas broadband landscape.

Chapter Five

"It's a Lifeline for Me": Public Library Computing Services and Digitally Marginalized Kansans [a]

As part of the study of broadband access throughout the state of Kansas, our team recognized that it is also important to understand digital inequities beyond the question of who has access to affordable, high-speed internet at home. For example, who does not have a computer at home? Who accesses the internet only via their mobile phone? Who uses the internet only on a public library computer? Who is unequipped to complete any task that involves using a computer or accessing the internet? Most importantly, what supports can help bridge the gap that exists between a society increasingly run through digital technology and those who are unable to use such technology?

Introduction

Having access to one's own computer and reliable high-speed internet at home affords an ease of moving through a world increasingly filled with expectations of digital literacy. It allows individuals to develop a relationship with technology that deepens and expands their technological and digital literacy. We define the digitally marginalized as those with relatively low levels of digital literacy and technological capital. For digitally marginalized people, navigating contemporary life can pose seemingly unsurmountable challenges, even when facing tasks that other computer and internet users might consider simple or easy. Updating a resume to change jobs, resetting a lost password, accessing financial records, or connecting with friends on social media are just a few examples of things those in the digital mainstream do every day. Indeed, people are expected to know how to do these kinds of tasks.

For more than two decades, researchers have recognized that digital inequalities are not simply reducible to questions of internet access (Hargittai 2002; Mossberger, Tolbert, and Stansbury 2003; Carlson and Isaacs 2018). Rather, like other forms of social

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inequality, digital inequalities are produced through the complex interplay of social forces: technological, economic, political, cultural, and personal. For the last five years our interdisciplinary team of researchers has tried to understand and begin to address the challenges faced by digitally marginalized Kansans living in Lawrence and the Kansas City metro area. This chapter outlines that work, conducted in partnership with three local public library systems. Above all, we recommend that policy makers, legislators, public-service providers, and academic researchers working toward greater digital equality pay attention to the conditions that lead to digital inequalities. That is, it might be easier for policymakers to try to address the specific details of how certain users lack access to technology, equipment, or infrastructure or lack digital literacy, but policymakers should not overlook the conditions that led to these gaps.

We have been studying the experiences and needs of digitally marginalized Kansans since 2017 through participant observation and interviews with library computer lab patrons and staff and have engaged in network traffic data scraping, and PUPS device development and testing. PUPS stands for *Personal User Privacy and Security*. This device is a USB-based virtual computing environment, developed by our team, and designed to afford public computer users increased customizability, session state persistence, and security as compared to the restricted use settings of most library PCs.

Our team is interdisciplinary, made up of sociologists and computer scientists, working with the public library organizations where we conducted fieldwork. Our ethnographers have spent more than two years collecting field observations across three municipal library systems, at eight different library branch locations. We have interviewed fifty-six library computer users and staffers, and have recently completed the third iteration of PUPS device usability testing.

Research Questions

Our research is guided by four questions:

1. Why do people use public library computers?
2. What are these users' digital needs (access, support), and what challenges do they face having those needs met?
3. What kinds of solutions are best suited to meeting the needs and addressing the challenges of this user group?
4. What role(s) do public libraries play in realizing those solutions?

First, why do people use public library computers? Lack of access to home internet and/or a personal computer are the most common reasons given by our participants. For many of these individuals, cost is a key factor, but it is not the only factor. Second, what are public library computer users' needs, and what challenges do they face? Our findings suggest two primary answers to this question, according to a user's level of digital literacy. Those with relatively higher levels of digital literacy generally need reliable hardware and an array of software options (especially a comprehensive office suite, including a PDF editor). They also need the ability to install software and the availability of basic tech support on an as-needed basis. The challenges these users face include library time limits, restrictions on the changes that can be made to library PCs, and the absence of specific software options. Those with relatively low levels of digital literacy still need same the basic hardware and software. However, more important, and in contrast to the first group, low-digital literacy users require much more intensive tech support to accomplish even simple tasks.

Our third and fourth questions are meant to inform public policy and library initiatives designed to ameliorate digital inequalities. What kinds of solutions are best suited to meeting the needs and addressing the challenges of these user groups? And what roles do the libraries play in realizing those solutions? The answers to these questions are implied in the findings of the first two questions: for higher digital literacy users, persistent and customizable computing environments when using library computers are important. The PUPS device our team has been developing during the last two years is one example of this kind of solution. Lower digital-literacy users need dedicated library staff whose specific role is to assist users with their day-to-day business and build digital literacy. Additionally, many of these users would benefit from (and many ask for) more structured classes in which a basic curriculum of digital how-tos, best practices, tips and tricks would be presented at a skill-appropriate level and pace. These findings are discussed in greater detail below.

Terms & Definitions

In this study, the term **digital literacy** refers to the practical know-how people use to solve problems specific to digital life: managing online accounts, installing software, protecting personal data online, doing basic troubleshooting, and so on. As with textual literacy, individuals' levels of digital literacy vary within the population. But in most cases, greater levels of digital literacy mean that someone can better function in a digital society. Furthermore, digital literacy, like those other forms of literacy, is not set. It tends to increase with digital experience (DiMaggio and Hargittai 2001; Hargittai 2002;

Hargittai and Dobransky 2017; Seo et al. 2019). So, those people with limited access to their own digital technologies generally have more difficulty increasing their digital literacy.

The terms **digital inequality** and **digital divide** acknowledge the relative, differential distribution of both access to digital resources and literacy among citizens of highly technologically developed societies. In these societies, access and literacy are important paths of social connection and mobility. It is clear that lack of access continues to be an issue, even in the US (Hilbert 2016; Hampton et al. 2021; Comi et al. 2022). However, even in the early 2000s, it was equally clear to researchers that focusing on access alone was not enough to understand the mechanisms at play in the digital divide. Differences in individuals' skills and use patterns also create digital inequalities (Attewell 2001; Hargittai 2002, 2006; Yu et al. 2016; Chen and Li 2021). Differences in skill and use patterns are referred to as the **second-level divide**. Most recently, scholars have started to focus on a **third-level divide**, that of differences in material outcomes resulting from the first- and second-level divides (Ragnedda 2017).

In digital societies, individuals are expected to have access to technology and know how to use it, and without access or literacy, they may not be able to fully access important basic services like education (Flynn 2021; González-Betancor, López-Puig, and Cardenal 2021; Hampton et al. 2021) and healthcare (Borg et al. 2019; Philbin et al. 2019; Beaunoyer, Dupéré, and Guitton 2020). For someone who cannot meet them—by circumstance or choice—these expectations become an obstacle to full and inclusive citizenship (Sparks 2013). Our research shows the persistence of a digital divide in the everyday, lived experience of our research participants. We use the term **digital marginalization** to indicate the condition of those citizens whose digital access and/or know-how fall outside the typical standards of the society in which they live.

We use another concept that may be less familiar to readers: **technological capital**. Technological capital refers to the benefits of having routine access to people with technological know-how. For example, a digitally savvy adult child might help a parent who is setting up a banking or social media account. There are potential economic values associated with the assistance provided, but access to the person with technical know-how is free of charge and their knowledge and assistance is given voluntarily based on their social relationship. For example, those of us who are fortunate to have a job that provides a work computer generally also have access to a range of tech support options when something goes wrong (and to be honest, something always

goes wrong when it comes to digital devices). Others may have a child, other relative, or friend who is a tech whiz they can ask for help when necessary. We would describe such individuals as having high levels of technological capital: access, know-how, and social relationships to fill the gaps, all of which may be used to meet different needs and or create opportunities (e.g., changing jobs, filing taxes, making a rental assistance application, accessing health care records, or connecting with friends on social media). In addition to being digitally marginalized, many of our research participants have relatively low levels of technological capital. Their low technological capital is usually what makes them digitally marginalized. So, they go to public libraries not only to use a computer or get on the internet, but also to get help when their know-how falls short of what they need to accomplish their goals.

Methods and Data

We gathered information in several ways: participant observation, semi-structured interviewing of public library patrons and staff (Table 5.1), public library network traffic data scraping, and PUPS device development and testing. Our team is interdisciplinary, made up of sociologists and computer scientists, working with the public library organizations where we have conducted fieldwork. We have spent more than two years collecting field observations across three Kansas municipal library systems (Lawrence, Kansas City, and Johnson County), covering eight different library branch locations. We have interviewed 56 library computer users and staffers, and completed three iterations of PUPS device user testing.

Table 5.1. Library Sites and Timeline

Municipality	Branches	Branch Research Sites	Dates	Research Methods	Total Interviews [Patron:Staff]
Lawrence	1	Lawrence Public Library	2017-2018	- APO* - interviews - network analysis data	**20** [17:3]
Kansas City	5	- Main - South - West Wyandotte	2017-2018	- APO - interviews	**19** [16:3]
Johnson County	14	- Antioch - Cedar Roe -Central Resource -Oak Park	2021-2022	- APO - interviews -PUPS testing	**17** [17:0]
Total	**20**	**8**	**2017-2022**		**56** [50:6]

*Active Participant Observation

Library Partnerships

Our research would not be possible without the patron access our library partners have afforded us. In return, our ethnographers worked at branches within each system, offering user tech support for an average of twelve hours per week, per researcher, during each fieldwork period. Pre-COVID this allowed regular library staff to work on special projects in lieu of "sitting at the desk." During the pandemic, to protect their employees' and patrons' health, libraries shifted as much working time off site as possible and encouraged their staff to minimize close contact with patrons. Consequently, service desks have been minimally staffed. Library staff often help patrons from behind the service desk. In this context, our researchers have provided an important source of patron support, in many cases assisting patrons for an hour or more, standing beside them at their PC, guiding them step by step through tasks.

We selected library system partners based on location and willingness on the part of library administrators to partner with us. In the first phase of fieldwork (2017–2018), sites within the Kansas City, Kansas system were chosen based on the recommendations of library administration. In the second phase of fieldwork (2021–2022), we identified prospective sites by comparing the median household incomes of proximate census tracts, and identifying those branches located in or adjacent to areas with the highest proportions of median annual household incomes below $30,000.[1] Recent national survey research has demonstrated that as household income falls below this approximate threshold, so does broadband access (Pew Research Center 2018). We then met with library administration and settled on locations that both met our income-level criteria and had relatively higher rates of computer use.

Participant Demographics

We have conducted this research since 2017. Our ethnographers have accrued more than one thousand hours of active participant observation and had several times that number of discrete patron interactions. We cannot summarize demographics for those patrons in a reliable or accurate way here. Instead, we have a brief descriptive overview of our interview and PUPS device testing participants (n=50).[2]

[1] For expediency, we accomplished this with the Social Explorer data visualization tool (https://www.socialexplorer.com), which uses the most recent US Census data.

