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Consumer perceptions of broadband and telehealth across Telehealth Broadband Pilot Program counties

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Background

Broadband internet has become a critical feature to support individuals and communities in business, education, health, among many other domains.[1] Often referred to as a "super determinant of health,"[2] access to broadband is not equitably distributed across the United States (U.S.).[3] Rural communities within the U.S. have historically fallen short of urban communities in broadband access,[4,5] a disparity that became more pronounced during the COVID-19 public health emergency (PHE).[3,6] This rural-urban digital divide persists and has important implications for healthcare.

Telehealth services have the potential to increase healthcare access, particularly in rural communities that are disproportionately and negatively affected by healthcare shortages and healthcare facility closures.[7,8] However, telehealth is optimal when broadband is available, affordable, and acceptable to patients.[9]

Key Findings:

- Low cost, availability, perception of value, and high quality of service facilitate home broadband services among consumers interviewed.
- Perception of decreased patient burden, prior positive experiences with telehealth, and availability of telehealth services facilitate telehealth utilization.
- High cost, poor quality of connection, a lack of availability of quality services, poor quality of service, low digital literacy, no perceived value in broadband, and privacy and safety concerns are barriers to home broadband.
- Not perceiving value in telehealth, a lack of sufficient broadband, cost or reimbursement issues, a perceived lack of telehealth availability, and low digital literacy are barriers to telehealth utilization.

On September 1, 2020, the Federal Communications Commission (FCC), U.S. Department of Health and Human Services (HHS), and U.S. Department of Agriculture (USDA) signed a Memorandum of Understanding, launching

the Rural Telehealth Initiative (RTI). The RTI is a multi-department initiative that collaborates and shares information to address health disparities, resolves service provider challenges, and promotes broadband services and technology in rural areas of the U.S. The RTI created the Telehealth Broadband Pilot (TBP) Program to address gaps in broadband service that limit access to telehealth services in rural communities. In January 2021, HHS, through the Health Resources and Services Administration (HRSA), awarded $8 million to fund the TBP Program through December 31, 2024. The TBP Program assessed the broadband capacity available to rural healthcare providers and patient communities to improve their access to telehealth services. The National Telehealth Technology Assessment Resource Center (TTAC), based out of the Alaska Native Tribal Health Consortium, received $6.5 million to implement the TBP Program, and the Rural Telehealth Evaluation Center (RTEC) at the University of Arkansas for Medical Sciences—a Telehealth Research Center—received $1.5 million to evaluate the TBP Program. The TBP Program was implemented in 25 target counties or county-equivalents (henceforth, counties) across four states: Alaska, Michigan, Texas, and West Virginia. As part of the TBP Program evaluation, RTEC staff conducted and qualitatively analyzed interviews with members of the TBP communities to identify facilitators and barriers to broadband and telehealth adoption.

Methods

Semi-structured, qualitative interviews were conducted via phone with 21 consumers. Consumers were identified and recruited through TBP community partners. Consumers were eligible to participate in an interview if they were both 1) age 18 years or older, and 2) resided in one of the 25 target counties across Alaska, Michigan, Texas, and West Virginia. Consumers were mailed a $30 pre-paid gift card for their participation. Interviews lasted an average of approximately 22.4 minutes (range: 15 and 39 minutes).

Interviews were audio-recorded and transcribed verbatim. Transcripts were uploaded into MaxQDA qualitative analysis software for inductive coding to identify emergent themes and sub-themes regarding facilitators and barriers to broadband and telehealth. Coding was conducted collaboratively among three coders to establish an initial codebook. Later stages of coding were conducted independently by two of the coders, and discrepancies were resolved through discussion among all three coders. The final codebook emerged through collaborative discussion. The project was determined non-human subjects research by the University of Arkansas for Medical Sciences' Institutional Review Board (#297412).

Results

A summary of the emergent facilitators and barriers for home broadband and telehealth utilization can be found in Table 1. Themes represent general topics that emerged through qualitative coding and analysis (e.g., poor quality of broadband connection as a barrier to obtaining and sustaining broadband), and sub-themes represent more specific categories within those topics, if any (e.g., outages and slow speeds). Themes within a category are presented in order of frequency, with the most frequently identified themes presented first.