[2] This number and the findings in this section exclude library staff. Additionally, one PUPS tester and interview participant completed three rounds of testing but is represented only once in the demographic summary.

At the end of each interview, we gave participants a form to collect basic demographic data. Some questions were open-ended (gender, race/ethnicity), while others included a list of categories (household income, highest education). We coded responses to open-ended questions on race/ethnicity and gender so that we could analyze them. In the discussion below, we treat sex/gender and race/ethnicity as one combined variable each.

Our participants ranged in age from 20 to 72 years old, with a median age of 55 years and mean of 50.0 years. This compares to the national and state of Kansas median ages of 38.5 and 37.2.[3] One factor influencing the relatively older age of our sample is that we limit participation to adults 18 years old and older. Nonetheless, our sample tended toward older middle age, with 59.2 percent of participants 45 and older. Women outnumbered men 56 percent to 42 percent. One participant identified as non-binary. The majority of participants identified as white (65 percent), and 25 percent identified as Black or African American. The remaining participants identified as multiple races, Latino/a/x, or Native American, with two declining to specify their race/ethnicity.

In terms of education, all participants report having completed high school or its equivalent. Of those individuals, 37.5 percent completed some college, while 25 percent reported having completed a bachelor's degree, and 37.5 percent completed more formal education than a bachelor's degree. Participants were asked to report their annual household income within a range. This scale was composed of $20,000 increments ($0 to $19,999 etc.), the median of which was the $20,000 to $39,999 range. Forty percent of respondents reported a household income in the $0 to $19,000 range. Most participants (56 percent) lived alone, but the mean household size was 2 because several of our participants lived in households with 3 or more people. With regard to employment, 64 percent of the sample had one job, 14 percent of participants reported being unemployed, and 12 percent reported being fully retired or collecting disability.

PUPS

We used findings from our ethnographic research to develop and test the PUPS device. Again, the PUPS device is a USB thumb drive-based virtual computing environment that allows its users more control over the security and functionality of public computers. Based on our observations at the Lawrence and Kansas City public libraries, we wanted to explore whether it would help users develop digital literacy and build tech-

[3] The comparative national and Kansas state statistics used in this section come from the United States Census Bureau (2021).

nological capital if they could have more control over the computer systems they use at public libraries. We designed and built PUPS to test this hypothesis, but we encountered some technical challenges with its development, so our testing has been more focused on device usability and debugging.

PUPS is configured by default with specially licensed versions of Windows 10 and the Microsoft Office suite, as well as the Firefox web browser. Because it relies on a library computer as its host system, PUPS uses the same printing interface that library patrons are already familiar with. Indeed, testers frequently commented that they did not perceive any real difference in the presentation or performance of PUPS as compared to the standard library computing interface. We completed three rounds of PUPS user testing (one round per major design revision) at the Antioch Branch of the Johnson County system. This included 19 separate test sequences with 17 individuals in total; one test participant repeated the test sequence for each design revision.

System administrators tend to be concerned with the overall security of their networks and the basic reliability of the PCs on those networks. Consequently, public library computers are frequently "locked down." In practical terms, this means system settings cannot be changed, software cannot be installed or removed, and user data does not remain on a given computer from one user session to the next. These steps are crucial to the maintenance of a viable, publicly accessible system, but such limitations also mean users cannot always leverage the capacity of public computers to meet their computing needs. PUPS allows users to treat a public PC as though it was their own personal device, customizable and persistent, without requiring marked changes to the underlying host computer or exposing the network to security risk.

Findings

Library computer users' tech access

According to recent research into national tech access, 77 percent of US adults report having home broadband access (Pew Research Center 2021b), and that same percentage also reports owning a personal computer (Pew Research Center 2021a). Additionally, 97 percent of respondents report owning a mobile phone of some variety, while 85 percent report owning a smartphone (Pew Research Center 2021a). Only 15 percent of survey respondents reported using a smart phone to access the internet at home (and have no other internet access), either on that device or as a wireless hotspot (Perrin 2021). By contrast, 50 percent of our participants have home broadband service (excluding mobile data/wireless hotspots), and half own a personal computer (50 per-

cent). Lack of tech access at home leads participants in our research to seek access at public libraries. In terms of mobile phone ownership, our participants were as likely as the national population to report owning a mobile phone (94 percent), although they reported lower levels of smartphone ownership (78 percent) than the national average.

Why do library computer users say they use library computers?

The library computer users we interviewed offered nearly 90 reasons why they use library computers. We categorized those responses and differentiated between the primary reasons offered by each participant, and ancillary reasons. Of primary reasons given [4], lack of access to one or more resources, including a personal computer, home internet access, a printer, specific software, or a smartphone accounted for 69 percent of responses. Put another way, nearly seven of ten participants explicitly said lack of access to some essential technological resource accounted for their library computer use. Of the participants whose lack of access motivated library computer use, 41 percent cited lack of a home computer, 16 percent cited lack of home internet (excluding mobile hotspot), 8 percent cited lack of a printer. The remainder (4 percent) cited lack of a smartphone or access to specific software applications as the reason they use library computers.

Financial concerns were mentioned by 26 percent of participants citing lack of access. Some said they absolutely cannot afford the monthly expense of broadband service. Others could afford it, yet didn't see it as worth the cost. While these findings are consistent with recent research on broadband adoption in the United States (Pew Research Center 2021b), our research indicates the use of public library computers is not simply about money, even among those participants for whom financial considerations are paramount. Furthermore, the inability to afford a home computer or internet access was often precipitated or complicated by other life circumstances.

Several participants had examples of home internet access being affected by other life circumstances. Elsa[5] was slowly rebuilding her life after a sporting accident left her with

[4] Note that while approximately 16 percent of participants said their primary reason for using library computers was lack broadband access, half of our sample did not have home broadband internet access. In lieu of home broadband access, 8 percent of our participants said they had used their mobile phone as a hotspot to use another device (i.e., not their phone) to access the internet from home.

[5] All participant names are pseudonyms. Appendix A includes basic demographic information for each participant quoted.

a traumatic brain injury. Because of her injuries and lengthy recovery, Elsa could only work part-time. She said, **"I can't afford internet at home. It's just that monthly thing I can't do."** Another participant, Margie, who also had a serious health condition, explained, **"I use [library computers] because I'm still, I told you I had kind of just a severe circumstance that threw me into, well kind of a poverty situation. I'm slowly recovering from that."** For both individuals, access to library computers proved essential to their recovery process and social re-acclimation, by being able to access email, look for work, and—in Elsa's case—re-learn how to read. Another participant, Meredith, explained how that her daughter's financial circumstances resulted in her own difficulties, leading her to use library computers:

> **"I cannot afford one. I just can't. [My financial situation] won't allow me to. What happened to me was, I had to help out my daughter because she had a hardship and she was losing her house, and I had to help her, and so I got in trouble with my credit cards and all my money was going to pay off my credit cards."**

Charles, an interviewee in the Kansas City, Kansas system relayed a similar account of compounding life circumstances:

> **"Because I don't have a computer . . . I got a little phone that I just got while I was working at the UPS, because I know they're going to snatch and shut down my food stamp phone for being over income guidelines. The tragedy with that is it's linked with all the VA material, and my father's in hospice, there at the VA in Topeka. The people that do the food stamp phone, they don't understand or care about how hard it is to have a number linked to the VA for their medical, because there's such a giant organization, they could care less. . . . So whenever he does cross over and they disconnect my phone, I may not even know, because it takes them months, and I have given them my new phone number, but it takes them months in order to send in information for the department thing online."**

In short, Charles was living in financially precarious circumstances, while also trying to manage his father's end-of-life care. Caught between various bureaucracies, he feared the loss of social service benefits. He worried that he would not even know when his father died. For this patron, the library offered an important lifeline in metaphorical and material terms.

Using library computers was a strategy two participants used to cope with or to try to leave abusive domestic relationships. Annie, who was printing more than $25 of divorce-related documents for her attorney[6], told me she used the library computers because **"my husband turned off my internet to be an ass."** Later, during an interview, Annie explained that using library computers was crucial as she researched her options while preparing to leave her husband:

> **"Since I don't have any money, then I can't go out on my own because I need to have a place to live. I've been gathering resources to see what possibilities that I can do to be independent."**

Kat explained how she used the library Wi-Fi to use a tablet that she'd recently gotten at the Social Service League, thereby affording her a new, however limited, sense of freedom:

> **"They gave this to me. I can't download any possible app on it, and it's not connected to the internet, but I can use Wi-Fi at least. That's a new development for me. I'm sure my husband will find it and take it. I'm sure that that'll happen at some point, but I have it now."**

Kat also commented how the intersection of her abusive relationship and lack of access to technology over the years left her in a position where it felt increasingly difficult to leave that relationship:

> **"Definitely before I was married, I was never without a computer. I would buy myself computers with money that I earned at jobs. Then it wasn't until my son was about four years old that my computer broke. Then it just wasn't replaced ever. . . . There's enough [money] for him to get his career moving, but mine gets to stop. . . . the fact that I'm not connected in some ways, and that I have allowed myself to fall behind that keeps me in my abusive relationship, because I know that I'm behind. I guess I could somehow learn all of the programs that I have not been able to learn in the interim. I realize my job prospects are not what they would have been."**

[6] As a point of reference, printing a single page at the library in question costs $0.15.

Not all participants were facing extreme situations. For some, the relative reliability of the library computers and internet was an important reason why they used these services. Nate, who used the Lawrence library reported **"I use the library computers because they're reliable, I know that they're always going to be available ... I mean, it's lightning fast. There's never viruses on the computers, that I know anyway."** Nate owns a computer, but reported **"it's just old and I've done the updates on it and it's Windows 7, but it's just not . . . It's now obsolete. I think it's like six to seven years old, and a lot changes with technology in that time."** Additionally, while he lived within the Lawrence town limits, he still had difficulty getting reliable broadband service. Nate reported actively researching new PCs but was not yet ready to make the financial commitment buying a computer comparable to the library ones would entail. Edith, who uses the Kansas City, Kansas system reported:

> **"I was just talking to a friend and her laptop died on her and she was supposed to submit some reports and she said, 'I'm tired of telling excuses.' And she took it to the place to get it repaired. I mean, just the story behind it, and I'm thinking, 'Oh boy, I don't have that issue. I carry my flash drive. I go in and go out.'"**

For certain participants, the convenience of a quick stop at the library during a busy day was enough motivation to keep them using library computers. Alex, a self-employed builder who also ran an online store for architectural salvage reported, **"I had a time when my phone broke, and I needed to check emails and trying to get in contact with people to either get a new phone or go to the places and meetings and things that I had to do."** Alex spent much of his day moving from one job site to another. Even after he replaced his phone, he still found the library a convenient place to stop and accomplish his administrative tasks during the workday. Sterling drove a bus for a local school district. His routes brought him to the library daily and he used the time between pick-ups and drop-offs to check his email and access financial records. He did not, as a matter of choice, own a smart phone. Like Alex, Sterling dropped by the library as it fit into his daily schedule to accomplish tasks that would be inconvenient or impossible without library computer access.

Sterling reported starting using library computers in college during the 1990s and has continued doing so. Likewise, Opal told us:

> **"I just got used to them back when I was in college. I didn't have any money. You figure out what resources are there for you. I've just kind of carried that over, I think. Obviously, those are expensive things to have, to have your own office stuff in your home... That's an expense I don't have to worry about."**

Opal further explained that in addition to the expense of having a home computer, she had made a conscious choice to limit her kids' screen time:

> **"It's also a way to keep my kids from having access to it constantly: 'Mom, can I play on the . . .' Nope. We don't have a computer. Can't play on it. Then it forces them to utilize and learn about public resources, too. Like, oh, you have this assignment that you have to do or this report. You need to print this stuff off. We have to go to the library. It's a learning opportunity for me to share that with them, like, this is how you use this stuff. I like the sharing economy that we have now with just people being able to use things instead of having to go out and buy their own of everything."**

This perspective was more commonly, but not exclusively, reported by participants at our Lawrence site. For example, Gareth, a writer in his early thirties, said, **"I am a huge fan of moderation, and if there's one thing I've noticed way too much of in my life and our generation's lives, it's just screens. Too many screens. And the less time I spend staring at a screen, the happier I seem to become."** Aurora, also in her thirties and mother of two primary school students reported:

> **"Because I'm working on simplifying my life. I don't want to have my own personal internet device, and I found that when I had a smart phone it was like an addiction for me, and it became a habit. It distracted myself from other things that were more important, like my kids, but at the same time, there's certain things that are necessary to my life, like email and I don't know, I've just developed these habits where it's almost impossible not to use it somewhat, so it helps me have that access without having it constantly at home."**

Aurora mentioned that the local school district had provided laptops to her kids, and that she limited their use almost exclusively to schoolwork. Other participants expressed

variations on the theme of wariness with the digital world. Morris, who was a patron of the Johnson County system reported, "I used to be a 'computer guy,' with a room full of computers and all that stuff. One day I got hacked, and I just said, 'pfffft, enough,' and I got rid of my smart phone and all that. I have a nice flip phone I like." Bill, a PUPS tester in his seventies, and devout Catholic, reported his retreat from regular engagement in the digital world was part of a spiritual preparation for death: "[I'm] not exactly hostile to the Internet, it's a matter of being able to make the best use of my time. I'm 71, so I'm running out of minutes here, at least on paper." Further explaining his journey, he continued saying technology "is beguiling. It's the world. I love this world, but I've got other things on my mind these days."

So, there are many reasons why patrons use public library computers. Lack of access to reliable devices and/or home broadband—largely because of financial issues—leads the list, while a range of other factors complicate the picture. Perhaps more important than any specific reason or complicating factor are the effects that a lack of access has on a user over time. As Kat's quotes indicated, although she was once quite knowledgeable and competent using a range of software packages, a long period without access has put her "behind," so she believed her "job prospects are not what they would have been." Nonetheless, Kat retained a base level of digital literacy that meant she could use library computers autonomously. For many other patrons, however—those who never possessed more than a marginal degree of digital literacy—an ongoing lack of access does not only erode once high levels of competence and relevance. Rather, lack of access prevents those individuals from developing the minimal levels of digital literacy expected for our hyper-technological society. Emily, a semi-retired MD in her seventies explained:

> **"Just that I don't know very much about it. I read an awfully lot, obviously, if I go to the library that often and have all those books. Like right now, I have Facebook and Laptops for Dummies checked out. As I told you the other day, I was in the generation that never had any computing instruction in school. Unless you do the smart thing and take a course, or whatever, you end up getting stuff piecemeal. I was fascinated about cut and copy and paste when I had a part-time job for a while. They were showing [me how] to do something, and I had no idea it was something that went across almost all computers."**

On the topic of normative expectations of digital literacy and age, a librarian in the Kansas City, Kansas system commented:

> **"Especially our demographic of people don't see the importance of being computer literate, and I feel like a lot of them are closed off from all the stuff that they have access [to] on the computer and can't help themselves or others. I don't even know what you could [do] for people over a certain age, just because the kids that are in school, that would be there for those classes, or are already taking computer classes are using it every day and they know."**

In some cases, individuals lack not only access and digital literacy, but also social relationships with others who are willing to share their own digital literacy skills and knowledge. So, many middle-aged and older users now cannot leverage any real technological capital. Few participants mention being able to rely on friends for access and support, which underscores this point. Public libraries provide a crucial source of technological capital for many users.

What do users do on library computers, and how secure do they feel doing it?

Participants reported using library computers for a wide range of purposes, but the most common of these included accessing email (89 percent), personal research (81 percent), looking for work (74 percent), reading the news (60 percent), and housing searches (52 percent). Almost all participants (90 percent) reported having entered personally identifying information (PII) or otherwise sensitive data while using library computers[7], although only around one-third (38 percent) reported feeling vulnerable while doing so. This corresponds with participants' relatively strong feelings of trust in the security of library computers. When asked whether they felt library computers were safe to use, 98 percent responded yes; when asked the same question about the internet more generally, only 65 percent of participants said they felt it was safe to use. Although 74 percent of participants said they had not seen another patron's PII, and most did not express distrust of other patrons generally, when asked to suggest an improvement that would increase their sense of security while using library computers, the largest single group of responses (30 percent) related to the physical spaces in which those PCs were situated. These suggestions included more distance between

[7] Participant definitions of personally identifying information include home addresses, social security numbers, credit card numbers, dates of birth, and medical information.

computers, dividers between computers, laptops that could be used anywhere in the library, or individual rooms for each PC.

Interview participants reported a range of potentially compromising experiences regarding their digital privacy and security (not necessarily related to library computer use). These include having been solicited to send PII via email (70 percent), having experienced some form of identity theft (34 percent), or having been scammed into sending a stranger money (19 percent). Two-thirds (69 percent) of our interviewees said they took some steps to protect their privacy online. But when asked what these measures were specifically, most simply said they try to determine if a site is authentic, or simply refrain from doing 'dangerous stuff' online. These determinations were made using idiosyncratic and subjective criteria. By comparison, when asked how they manage account passwords, only 16 percent of participants used dedicated password management applications that encrypted their data.[8] Almost half of participants (45 percent) reported relying on their memory and/or reuse of their passwords, while 16 percent wrote down their passwords and carried them around in a notebook or day planner.

Contributing to their subjective sense of security, most participants said they had some awareness that library computers were 'wiped clean' or 'reset' between uses, although their specific understanding of this process varied. We asked interviewees to rate their "computer-savviness" on a six-point scale, from 0 to 5, where increasing values corresponded to increasing digital literacy. The median score of the group was 3, or slightly above the scale midpoint. Put another way, these participants generally viewed themselves as having average or above average digital literacy as compared to the general population. Less than a third of the group identified as having below-average computer-savviness (29 percent). In contrast to our interviewees' digital literacy self-evaluations, those of us doing field work are often greeted by patrons professing their lack of techno-savviness. **"I'm computer illiterate,"** or **"I'm no techie,"** or "**it's all a mystery to me,"** are common variations on this theme. Library staff we interviewed also noted relatively low levels of digital literacy among the general population of library computer users.

[8] There was a miscommunication between two researchers about the current version of interview schedule to be used during our first round of interviews at the Lawrence and Kansas City, Kansas libraries. Consequently, participants at the KCK libraries were not asked if/how they managed their passwords. The findings presented here about password management only encompass responses from participants in Lawrence and Johnson County (valid n=31).

What does low technological capital look like on the ground?

Valerie, a woman in her fifties waves me over. ***She's trying to access a United Way website, but the browser rendering is so bad the page is basically unintelligible****. She tells me* **"I'm trying to get this,"** *holding up a United Way flyer about rental and utility assistance,* **"but I'm no good with computers."** *On and off* ***over the course of the next six hours*** *one of the staff librarians and I take turns* ***trying to help her figure out how to access the assistance that will help her avoid the eviction notice she's just received.***

At one point, trying to clarify the best approach, I ask if it's assistance with utilities, rent, or something else she's looking for. **"I need help with everything,"** *she tells me, her voice and facial expression matching each other's laconic aspect. Later, after calling someone at the United Way the façade cracks. She gets off the phone, takes off her glasses and pulls down her mask.* **"He asked if I was sick, said I sounded congested."** *Her eyes are red, now welling. "***No, I'm just crying. I'm sorry,"** *she begins to apologize to me. I try to reassure her.*

Eventually it becomes clear Valerie will need to ***get her Section 8 voucher paperwork from home;*** *she lives close by, she'll run home to get it. While she's away I get a coffee and drink it outside, trying to collect my own wits. Exhausted, I find myself hoping she won't come back so I can just go home. She arrives holding a handful of crumpled papers, out of breath from the physical and emotional exertions of the last several hours.* **"I got my voucher,"** *she says as I walk over to greet her.*

We ***spend the next hour looking up various of her account details: electric and gas bills.*** *She has written some account information in a small, tattered notebook whose pages are stained reddish-brown and mostly falling out.* ***She doesn't remember any passwords****, however, which are either not written in the notebook or have changed since she did write them down.*

Each bit of progress we make is bracketed by Valerie ***telling me a little more of the story of her downward spiral: a son who's in jail; a car that "shot craps," and another she bought with help from her church; overworking multiple jobs, exhausted and oversleeping, getting fired; catching up on bills only to fall behind with the next crisis.*** *She cries, asks me* **"who else is going to listen?"** *even though it's more a statement about her own hopelessness than a question.* **"You have to get it off your chest somehow. It's just a lot,"** *she continues. She tells me* ***she hasn't eaten all day****. The furnace is out at her apartment, so* ***she hasn't had heat for a couple of months****. When I ask, she explains she doesn't have any leverage to get the furnace fixed because* ***she's behind on rent****.*

For hours I instruct Valerie to "click here," and "try to search for . . .," or ask if she recalls a username or password. She's adrift, uncertain at each turn. ***There is no way in hell she'd have made any progress if the other library staff and I weren't here to help her.*** *We don't complete the assistance application before closing time; I say I'll be here tomorrow.* ***She says she'll be back, but I never see her again.***

Although it barely mentions Valerie's digital literacy, the preceding vignette, taken from one of our team member's fieldnotes, is meant to illustrate the collision between the normative expectations of a highly technologically advanced society and one of its citizens, whose negligible technological capital amplifies their lack of economic and social capital. In this sense, digital inequality is a secondary form of inequality, magnifying and exacerbating primary forms of inequality (class, gender, race, age). Valerie did not have a computer or broadband at home, nor did she possess the basic level of digital literacy that would have allowed her to accomplish the online tasks necessary to avoid eviction on her own. Furthermore, Valerie did not have anyone in her life who could either provide access or the requisite level of digital literacy to assist her through this crucial process. She was stuck, and she came to the library for help.