Table 1. Emergent themes when examining facilitators and barriers to obtaining and sustaining home broadband, and for telehealth utilization.

	Category	Theme	Sub-Theme
Broadband	Access and Usage	Access to broadband at home	
		Home broadband quality	
		Home broadband technologies	
		Home broadband devices utilized	
		Choice of home broadband service provider	Quality Cost Local or personal relationship or recommendations Lack of choice
		Broadband-enabled activities	Entertainment Employment and education Activities of daily living Completion of paperwork Communication with friends, family, and others Healthcare
	Facilitators	Low cost	
		Availability of quality service due to geographic proximity	
		Perception of value in broadband	
		High quality of broadband service	
		High quality of broadband connection	
	Barriers	High cost	
		Lack of quality service availability due to geographic proximity	
		Perception of a lack of value in broadband	
		Poor quality of broadband service	Data limits or caps Complicated or difficult set-up or maintenance Poor customer service
		Poor quality of broadband connection	Outages Slow speeds
		Low digital literacy	
		Privacy and security concerns	
Telehealth	Access and Usage	Prior telehealth experience	
		Modality	Audio/video Audio-only Remote patient monitoring
	Facilitators	Perception of a decreased patient burden	Reducing travel Saving time Saving on costs Convenience
		Prior positive telehealth experiences	
		Telehealth service availability	
	Barriers	Perception of a lack of value in telehealth	
		Lack of sufficient broadband connection	
		High cost or the perception of a lack of coverage	
		Perception of a lack of telehealth availability	
		Low digital literacy	

Broadband Access and Usage

Most consumers reported having **access to broadband at home**. Among those who did not have broadband at home, one previously had broadband but could no longer afford it, and one had attempted to purchase home broadband but could not identify a quality, affordable connection (see *Broadband Barriers*). Among those who had broadband at home, **home broadband quality** varied considerably, with some consumers reporting good quality home broadband and others reporting home broadband quality that was poor (see Box 1). A range of **home broadband technologies** were reported by consumers, including fiber, cable, cellular or mobile data, digital subscriber lines (DSL), satellite, and wireless microwave. Consumers also reported utilizing **home broadband with many different broadband-connected devices** including home computers, cell phones, security cameras, and entertainment devices like smart TVs, Blu-ray players, and digital assistants. Additionally, several consumers mentioned using devices that enabled broadband in their homes, such as mesh systems and hotspots.

Consumers reported four key sub-themes that drove their **choice of a home internet service provider (ISP)**: *quality*, *cost*, *local or personal relationship or recommendations*, and *lack of choice*. *Quality* and *cost* were often described as drivers in choice of ISP. One consumer described switching ISPs specifically due to cost, saying, "We had [former ISP] and it was—it got too expensive, and we dropped it." Many consumers described either a *local or personal relationship or having a trusted recommendation* as driving their choice of ISP. One consumer described how their choice of current ISP provider was influenced by recommendations and the provider's reputation. Another consumer described seeking ISP recommendations online. Several consumers described having a *lack of choice* in ISP, or, in the words of one consumer, they chose their ISP because "they were the only game in town."

Box 1. Consumer Experiences: Quality of Broadband

"Back when we had [former ISP], our service was literally so bad that…on a good day, we could, either one person watch [video streaming service] or one person could browse the internet. We could not do both at the same time 'cause if you tried to browse after you started [video streaming service], your—it'll take forever for the page to load, or if you tried to fire up [video streaming service] after you started browsing, [video streaming service] would constantly buffer. It was just a constant battle back-and-forth of who could do what, when."

Consumers described using their broadband in multiple ways (**broadband-enabled activities**), notably for *entertainment*; *employment and education*; *activities of daily living*; *completion of paperwork*; *communication with friends, family, and others*; and *healthcare*. Many consumers described using their home broadband for *entertainment*, including social media, online gaming, and streaming or downloading entertainment. Another common use of home broadband was for *employment*, including remote work and *education*, including homework and attending online classes. One consumer described the advantage of using broadband for education. Another consumer described broadband as facilitating employment, not just for themselves but also for the employees of their business.