Who to turn to for help is not a trivial question for people with low technological capital. Bernice, a Johnson County system patron in her seventies, expressed concern that she would eventually get too old to be able to tell if she was being targeted by an online scam. "I think as you don't have the cognitive awareness, you could be tricked to a very

serious outcome," she said, "so, right now I feel okay, but I do not [have someone to check on me] at this time. I don't." Reinforcing the point that public libraries provide a crucial source of technological capital for many of their patrons, Larry, a Kansas City, Kansas library user commented:

> **"Because I don't have one [computer] at home, and my buddy has one in his office as an insurance agent, but it's not a certainty that he's going to have time to help me. Besides, there's always someone here. The people here in the library are pretty helpful. If I have a question or two, if they have time, they're pretty helpful. That helps me come up here and gives me even more confidence."**

People with low technological capital face some combination of the insidious, compounding trifecta of not having access, low digital literacy, and lack of reliable help from friends or family with either of those things. They need a different set of solutions to make their way in the digital world. The amelioration of digital inequalities requires increasing digital literacy at least as much as improving access for low technological capital users. For example, one finding of our PUPS testing is that low technological capital users will not benefit from the device as much as those with higher levels: that is, those for whom reliable access rather than low digital literacy and/or digitally literate social networks are lacking. Instead, low technological capital users require some form of ongoing digital literacy education/training and support while building digital literacy. In future research, we plan to test the role PUPS might play in helping build digital literacy by affording its users a computing environment that more closely approximates a personal computer.

During the COVID pandemic those with low technological capital have suffered most. Library PCs were available, as long as library branches remained open, although as part of their physical distancing measures, libraries reduced available terminals and session durations. Libraries also reduced in-person staffing to protect both library patrons and staff. They also cut programs like tech drop-in hours during which patrons could schedule one-on-one help with staff. It is precisely these human-to-human services that are most beneficial to low technological capital users.

Discussion

Our findings indicate any single approach to addressing the needs of digitally marginalized Kansans is inadequate. This does not mean local communities should be left to try to solve issues of digital inequalities on their own. Rather, community-specific initiatives should be developed in concert with state and federal agencies, with

the range of stakeholders involved, including public library administration and staff, digital literacy professionals, and library patrons themselves. These initiatives must be adequately funded by state and federal government agencies and legislatures. As research demonstrates, underfunding of social services and public goods, public libraries among these—has made social inequality worse (Sigler et al. 2011; Jaeger et al. 2014). Likewise, underfunding social services and public goods like libraries makes digital inequality worse, and we know that digital inequality is a pernicious and tenacious problem. Identifying the existence of the digital divide does not address the existence of the divide. Knowing about the digital divide does not mean we know how and/or why people who are digitally marginalized have come to occupy that position. Certainly, socio-economic status is a conditioning factor, and especially in rural areas, lack of broadband infrastructure is also an issue (Anderson 2018; Anderson and Kumar 2019). But our findings demonstrate that lack of access is frequently the result of, and compounded by, other life circumstances.

Most of us working to ameliorate issues of digital inequality enjoy a level of technological, social, and economic capital that makes it difficult to understand the experiences of the digitally marginalized. Having one's own computer, at work or at home, affords both an ease of moving through a world increasingly filled with expectations of digital literacy. Having one's own computer also allows an individual to develop a relationship with technology that deepens and expands our own technological capital. Those of us who enjoy high levels of technological capital think about moving through the world differently than those with low technological capital. We discover new possibilities and efficiencies through using our technologies. Those who do not have a personal computer or broadband at home need to seek out public computers to apply for a new job, do schoolwork, send a friend an email, look up their medical records, check on the status of their government benefits, or buy a plane ticket. They are excluded from the very processes of learning about and adapting to new expectations around digital skills. The technologies available to public library computer users are not cutting-edge. They generally include a limited range of internet browsing, office suite, and multimedia software, as well as document scanning and Wi-Fi internet access. The PCs available at public libraries are not the latest models. Yet, this doesn't matter to many public library computer users, who still have trouble with simple tasks such as scanning a document and attaching it to an email, never mind securely managing log-in information and navigating the two-factor authentication processes often required to access their email accounts from a library computer. The list of compounding factors and implications goes on and on.

Conclusion

In this chapter we have presented an overview of findings from five years of research into the experiences of digitally marginalized Kansans. The findings presented here have focused primarily on data drawn from the nearly 50 interviews conducted with public library computer users. Our analyses indicate the need for a nuanced approach to questions of digital inequality, attentive to how technological capital affords access and conditions marginalization. While the extension of affordable (or even free) broadband to all Kansans should be understood as an important step, it will not be sufficient to ameliorate digital inequalities. Rather, we must also address the causes of relative disparities in technological capital—the interplay of an individual's digital access and know-how with their social relationships—while recognizing lack of access is one important factor. These factors include:

1. **Disparities in educational opportunity, mitigatable through continuing education for those who may not have benefited from such opportunities earlier in life;**
2. **The availability of community resources, such as those provided daily by public library staff on ad-hoc basis (especially dedicated, public-facing tech support staff), and more organized programming such as tech help drop-in and how-to sessions;**
3. **A shrinking social safety net that leaves many Kansans vulnerable to the vagaries of life events over which they may have relatively little control including health crises, job loss, abusive relationships, and other significant challenges.**

As with other social problems, digital inequalities are informed by an individual's life history, social positions, and the precarity of their current life circumstances. Consequently, we advocate a holistic, integrated approach to addressing low technological capital and digital inequality specifically, within a more general program of grappling with other structural inequalities.

We acknowledge the limitations of our work, particularly in terms of extending our findings to the state-wide level on a statistically representative basis. Nonetheless, these findings provide a unique and important contextual contribution to those trying to understand the experiences of Kansans who do not have broadband and/or a reliable personal computer at home. As existing research

demonstrates, the structural conditions of social disadvantage and marginalization in the United States are well understood. These include income and wealth, gender, and race; more recently, digital access and literacy have entered the frame as compounding factors. Our research adds a detailed account of the everyday ways in which the "continued existence of a digital divide, however defined, is an obstacle to any agenda of social inclusion" (Sparks 2013:29). We offer a sense of the experiences of digitally marginalized Kansans to those who can make decisions about how to help them.

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Our interdisciplinary team is led by PI Dr. William Staples, and co-PIs Dr. Drew Davidson and Dr. Perry Alexander, all faculty at the University of Kansas. Dr. Staples is a sociologist whose work has focused on digital surveillance and inequalities, while Drs. Davidson and Alexander are computer scientists whose areas of research focus on security, privacy, and trusted computing. In addition to Drs. Staples, Davidson and Alexander, our team includes Walter Goettlich, who is a doctoral candidate in sociology, and Bailey Srimoungchanh, who is a graduate student in computer science. Because this has been a long-running project, several other research assistants have contributed to this research, including Dr. Matt Comi, Erin Adamson, Jon Volden, Dr. Marissa Wiley, and Matthew Weich.

Chapter Six

Conclusions and Policy Recommendations

This report set out to understand broadband access in the state of Kansas. After reviewing the available data from the FCC, American Community Survey and Microsoft, we found an incomplete picture of broadband access in the state. The FCC data reports top speeds offered by providers in an area, and often what is advertised is not what is available. The American Community Survey provided self-reported data that is now three years out of date. The Microsoft data report broadband speeds at the outdated 25/3 standard. Given the dearth of data, IPSR fielded a survey that also provided speed tests. Almost 7,000 Kansans responded to our survey. IPSR's broadband survey indicated that many areas report connection speeds of less than 25/3, and over 1 million Kansans live in regions with less than 100 Mbps download and 20 Mbps upload. Over one-third of survey respondents have no choice over the type of internet service that they purchase.

The IPSR survey examined the relationship between broadband speed, affordability, and overall satisfaction. The results were sobering. Close to half of those surveyed (46 percent) were dissatisfied or very dissatisfied with their broadband service. Those living in cities were overwhelmingly satisfied with the speed of their service (70 percent) but only 31 percent were satisfied with costs. Over half of Kansans residing outside of cities were dissatisfied with both broadband speeds and costs. Despite the high median monthly cost of $71 to $80 for broadband services reported, survey respondents, especially those residing outside of cities, were willing to pay $86 for marginally better service (50/10).

In addition to the survey, IPSR conducted focus groups with internet users in rural and frontier communities as well as internet users residing immediately outside of city limits, representatives from Kansas-based broadband service providers and electric cooperatives, and representatives from the Kansas Office of Broadband Development and the Kansas Farm Bureau. We also summarized written survey responses. Participants highlighted the difficulties they and their families had working and studying online with poor internet connections. Some reported driving long distances for internet access or having to return to the office within a few days of going remote because they could not work with their at-home connection. Many expressed that a lack of reliable broadband had a negative impact on their jobs and careers. Study participants felt that their struggles with inadequate internet access were unheard and unheeded by policymakers and internet service providers. Several participants expressed a willingness to pay for fast and reliable broadband service because it was perceived as a utility, even as a means of survival.

For Kansans without resources or in need of secure internet access, public libraries provide a lifeline of digital access. Many computer users in libraries have low digital literacy and need support from library staff to access the internet to obtain public services or search for a job. Nearly seven of ten participants explicitly said lack of access to some essential technological resource accounted for their library computer use. For others, the relative reliability of the library computers and internet was an important reason why they used these services. In some cases, people reported using library computers in order to leave abusive relationships. For these reasons, community-specific initiatives should be developed in concert with state and federal agencies (and vice versa). These initiatives should involve a range of stakeholders, including public library administration and staff, digital literacy professionals, and library patrons themselves to provide digital access and literacy training to library users. Building partnerships and information sharing between local organizations who invest in and understand digital access and equity concerns and the Kansas Office of Broadband is imperative.

Taken together, our results show a significant **market failure** when it comes to broadband access in Kansas, especially outside of city limits. Broadband has transitioned from being a consumer luxury to an educational and employment necessity. The future of economic development will depend on broadband access, and the state should consider support for broadband as an investment in economic development. That said, the costs of providing service to sparsely populated regions in the state will require significant public investment. Next, we consider a historical model for broadband policy.

Rural Electrification as a Model for Broadband Policy

The rural electrification project that began in the 1930s provides historical insight into both the challenges and importance of rural broadband provision in Kansas and the country as a whole. It also serves as an **example of government intervention in a marketplace** that would not have otherwise met the needs of the American public. Prior to the establishment of the Rural Electrification Act of 1936 (REA), few rural Americans were connected to the power grid. In 1930, only one in ten American farms had electrical service, compared to more than eight in ten non-farm dwellings (US Department of Commerce 1975, 827). At the time, commercial power companies cited the high cost of expansion in areas where distribution lines would serve few customers. As Commerce Monthly, a periodical for investors and businessmen, noted in 1925: "(a) mile of distribution line can serve 50 to 200 customers in a city; in the country the average is three customers to a mile" (National Bank of Commerce in New York 1925, 7). The author described electrification of most of America's farms as financially unfeasible. This, the author argued, explained why farmers were not likely to purchase new electric appliances such as the radio, despite relevant programming such as crop reports and weather predictions.

The REA was a policy response to what was then a new economic and social reality: in President Franklin Roosevelt's words, "electricity is a modern necessity of life and ought to be found in every village, every home, and every farm in every part of the United States" (Roosevelt 1938). The REA allocated federal loans to rural electric cooperatives and later rural telephone cooperatives. Most of the money loaned through this program was used for generation and transmission facilities (Kitchens and Fishback 2015). These 30-year loans were to be paid by residents' electric bills. Interest rates for the loans were pegged to the long-term U.S. Treasury bond, which represented the federal government's cost of borrowing and fluctuated between 2.69 and 3 percent (Kitchens and Fishback 2015). REA loans were allocated based on fiscal soundness of applicant cooperatives, which mainly depended on the rates cooperatives could secure from wholesale power companies (Kitchens and Fishback 2015). The REA also provided information about creating rural cooperatives to interested residents and helped pass state legislation that made the cooperatives easier to set up (Kitchens and Fishback 2015). In April 1938, the Brown-Atchison Cooperative became the first such provider to string electric lines in rural Kansas. A historical marker in Horton commemorates the first pole. The REA approved 1,076 individual loans by 1950, serving 3.5 million rural Americans with over a million miles of electric line (US Department of Commerce 1975, 829). By

then, 78 percent of farms had power. A generation of rural Americans still remember the day their homes received electricity for the first time. Access to power for farm equipment, refrigeration, and communication meant a dramatic and permanent increase in quality of life. As this report shows, access to quality internet connections, while perhaps not as dramatic as "flipping the switch," is now a similar prerequisite for improving economic, educational, social, and health outcomes.

The federal government and Kansas are making significant investments in broadband access. As of now, Kansas has earmarked $65 million of CARES Act (Taborda 2022) and $83.5 million of ARPA funds (KDOC 2022) to improve broadband access. Kansas is also expected to receive at least $100 million in additional funds for broadband from the Infrastructure Investment and Jobs Act (The White House 2022b). With so much money at stake, we now consider policy recommendations for investments in broadband in Kansas.

Policy Recommendations for Improving Broadband Access in Kansas

1. Kansas needs better broadband data.

The FCC allows states to challenge data provided on FCC maps. We suggest that the Kansas Office of Broadband work with local governments and economic development districts to provide speed test and granular service-area data to challenge the FCC maps. More accurate data on broadband service provision and use would enhance the competitiveness of Kansas independent internet service providers (ISPs) for receiving federal funding to provide service to underserved communities.

Efforts to collect this data should focus on the quality, affordability, and experience of the internet connection and services offered. Upon collecting these data, Kansas policymakers will learn that a lack of broadband access, especially in the western and rural parts of the state, is a market failure. The costs of providing service to sparsely populated regions will require significant public investment.

2. Kansas needs a strategic broadband research plan for future broadband investments.

The Kansas Office of Broadband should work with organizations within the state to develop a strategic broadband research plan for future broadband investments. This plan should include:

- Collecting speed test data by location throughout the state to identify locations needing investment in broadband infrastructure;
- Documenting pre-existing broadband infrastructure, including middle mile and dark fiber, and create policies for maximizing the use of current fiber-optic routes and capacity as well as investing in new technologies and infrastructure;
- Documenting broadband adequacy for anchor institutions including school districts, hospitals and libraries; and
- Studying digital equity by income, geography, and other socioeconomic characteristics.

3. The Kansas Office of Broadband should serve as a hub for related efforts to document broadband service in Kansas.

Several organizations across the state have collected data on internet service provision in Kansas and issued reports or memos that have not been widely shared. In addition, several state and local organizations aim to improve internet access, affordability, and equity in Kansas, but they are not yet working together. The Kansas Office of Broadband facilitates partnerships and research-sharing across the state.

4. Kansas investments in broadband should focus on developing better infrastructure.

Investment in quality broadband infrastructure such as fiber optic networks, or broadband networks that provide similar reliability and speed, should be prioritized. Kansans expressed a willingness to pay for fast and reliable broadband service in rural as well as urban areas. Although significant federal resources are being allocated for broadband development, additional state funding will be necessary to build out middle-mile and last-mile access. Many of the state's rural residents are in difficult-to-serve locations, and this reality makes private sector solutions unlikely. Any state investments supporting broadband development should include a requirement for ISPs who receive funding to provide data to the state including speed tests, addresses served, types of service plans and types of connections offered.

5. The state should support increased competition among broadband providers.

Survey respondents who have only a single provider experience lower speeds and are less satisfied with speed and cost of service. Competition should incentivize ISPs to provide faster broadband at more affordable prices.

6. The state should invest in digital equity

Digital inequity takes many forms: lack of affordable and adequate broadband, lack of devices needed to access the internet and lack of digital literacy needed to use the internet. Technical support at public libraries provides access to the "digitally homeless" and those who lack digital literacy skills. Public funding for libraries and local non-profit organizations embedded in underserved communities should be increased to support digital access and digital literacy.

To promote digital equity, community-specific initiatives should be developed in concert with state and federal agencies and with a range of local stakeholders involved, including (but not limited to) public library administration and staff, digital literacy professionals, community members who lack adequate internet access, and local organizations working to alleviate digital divides and socio-economic marginalization.

Appendices

Chapter 2; Appendix A: Constructing the Broadband Index

We use principal component analysis to construct the broadband index. We provide details on this approach below.

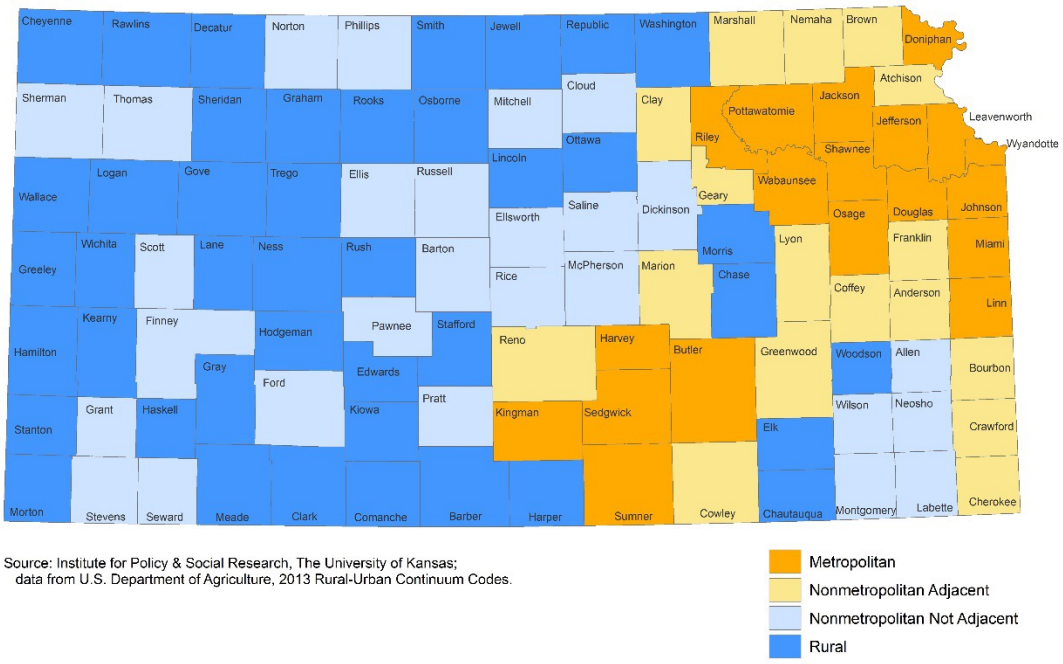
Principal component analysis involves using a group of variables that are indicators of an overarching phenomenon to create an artificial index representing all of those variables with a single number. This involves estimating a matrix of correlation coefficients and using those coefficients to weight certain variables differently. The weighting reflects how differences in those variables relate to differences in the other variables. In the broadband index we constructed, we estimated how cross-county differences in Microsoft broadband usage at 25/3 Mbps are reflected in differences in the three American Community Survey (ACS) variables. We also estimated how differences in each of the ACS variables relate to the differences in the other two ACS variables and in the Microsoft data. We used these correlation coefficients to make standard weights for each variable across all the counties in our dataset to obtain an index value for each county.

The three variables from the ACS were given positive weights. The ACS variables included the share of households who connect to the internet via satellite connections only, the share who use cell service only, and the share who have no internet at all. From the Microsoft data, the share of users with 25/3 or better internet speeds were given a negative weight in the analysis. This makes intuitive sense: the share of people with 25/3 or better speeds should have an inverse relationship with those using less reliable connections through satellite and cell service and those who have no internet connection at all. In order to show a higher index value as better and a lower as worse internet access, we then inverted the index values by multiplying by -1.