Consumers also described using broadband for *activities of daily living*, such as shopping, accessing news and weather, and searching for information. Another common use of broadband among consumers was *to complete paperwork*, such as banking, paying bills, and applying for social services or benefits. Consumers also mentioned that broadband facilitated *communication with friends, family, and others*. One consumer said that broadband "keeps us

connected…all my kids are grown and moved away." Finally, several consumers described using broadband for *healthcare* (see *Telehealth Usage*).

Broadband Facilitators

A visual representation of broadband facilitators can be found in Figure 1. Themes are presented in order of frequency, with the most frequently identified themes presented first.

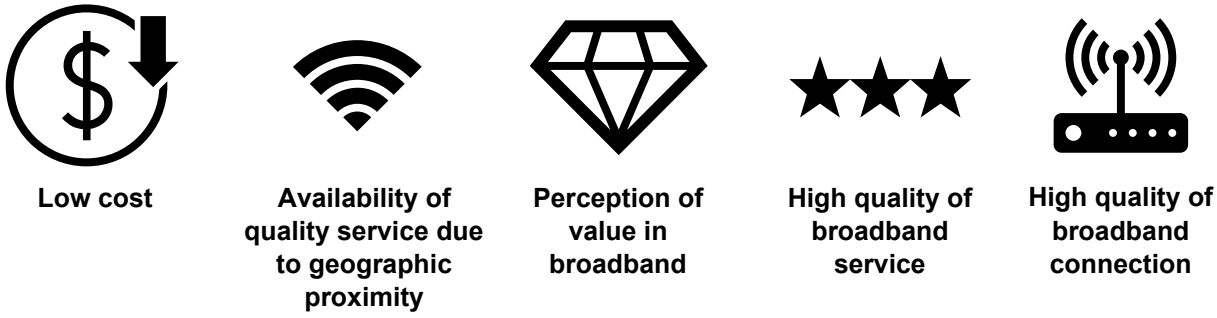

Figure 1: Broadband facilitators for consumers in the 25 TBP target counties.

Consumers described several influences that facilitated their broadband access. Many consumers expressed that having a relatively **low cost** of broadband helped them attain or keep their service. Several consumers described a positive impact of participating in the Affordable Connectivity Program (ACP), which reduced their monthly bill (see Box 2). One consumer explained, "It's $88, and I'm getting a $30 discount for [the ACP]. So, if it wasn't for that, it'd be over a hundred dollars." **Availability of quality service due to geographic proximity** was also a noted facilitator of home broadband among consumers. For example, one consumer described benefiting from close geographic proximity to a large commercial business, perceiving that the ISP prioritized providing quality broadband to that large business.

Box 2. Consumer Experiences: Participation in the Affordable Connectivity Program (ACP)

"I was involved in [the ACP]. Yeah, so cool. I got that pretty much as soon as I, uh, moved out. And I'm actually still on since I just started, they give you a discount for a couple years. So, the first year being here I didn't have to pay a cent for the internet. It was between a discount and [the] ACP program. It was all covered…It was really nice coming out for just moving out of the house the first time, getting all these bills and then having that one taken care of."

Perception of value in broadband was also a key influence on broadband adoption. Many consumers described a task or process conducted over broadband as faster, easier, or better than the equivalent analog option, such as electronic communication being faster than postal mail and online communication being easier than telephone. **High quality of the broadband service**—particularly a local service—was also described by consumers as a facilitator of home broadband. **High quality of the broadband connection** in the home was also identified as a driver of broadband adoption.

Broadband Barriers

A visual representation of broadband facilitators can be found in Figure 2. Themes are presented in order of frequency, with the most frequently identified themes presented first.