Chapter 2; Appendix B: Rural-Urban Status in Kansas, by County

The U.S. Department of Agriculture provides nine Rural-Urban continuum codes classifying metropolitan counties based on their population and non-metro counties based on their degree of urbanization and their adjacency to a census-designated metro area. In this report, we aggregate codes 1-3 to show metropolitan counties, codes 4 and 6 to show nonmetropolitan counties (with an urban population over 2,500) adjacent to a metro area, codes 5 and 7 to show nonmetropolitan counties not adjacent to a metro area, and codes 8 and 9 to show rural counties with fewer than 2,500 urban residents regardless of adjacency to a metro area. More information about rural-urban continuum codes can be found at: https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx.

Map 1. Rural-Urban Status in Kansas, by County



Chapter 3; Appendix A: Survey Methods

Survey Methodology

The Kansas Broadband study deployed two surveys: the Regents Student Survey and the Kansas Household Survey. Respondents were invited to participate via email from our network of state and local partners, press releases, and social media. For both surveys, the informed consent was followed by an embedded Ookla Speedtest (Ookla is a web service that provides free internet connection analysis) and a link to the survey hosted in Qualtrics.

Working through two- and four-year Kansas Board of Regents (KBOR) institutions, an email was sent to students seeking their participation in the Regents Student Survey. This survey included an incentive in which participants had the option to enter their email address to win one of 200 $25 gift cards to Amazon. The survey of KBOR students launched January 14, 2021 and closed on March 11, 2021. In total, 2,617 students began the survey, and 2,404 students completed this survey.

This survey was modified to include questions on cost and affordability and the Kansas Household Survey was launched on May 17, 2021 to the general public. (See Appendix B for a copy of the survey instruments.) IPSR worked with partner groups across Kansas to disseminate the survey, including EDA Economic Development Districts, the Kansas Department of Commerce (including Office of Rural Prosperity and Kansas Economic Development Alliance), the Kansas Governor's Office, Kansas League of Municipalities, Kansas Action for Children, Kansas Association of School Boards, KU's Center for Public Partnerships & Research, and the State Library of Kansas. IPSR used crowdsourcing, such as press releases and social media (Facebook and Twitter), to enhance participation. The Kansas Household Survey closed January 11, 2022 with a total of 4,278 surveys started and 3,602 surveys completed.

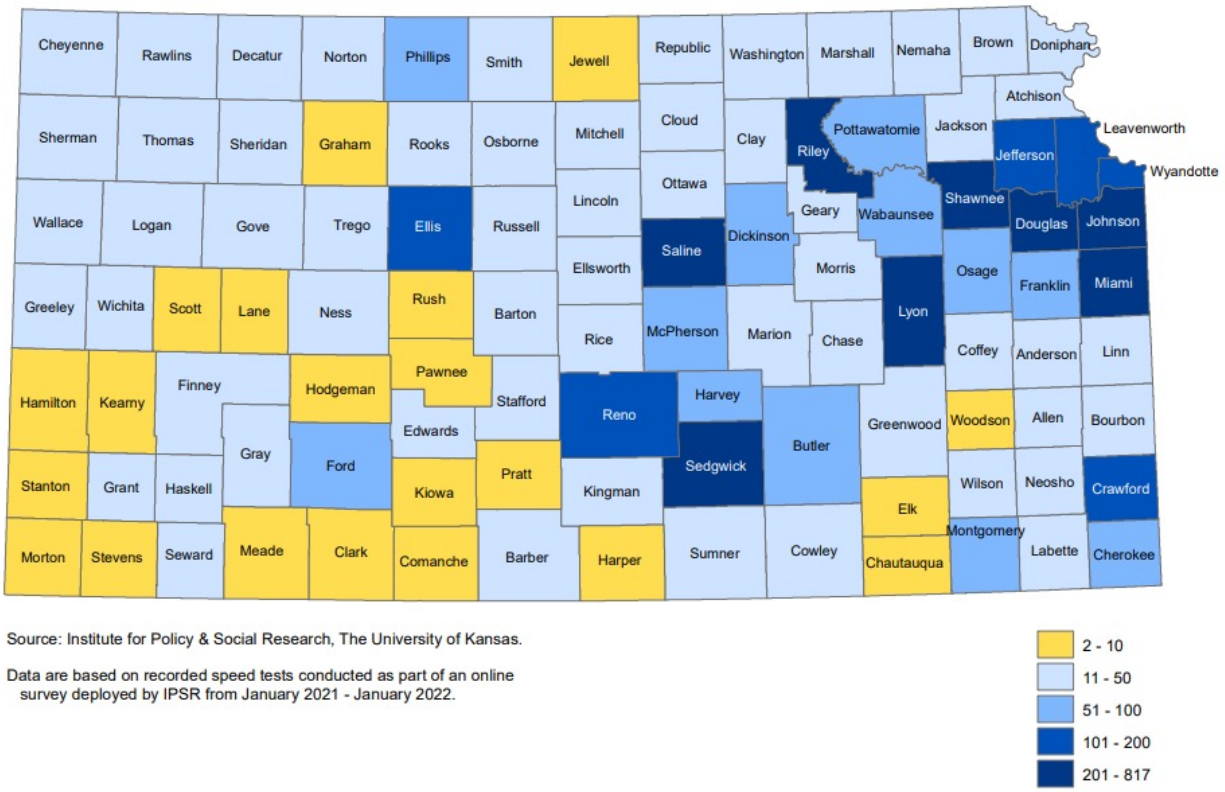
Survey results were merged with speed tests recorded by Ookla by network ID and timestamp. Records were automatically matched where the user started the survey within two minutes of the speed test. Records without a speed test were individually researched and matched to a speed test where possible. We were able to match 5,583 surveys to a speed test (Table 3.1).

In general, the respondents to the Kansas Broadband surveys were more likely to be female, younger than the general population, and have attained more years of formal

education. The survey captured racial and ethnic diversity similar to the Kansas population for American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, white, and people with two or more races. The survey did not capture a proportion of Black or Hispanic respondents similar to the Kansas population. The Kansas median income fell within the median income range for the survey respondents. Specifically, Kansas women are overrepresented in the survey, with 65.1 percent of respondents identifying as female, while only 50.2 percent of all Kansas residents are female per the 2019 census estimates (Appendix C, Table 1). Furthermore, survey respondents tended to be younger than the overall state population. The share of respondents reporting that they were aged 18 to 25 was 28.2 percent in the survey, compared to 11.5 in the 2019 Kansas single year estimate from the Census Bureau. The overrepresentation of college-age population in this survey likely overstates internet access within the sample. Similarly, only 15.8 percent of respondents were age 60 or older, compared with 22.6 percent of the overall Kansas population. Additionally, only 1.9 percent of the sample population identified as Black, whereas 5.7 percent of the total state population identified as Black in the 2019 estimate (Appendix C, Table 2). Further information about the survey sample and Kansas total age, sex and race/ethnicity estimates, educational attainment, and family income can be found in Appendix C, Tables 1-3.

Map 2 in the appendix illustrates that responses were received from every county in Kansas with more responses coming from the eastern half and urban areas of Kansas. As to be expected, the zip codes and counties in which KBOR four-year institutions are located (Crawford, Douglas, Ellis, Lyon, Riley, Sedgwick, and Shawnee) also had a high number of responses because the first survey was targeted toward college students.

Map 2. Number of survey Respondents, by County



Source: Institute for Policy & Social Research, The University of Kansas.

Data are based on recorded speed tests conducted as part of an online survey deployed by IPSR from January 2021 - January 2022.

Chapter 3; Appendix B: Survey Instruments

Kansas Regents Instrument

Default Question Block

Please answer all further questions in regard to the network you used for the speed test.

What is your zipcode? Please indicate the zipcode where you are physically located at this moment. Answer all questions in regard to this address.

Do you reside within city limits?

- ○ Yes
- ○ No

Do you currently subscribe to internet service at home?

- ○ Yes
- ○ No
- ○ Don't know
- ○ Other

If yes to internet in the home

What kind of service do you have? Select all that apply.

- ☐ Cable internet connection
- ☐ Fiber internet connection
- ☐ DSL (digital subscriber line)
- ☐ Satellite
- ☐ Mobile hotspot
- ☐ Fixed wireless
- ☐ Dial-up
- ☐ Don't know
- ☐ Other

What company provides your internet service?

Do you have a data cap on your home internet service?

- ○ Yes
- ○ No
- ○ Don't know
- ○ Other

Do you regularly connect to the internet using a wireless router?

- ○ Yes
- ○ No
- ○ Don't know
- ○ _____ Other

Are you satisfied with the internet speeds you have at home?

- ○ Yes
- ○ No
- ○ Don't know
- ○ _____ Other

What online activities do you have difficulty participating in because of an inadequate internet connection? Please select all that apply.

- ☐ Email
- ☐ Downloading content (such as receiving email attachments, online forms, video or audio, etc.)
- ☐ Uploading content (submitting homework, sending attachments, posting to discussion boards, etc.)
- ☐ Participating in real-time discussion or collaborative documents
- ☐ Videoconferencing or video calls (such as Zoom, Skype, FaceTime, etc.)
- ☐ Audio calls (audio-only Zoom, Skype, etc.)
- ☐ Streaming content (movies or TV, music, podcasts, live broadcasts, etc.)
- ☐ Social media
- ☐ Gaming
- ☐ _____ Other activities (write-in)

If no internet in home

You indicated you do not subscribe to internet service at home, why not? Please drag the items below to rank them in terms of most to least important:

Internet service is not available where I live

Internet service is not available at an acceptable speed

The monthly cost of home internet subscription is too expensive

I don't have a need for it at home

I have other options for internet access outside of my home

Some other reason (write-in) _____

Block 3

Do you regularly travel outside of your home to connect to the internet?

- ○ Yes
- ○ No

Please indicate all locations that you regularly travel to in order to connect to the internet.

- ☐ Place of employment
- ☐ Public library
- ☐ School or university
- ☐ Restaurant or café
- ☐ Retail location
- ☐ Gym or recreation center
- ☐ Community center
- ☐ Park
- ☐ Friend or family member's house
- ☐ _____ Other location (write-in)

Would you like to have broadband or high-speed internet at home? Broadband speeds are defined as 25 Mbps download and 3 Mbps upload.

- ○ Yes
- ○ No
- ○ Already have broadband speeds at home
- ○ Don't know

Why don't you currently have broadband or high-speed internet at home? Please drag the items below to rank them in terms of most to least important

- Broadband internet service is not available where I live
- Broadband internet is not available at an acceptable speed
- Monthly cost of home broadband subscription is too expensive
- Cost of a computer is too expensive
- I dislike the broadband internet service provider in my area
- Some other reason (write-in) _____

You indicated you would not like broadband or high-speed internet at home, why not? Please drag the items below to rank them in terms of most to least important

- Broadband internet service is not available where I live
- Broadband internet is not available at an acceptable speed
- Monthly cost of home broadband subscription is too expensive
- Smartphone does everything I need
- I have other options for broadband access outside of my home

I dislike the broadband internet service provider in my area

Some other reason (write-in) _____

What online activities would you participate in if you had broadband or high-speed internet access at home?