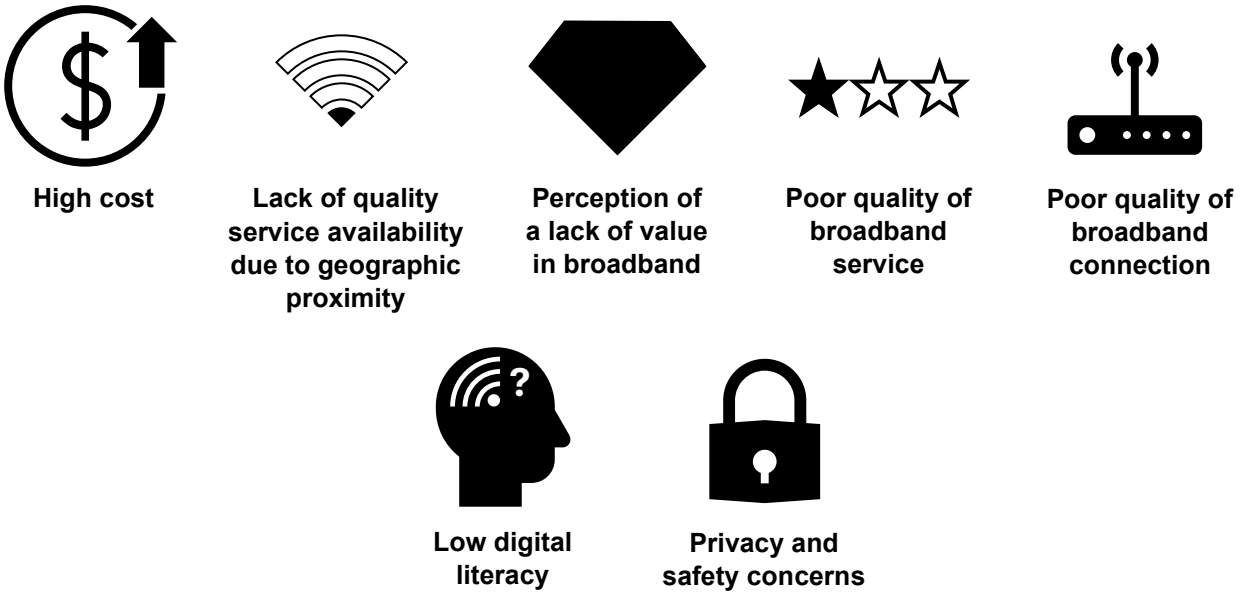

Figure 2: Broadband barriers for consumers in the 25 TBP target counties.

Consumers identified several barriers to obtaining, sustaining, and accessing broadband in their homes. Consumers described the **high cost** of broadband as a barrier to accessing broadband because of high start-up costs, high costs of bundled services that included not just broadband but also additional services (such as a telephone landline) not truly needed, and how other utilities would take precedence if finances were limited. One consumer outlined several monthly payments they needed to make—including electricity and water—describing broadband service as "pretty well low on the list." Another consumer described cancellation of two prior broadband services due to increasing service costs and relying on their mobile phone for connectivity in lieu of home broadband. One consumer, regarding the cost of broadband in their area, said, "I'm paying over a hundred dollars a month just for internet that I'm not happy with. And I would say as a result, there's a lot of people around here don't have it at all because they can't afford it." Another consumer described not being able to afford the higher cost of broadband service after the end of the ACP.

Multiple consumers reported a **lack of quality service availability due to geographic proximity** as a broadband barrier. In the words of one consumer: "It's hard to run a wire to that location. Or it's expensive and that cost gets put on the individual. And then that

Box 3. Consumer Experiences: Lack of quality service availability due to geographic proximity

"[ISP] was pretty much the only thing that was available. I'm out here in the country on top of a hill. My cell phone doesn't even work here, so I paid for them to put that dish in here so I could have service. And I've got it some of the time, but I'm just not happy with it. It's not fast enough, and, you know, before a month's out, it's dragging even worse…I found out afterwards I could've gone through the phone company, [other ISP]…well, I'll tell you this whole area, for the past couple of years, we've had so much storms, and trees are falling in West Virginia like you wouldn't believe. And, uh, it seemed like the phone lines are going down all the time, so I didn't want to risk that being my internet also."

increases the cost of installing service to the home." (See Box 3 for another example.) Another consumer in rural Alaska described a specific example of a lack of available, quality broadband, explaining how their home on the tundra physically shifted over time, necessitating additional adjustments to their satellite dish or risk being unable to complete online tasks, such as sending an email. Some consumers described their perception of rural areas of their state as neglected from infrastructure investment, one saying, "Out here in West Virginia, it's internet no-man's land." Others described the prioritization of areas with larger populations over investment in areas with smaller populations.

Perception of a lack of value in broadband was also a barrier for some consumers living in the TBP target counties. For example, some saw the value in having home broadband to watch the news on TV and run their home security cameras but did not value other uses for home broadband, such as online shopping. Consumers also described **poor quality of broadband service**—including *data limits or caps*, *complicated or difficult set-up or maintenance*, and *poor customer service*—as barriers to obtaining and sustaining access to broadband. One consumer described streaming videos at home only "towards the end of the month when I've got data left" to ensure they did not exceed the limit of their data plan, which would incur additional costs. Another barrier to broadband service consumers identified was **poor quality of broadband connection**, including *outages* and *slow speeds*. One consumer described broadband outages as impacting their work. In this example, the consumer utilized a satellite service and experienced outages "anywhere from 15 minutes to 45 minutes," which they described as "not that long." Another consumer described delays with streaming videos, explaining how they sometimes waited five minutes to watch a two-minute clip because of long buffering times.

Low digital literacy was also identified by consumers as a broadband barrier. One consumer described their broadband issues, saying, "Honestly, 99% of the trouble I have with the computer is my lack of knowledge and how to use the things, you know? I tell people I know just enough to get me in trouble." Another consumer, when asked why they did not have broadband, said, "I don't understand it. I wasn't born with a mouse in my hand. And I just never was around that particular technology…I know that there's things there that I'm missing out on that could be very helpful on a daily basis."

Finally, a few consumers identified **privacy and security concerns** as a broadband barrier. One consumer who did not have broadband explained, "I'll tell you the big setback, the big block wall…nobody can give me a hundred percent guarantee on privacy and security. And they all shy away from that question. That's a big thing. Because actually, I don't trust all this modern technology."

Telehealth Usage

All consumers were asked about **prior telehealth experience**. Most consumers had used telehealth before, but several had not. Among those who had experience with telehealth services, experience with several different telehealth **modalities** were reported. Many consumers reported experience with *audio/video visits*, multiple consumers reported *audio-only telehealth* experience, and a few consumers had used *remote patient monitoring* services.

Telehealth Facilitators

A visual representation of telehealth facilitators can be found in Figure 3. Themes are presented in order of frequency, with the most frequently identified themes presented first.

Figure 3. Telehealth facilitators for consumers in the 25 TBP target counties.

Consumers who had previously used telehealth described three influences that had **facilitated using telehealth**. First, most telehealth-experienced consumers described a **perception of how telehealth decreased patient burden**, including *reducing travel*, *saving time*, *saving on costs*, and providing *convenience* overall. One consumer described how telehealth allowed them to address their condition without the need for an in-person visit an hour away. Another consumer noted how telehealth saved them both time and money, in terms of the cost of gas and sparing them a three-hour trip for a 15-minute visit. A third consumer explained that they were unable to have telehealth visits at home, but that they were able to use their work internet for telehealth because their internet was more reliable. Being able to complete their telehealth visit from work meant avoiding taking time off work and ensured a more reliable experience than if they used their home internet. More than one consumer described how telehealth benefited their families by making access to care more convenient for members of their family with disabilities for whom travel for an in-person visit to their provider was more burdensome (see Box 4).

The second facilitator of telehealth service utilization identified through consumer interviews was **prior positive telehealth experiences**. Consumers with telehealth experiences described them as "fantastic…very satisfied," "I didn't have any issues," "it worked just fine," and "it all worked as advertised." One consumer in rural Alaska described how essential telehealth was for their family, highlighting the importance of accessible, home-based telehealth and the ability to communicate with a clinic, particularly for members of their household with disabilities, emphasizing how telehealth has become an integral part of their daily lives. Finally, the **telehealth service availability** was the third telehealth facilitator for consumers interviewed, particularly during the COVID-19 PHE. For example, one consumer relocated from their primary home in an urban to a second home in a rural area during the COVID-19 PHE on a physician recommendation because of their health status placing them at greater risk of severe COVID-19 infection and death. Telehealth provided continuity of care for this consumer, who was able to receive their medical care via telehealth with their doctor located four hours away. Another consumer described prior telehealth experience for an annual wellness visit, explaining that

Box 4. Consumer Experience: Decreased patient burden

"We all have health issues. We're all…disabled, and because we're so remote, the doctors and specialists are so far away. Like, for me to go to see a rheumatologist, the rheumatologist is two and a half hours away. It's about—it's like 150 miles to get to get to a specialist…I'm in Northern Michigan, when in the wintertime—there's a lot of times it's not safe to travel. So, that is the best time for us to be able to have…the telehealth options."

telehealth had been offered to them in an effort to reduce the number of patients seen in-person and thus reduce the spread of COVID-19.