- ☐ Email
- ☐ Downloading content (such as receiving email attachments, online forms, video or audio, etc.)
- ☐ Uploading content (submitting homework, sending attachments, posting to discussion boards, etc.)
- ☐ Participating in real-time discussion or collaborative documents
- ☐ Videoconferencing or video calls (such as Zoom, Skype, FaceTime, etc.)
- ☐ Audio calls (audio-only Zoom, Skype, etc.)
- ☐ Streaming content (movies or TV, music, podcasts, live broadcasts, etc.)
- ☐ Social media
- ☐ Gaming
- ☐ _____ Other activities (write-in)

When you use the internet at home, do you mostly connect using your cell phone or mostly using some other device like a desktop, laptop or tablet computer?

- ○ Mostly on cell phone
- ○ Mostly on another device
- ○ Both equally
- ○ Depends
- ○ None
- ○ _____ Other

Demographic information

What is your age?

- ○ 18-20
- ○ 21-25
- ○ 26-30
- ○ 31-40
- ○ 40+

Are you of Hispanic, Latino, or Spanish origin, such as Mexican, Puerto Rican or Cuban?

- ○ Yes
- ○ No
- ○ Don't know
- ○ Prefer not to answer

Which of the following describes your race? You can select as many as apply.

- [ ] White (e.g., Caucasian, European, Irish, Italian, Arab, Middle Eastern)
- [ ] Black or African-American (e.g., Kenyan, Nigerian, Haitian)
- [ ] Asian or Asian-American (e.g., Asian Indian, Chinese, Filipino, Vietnamese or other Asian origin groups)
- [ ] Native American/American Indian/Alaska Native
- [ ] Pacific Islander/Native Hawaiian
- [ ] _____ Some other race (SPECIFY)
- [ ] Don't know
- [ ] Prefer not to answer

Last year, that is in 2020, what was your total family income from all sources, before taxes?

- ○ Less than $10,000
- ○ 10 to under $20,000
- ○ 20 to under $30,000
- ○ 30 to under $40,000
- ○ 40 to under $50,000
- ○ 50 to under $75,000
- ○ 75 to under $100,000
- ○ 100 to under $150,000
- ○ $150,000 or more
- ○ Don't know

How many people living in your household, including yourself, are age 6 or older?

How many people regularly connect to the internet at home?

If you have any questions or experience technical difficulties, please email ipsr@ku.edu.

Powered by Qualtrics

Kansas Broadband Survey

Default Question Block

Please answer all further questions in regard to the network you used for the speed test.

Are you completing this survey from your computer or mobile device?

- ○ Computer (laptop or desktop)
- ○ Mobile device (cell phone or tablet)
- ○ _____ Other

What is your zipcode? Please indicate the zipcode where you currently reside. Answer all questions in regard to this address.

_____

Did you complete the speed test from this zipcode?

- ○ Yes
- ○ No (if no, please enter the zipcode for the location where test was completed)
  _____
- ○ Unable or did not complete the speed test

Do you reside within city limits?

- ○ Yes
- ○ No

Do you currently subscribe to internet service at home?

- ○ Yes
- ○ No
- ○ Don't know
- ○ _____ Other

If yes to internet in the home

- [ ] Fiber internet connection
- [ ] DSL (digital subscriber line)
- [ ] Satellite
- [ ] Mobile hotspot
- [ ] Fixed wireless
- [ ] Dial-up using a modem and phone line
- [ ] Don't know
- [ ] Other

Why did you select the internet service you currently have? (select all that apply)

- [ ] It is the best priced option available
- [ ] It is the fastest option available
- [ ] It is the most reliable service available
- [ ] It is the best option bundled with other services (i.e. phone, TV)
- [ ] It is the only service available.
- [ ] _____ Other (please specify)

What other options do you have for internet service at home? (select all that apply)

- [ ] Cable internet connection
- [ ] Fiber internet connection
- [ ] DSL (digital subscriber line)
- [ ] Satellite
- [ ] Mobile hotspot
- [ ] Fixed wireless
- [ ] Dial-up using a modem and phone line
- [ ] I have no other options
- [ ] I don't know
- [ ] _____ Other (please specify)

What company provides your internet service?

Does this company provide a higher-speed internet service than what you currently subscribe to?

- ○ Yes
- ○ No
- ○ I don't know

How much do you pay for internet service at home per month?

- ○ $10-20
- ○ $21-30
- ○ $31-40
- ○ $41-50
- ○ $51-60
- ○ $61-70
- ○ $71-80
- ○ $81-90
- ○ $91-100
- ○ Over $100
- ○ I don't know

Is your internet service bill bundled with other services (e.g. phone or cable TV)?

- ○ Yes, phone
- ○ Yes, cable TV
- ○ Yes, phone and cable TV
- ○ No
- ○ I don’t know

How satisfied are you with the price you pay for internet service at home?

- ○ Very satisfied
- ○ Satisfied
- ○ Neither satisfied or dissatisfied
- ○ Dissatisfied
- ○ Very dissatisfied

Do you have a data cap on your home internet service?

- ○ Yes
- ○ No
- ○ Don’t know
- ○ _____ Other (please specify)

Do you regularly connect to the internet using a wireless router?

- ○ Yes
- ○ No
- ○ Don’t know
- ○ _____ Other (please specify)

Are you satisfied with the internet speeds you have at home?

- ○ Yes
- ○ Somewhat satisfied
- ○ No
- ○ _____ Other (please specify)

What online activities do you have difficulty participating in because of an inadequate internet connection? Please select all that apply.

- ☐ Email
- ☐ Downloading content (such as receiving email attachments, online forms, video or audio, etc.)
- ☐ Uploading content (submitting homework, sending attachments, posting to discussion boards, etc.)
- ☐ Participating in real-time discussion or collaborative documents
- ☐ Videoconferencing or video calls (such as Zoom, Skype, FaceTime, etc.)
- ☐ Audio calls (audio-only Zoom, Skype, etc.)
- ☐ Streaming content (movies or TV, music, podcasts, live broadcasts, etc.)
- ☐ Social media
- ☐ Gaming
- ☐ _____ Other activities (please specify)
- ☐ No difficulties participating in online activities

If no internet in home

You indicated you do not subscribe to internet service at home, why not? Please drag the items below to rank them in terms of most to least important.

Internet service is not available where I live

Internet service is not available at an acceptable speed

The monthly cost of home internet subscription is too expensive

I don't have a need for it at home

The cost of a computer is too expensive

I have other options for internet access outside of my home

I dislike the internet service provider in my area

Some other reason (please specify) _____

Asked of Everyone

Imagine your current at-home internet service price went up by $20 and your options for at-home internet service in your area remained the same as they are now. What would you be most likely to do?

- ○ Keep my current internet service provider
- ○ Cancel my service and live without at-home internet connection
- ○ Switch to a lower cost service provider available in my area
- ○ Move to a location with other options for internet connection
- ○ _____ Other (please specify)

What is the ***most*** you would be willing to pay per month for this service? Please indicate the maximum amount you would pay on the slider below.

0 25 50 75 100 125 150 175 200 225 250

Dollars per Month

If your only option for at-home internet service was a reliable, broadband internet connection of 50 Mbps download and 10 Mbps upload (capacity to stream high-definition content, gaming, share large files on multiple devices), what is the ***most*** you would be willing to pay per month for this service? Please indicate the maximum amount you would pay on the slider below.

0 25 50 75 100 125 150 175 200 225 250

Dollars per Month

If the following plans were available in your area, which one would you choose:

- ○ $15 per month - Less than 5 Mbps with no device or data limits (allows for checking email and web browsing)
- ○ $25 per month - 25 Mbps download, 3 Mbps upload - limited to two simultaneous devices and 5GB of data per month (5GB allows for 3-4 hours daily web browsing OR 40 minutes of browsing and 1 hour of music streaming daily OR 40 minutes of daily browsing and streaming a few movies in standard definition each month)
- ○ $35 per month - 25 Mbps download, 3 Mbps upload - with no device or data limits (stream standard-definition video on 1-2 devices without buffering, play most online games without lag, fast web browsing)
- ○ $45 per month - 50 Mbps download, 10 Mbps upload (stream high-definition content, gaming, share large files on multiple devices)
- ○ $65 per month - 100 Mbps download, 20 Mbps upload (stream high-definition content, video chat for 2-5 users simultaneously, play online games without lag)
- ○ $75 per month - 200 Mbps download, 20 Mbps upload (stream high-definition content, video chat for 5+ users simultaneously, play online games without lag, share and receive large files quickly, run a small home office)
- ○ $100 per month - 1,000 Mbps download (Gigabit), 20 Mbps upload (download 2 hour high-definition move in 25 seconds, fast streaming and downloading for 10+ devices, no lag time or delays in sharing and receiving streams or large files)
- ○ _____ Would not purchase any of these options (please share why)

Do you regularly travel outside of your home to connect to the internet?

- ○ Yes
- ○ No

Please indicate all locations that you regularly travel to in order to connect to the internet.

- [ ] Place of employment
- [ ] Public library
- [ ] School or university
- [ ] Restaurant or café
- [ ] Retail location
- [ ] Gym or recreation center
- [ ] Community center
- [ ] Park
- [ ] Friend or family member's house
- [ ] _____ Other location (please specify)

Would you like to have broadband or high-speed internet at home? Broadband speeds are defined as 25 Mbps download and 3 Mbps upload.

- ○ Yes
- ○ No
- ○ Already have broadband speeds at home
- ○ Don't know

Why don't you currently have broadband or high-speed internet at home? Please select all that apply.

- [ ] Broadband internet service is not available where I live
- [ ] Broadband internet is not available at an acceptable speed
- [ ] Monthly cost of home broadband subscription is too expensive
- [ ] I don't have a need for it at home
- [ ] Smartphone does everything I need
- [ ] I have other options for broadband access outside of my home
- [ ] I dislike the broadband internet service provider in my area
- [ ] _____ Some other reason (please specify)

You indicated you would not like broadband or high-speed internet at home, why not? Please drag the items below to rank them in terms of most to least important

Broadband internet service is not available where I live

Broadband internet is not available at an acceptable speed

Monthly cost of home broadband subscription is too expensive

I don't have a need for it at home

Smartphone does everything I need

I have other options for broadband access outside of my home

I dislike the broadband internet service provider in my area

Some other reason (please specify) _____

What online activities would you participate in if you had broadband or high-speed internet access at home?