Telehealth Barriers

A visual representation of telehealth barriers can be found in Figure 4. Themes are presented in order of frequency, with the most frequently identified themes presented first.

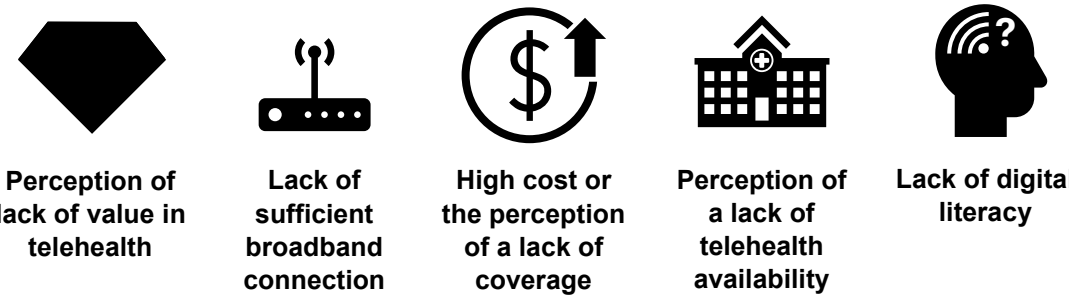

Figure 4. Telehealth barriers for consumers in the 25 TBP target counties.

Themes identified for telehealth barriers were similar to those identified for broadband. A **perception of a lack of value in telehealth** was articulated largely by consumers who did not have experience with telehealth, though not exclusively. Consumers with telehealth experience described both negative and positive experiences, with one consumer preferring in-person visits to a clinic only 15-20 minutes away by car. Consumers also described **a lack of sufficient broadband connection** as a barrier to utilizing telehealth. One consumer explained their lack of broadband as influencing their ability to access telehealth, explaining that although their provider offered telehealth services, they could not utilize them because they lacked home broadband. Another consumer noted that connectivity issues contributed to poor quality telehealth visits; however, the consumer was unsure if the issue was with their broadband connection or the provider's. One consumer described similar issues with a tele-mental health audio/video visit, including dropped calls, freezing video, and difficulties with email attachments. When asked by the interviewer if these issues had led the consumer to pursue an alternative ISP for broadband, the consumer responded that there were no other ISPs in their area. Another consumer described their experience with variable broadband quality at different times of day as influencing their decision to have a telehealth visit (see Box 5). One consumer in rural Alaska described a digital divide in their region, noting that while their hub community had the infrastructure to support telehealth, the more remote villages had slower connections and limited telehealth infrastructure. Another consumer explained how they were unable to fully participate in a remote patient monitoring service and telehealth services more broadly due to a lack of affordable broadband connectivity in their area.

Box 5. Consumer Experiences: Lack of sufficient broadband connection

"[In the] morning…it's pretty fast. And then [in the] evening, a lot of times, you know, one point something, two or three…megabytes per second, you can't hardly do much of nothing on that. So you would definitely need to make [all your appointments in the morning]."

High cost or the perception of a lack of coverage was also identified by consumers as barriers to receiving telehealth services. One consumer described difficulties accessing telehealth due to previous insurance providers not reimbursing for telehealth visits, while another described a preference for telehealth services due to a lack of reliable transportation but felt pressure from their healthcare provider to utilize in-person services (see Box 6). Some consumers described a **perception of a lack of telehealth availability** as a barrier to receiving telehealth services. Some consumers were unaware of telehealth services being offered by their providers, while others experienced changes in telehealth availability. One consumer in Alaska described a disabled sibling they cared for as having previously participated in a telehealth-enabled pacemaker via phone, but later required in-person monitoring.

Low digital literacy was also a perceived barrier to telehealth service utilization for some consumers. One consumer described a lack of knowledge of how to participate in a telehealth visit as a barrier, explaining that they did not know how to use telehealth services. Another consumer who had broadband at home explained their aversion to telehealth, citing difficulty using computers due to limited experience with technology and lacking typing skills.

Discussion

As part of the evaluation of the TBP Program implemented in 25 target counties of Alaska, Michigan, Texas, and West Virginia, 21 interviews with residents of these communities were conducted to assess facilitators and barriers to obtaining and sustaining home broadband service, as well as facilitators and barriers to utilizing telehealth services. Results demonstrated that **low cost**, **availability of quality service due to geographic proximity**, **perception of value**, **high service quality**, and **high connection quality** facilitated home broadband service among the consumers interviewed. Additionally, **a perception of decreased patient burden**, **prior positive experiences with telehealth**, and **telehealth service availability** emerged as facilitators of telehealth utilization for consumers within the TBP target counties.

Box 6. Consumer Experience: High cost or the perception of a lack of reimbursement

"Once we moved out of COVID, like, I was being harassed about how they weren't going to offer telehealth anymore. At first, they started…saying my insurance wouldn't cover it and that I needed to talk to my insurance… I am disabled. So, if I can't physically transport myself there, then…how am I going to get the specialized care that I need?"

However, several barriers to both broadband and telehealth access were also identified among consumers interviewed, including changes in telehealth availability after the COVID-19 PHE ended. Barriers to home broadband included **high cost**, **lack of quality service availability due to geographic proximity**, **perception of a lack of value in broadband**, **poor quality of service**, **poor quality of connection**, **low digital literacy**, and **privacy and safety concerns**. For telehealth utilization, recognized barriers included a **perception of a lack of value in telehealth**, a **lack of sufficient broadband**, **high cost or coverage issues**, **perception of a lack of telehealth availability**, and **low digital literacy**. Some consumers expressed a preference for in-person visits, citing the perceived simplicity and convenience of in-person visits compared to telehealth.

Previous research conducted in other parts of the rural U.S. has supported these results. For example, several recent studies have found that rural broadband adoption has stagnated and still lags behind that of urban areas, suggesting that many rural communities are still

experiencing barriers to broadband adoption.[10–12] Additionally, several previous studies have found that poor broadband access is associated with low telehealth adoption, aligning with the finding that a lack of broadband access is a barrier to consumers accessing telehealth in TBP target counties.[13,14] Many of the facilitators to telehealth access identified in the evaluation of the TBP Program have also been identified previously, as in a recent systematic review that corroborated the facilitative influence of reduced patient burden (including cost savings, reduced travel time, and convenience) and prior positive experience.[15] This systematic review also corroborated this finding of not perceiving value in telehealth (or preferring in-person visits); lack of sufficient broadband including slow speeds, issues with broadband access, poor signal coverage, poor signal, poor audio quality, and poor video quality; cost and reimbursement issues; and low digital literacy (i.e., resistance to technology, technological incompatibility, difficult to use the system).

Overall, residents of the 25 target counties across Alaska, Michigan, Texas, and West Virginia reported several facilitators to access both broadband and telehealth but also identified multiple barriers to obtaining and sustaining broadband, as well as utilizing telehealth that persist to the present day. These findings support the need for upcoming infrastructure investments planned through the Broadband Equity, Access, and Deployment (BEAD) Program to prioritize unserved and underserved communities. Although investments in broadband infrastructure will not eliminate the digital divide in rural communities relative to urban communities, these broadband improvements have the potential to increase not only broadband access, but healthcare access via telehealth. Interviews with consumers also revealed geographic barriers to obtaining and sustaining broadband, such as mountainous terrain in West Virginia and tundra in Alaska. These barriers have also been identified by the FCC, which has reported that frozen tundra and marshlands of Alaska necessitate different funding and solutions to increase broadband access.[16] The West Virginia BEAD proposal also cites terrain challenges for broadband expansion, namely mountains and forests that make broadband infrastructure development more costly.[17] These findings also support the need to provide digital navigation education for many members of rural communities who lack digital literacy to facilitate participation in broadband-enabled services such as telehealth. Additional educational needs identified in the TBP Program evaluation included online privacy and safety, which was a barrier identified by consumers who feared greater participation in broadband-enabled activities because of concerns regarding the safety of their information stored or transferred online. Findings from the TBP Program evaluation also highlight the need for telehealth reimbursement, as consumers expressed concerns about a lack of reimbursement and noted their perception that healthcare providers often preferred in-person due to higher reimbursement rates. This perception of a lack of coverage was a barrier to greater telehealth adoption for several consumer interviewees and may be exacerbated by potential future changes to telehealth reimbursement policy.[18]

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