- [ ] Email
- [ ] Downloading content (such as receiving email attachments, online forms, video or audio, etc.)
- [ ] Uploading content (submitting homework, sending attachments, posting to discussion boards, etc.)
- [ ] Participating in real-time discussion or collaborative documents
- [ ] Videoconferencing or video calls (such as Zoom, Skype, FaceTime, etc.)
- [ ] Audio calls (audio-only Zoom, Skype, etc.)
- [ ] Streaming content (movies or TV, music, podcasts, live broadcasts, etc.)
- [ ] Social media
- [ ] Gaming
- [ ] _____ Other activities (write-in)

When you use the internet at home, do you mostly connect using your cell phone or mostly using some other device like a desktop, laptop or tablet computer?

- ○ Mostly on cell phone
- ○ Mostly on another device
- ○ Both equally
- ○ None
- ○ _____ Other (please specify)

Demographic information

What is your age?

- ○ 18-20
- ○ 21-25
- ○ 26-30
- ○ 31-40
- ○ 41-50
- ○ 51-60
- ○ 61-70
- ○ 71-80
- ○ 80+

What is your gender?

- ○ Female
- ○ Male
- ○ _____ Prefer to self-identify
- ○ Prefer not to answer

Are you of Hispanic, Latino, or Spanish origin, such as Mexican, Puerto Rican or Cuban?

- ○ Yes
- ○ No
- ○ Don't know
- ○ Prefer not to answer

Which of the following describes your race? You can select as many as apply.

- ☐ White (e.g., European, Irish, Italian, Arab, Middle Eastern)
- ☐ Black or African-American (e.g., Kenyan, Nigerian, Haitian)
- ☐ Asian or Asian-American (e.g., Asian Indian, Chinese, Filipino, Vietnamese or other Asian origin groups)
- ☐ Native American/American Indian/Alaska Native
- ☐ Pacific Islander/Native Hawaiian
- ☐ _____ Some other race (please specify)
- ☐ Don't know
- ☐ Prefer not to answer

What is the highest degree or level of school you have completed?

- ○ Did not complete high school or GED
- ○ High school diploma, GED, or alternative credential
- ○ Some college or Associate's degree
- ○ Bachelor's degree (for example: BA, BS)
- ○ Master's degree (for example: MA, MS, MEng, MEd, MSW, MBA)
- ○ Professional or Doctorate degree (for example: MD, DDS, DVM, LLB, JD, PhD, EdD)

Last year, that is in 2020, what was your total family income from all sources, before taxes?

- ○ Less than $10,000
- ○ 10 to under $20,000
- ○ 20 to under $30,000
- ○ 30 to under $40,000
- ○ 40 to under $50,000
- ○ 50 to under $75,000
- ○ 75 to under $100,000
- ○ 100 to under $150,000
- ○ $150,000 or more
- ○ Don't know

Were you working from home in January 2020?

- ○ Yes
- ○ No

Are you currently employed?

- ○ Yes
- ○ No
- ○ Retired

Work Questions

Which of the following best describes the industry in which you are employed? (If retired,please choose the industry during the time when you were employed).

- ○ Agriculture, Forestry, Fishing and Hunting
- ○ Mining, Quarrying, and Oil and Gas Extraction
- ○ Utilities
- ○ Construction
- ○ Manufacturing
- ○ Wholesale Trade
- ○ Retail Trade
- ○ Transportation and Warehousing
- ○ Information
- ○ Finance and Insurance
- ○ Real Estate and Rental and Leasing
- ○ Professional, Scientific, and Technical Services
- ○ Management of Companies and Enterprises
- ○ Administrative and Support and Waste Management and Remediation Services
- ○ Educational Services
- ○ Health Care and Social Assistance
- ○ Arts, Entertainment, and Recreation
- ○ Accommodation and Food Services
- ○ Other Services (except Public Administration)
- ○ Public Administration
- ○ Other

Are you able to do your job from home?

- ○ Yes
- ○ No
- ○ Not applicable

Are you currently working from home?

- ○ Yes
- ○ No

Demographic 2

How many people reside in your household?

How many people living in your household, including yourself, are age 6 or older?

How many people regularly connect to the internet at home?

Are there any additional complaints or concerns that you have regarding your at-home internet access that you would like us to consider?

If you have any questions or experience technical difficulties, please email ipsr@ku.edu.

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Chapter 3; Appendix C: Supplemental Tables

Table C-1. Survey Respondents: Gender and Age

	Survey Respondents		
Demographic Characteristics	**Number**	**Percent Total**	**Percent Kansas**
Gender			
Female	2,355	65.1	50.2
Male	1,143	31.6	49.8
Prefer not to answer	100	2.8	-
Prefer to self-identify	17	0.5	-
Total	3,615		
Age			
18-25	1,697	28.2	11.5
26-40	1,575	26.1	19.6
40-60*	1,802	29.9	24.8
60+	949	15.8	22.6
Total	6,023		

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021; U.S. Census Bureau, 2019 population estimates.

* Includes 213 respondents from the Regents Survey that indicated 40+.
Note: The Census Bureau does not include the option to decline to answer or self-identify in response to the questions on gender.

Table C-2. Survey Respondents: Race and Ethnicity

	Survey Respondents		
Demographic Characteristics	**Number**	**Percent Total**	**Percent Kansas**
Race			
Black	113	1.9	5.7
White	5,106	85.3	83.6
American Indian/Alaska Native	53	0.9	0.8
Asian	235	3.9	3.0
Native Hawaiian and Other Pacific Islander	2	0.0	0.1
Some other race	317	5.3	3.0
Two or more races	184	3.1	3.7
Total	6,010		
Hispanic Origin			
Yes	326	5.4	12.2
No	5,434	90.8	87.8
Prefer not to answer	215	3.6	-
Don't know	11	0.2	-
Total	5,986		

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021; U.S. Census Bureau, 2019 American Community Survey.

Table C-3. Survey Respondents: Educational Attainment and Income

	Survey Respondents		
Demographic Characteristics	**Number**	**Percent Total**	**Percent Kansas**
Educational Attainment			
Less than high school	31	0.9	9.1
High school	303	8.4	25.9
Some college	1,064	29.4	31.7
Bachelor's degree	1,185	32.8	21.1
Graduate or professional degree	1,035	28.6	12.3
Total	**3,618**		
Family Income from All Sources before Taxes	**Survey**	**Kansas**	
Median Income	$50,000 to under $75,000	$59,597	
N=	**5,293**		

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021; U.S. Census Bureau, 2015-2019, American Community Survey.

Table C-4. Broadband Access in Kansas: Kinds of Internet Service at Home

	Reside within City Limits						
Service at Home	**Yes**	**No**	**Percent Yes**	**N=**	**Percent Total**	**Ave. Download**	**Ave. Upload**
Cable	2,031	244	89.3	2,275	34.3	102.1	32.4
DSL	288	228	55.8	516	7.8	34.4	12.0
Dial-up	30	24	55.6	54	0.8	11.7	1.9
Fiber	988	215	82.1	1,203	18.1	140.8	126.5
Fixed wireless	469	322	59.3	791	11.9	68.4	45.7
Mobile	213	175	54.9	388	5.9	93.5	58.3
Satellite	76	356	17.6	432	6.5	24.0	9.2
Other	42	94	30.9	136	2.1	20.3	4.6
Don't Know	616	216	74.0	832	12.6	45.7	14.5
Total	**4,753**	**1,874**	**71.7**	**6,629**			

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Table C-5. Broadband Affordability in Kansas: Willingness to Pay for Service by Family Income

Service Option	Number	% Total	Total Family Income in 2020 from All Sources before Taxes: < $30,000	$30,000 -$49,999	$50,000 -$74,999	$75,000 -$99,999	$100,000 -$149,99	$150,000 or More	Don't Know
$15 per month - Less than 5 Mbps with no device or data limits	29	0.8	7	6	5	3	1		3
$25 per month - 25 Mbps download, 3 Mbps upload - limited to two devices and 5GB of data per month	47	1.3	13	13	7	5	3	1	3
$35 per month - 25 Mbps download, 3 Mbps upload, no devise or data limits	224	6.1	37	42	40	42	21	13	15
$45 per month - 50 Mbps download, 10 Mbps upload	701	19.0	69	127	166	116	94	39	46
$65 per month - 100 Mbps download, 20 Mbps upload	885	24.0	80	137	165	166	142	87	47
$75 per month - 200 Mbps download, 20 Mbps upload	745	20.2	47	98	145	142	130	97	38
$100 per month - 1,000 Mbps download (Giga-bit), 20 Mbps upload	854	23.1	44	78	124	133	197	179	66
Would not purchase any of these options	207	5.6	41	35	32	26	19	15	19
Total	3,692		338	536	684	633	607	431	237
Percent of Total			9.2	14.5	18.5	17.1	16.4	11.7	6.4

Source: Institute for Policy & Social Research, University of Kansas, Kansas Broadband Survey, 2021.

Chapter 5; Appendix A: Supplemental Tables

Table A-1. Quoted Participant Demographic Information

Pseudonym	Age	Gender	Race/Ethnicity	Income Level [Household Size]	Education
Alex	31	Male	White	$40,000-$59,000 [7]	some college
Annie	62	Female	White	$20,000-$39,999 [2]	some college
Aurora	34	Female	White	$0- $19,999 [3]	AS
Bill	71	Male	White	$40,000-$59,999 [1]	MA/MS/MBA
Charles	n/s	Male	Black	$0- $19,999 [1]	n/s
Edith	67	Female	Black	n/s	MA/MS/MBA
Elsa	64	Female	White	$0-$19,999 [1]	some college
Emily	71	Female	White	$40,000-$59,999 [1]	PhD/MD/JD
Gareth	30	Male	White	$20,000-$39,999 [1]	HS/GED
Kat	37	Female	White	$20,000-$39,999 [4]	BA/BS
Margie	59	Female	White	$20,000-$39,999 [1]	MA/MS/MBA
Meredith	70	Female	Latina	$0-$19,999 [1]	HS/GED
Morris	n/s	Male	White	n/s	n/s
Nate	24	Male	White	$0-$19,999 [1]	BA+
Opal	43	Female	White	$20,000-$39,999 [5]	n/s1
Sterling	66	Male	White	$60,000-$79,999 [2]	BA+
Valerie	n/s	Female	Black	$0- $19,999 [1]	n/s

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